

Positive Crankcase Ventilation41

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PRECAUTION

PRECAUTIONS

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

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 "SRS AIR BAG" and "SEAT BELT" 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 that 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 "SRS AIR BAG".
- 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.

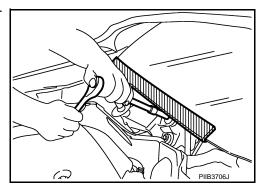
PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag 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 3 minutes before performing any service.

Precaution for Procedure without Cowl Top Cover

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



Precautions For Xenon Headlamp Service

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WARNING:

Comply with the following warnings to prevent any serious accident.

- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)

Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

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CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.
- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

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

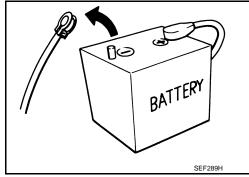
The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:

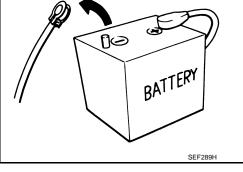
- Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.
- Always connect and lock the connectors securely after work. A loose (unlocked) 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.)
- · 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-5, "Harness Connec-
- 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

- 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.

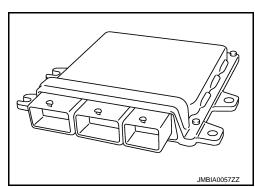


- Never disassemble ECM.
- If a battery cable is disconnected, the memory will return to the ECM value.
 - The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because 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



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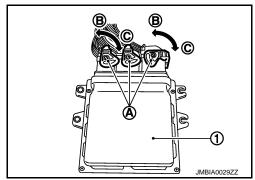
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< PRECAUTION > [VQ37VHR]

 When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.

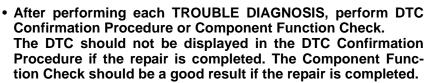
- 1 : ECM
- C: Loosen

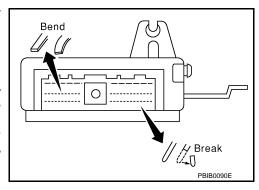


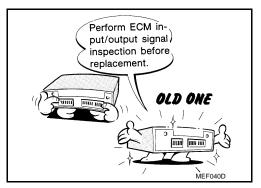
 When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break).
 Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

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.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to <u>EC-83</u>, "<u>Reference Value</u>".
- 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).









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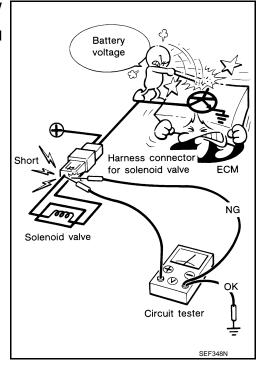
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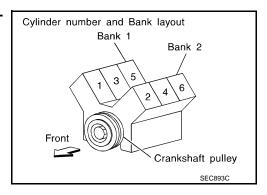
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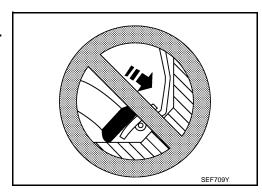
 When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
 Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



- 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.

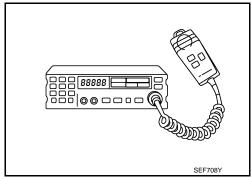


PRECAUTIONS

< PRECAUTION > [VQ37VHR]

 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 > [VQ37VHR]

PREPARATION

PREPARATION

Special Service Tools

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NOTE:

The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

| Tool number (Kent-Moore No.) Tool name | | Description |
|--|--------|----------------------|
| (J-44321) Fuel pressure gauge kit | LEC642 | Checks fuel pressure |

Commercial Service Tools

INFOID:0000000005914040

| Tool name (Kent-Moore No.) | | Description |
|---|---|--|
| Leak detector i.e.: (J-41416) | S-NT703 | 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.: (MLR-8382) | S-NT704 | Checks fuel tank vacuum relief valve opening pressure |
| Socket wrench | 19 mm (0.75 in) More than 32 mm (1.26 in) S-NT705 | Removes and installs engine coolant temperature sensor |

PREPARATION

< PREPARATION > [VQ37VHR]

| Tool name (Kent-Moore No.) | | Description | А |
|---|---------------------------------|--|----|
| Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12) | a Mating surface shave cylinder | Reconditions the exhaust system threads before installing a new oxygen sensor. Use with antiseize 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 Titania Oxygen Sensor | EC |
| Anti-seize lubricant i.e.: (Permatex TM 133AR or equivalent meeting MIL specifica- | | Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads. | D |
| tion MIL-A-907) | S-NT779 | | E |

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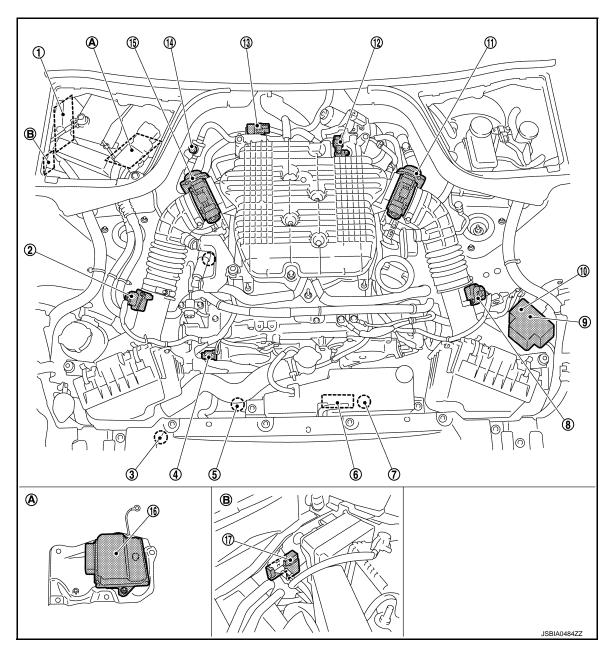
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SYSTEM DESCRIPTION

COMPONENT PARTS ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM: Component Parts Location

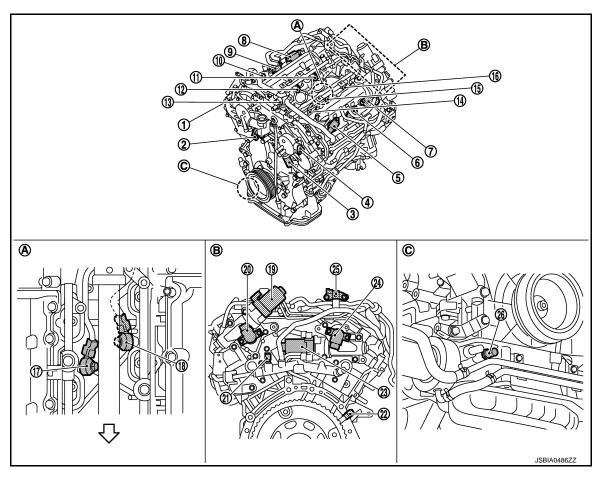
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- 1. IPDM E/R PCS-5, "IPDM E/R: Component Parts Location"
- Camshaft position sensor (PHASE) 5. (bank 1)
- 7. Cooling fan motor-1
- 10. Cooling fan relay
- 13. EVAP canister purge volume control 14. EVAP service port solenoid valve
- Mass air flow sensor (with intake air 3. temperature sensor) (bank 1)
- Cooling fan motor-2
- 8. Mass air flow sensor (bank 2)
- 11. Electric throttle control actuator (bank 2)

- Refrigerant pressure sensor
- Cooling fan control module
- VVEL actuator motor relay
- 12. Manifold absolute pressure (MAP)
- 15. Electric throttle control actuator (bank 1)

- 16. VVEL control module
- A. Under the battery tray (View with upside-down)
- 17. Battery current sensor (with battery temperature sensor)
- B. Body side in battery case



- Camshaft position sensor (PHASE) (bank 1)
- 4. Camshaft position sensor (PHASE) (bank 2)
- 7. Ignition coil (with power transistor) and spark plug (No.6 cylinder)
- Ignition coil (with power transistor) and spark plug (No.1 cylinder)
- 13. Fuel injector (No.1 cylinder)
- 16. Fuel injector (No.6 cylinder)
- 19. VVEL actuator motor (bank 2)
- 22. Crankshaft position sensor (POS)
- 25. EVAP canister purge volume control solenoid valve
- Top view of the engine (View with intake manifold is removed)
- Engine front

- 2. Intake valve timing control solenoid valve (bank 1)
- 5. Ignition coil (with power transistor) and spark plug (No.2 cylinder)
- 8. Ignition coil (with power transistor) and spark plug (No.5 cylinder)
- 11. Fuel injector (No.5 cylinder)
- 14. Fuel injector (No.2 cylinder)
- 17. Knock sensor (bank 1)
- 20. VVEL control shaft position sensor (bank 2)
- 23. VVEL actuator motor (bank 1)
- 26. Engine oil temperature sensor
- B. Rear view of the engine

- Intake valve timing control solenoid valve (bank 2)
- 6. Ignition coil (with power transistor) and spark plug (No.4 cylinder)
- 9. Ignition coil (with power transistor) and spark plug (No.3 cylinder)
- 12. Fuel injector (No.3 cylinder)
- 15. Fuel injector (No.4 cylinder)
- 18. Knock sensor (bank 2)
- 21. Engine coolant temperature sensor
- VVEL control shaft position sensor (bank 1)
- C. Front view of the engine

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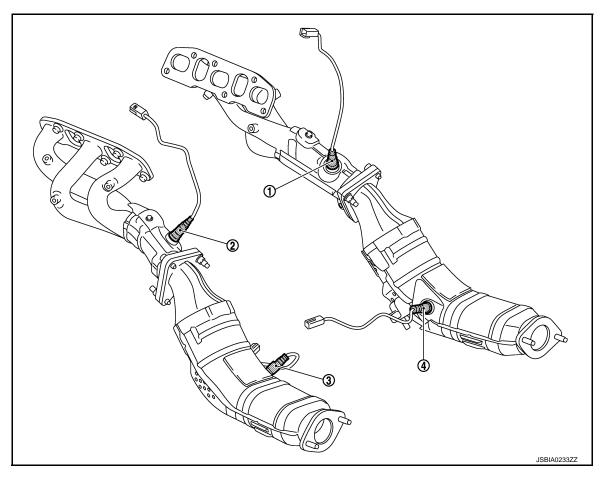
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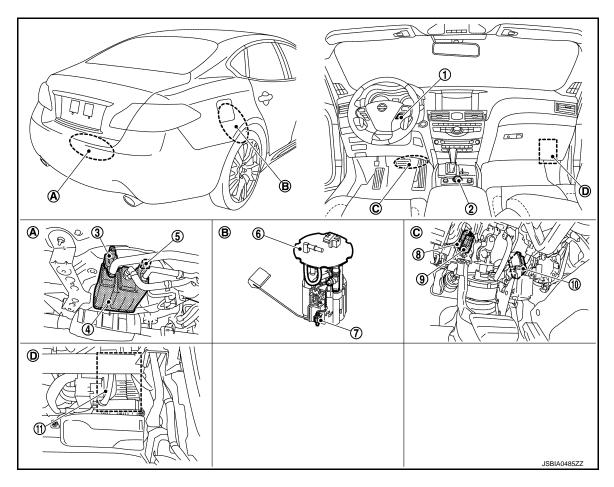
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- 1. A/F sensor 1 (bank 1)
- 2. A/F sensor 1 (bank 2)
- 3. Heated oxygen sensor 2 (bank 2)

4. Heated oxygen sensor 2 (bank 1)



- 1. ASCD steering switch
- 4. EVAP canister
- 7. Fuel tank temperature sensor
- 10. Accelerator pedal position sensor
- A. Under the spare tire housing
- D. Lower right of the glove box
- 2. Drive mode select switch
- 5. EVAP control system pressure sensor
- 8. Stop lamp switch
- 11. ECM
- B. Rear seat (lower right)
- 3. EVAP canister vent control valve
- 6. Fuel level sensor unit and fuel pump
- 9. ASCD brake switch
- C. Around the pedal

ENGINE CONTROL SYSTEM: Component Description

INFOID:0000000005913564

| Component | Reference |
|------------------------------------|---|
| A/F sensor 1 | EC-30, "Air Fuel Ratio Sensor 1" |
| A/F sensor 1 heater | EC-30, "Air Fuel Ratio Sensor 1 Heater" |
| Accelerator pedal position sensor | EC-30, "Accelerator Pedal Position Sensor" |
| ASCD brake switch | EC-454, "Description" |
| ASCD steering switch | EC-31, "ASCD Steering Switch" |
| Battery current sensor | EC-31, "Battery Current Sensor (With Battery Temperature Sensor)" |
| Camshaft position sensor (PHASE) | EC-32, "Camshaft Position Sensor (PHASE)" |
| Cooling fan control module | EC-32, "Cooling Fan" |
| Cooling fan motor | EC-32, "Cooling Fan" |
| Crankshaft position sensor (POS) | EC-33, "Crankshaft Position Sensor (POS)" |
| Electric throttle control actuator | EC-33. "Electric Throttle Control Actuator" |
| Engine coolant temperature sensor | EC-33, "Engine Coolant Temperature Sensor" |

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COMPONENT PARTS

< SYSTEM DESCRIPTION >

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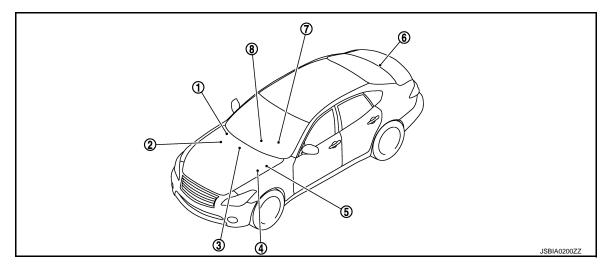
| Component | Reference |
|---|--|
| Engine oil temperature sensor | EC-34, "Engine Oil Temperature Sensor" |
| EVAP canister purge volume control solenoid valve | EC-34, "EVAP Canister Purge Volume Control Solenoid Valve" |
| EVAP canister vent control valve | EC-35, "EVAP Canister Vent Control Valve" |
| EVAP control system pressure sensor | EC-35, "EVAP Control System Pressure Sensor" |
| Fuel injector | EC-35, "Fuel Injector" |
| Fuel level sensor | EC-35, "Fuel Level Sensor" |
| Fuel pump | EC-35, "Fuel Pump" |
| Fuel tank temperature sensor | EC-36, "Fuel Tank Temperature Sensor" |
| Heated oxygen sensor 2 | EC-36, "Heated Oxygen Sensor 2" |
| Heated oxygen sensor 2 heater | EC-36, "Heated Oxygen Sensor 2 Heater" |
| ICC brake switch | EC-37, "ICC Brake Switch" |
| ICC steering switch | EC-38, "ICC Steering Switch" |
| Ignition signal | EC-37, "Ignition Coil" |
| Intake air temperature sensor | EC-37, "Intake Air Temperature Sensor" |
| Intake valve timing control solenoid valve | EC-37, "Intake Valve Timing Control Solenoid Valve" |
| Knock sensor | EC-38, "Knock Sensor" |
| Manifold absolute pressure (MAP) sensor | EC-38, "Manifold Absolute Pressure Sensor" |
| Mass air flow sensor | EC-38, "Mass Air Flow Sensor" |
| PCV valve | EC-41, "Positive Crankcase Ventilation" |
| Power steering pressure sensor | EC-38, "Power Steering Pressure Sensor" |
| Refrigerant pressure sensor | EC-39, "Refrigerant Pressure Sensor" |
| Stop lamp switch | EC-32, "Brake Switch" |
| Throttle control motor | EC-39, "Throttle Control Motor" |
| Throttle control motor relay | EC-39, "Throttle Control Motor Relay" |
| Throttle position sensor | EC-39, "Throttle Position Sensor" |
| VVEL actuator motor | EC-39, "VVEL Actuator Motor" |
| VVEL actuator motor relay | EC-39, "VVEL Actuator Motor Relay" |
| VVEL control module | EC-40, "VVEL Control Module" |
| VVEL control shaft position sensor | EC-40, "VVEL Control Position Sensor" |

Infiniti Drive Mode Selector

[VQ37VHR]

Infiniti Drive Mode Selector: Component Parts Location

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1. A/C auto amp. Refer to HAC-7, "AUTOMATIC AIR **CONDITIONING SYSTEM (WITH** FOREST AIR): Component Parts Location" (WITH FOREST AIR). Refer to HAC-10, "AUTOMATIC AIR **CONDITIONING SYSTEM (WITH-**OUT FOREST AIR): Component Parts Location" (WITHOUT FOREST AIR).

ECM

Refer to EC-24, "ENGINE CONTROL SYSTEM: Component Parts Location".

AV control unit Refer to AV-10, "Component Parts Location" (BASE AUDIO WITHOUT NAVIGATION).

Refer to AV-144, "Component Parts Location" (BOSE AUDIO WITH NAV-IGATION).

Accelerator pedal actuator

Combination meter (Vehicle information display, and ECO drive indicator)

Drive mode select switch

6. ADAS control unit DAS-14, "Component Parts Location".

7. TCM TM-8, "A/T CONTROL SYSTEM: Component Parts Location".

Infiniti Drive Mode Selector: Component Description

INFOID:00000000006034986

| Part name | Description | |
|---|--|--|
| Drive mode select switch | Transmits an ON/OFF state signal of STANDARD, SPORT, ECO, or SNOW mode to the A/C auto amp. | |
| A/C auto amp. | Transmits an input signal (ON/OFF state of each mode) received from the drive mode select switch to the TCM, combination meter, 4WAS main control unit, and ADAS control unit via CAN communication. | |
| AV control unit | Transmits an ECO pedal* reaction force setting signal (Standard/Soft/OFF) to ECM via CAN communication. This signal determines reaction force of the accelerator pedal. | |
| TCM | Transmits a state of a mode received from the A/C auto amp. to ECM. | |
| Receives a ECO mode signal from TCM and controls throttle angle chara and torque. Determines reaction force in accordance with the accelerator pedal operating ECO mode and transmits an ECO pedal* reaction force control signal to the control unit. When receiving the ECO pedal* reaction force setting signal (Soft/OFF) from the AV control unit, ECM updates ECO pedal* reaction force more, ECM sends back the received signal to the AV control unit for confine Controls the ECO drive indicator when in ECO mode. | | |

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| Part name | Description |
|----------------------------|---|
| Combination meter | Indicates a mode state on the vehicle information display, based on a mode state signal received from the A/C auto amp. Turns ON or blinks (with ECO pedal*) the ECO drive indicator according to a request from ECM when in ECO mode. |
| ADAS control unit | Controls accelerator pedal reaction force of the accelerator pedal actuator when in ECO mode, based on an ECO pedal* reaction force control signal received from ECM. |
| Accelerator pedal actuator | Applies reaction force to the accelerator pedal when in ECO mode, based on an accelerator pedal reaction force control signal received from the ADAS control unit. |

^{*:} ECO pedal control is only for vehicles with intelligent pedal (distance control assist).

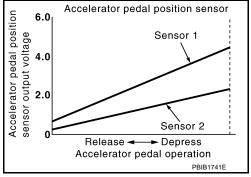
Accelerator Pedal Position Sensor

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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.

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.



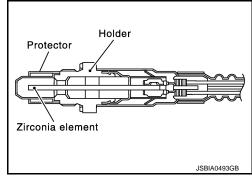
Air Fuel Ratio Sensor 1

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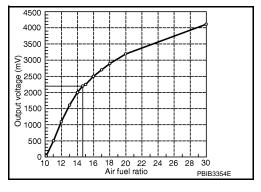
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

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).



Air Fuel Ratio Sensor 1 Heater

SYSTEM DESCRIPTION

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[VQ37VHR]

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| 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 | Air fuel ratio (A/F) sensor 1 heater |
| Mass air flow sensor | Amount of intake air | Tieater control | Tieatei |

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

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-49, "AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description" for the ASCD function.

ASCD Indicator

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.
- SET/COAST 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-49, "AUTÓMATIC SPEED CONTROL DEVICE (ASCD): System Description" for the ASCD function.

ASCD Steering Switch

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

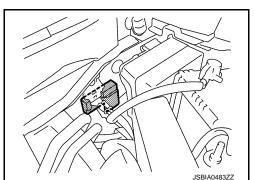
Refer to EC-49, "AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description" for the ASCD function.

Battery Current Sensor (With Battery Temperature Sensor)

OUTLINE

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator.

Based on sensor signals, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-8. "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM: System Description".



CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

BATTERY CURRENT SENSOR

The battery current sensor is installed to the battery negative cable. The sensor measures the charging/discharging current of the battery.

BATTERY TEMPERATURE SENSOR

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< SYSTEM DESCRIPTION >

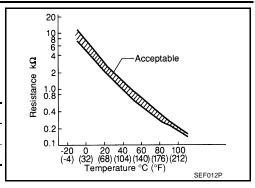
Battery temperature sensor is integrated in battery current sensor. The sensor measures temperature around the battery.

The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

| Ttemperature [°C (°F)] | Voltage* (V) | Resistance ($k\Omega$) |
|------------------------|--------------|--------------------------|
| 25 (77) | 3.333 | 1.9 - 2.1 |
| 90 (194) | 0.969 | 0.222 - 0.258 |

^{*:} These data are reference values and are measured between battery temperature sensor signal terminal and sensor ground.



Brake Switch

Brake 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.

Camshaft Position Sensor (PHASE)

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.

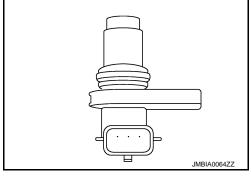
The sensor consists of a permanent magnet and Hall IC.

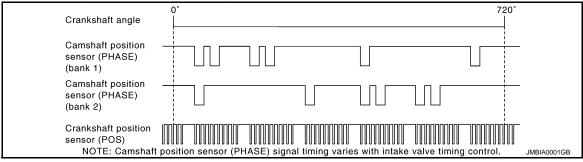
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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.





Cooling Fan

COOLING FAN CONTROL MODULE

Cooling fan control module receives ON/OFF pulse duty signal from IPDM E/R. Corresponding to this ON/OFF pulse duty signal, cooling fan control module sends cooling fan motor operating voltage to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

COOLING FAN MOTOR

Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

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Crankshaft Position Sensor (POS)

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.

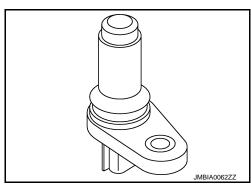
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

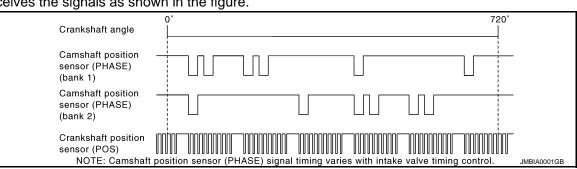
The changing gap causes the magnetic field near the sensor to change.

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.

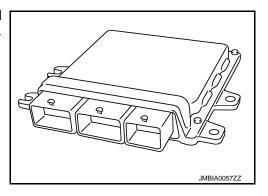
ECM receives the signals as shown in the figure.





ECM (INFOID:000000005913819)

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

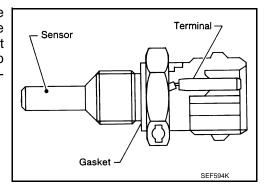
Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.

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

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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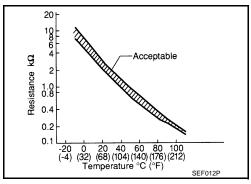
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<Reference data>

| Engine coolant temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|--------------------------------------|--------------|-----------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.37 - 2.63 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

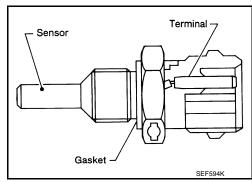
^{*:} These data are reference values and are measured between ECM terminals 71 (Engine coolant temperature sensor) and 84 (Sensor ground).



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Engine Oil Temperature Sensor

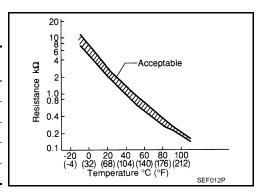
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance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



<Reference data>

| Engine oil 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 |
| 110 (230) | 0.6 | 0.143 - 0.153 |

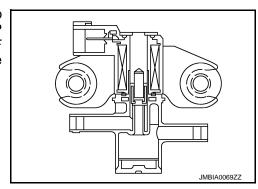
^{*:} These data are reference values and are measured between ECM terminals 78 (Engine oil temperature sensor) and 84 (Sensor ground).



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EVAP Canister Purge Volume Control Solenoid Valve

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.



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EVAP Canister Vent Control Valve

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.

Spring Valve Coil O-ring Plunger Canister side PBIB1263E

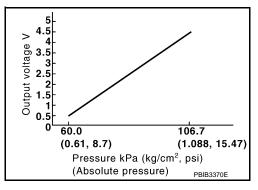
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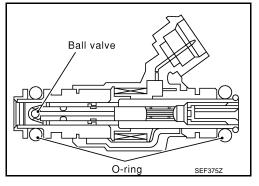
EVAP Control System Pressure Sensor

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

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

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 "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

| 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

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< SYSTEM DESCRIPTION >

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. |

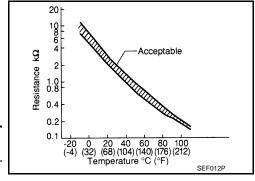
Fuel Tank Temperature Sensor

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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 106 (Fuel tank temperature sensor) and 128 (ECM ground).

Heated Oxygen Sensor 2

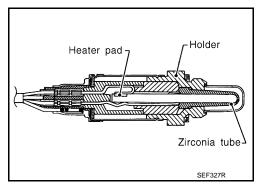
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The heated oxygen sensor 2, after three way catalyst 1, monitors the oxygen level in the exhaust gas on each bank.

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.



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Heated Oxygen Sensor 2 Heater

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

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| Engine speed rpm | Heated oxygen sensor 2 heater |
|---|-------------------------------|
| Above 3,600 | OFF |
| 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 | ON |

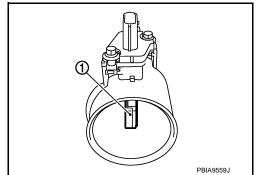
Ignition Coil

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

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.

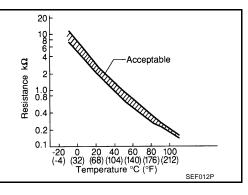
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.



<Reference data>

| Intake air temperature [°C (°F)] | Voltage* (V) | Resistance ($k\Omega$) |
|-------------------------------------|--------------|--------------------------|
| 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 67 (Intake air temperature sensor) and 68 (Sensor ground).



INFOID:0000000005913637

Intake Valve Timing Control Solenoid Valve

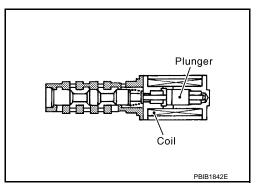
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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.



ICC Brake Switch

When the brake pedal is depressed, ICC 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 CCS-12, "System Description" for the ICC function.

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ICC Steering Switch

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ICC 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 CCS-12, "System Description" for the ICC function.

Knock Sensor

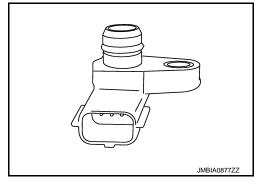
The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.

Manifold Absolute Pressure Sensor

INFOID:0000000005913645

The manifold absolute pressure (MAP) sensor is placed at intake manifold collector. It detects intake manifold pressure and sends the voltage signal to the ECM.

The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.



Malfunction Indicator Lamp

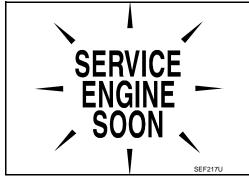
INFOID:0000000005914005

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-61, "Diagnosis Description".

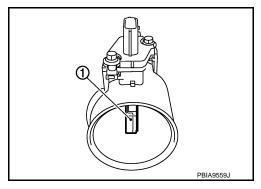


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Mass Air Flow Sensor

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 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.



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Power Steering Pressure Sensor

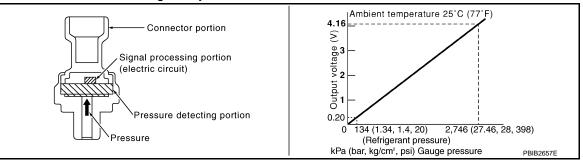
Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load.

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.

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Refrigerant Pressure Sensor

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:0000000005913874

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:0000000005913888

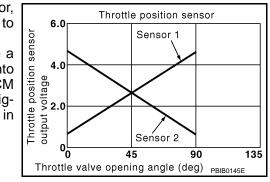
Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the 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:0000000005913861

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.



VVEL Actuator Motor

INFOID:0000000005913841

The VVEL actuator motor rotates the control shaft according to the control signal from the VVEL control module. The VVEL control module judges whether the VVEL actuator motor controls the angle properly by the VVEL control shaft position sensor signal.

VVEL Actuator Motor Relay

INFOID:0000000005913847

Power supply for the VVEL actuator motor is provided to the VVEL control module via VVEL actuator motor relay. VVEL actuator motor relay is ON/OFF controlled by the VVEL control module. In addition, when the VVEL actuator motor relay cannot be controlled by the VVEL control module for some reason, it ON/OFF controlled by ECM.

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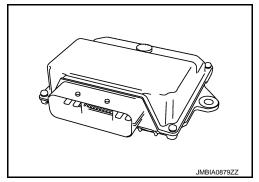
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VVEL Control Module

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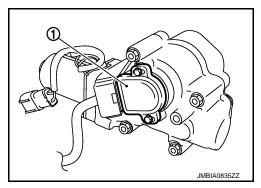
The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.



INFOID:0000000005913837

VVEL Control Position Sensor

VVEL control shaft position sensor (1) is placed on VVEL actuator sub assembly and detects the control shaft position angle. A magnet is pressed into the arm on the edge of control shaft. The magnetic field changes as the magnet rotates together with the arm resulting in the output voltage change of the sensor. VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.



INFOID:0000000006054182

STRUCTURE AND OPERATION

Positive Crankcase Ventilation

A JMBIA1237ZZ

- 1. PCV valve
- A. Normal condition
- ⟨□: Fresh air
- ←: Blow-by air

- 2. Electric throttle control actuator
- B. Hi-load condition
- 3. Mass air flow sensor

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

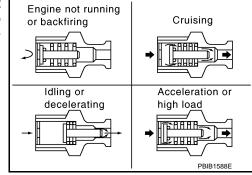
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

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.



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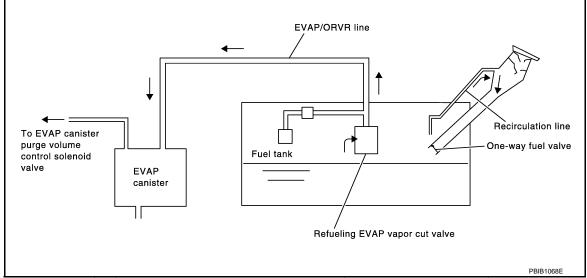
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On Board Refueling Vapor Recovery (ORVR)

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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:

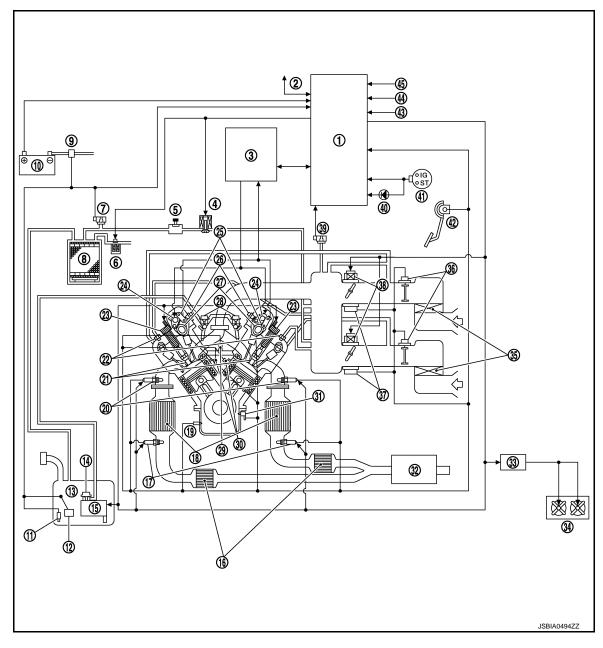
- Before removing fuel line parts, carry out the following procedures:
- Put drained fuel in an explosion-proof container and put lid on securely.
- Release fuel pressure from fuel line. Refer to EC-161, "Work Procedure".
- Disconnect battery ground cable.
- Always replace O-ring when the fuel gauge 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:0000000005913561



- **ECM** 1.
- EVAP canister purge volume control 5. solenoid valve
- EVAP control system pressure sen-7.
- 10. Battery
- 13. Fuel tank
- 16. Three way catalyst 2
- Engine oil temperature sensor 19.
- 22. PCV valve
- 25. VVEL control shaft position sensor

- Can communication
- **EVAP** service port
- 8. **EVAP** canister
- Fuel tank temperature sensor
- Fuel pressure regulator
- Heated oxygen sensor 2
- A/F sensor 1 20.
- Ignition coil (with power transistor) 23.
- 26. Intake valve timing control solenoid valve

- VVEL control module 3.
- EVAP canister vent control valve
- Battery current sensor (with Battery temperature sensor)
- 12. Fuel level sensor
- 15. Fuel pump
- 18. Three way catalyst 1
- 21. Spark plug
- 24. VVEL actuator motor
- 27. Camshaft position sensor (PHASE)

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| 28. | Fuel damper | 29. | Engine coolant temperature sensor | 30. | Knock sensor |
|-----|------------------------------------|-----|-----------------------------------|-----|---|
| 31. | Crankshaft position sensor (POS) | 32. | Muffler | 33. | Cooling fan control module |
| 34. | Cooling fan | 35. | Air cleaner | 36. | Mass air flow sensor (with intake air temperature sensor) |
| 37. | Electric throttle control actuator | 38. | Throttle position sensor | 39. | Manifold absolute pressure (MAP) sensor |
| 40. | MIL | 41. | Ignition switch | 42. | Accelerator pedal position sensor |
| 43. | Power steering pressure sensor | 44. | Refrigerant pressure sensor | 45. | PNP signal |

ENGINE CONTROL SYSTEM: System Description

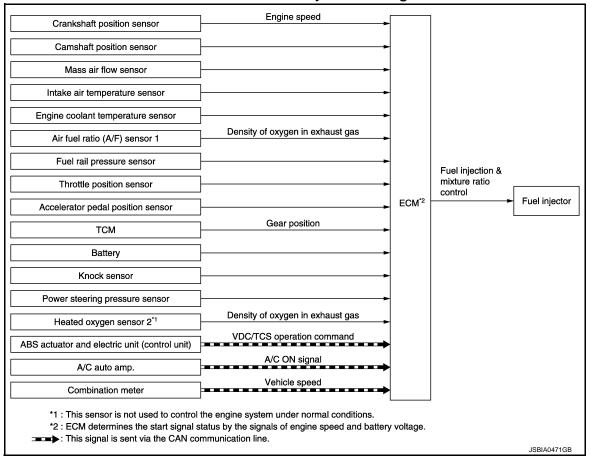
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ECM performs various controls such as fuel injection control and ignition timing control.

MULTIPORT FUEL INJECTION SYSTEM

MULTIPORT FUEL INJECTION SYSTEM: System Diagram

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MULTIPORT FUEL INJECTION SYSTEM : System Description

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INPUT/OUTPUT SIGNAL CHART

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| Sensor | Input Signal to ECM | ECM function | Actuator | |
|--|--|-----------------|---------------|---|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed* ³ Piston position | | | |
| Mass air flow sensor | Amount of intake air | | | E |
| 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 | Fuel injection | | |
| TCM | Gear position | & mixture ratio | Fuel injector | |
| Battery | Battery voltage*3 | control | | |
| 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 command | | | |
| A/C auto amp. | A/C ON signal* ² | | | |
| Combination meter | Vehicle speed*2 | | | |

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

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.

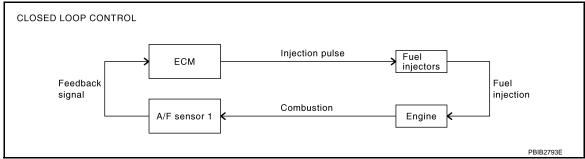
<Fuel increase>

- 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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



^{*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.

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 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-30. "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.

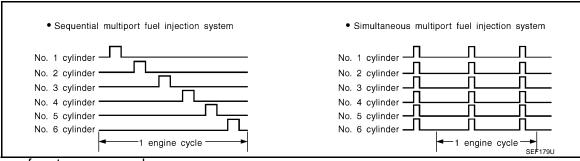
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of "injection pulse duration" to automatically compensate for the difference between the two ratios.

"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

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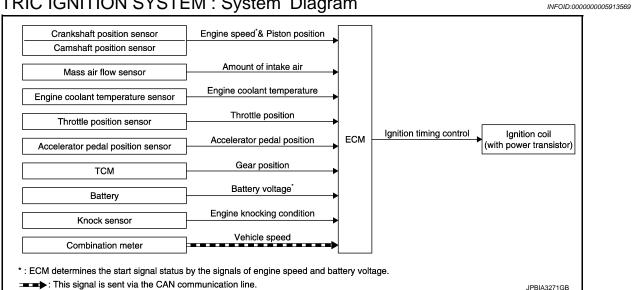
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Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM: System Diagram



ELECTRIC IGNITION SYSTEM: System Description

INPUT/OUTPUT SIGNAL CHART

| Sensor | Sensor Input Signal to ECM | | tion Actuator | |
|-----------------------------------|----------------------------|-----------------|---------------------------------------|--|
| Crankshaft position sensor (POS) | Engine speed*2 | | | |
| Camshaft position sensor (PHASE) | Piston position | | | |
| Mass air flow sensor | Amount of intake air | | Ignition coil (with power transistor) | |
| Engine coolant temperature sensor | Engine coolant temperature | | | |
| Throttle position sensor | Throttle position | Ignition timing | | |
| Accelerator pedal position sensor | Accelerator pedal position | control | | |
| ТСМ | 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.

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

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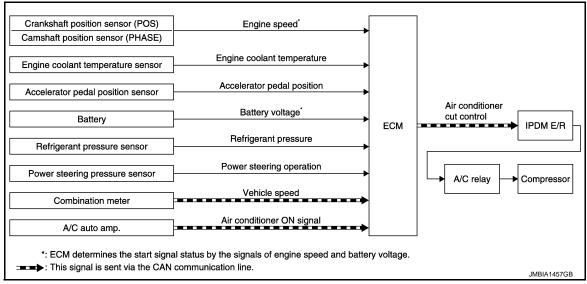
^{*2:} ECM determines the start signal status by the signals of engine speed and battery voltage.

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

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AIR CONDITIONING CUT CONTROL: System Description

INFOID:0000000005913574

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input Signal to ECM | ECM function | Actuator | |
|--|-----------------------------|-----------------|-----------------------------------|--|
| Crankshaft position sensor (POS) Camshaft position sensor (PHASE) | Engine speed*2 | | | |
| Engine coolant temperature sensor | Engine coolant temperature | | IPDM E/R ↓ A/C relay ↓ Compressor | |
| Accelerator pedal position sensor | Accelerator pedal position | | | |
| Battery | Battery voltage*2 | Air conditioner | | |
| Refrigerant pressure sensor | Refrigerant pressure | cut control | | |
| Power steering pressure sensor | Power steering operation | | | |
| Combination meter | Vehicle speed*1 | | | |
| A/C auto amp. | Air conditioner ON signal*1 | | | |

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

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)

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

AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Diagram

INFOID:0000000005913577 ASCD brake switch ASCD vehicle Stop lamp switch speed control Electric throttle control actuator ASCD steering switch ECM ASCD status Park/neutral position signal Combination meter TCM Output shaft revolution signal Vehicle speed signal Combination meter : This signal is sent via the CAN communication line.

AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description

INFOID:0000000005913578

JPBIA3272GB

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | |
|----------------------------------|---------------------------------|--|---|--|
| ASCD brake switch | Brake pedal operation | | | |
| Stop lamp switch | Brake pedal operation | ASCD vehicle speed control | Electric throttle control actua- tor | |
| ASCD steering switch | ASCD steering switch operation | | | |
| TCM | Park/neutral position signal | | | |
| TCIVI | Output shaft revolution signal* | naft revolution signal* ASCD status 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 SET/COAST switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

If the RESUME/ACCELERATE 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, R position
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed

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• 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 SET/COAST switch or RESUME/ACCELERATE 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 SET/COAST 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 RESUME/ACCELERATE 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
- A/T 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

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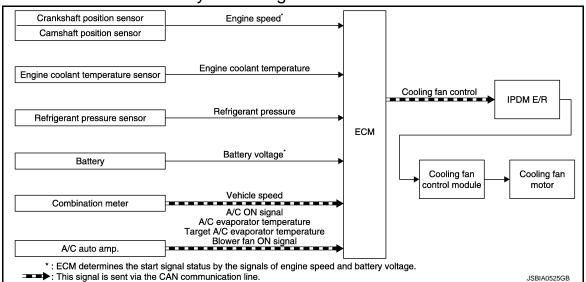
CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information 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 <u>LAN-16</u>, "<u>CAN COMMUNICATION SYSTEM</u>: <u>CAN Communication Control Circuit</u>", about CAN communication for detail.

COOLING FAN CONTROL

COOLING FAN CONTROL: System Diagram

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COOLING FAN CONTROL: System Description

INFOID:0000000005913583

INPUT/OUTPUT SIGNAL CHART

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

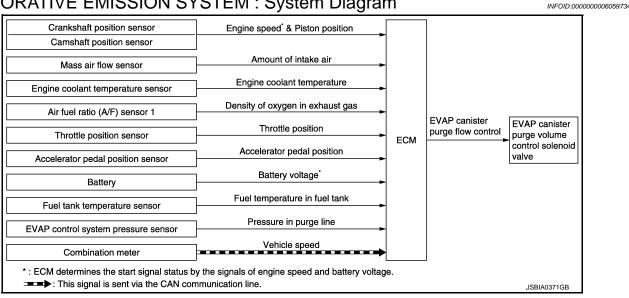
^{*1:} The ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, air conditioner ON signal, refrigerant pressure, target A/C evaporator temperature and A/C evaporator temperature. Cooling fan control signal is sent to IPDM E/R from ECM by CAN communication line. Then, IPDM E/R sends ON/OFF pulse duty signal to cooling fan control module. Corresponding to this ON/OFF pulse duty signal, cooling fan control module gives cooling fan motor operating voltage to cooling fan motors. Cooling fan speed is controlled by duty cycle of cooling fan motor operating voltage sent from cooling fan control module.

EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM: System Diagram



EVAPORATIVE EMISSION SYSTEM: System Description

INPUT/OUTPUT SIGNAL CHART

EC-51 Revision: 2010 June 2011 M37/M56

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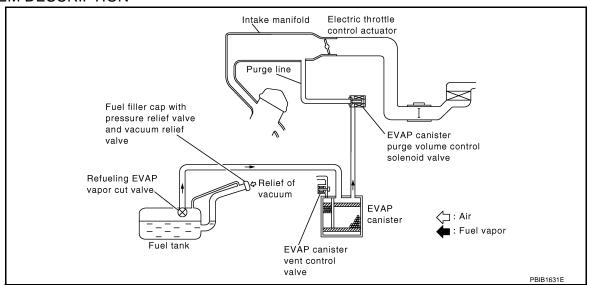
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^{*2:} This signal is sent to ECM via the CAN communication line.

| Sensor | Input signal to ECM | ECM function | Actuator | |
|--|--|----------------------------------|---|--|
| Crankshaft position sensor Camshaft position sensor | Engine speed*1 | | | |
| Mass air flow sensor | Amount of intake air | | | |
| Engine coolant temperature sensor | Engine coolant temperature | | EVAP canister purge volume control solenoid valve | |
| Battery | Battery voltage*1 | | | |
| Throttle position sensor | Throttle position | EVAP canister purge flow control | | |
| 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* ² | | | |

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

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

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

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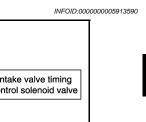
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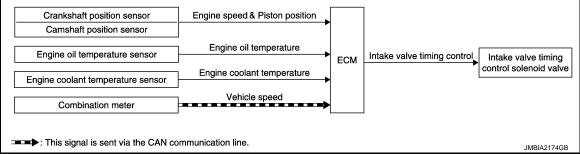
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INTAKE VALVE TIMING CONTROL : System Diagram





INTAKE VALVE TIMING CONTROL: System Description

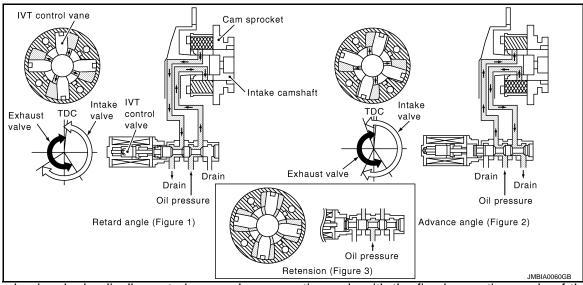
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INPUT/OUTPUT SIGNAL CHART

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

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

SYSTEM DESCRIPTION



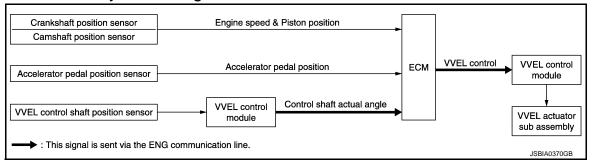
This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

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.

VVEL SYSTEM

VVEL SYSTEM: System Diagram

INFOID:0000000006115720



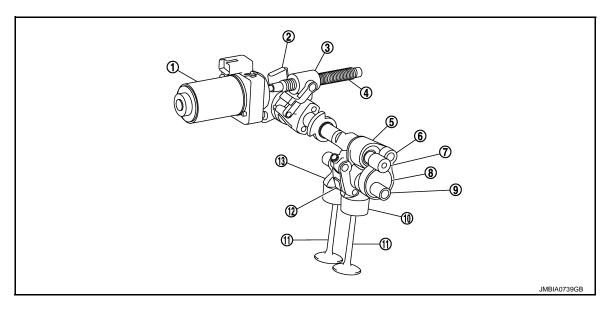
VVEL SYSTEM: System Description

INFOID:0000000006115721

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | |
|--|----------------------------------|--------------|----------------------------|--|
| Camshaft position sensor Crankshaft position sensor | Engine speed and piston position | | | |
| Accelerator pedal position sensor | Accelerator pedal position | VVEL control | VVEL control module ↓ | |
| VVEL control shaft position sensor ↓ VVEL control module | Control shaft actual angle | | VVEL actuator sub assembly | |

SYSTEM DESCRIPTION



- VVEL actuator motor
- 4. Ball screw shaft
- 7. Control shaft
- 10. Valve lifter
- 13. Output cam

- 2. VVEL control shaft position sensor
- 5. Rocker arm
- 8. Eccentric cam
- Intake valve

- 3. Ball screw nut
- 6. Link A
- 9. Drive shaft
- 12. Link B

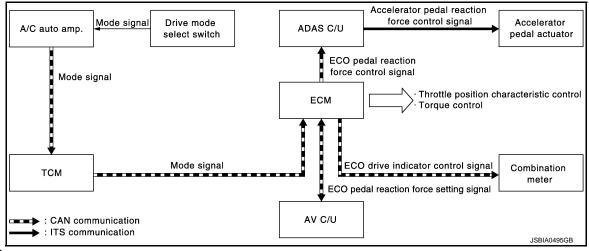
VVEL (Variable Valve Event & Lift) is a system that controls valve event and valve lift continuously. Rotational movement of the drive shaft equipped with eccentric cam is transmitted to output cam via the rocker arm and two kinds of links to depress the intake valve. ECM decides the target valve lift according to the driving condition and sends the command signal to the VVEL control module. The VVEL control module controls the rotation of the control shaft using the VVEL actuator motor and changes the movement of the output cam by shifting the link supporting point. As a result, valve lift changes continuously to improve engine output and response.

Infiniti Drive Mode Selector

Infiniti Drive Mode Selector: System Description

INFOID:0000000006035042

System Diagram



NOTE:

- This section provides descriptions only about the control by ECM. For overall control, refer to DMS-5, "Infiniti Drive Mode Selector: System Description".
- ECO pedal control is only for vehicles with intelligent pedal (distance control assist).

Infiniti drive mode selector

- A/C auto amp. receives an operation state signal of the drive mode select switch and transmits a mode signal (see below) to TCM via CAN communication.
- STANDARD: ON/OFF
- SPORT: ON/OFF
- ECO: ON/OFF
- SNOW: ON/OFF
- TCM transmits a mode state signal to ECM via CAN communication, based on a ECO mode signal received from the A/C auto amp.
- ECM controls throttle angle characteristics and torque appropriate to each mode, based on a ECO mode signal received from TCM via CAN communication.
- The combination meter turns ON or blinks (with ECO pedal) the ECO drive indicator when in ECO mode, based on a ECO drive indicator control signal received from ECM via CAN communication.

ECO pedal control

 The AV control unit transmits an ECO pedal reaction force setting signal (Standard/Soft/OFF) to ECM via CAN communication.

NOTE:

An ECO pedal reaction force setting signal which determines reaction force of the accelerator pedal can be selected on the settings screen of the Multi AV system.

- ECM transmits an ECO pedal reaction force control signal to the ADAS control unit via CAN communication, based on a ECO mode signal received from TCM via CAN communication and an ECO pedal reaction force setting signal received from the AV control unit via CAN communication.
- ECM sends back an ECO pedal reaction force setting signal received from the AV control unit to the AV control unit for confirmation.
- The ADAS control unit controls pedal reaction force of the accelerator pedal actuator via ITS communication, based on an ECO pedal reaction force control signal received from the ADAS control unit.

Control

- With the drive mode selector, a drive mode select switch installed at the top of the center console switches a
 vehicle drive mode, changes throttle angle characteristics, and controls torque and ECO pedal.
- Vehicle characteristics are controlled in the following modes, on the basis of STANDARD mode ("●" position
 of the drive mode select switch).
- SPORT: Changing throttle angle characteristics allows to use a high engine performance range and increases driving performance.

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- ECO: Changing throttle angle characteristics and controlling torque, ECO drive indicator, and ECO pedal enhance fuel economy in actual traffic.
- SNOW: Changing throttle angle characteristics enhances driving performance on roads with a low coefficient of friction.

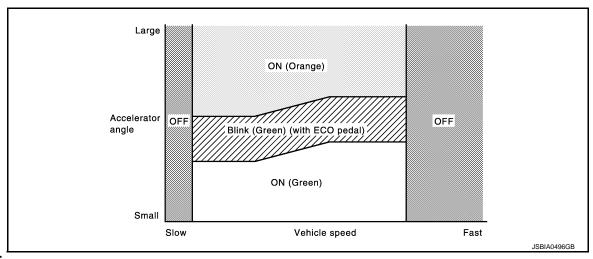
| Control item | Vel | Vehicle drive mode | | Description |
|-------------------------|-------|--------------------|------|--|
| Control item | SPORT | ECO | SNOW | Description |
| Engine | × | × | × | Changes throttle angle and controls torque ^{*1} and the ECO drive indicator ^{*1} . |
| ECO pedal ^{*2} | | × | | Controls ECO pedal (Accelerator pedal reaction force control). |

^{*1:} Torque control and the ECO drive indicator is available only when in ECO mode.

ECO drive indicator control

- ECO drive indicator turns ON or blinks (with ECO pedal) when in ECO mode, according to the operation of the accelerator pedal.
- For vehicles with ECO pedal, the blinking timing of the ECO drive indicator (green) synchronizes to the generation timing of ECO pedal reaction force.

| ECO drive indicator | Driving condition | | | | | |
|--|---|--|--|--|--|--|
| ON (Green) | Within the ECO drive range. | | | | | |
| Blink (Green) (if so equipped ECO pedal) | Likely over the ECO drive range. | | | | | |
| ON (Orange) | Over the ECO drive range. | | | | | |
| OFF | Low-speed range [approx. 3 MPH (4.8 km/h) or less] and high-speed range [approx. 90 MPH (144 km/h) or more] | | | | | |



NOTE:

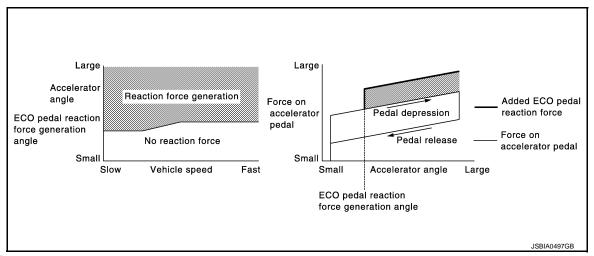
ECO drive indicator turns OFF under the following conditions.

- Intelligent cruise control in operation.
- Selector lever is in R range.

ECO pedal control

- Increasing reaction force of the accelerator pedal supports ECO driving in accordance with the accelerator pedal operation when in ECO mode.
- The level of reaction force to the accelerator pedal can be changed among Standard/Soft/OFF on the navigation screen. ECO pedal reaction force can be turned OFF even when in ECO mode.
- The generation timing of ECO pedal reaction force synchronizes to the blinking timing of the ECO drive indicator (Green).

^{*2:} ECO pedal control is only for vehicles with an intelligent pedal (distance control assist).



NOTE:

- When switching from ECO mode to the other mode by operating the drive mode select switch, ECO pedal reaction force is generated in common with ECO mode until the accelerator pedal is released.
- ECO pedal reaction force is not generated under the following conditions.
- Intelligent cruise control is in operation.
- Accelerator pedal is depressed quickly.
- Selector lever is in N or R range.

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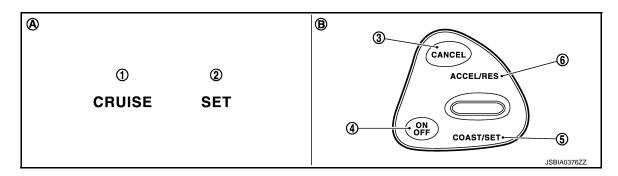
OPERATION

AUTMATIC SPEED CONTROL DEVICE (ASCD)

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

INFOID:0000000006118907

SWITCHES AND INDICATORS



- 1. CRUISE indicator
- 2. SET indicator
- 5. COAST/SET switch
- 3. CANCEL switch
- ACCEL/RES switch (ACCELERATE/RESUME)

- A. On the combination meter (Information display)
- B. On the steering wheel

ASCD MAIN switch

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. |
| RES / + switch (RESUME/ACCELERATE) | Resumes the set speed. Increases speed incrementally during cruise control driving. |
| SET / – switch (SET/COAST) | 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 SET/COAST switch or RESUME/ACCELERATE switch.

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

OPERATION

< SYSTEM DESCRIPTION >

[VQ37VHR]

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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HANDLING PRECAUTION

< SYSTEM DESCRIPTION >

[VQ37VHR]

HANDLING PRECAUTION

Infiniti Drive Mode Selector

INFOID:0000000006035044

ECO DRIVE INDICATOR LAMP CONTROL

- ECO drive indicator turns OFF under the following conditions.
- While driving at low speeds [3 MPH (4.8 km/h) or less] or high speeds [90 MPH (144 km/h) or more].
- Intelligent cruise control is in operation.
- Selector lever is in R range.

ECO PEDAL CONTROL

- When switching from ECO mode to the other mode by operating the drive mode select switch, ECO pedal reaction force is generated in common with ECO mode until the accelerator pedal is released.
- ECO pedal reaction force is not generated under the following conditions.
- Intelligent cruise control is in operation.
- Accelerator pedal is depressed quickly.
- Selector lever is in N or R range.
- ECO pedal reaction force setting is OFF.

NOTF:

ECO pedal control is only for vehicles with an intelligent pedal (distance control assist).

ENGINE OUTPUT CHARACTERISTICS AFTER SWITCHING MODE

- Engine output characteristics after switching mode by operating the drive mode select switch are as follows.
- After switching mode to a mode that engine output increase, engine output characteristics are changed by releasing the accelerator pedal.
- After switching mode to a mode that engine output decreases, engine output characteristics are changed immediately.
- When an accelerator angle is constant, engine output characteristics are as follows.
- SPORT > STANDARD > ECO > SNOW

Output characteristics of each mode

| Control mode | Engine output |
|--------------|---|
| SPORT | Increase |
| STANDARD | Normal |
| ECO | Decrease |
| SNOW | Decrease (More reduction than ECO mode) |

ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION > [VQ37VHR]

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

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)

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-46. "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

VFOID:0000000006062288

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

| | | М | IL | | D. | TC | 1st trip DTC | | |
|---|-----------------|------------|----------|------------|------------|------------|--------------|------------------------|--|
| Items | 1s ⁻ | t trip | 2nd | d trip | 1st trip | 2nd trip | 1st trip | 2nd trip displaying | |
| | Blinking | Illuminate | Blinking | Illuminate | displaying | displaying | displaying | | |
| 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-639, "DTC_Index".) | _ | × | _ | _ | × | _ | _ | _ | |
| Except above | _ | _ | _ | × | _ | × | × | _ | |

DIAGNOSIS DESCRIPTION: DTC and Freeze Frame Data

INFOID:00000000006062289

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 <u>EC-102, "DTC Index"</u>. 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-III.

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-142, "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-III or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-III screen.

< SYSTEM DESCRIPTION >

[VQ37VHR]

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.

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| 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 da | ata | | | | | | |

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

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-III 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"

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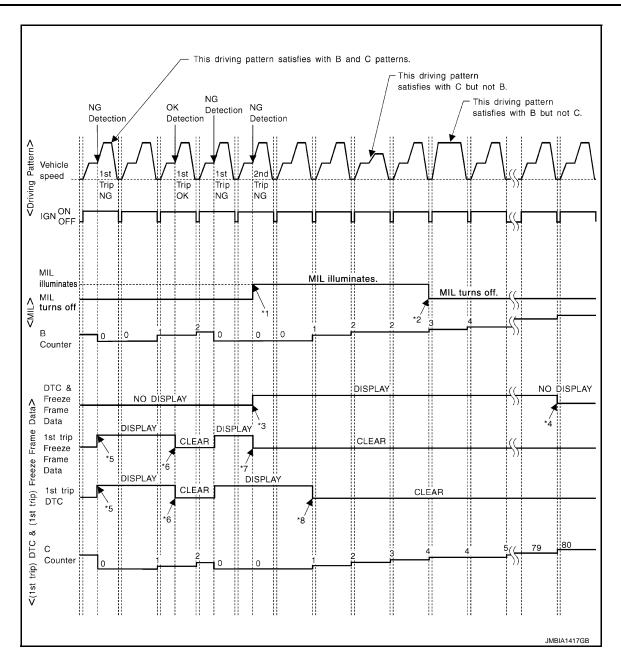
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Revision: 2010 June **EC-63** 2011 M37/M56



- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *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.)
- *7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- *2: MIL will turn OFF after vehicle is driv- *3: When the same malfunction is deen 3 times (pattern B) without any malfunctions.
- *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.
- *8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.
- tected in two consecutive trips, the DTC and the 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.

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

Driving pattern B means the vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION > [VQ37VHR]

The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.

- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will turn OFF when the B counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

<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) x (1±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).

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"

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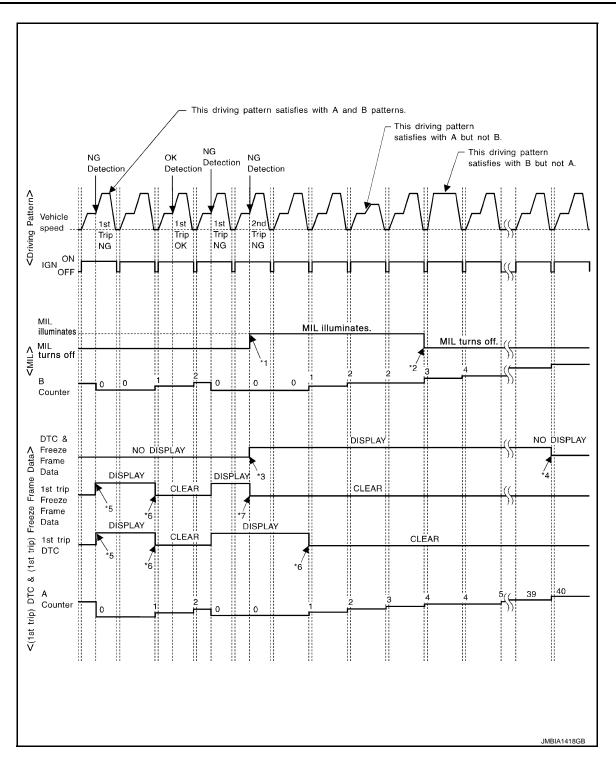
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- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- en 3 times (pattern B) without any malfunctions.
- *2: MIL will turn OFF after vehicle is driv- *3: When the same malfunction is detected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

DIAGNOSIS SYSTEM (ECM)

< SYSTEM DESCRIPTION >

[VQ37VHR]

- *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.)
- *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: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

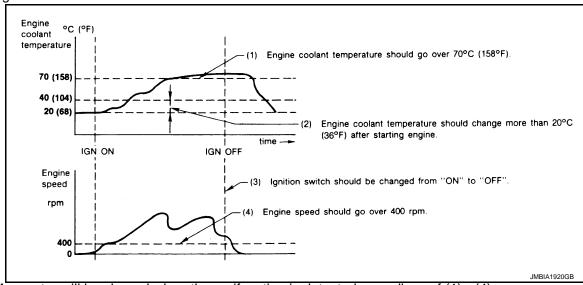
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*7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

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

<Driving Pattern A>



• The A counter will be cleared when the malfunction is detected regardless of (1) - (4).

• The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.

• The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means operating vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will turn OFF when the B counter reaches 3 (*2 in OBD SYSTEM OPERATION CHART).

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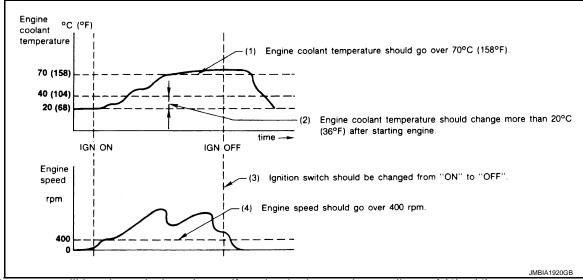
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DIAGNOSIS DESCRIPTION: Driving Pattern

INFOID:000000000606229

DRIVING PATTERN A



- The A counter will be cleared when the malfunction is detected regardless of (1) (4).
- The A counter will be counted up when (1) (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

DRIVING PATTERN B

Driving pattern B means operating vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will turn OFF when the B counter reaches 3.

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) x (1±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).
- 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.

DIAGNOSIS DESCRIPTION: System Readiness Test (SRT) Code

INFOID:00000000006062292

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.

| | | | | Example | | | | | | |
|---------------|-------------|-------------------|--|---------|--------------|--------------------------|--|--|--|--|
| Self-diagno | osis result | Diagnosis | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | | | | | | | |
| 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 | ОК | _ | _ | | | | |
| | | P0402 | _ | _ | _ | _ | | | | |
| | | P1402 | NG | _ | NG | NG (Consecutiv 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.

When all SRT related self-diagnoses show OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate "CMPLT". \rightarrow 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. \rightarrow Case 2 above

If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT". \rightarrow 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".

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^{-:} Self-diagnosis is not carried out.

DIAGNOSIS DESCRIPTION: Malfunction Indicator Lamp (MIL)

INFOID:0000000006062293

SERVICE

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.

 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-516, "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:0000000006062294

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 <u>EC-150, "Description"</u> . |
| Throttle valve closed position learning | ECM can learn the throttle valve closed position. Refer to EC-150, "Description". |
| Idle air volume learning | ECM can learn the idle air volume. Refer to EC-152, "Description". |
| VVEL control shaft position sensor adjustment | The initial position of the VVEL control shaft position sensor can be adjusted. Refer to EC-154, "Description". |

BLUB CHECK MODE

Description

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

Operation Procedure

- Turn ignition switch ON.
- 2. The MIL on the instrument panel should stay ON.

 If it remains OFF, check MIL circuit. Refer to EC-516, "Diagnosis Procedure".

SRT STATUS MODE

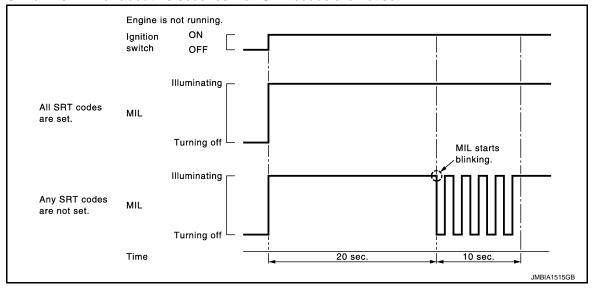
Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to EC-68, "DIAGNOSIS DESCRIPTION: System Readiness Test (SRT) Code".

Operation Procedure

- 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.

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

- Turn ignition switch ON.
- Check that MIL illuminates. If it remains OFF, check MIL circuit. Refer to EC-516, "Diagnosis Procedure".
- 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
 - 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.
- Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 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.

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

EC-71 Revision: 2010 June 2011 M37/M56

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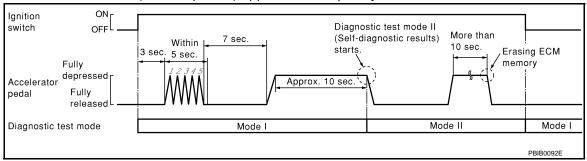
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NOTE:

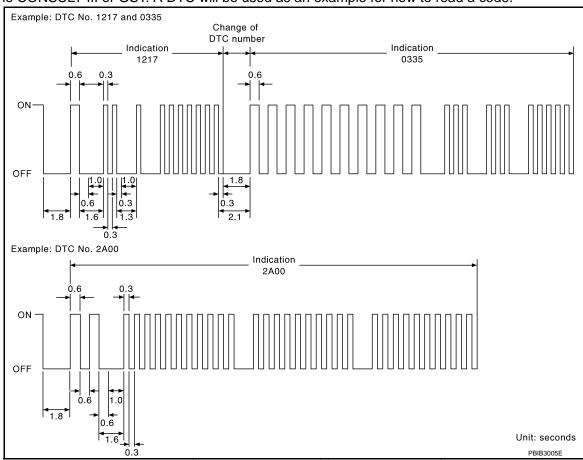
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



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-III 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 | Α | В | С | D | Е | 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.

< SYSTEM DESCRIPTION >

[VQ37VHR]

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to <u>EC-102</u>, "<u>DTC Index</u>".

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.
- 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-III Function

INFOID:0000000006066591

FUNCTION

| Diagnostic test mode | Function | |
|--------------------------------|---|--|
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-III unit. | |
| Self-diagnostic results | 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. | |
| CAN diagnostic support monitor | The results of transmit/receive diagnosis of CAN communication can be read. | |
| Active test | Diagnostic Test Mode in which CONSULT-III drives some actuators apart from the ECMs and also shifts some parameters in a specified range. | |
| DTC & SRT confirmation | The status of system monitoring tests and the self-diagnosis status/results can be confirmed. | |
| Function test | This mode is used to inform customers when their vehicle requires periodic maintenance. | |
| ECU part number | ECM part number can be read. | |

- *: 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

WORK SUPPORT MODE

Work Item

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| WORK ITEM | CONDITION | USAGE |
|-----------------------|---|---|
| IDLE AIR VOL LEARN | 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. IGN SW ON ENGINE NOT RUNNING AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM FUEL TANK TEMP. 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-III WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. NOTE: WHEN STARTING ENGINE, CONSULT-III MAY DISPLAY "BATTERY VOLTAGE IS LOW. CHARGE BATTERY", EVEN WHEN USING A CHARGED BATTERY. | When detecting EVAP vapor leak in the EVAP system |
| FUEL PRESSURE RELEASE | FUEL PUMP WILL STOP BY TOUCHING "START" DUR- ING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS. | When releasing fuel pressure from fuel line |
| SELF-LEARNING CONT | THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEF- FICIENT. | When clearing mixture ratio self- learning value |
| TARGET IDLE RPM ADJ* | IDLE CONDITION | When setting target idle speed |
| TARGET IGN TIM ADJ* | IDLE CONDITION | When adjusting target ignition timing |
| VIN REGISTRATION | IN THIS MODE, VIN IS REGISTERED IN ECM. | When registering VIN in ECM |
| VVEL POS SEN ADJ PREP | USE THIS ITEM ONLY WHEN REPLACING VVEL ACTUATOR SUB ASSEMBLY. IGNITION ON AND ENGINE STOPPED. | When adjusting VVEL control shaft position sensor |

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-102, "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:

- 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-102), skip step 1.
- 1. Erase DTC in TCM. Refer to TM-56, "Diagnosis Description".
- 2. Select "ENGINE" with CONSULT-III.
- Select "SELF-DIAG RESULTS".
- 4. Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

[VQ37VHR]

| Freeze frame data item* | Description | А |
|---------------------------------|---|-----|
| DIAG TROUBLE CODE [PXXXX] | The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to EC-102, "DTC Index".) | EC |
| 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. | С |
| 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. | D |
| 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. | Е |
| 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 | F |
| 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 | G |
| 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. | - H |
| 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 enleanment) 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 | I |
| INT MANI PRES [kPa] | | J |
| COMBUST CONDI- TION | These items are displayed but are not applicable to this model. | 3 |

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

DATA MONITOR MODE

Monitored Item

x: Applicable

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| Monitored item | Unit | Description | Remarks |
|----------------|------|--|---|
| ENG SPEED | rpm | Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE). | 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 | | · · · · · · · · · · · · · · · · · · | When the engine is stopped, a certain |
| MAS A/F SE-B2 | V | The signal voltage of the mass air flow sensor is displayed. | value is indicated.When engine is running, specification range is indicated in "SPEC". |
| B/FUEL SCHDL | msec | "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B1 | | | When the engine is stopped, a certain value is indicated. |
| A/F ALPHA-B2 | % | The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated. | 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". |

| Monitored item | Unit | Description | Remarks |
|---------------------------------|-------------|---|--|
| COOLAN TEMP/S | °C or °F | The engine coolant temperature (determined by the signal voltage of the engine coolant tempera- ture sensor) is displayed. | When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The en- gine coolant temperature determined by the ECM is displayed. |
| A/F SEN1 (B1) | V | The A/F signal computed from the input signal of | |
| A/F SEN1 (B2) | V | the air fuel ratio (A/F) sensor 1 is displayed. | |
| HO2S2 (B1) | V | The signal voltage of the heated oxygen sensor 2 | |
| HO2S2 (B2) | V | is displayed. | |
| HO2S2 MNTR (B1) HO2S2 MNTR (B2) | RICH/LEAN | 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. | When the engine is stopped, a certain value is indicated. |
| VHCL SPEED SE | km/h or mph | The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed. | |
| BATTERY VOLT | V | The power supply voltage of ECM is displayed. | |
| ACCEL SEN 1 | | The accelerator pedal position sensor signal volt- | ACCEL SEN 2 signal is converted by |
| ACCEL SEN 2 | V | age is displayed. | ECM internally. Thus, they differs from ECM terminal voltage signal. |
| TP SEN 1-B1 | | The throttle position sensor signal voltage is dis- | TP SEN 2-B1 signal is converted by |
| TP SEN 2-B1 | V | played. | ECM internally. Thus, they differs from ECM terminal voltage signal. |
| FUEL T/TMP SE | °C or °F | The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed. | |
| INT/A TEMP SE | °C or °F | The intake air temperature (determined by the signal voltage of the intake air temperature sen- sor) is indicated. | |
| EVAP SYS PRES | V | The signal voltage of EVAP control system pressure sensor is displayed. | |
| FUEL LEVEL SE | V | The signal voltage of the fuel level sensor is displayed. | |
| START SIGNAL | ON/OFF | Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. | After starting the engine, [OFF] is dis- played regardless of the starter sig- nal. |
| CLSD THL POS | ON/OFF | Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. | |
| AIR COND SIG | ON/OFF | Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| P/N POSI SW | ON/OFF | Indicates [ON/OFF] condition from the park/neutral position (PNP) signal. | |
| PW/ST SIGNAL | ON/OFF | [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 | 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 | Indicates [ON/OFF] condition from ignition switch signal. | |

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|----------------|-------------|---|--|
| HEATER FAN SW | ON/OFF | Indicates [ON/OFF] condition from the heater fan switch signal. | |
| BOOST VCUM SW | ON/OFF | Always a certain value is displayed.This item is not efficient for Y51 models. | |
| BRAKE SW | ON/OFF | Indicates [ON/OFF] condition from the stop lamp switch signal. | |
| INJ PULSE-B1 | | Indicates the actual fuel injection pulse width | When the engine is stopped, a certain |
| INJ PULSE-B2 | msec | compensated by ECM according to the input signals. | computed value is indicated. |
| IGN TIMING | BTDC | Indicates the ignition timing computed by ECM according to the input signals. | When the engine is stopped, a certain value is indicated. |
| CAL/LD VALUE | % | "Calculated load value" indicates the value of the current air flow divided by peak air flow. | |
| MASS AIRFLOW | g/s | Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor. | |
| PURG VOL C/V | % | 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) | 204 | Indicates [°CA] of intake camshaft advance an- | |
| INT/V TIM (B2) | °CA | gle. | |
| INT/V SOL (B1) | | The control value of the intake valve timing con- | |
| INT/V SOL (B2) | % | trol solenoid valve (determined by ECM according to the input signals) is indicated. The advance angle becomes larger as the value increases. | |
| TP SEN 1-B2 | | The throttle position sensor signal voltage is dis- | TP SEN 2-B2 signal is converted by |
| TP SEN 2-B2 | V | played. | ECM internally. Thus, they differs from ECM terminal voltage signal. |
| AIR COND RLY | ON/OFF | The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. | |
| FUEL PUMP RLY | ON/OFF | Indicates the fuel pump relay control condition determined by ECM according to the input sig- nals. | |
| VENT CONT/V | ON/OFF | 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 | Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. | |
| HO2S2 HTR (B1) | _ | Indicates [ON/OFF] condition of heated oxygen | |
| HO2S2 HTR (B2) | ON/OFF | sensor 2 heater determined by ECM according to the input signals. | |
| I/P PULLY SPD | rpm | Indicates the engine speed computed from the in- put speed sensor signal. | |
| VEHICLE SPEED | km/h or mph | The vehicle speed computed from the vehicle speed signal sent from TCM is displayed. | |

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|-----------------|-------------|--|---------|
| IDL A/V LEARN | YET/CMPLT | 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. | |
| SNOW MODE SW | ON/OFF | Indicates [ON/OFF] condition from snow mode switch signal. | |
| ENG OIL TEMP | °C or °F | The engine oil temperature (determined by the signal voltage of the engine oil temperature sen- sor) is displayed. | |
| TRVL AFTER MIL | km or mile | Distance traveled while MIL is activated. | |
| A/F S1 HTR (B1) | | Air fuel ratio (A/F) sensor 1 heater control value | |
| A/F S1 HTR (B2) | % | computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. | |
| AC PRESS SEN | V | The signal voltage from the refrigerant pressure sensor is displayed. | |
| VHCL SPEED SE | km/h or mph | The vehicle speed computed from the vehicle speed signal sent from combination meter is dis- played. | |
| MAIN SW | ON/OFF | Indicates [ON/OFF] condition from MAIN switch signal. | |
| CANCEL SW | ON/OFF | Indicates [ON/OFF] condition from CANCEL switch signal. | |
| RESUME/ACC SW | ON/OFF | Indicates [ON/OFF] condition from RESUME/AC- CELERATE switch signal. | |
| SET SW | ON/OFF | Indicates [ON/OFF] condition from SET/COAST switch signal. | |
| BRAKE SW1 | ON/OFF | Indicates [ON/OFF] condition from ASCD brake switch signal. | |
| BRAKE SW2 | ON/OFF | Indicates [ON/OFF] condition of stop lamp switch signal. | |
| DIST SW | ON/OFF | Indicates [ON/OFF] condition from DISTANCE switch signal. | |
| CRUISE LAMP | ON/OFF | Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals. | |
| BAT CUR SEN | mV | The signal voltage of battery current sensor is displayed. | |
| ALT DUTY SIG | ON/OFF | The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive. | |
| A/F ADJ-B1 | | Indicates the correction of factor stored in ECM. | |
| A/F ADJ-B2 | _ | The factor is calculated from the difference be- tween the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 sig- nal. | |
| FAN DUTY | % | Indicates a command value for cooling fan. The value is calculated by ECM based on input signals. | |

< SYSTEM DESCRIPTION >

[VQ37VHR]

| Monitored item | Unit | Description | Remarks | Λ |
|--|------------------|--|---------|--------|
| AC EVA TEMP | °C or °F | Indicates A/C evaporator temperature sent from "A/C auto amp.". | | А |
| AC EVA TARGET | °C or °F | Indicates target A/C evaporator temperature sent from "A/C auto amp.". | | EC |
| ALTDUTY | % | Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal. | | С |
| MAP SENSOR | V | The signal voltage from the manifold absolute pressure (MAP) sensor is displayed. | | |
| BRAKE BST PRES SE | mV | Always a certain value is displayed.This item is not efficient for Y51 models. | | D |
| VVEL SEN LEARN- B1 | V | a Indicator the VV/EL Journing value | | Е |
| VVEL SEN LEARN- B2 | V | Indicates the VVEL learning value. | | |
| VVEL POSITION SEN-B1 | V | The VVEL control shaft position sensor signal voltage is displayed. | | F |
| VVEL POSITION SEN-B2 | | voltage is displayed. | | G |
| VVEL TIM-B1 | deg | Indicates [deg] of VVEL control shaft angle. | | |
| VVEL TIM-B2 | 3.79 | | | Н |
| VVEL LEARN | YET/DONE | Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been performed successfully. | | |
| BAT TEMP SEN | V | The signal voltage from the battery temperature sensor is displayed. | | ı |
| EVAP LEAK DIAG | YET/CMPLT | Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully. | | J K |
| EVAP DIAG READY | ON/OFF | Indicates the ready condition of EVAP leak diagnosis. ON: Diagnosis has been ready condition. OFF: Diagnosis has not been ready condition. | | L |
| HO2 S2 DIAG1 (B1) | INCMP/CM- PLT | Indicates DTC P0139 self-diagnosis (delayed responce) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | | M |
| HO2 S2 DIAG1 (B2) | INCMP/CM- PLT | Indicates DTC P0159 self-diagnosis (delayed responce) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | | N |
| HO2 S2 DIAG2 (B1) | INCMP/CM- PLT | Indicates DTC P0139 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | | 0 |
| HO2 S2 DIAG2 (B2) | INCMP/CM- PLT | Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete. | | Р |
| A/F SEN1 DIAG2 (B1) A/F SEN1 DIAG2 (B2) | _ | NOTE: The item is indicated, but not used. | | |

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< SYSTEM DESCRIPTION >

[VQ37VHR]

| Monitored item | Unit | Description | Remarks |
|------------------|------|--------------------------------------|---------|
| THRTL STK CNT B1 | _ | NOTE: | |
| THRTL STK CNT B2 | | 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.

ACTIVE TEST MODE

Test Item

| TEST ITEM | CONDITION | JUDGEMENT | CHECK ITEM (REMEDY) |
|-------------------------|---|--|--|
| VENT CON- TROL/V | Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT-III and listen to operating sound. | Solenoid valve makes an operating sound. | Harness and connectors Solenoid valve |
| ENG COOLANT TEMP | Engine: Return to the original trouble condition Change the engine coolant temperature using CONSULT-III. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Engine coolant temperature sensor Fuel injector |
| FUEL INJEC- TION | Engine: Return to the original trouble condition Change the amount of fuel injection using CONSULT-III. | If trouble symptom disappears, see CHECK ITEM. | Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1 |
| FUEL/T TEMP SEN | Change the fuel tank temperature | using CONSULT-III. | |
| PURG VOL CONT/V | Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III. | Engine speed changes according to the opening percent. | Harness and connectors Solenoid valve |
| FUEL PUMP RE- LAY | Ignition switch: ON (Engine stopped) Turn the fuel pump relay ON and OFF using CONSULT-III and listen to operating sound. | Fuel pump relay makes the operating sound. | Harness and connectors Fuel pump relay |
| IGNITION TIM- ING | Engine: Return to the original trouble condition Timing light: Set Retard the ignition timing using CONSULT-III. | If trouble symptom disappears, see CHECK ITEM. | Perform Idle Air Volume Learning. |
| FAN DUTY CONTROL* | Ignition switch: ON Change duty ratio using CON- SULT-III. | Cooling fan speed changes. | Harness and connectors Cooling fan motor Cooling fan relay Cooling fan control module IPDM E/R |
| ALTERNATOR DUTY | Engine: Idle Change duty ratio using CON- SULT-III. | Battery voltage changes. | Harness and connectors IPDM E/R Alternator |
| POWER BAL- ANCE | Engine: After warming up, idle the engine. A/C switch OFF Selector lever: P or N Cut off each injector signal one at a time using CONSULT-III. | Engine runs rough or dies. | Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil |
| INT V/T ASSIGN ANGLE | Engine: Return to the original non-standard condition Change intake valve timing using CONSULT-III. | If malfunctioning symptom disappears, see CHECK ITEM. | Harness and connectors Intake valve timing control solenoid valve |

< SYSTEM DESCRIPTION >

[VQ37VHR]

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

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

- For items whose SRT codes are set, "CMPLT" is displayed on the CONSULT-III 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.
- Turn ignition switch ON.
- Select "PERMANENT DTC STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT-III.NOTE:

Permanent DTCs stored in ECM memory are displayed on the CONSULT-III 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".

| CAUTION: Turn ignition switch from status screen. | n ON to OFF twice to update the informa | ation on the |
|---|---|-------------------|
| 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 |

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.

DTC WORK SUPPORT Mode

| Test mode | Test item | Corresponding DTC No. | Reference page |
|--------------------|----------------------------|-----------------------|----------------|
| EVAPORATIVE SYSTEM | EVP SML LEAK P0442*/P1442* | _ | _ |
| | EVP V/S LEAK P0456/P1456* | P0456 | EC-352 |
| | PURG VOL CN/V P1444 | P0443 | EC-323 |
| | PURG FLOW P0441 | P0441 | EC-318 |

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< SYSTEM DESCRIPTION >

| Test mode | Test item | Corresponding DTC No. | Reference page |
|-----------|---------------------------|-----------------------|----------------|
| | A/F SEN1 (B1) P1278/P1279 | P0133 | EC-248 |
| A/F SEN1 | A/F SEN1 (B1) P1276 | P0130 | EC-238 |
| A/F SEINT | A/F SEN1 (B2) P1288/P1289 | P0153 | EC-248 |
| | A/F SEN1 (B2) P1286 | P0150 | EC-238 |
| | HO2S2 (B1) P1146 | P0138 | EC-259 |
| | HO2S2 (B1) P1147 | P0137 | EC-253 |
| HO2S2 | HO2S2 (B1) P0139 | P0139 | EC-267 |
| ПОZЗZ | HO2S2 (B2) P1166 | P0158 | EC-259 |
| | HO2S2 (B2) P1167 | P0157 | EC-253 |
| | HO2S2 (B2) P0159 | P0159 | EC-267 |

^{*:} DTC P0442, P1442 and P1456 does not apply to Y51 models but appears in DTC Work Support Mode screens.

ECU DIAGNOSIS INFORMATION

ECM

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VALUES ON THE DIAGNOSIS TOOL

NOTE:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- * Specification data may not be directly related to their components signals/values/operations. i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show

the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIM-ING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

CONSULT-III MONITOR ITEM

| Monitor Item | Co | Values/Status | |
|-----------------|---|--|--------------------------------------|
| ENG SPEED | Run engine and compare CONSUL | Almost the same speed as the tachometer indication | |
| MAS A/F SE-B1 | See EC-172, "Description". | | |
| MAS A/F SE-B2 | See EC-172, "Description". | | |
| B/FUEL SCHDL | See EC-172, "Description". | | |
| A/F ALPHA-B1 | See EC-172, "Description". | | |
| A/F ALPHA-B2 | See EC-172, "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 |
| A/F SEN1 (B2) | Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 2.2 V |
| HO2S2 (B1) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | 0 - 0.3 V ←→ Approx. 0.6 - 1.0 V | |
| HO2S2 (B2) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | 0 - 0.3 V ←→ Approx. 0.6 - 1.0 V | |
| HO2S2 MNTR (B1) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | $LEAN \longleftrightarrow RICH$ | |
| HO2S2 MNTR (B2) | Revving engine from idle up to 3,00 are met. Engine: After warming up After keeping engine speed betwee idle for 1 minute under no load | LEAN ←→ RICH | |
| VHCL SPEED SE | Turn drive wheels and compare CC dication. | Almost the same speed as speedometer indication | |
| BATTERY VOLT | Ignition switch: ON (Engine stoppe | 11 - 14 V | |
| ACCEL CENTA | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.00 V |
| ACCEL SEN 1 | (Engine stopped) | Accelerator pedal: Fully depressed | 4.4 - 4.8 V |
| 400EL 0EN 5:1 | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.00 V |
| ACCEL SEN 2*1 | (Engine stopped) | Accelerator pedal: Fully depressed | 4.3 - 4.8 V |

| Monitor Item | Co | ondition | Values/Status |
|----------------|--|--|--------------------------------------|
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 1-B1 | (Engine stopped)Selector lever: D | Accelerator pedal: Fully depressed | Less than 4.75 V |
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 2-B1*1 | (Engine stopped)Selector lever: D | Accelerator pedal: Fully depressed | Less than 4.75 V |
| FUEL T/TMP SE | Ignition switch: ON | | Indicates fuel tank temperature |
| INT/A TEMP SE | Ignition switch: ON | | Indicates intake air temper ature |
| 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: $ON \rightarrow START \rightarrow O$ | N | $OFF \to ON \to OFF$ |
| 01.00 7111 000 | Ignition switch: ON | Accelerator pedal: Fully released | ON |
| CLSD THL POS | (Engine stopped) | Accelerator pedal: Slightly depressed | OFF |
| | • Engines After warming a second state of | Air conditioner switch: OFF | OFF |
| AIR COND SIG | Engine: After warming up, idle the engine | Air conditioner switch: ON (Compressor operates.) | ON |
| D/N DOSLSW | Ignition switch: ON | Selector lever: P or N | ON |
| P/N POSI SW | Ignition switch: ON | Selector lever: Except above | OFF |
| PW/ST SIGNAL | Engine: After warming up, idle the | Steering wheel: Not being turned | OFF |
| PW/ST SIGNAL | engine | Steering wheel: Being turned | ON |
| LOAD SIGNAL | Ignition switch: ON | Rear window defogger switch: ON and/or Lighting switch: 2nd position | ON |
| | ·g······· | Rear window defogger switch and lighting switch: OFF | OFF |
| IGNITION SW | • Ignition switch: $ON \rightarrow OFF \rightarrow ON$ | | $ON \to OFF \to ON$ |
| HEATER FAN SW | Engine: After warming up, idle the | Heater fan switch: ON | ON |
| HEATER FAIN SW | engine | Heater fan switch: OFF | OFF |
| BRAKE SW | Ignition switch: ON | Brake pedal: Fully released | OFF |
| BITAIL SW | - ignition switch. ON | Brake pedal: Slightly depressed | ON |
| | Engine: After warming up Selector lever: P or N | Idle | 2.0 - 3.0 msec |
| INJ PULSE-B1 | Air conditioner switch: OFF No load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | Idle | 2.0 - 3.0 msec |
| INJ PULSE-B2 | Selector lever: P or N Air conditioner switch: OFF No load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | Idle | 7° BTDC |
| IGN TIMING | Selector lever: P or N Air conditioner switch: OFF No load | 2,000 rpm | 25° - 45° BTDC |
| | Engine: After warming up | Idle | 5% - 35% |
| CAL/LD VALUE | Selector lever: P or N Air conditioner switch: OFF No load | 2,500 rpm | 5% - 35% |
| | Engine: After warming up | Idle | 2.0 - 6.0 g/s |
| MASS AIRFLOW | Selector lever: P or N Air conditioner switch: OFF No load | 2,500 rpm | 7.0 - 20.0 g/s |

| Monitor Item | Co | ondition | Values/Status |
|---------------------------|--|--|-------------------|
| PURG VOL C/V | Engine: After warming up Selector lever: P or N Air conditioner switch: OFF | Idle (Accelerator pedal: Not depressed even slightly, after engine starting.) | 0% |
| | No load | 2,000 rpm | _ |
| | Engine: After warming up | Idle | – 5 - 5°CA |
| NT/V TIM (B1) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 30°CA |
| | Engine: After warming up | Idle | – 5 - 5°CA |
| NT/V TIM (B2) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 30°CA |
| | Engine: After warming up | Idle | 0 - 2% |
| NT/V SOL (B1) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% |
| | Engine: After warming up | Idle | 0 - 2% |
| NT/V SOL (B2) | Selector lever: P or NAir conditioner switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% |
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 1-B2 | (Engine stopped)Selector lever: D | Accelerator pedal: Fully depressed | Less than 4.75 V |
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| ΓP SEN 2-B2* ¹ | (Engine stopped)Selector lever: D | Accelerator pedal: Fully depressed | Less than 4.75 V |
| | | Air conditioner switch: OFF | OFF |
| AIR COND RLY | Engine: After warming up, idle the engine | Air conditioner switch: ON (Compressor operates) | ON |
| FUEL PUMP RLY | For 1 second after turning ignition Engine running or cranking | switch: ON | ON |
| | Except above | | OFF |
| VENT CONT/V | Ignition switch: ON | | OFF |
| HRTL RELAY | Ignition switch: ON | | ON |
| HO2S2 HTR (B1) | Engine speed: Below 3,600 rpm af Engine: After warming up Keeping the engine speed betweer idle for 1 minute under no load | ter the following conditions are met. n 3,500 and 4,000 rpm for 1 minute and at | ON |
| | Engine speed: Above 3,600 rpm | | OFF |
| HO2S2 HTR (B2) | Engine speed: Below 3,600 rpm af Engine: After warming up Keeping the engine speed between idle for 1 minute under no load | ter the following conditions are met. n 3,500 and 4,000 rpm for 1 minute and at | ON |
| | Engine speed: Above 3,600 rpm | | OFF |
| /P PULLY SPD | Vehicle speed: More than 20 km/h | Almost the same speed as the tachometer indication | |
| VEHICLE SPEED | Turn drive wheels and compare CO dication. | Almost the same speed as the speedometer indication | |
| DL A/V LEARN | Engine: Running | Idle air volume learning has not been performed yet. | YET |
| | gg | Idle air volume learning has already been performed successfully. | CMPLT |
| SNOW MODE SW | Ignition switch: ON | Snow mode switch: Pressed | ON |
| | g | Snow mode switch: Released | OFF |

< ECU DIAGNOSIS INFORMATION >

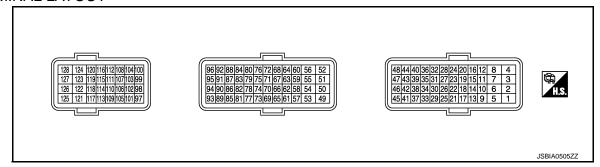
| Monitor Item | C | Condition | Values/Status |
|-------------------------|---|--|---|
| ENG OIL TEMP | Engine: After warming up | | More than 70°C (158°F) |
| TRVL AFTER MIL | | | 0 - 65,535 km (0 - 40,723 miles) |
| A/F S1 HTR (B1) | Engine: After warming up, idle the (More than 140 seconds after star | | 4 - 100% |
| A/F S1 HTR (B2) | Engine: After warming up, idle the (More than 140 seconds after star | | 4 - 100% |
| AC PRESS SEN | Engine: Idle Both A/C switch and blower fan sv | witch: ON (Compressor operates) | 1.0 - 4.0 V |
| VHCL SPEED SE | Turn drive wheels and compare C dication. | ONSULT-III value with the speedometer in- | Almost the same speed as the speedometer indication |
| SET VHCL SPD | Engine: Running | ASCD: Operating | The preset vehicle speed is displayed |
| MAIN SW | Ignition switch: ON | MAIN switch: Pressed | ON |
| WAIN SW | 1grittori switch. ON | MAIN switch: Released | OFF |
| CANCEL SW | Ignition switch: ON | CANCEL switch: Pressed | ON |
| CANCEL SW | 1grittori switch. ON | CANCEL switch: Released | OFF |
| RESUME/ACC SW | a Ignition quitable ON | RESUME/ACCELERATE switch: Pressed | ON |
| RESUME/ACC SW | Ignition switch: ON | RESUME/ACCELERATE switch: Released | OFF |
| OFT OW | a lamitian quitabi ON | SET/COAST switch: Pressed | ON |
| SET SW | Ignition switch: ON | SET/COAST switch: Released | OFF |
| BRAKE SW1 | | Brake pedal: Fully released | ON |
| (ICC/ASCD brake switch) | Ignition switch: ON | Brake pedal: Slightly depressed | OFF |
| BRAKE SW2 | Ignition switch: ON | Brake pedal: Fully released | OFF |
| (Stop lamp switch) | ignition owton: Ort | Brake pedal: Slightly depressed | ON |
| DIST SW | Ignition switch: ON | DISTANCE switch: Pressed | ON |
| | ignilien ennem en | DISTANCE switch: Released | OFF |
| CRUISE LAMP | Ignition switch: ON | MAIN switch: Pressed at the 1st time \rightarrow at the 2nd time | $ON \to OFF$ |
| BAT CUR SEN | Engine speed: Idle Battery: Fully charged*² Selector lever: P or N Air conditioner switch: OFF No load | | Approx. 2,600 - 3,500 mV |
| | Engine: After warming up Selector lever: P or N | Idle | Approx. 1.0 V |
| MAP SENSOR | A/C switch: OFF No load | 2,000 rpm | Approx. 1.35 V |
| ALT DUTY | Engine: Idle | 1 | 0 - 80% |
| BRAKE BST PRES SE | This item is displayed but is not approximately | oplicable to this model. | |
| | Engine: After warming up | Idle | Approx. 0.25 - 1.40 V |
| VVEL POSITION SEN-B1 | Selector lever: P or N Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0.25 - 4.75 V |
| | Engine: After warming up | Idle | Approx. 0.25 - 1.40 V |
| VVEL POSITION SEN-B2 | Selector lever: P or NAir conditioner switch: OFFNo load | When revving engine up to 2,000 rpm quickly | Approx. 0.25 - 4.75 V |

| Monitor Item | C | ondition | Values/Status |
|------------------------|--|--|---|
| | Engine: After warming up | Idle | Approx. 0 - 20 deg |
| VVEL TIM-B1 | Selector lever: P or NAir conditioner switch: OFFNo load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| | Engine: After warming up | Idle | Approx. 0 - 20 deg |
| VVEL TIM-B2 | Selector lever: P or NAir conditioner switch: OFFNo load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| VVEL LEARN | • Ignition switch: OFF \rightarrow ON | VVEL learning has not been performed yet. | YET |
| V V Z Z Z Z Z X X X X | (After warming up) | VVEL learning has already been performed successfully. | DONE |
| VVEL SEN LEARN- B1 | VVEL learning has already been p | performed successfully | Approx. 0.30 - 0.80 V |
| VVEL SEN LEARN- B2 | VVEL learning has already been p | performed successfully | Approx. 0.30 - 0.80 V |
| A/F ADJ-B1 | Engine: Running | | -0.330 - 0.330 |
| A/F ADJ-B2 | Engine: Running | | -0.330 - 0.330 |
| FAN DUTY | Engine: Running | | 0 - 100% |
| ALT DUTY SIG | Power generation voltage variable | control: Operating | ON |
| ALI DOTT SIG | Power generation voltage variable | control: Not operating | OFF |
| BAT TEMP SEN | Engine: After warming up Selector lever: P or N A/C switch: OFF No load | Idle | Indicates the temperature around the battery. |
| EVAP LEAK DIAG | Ignition switch: ON | 1 | Depending on condition of EVAP leak diagnosis |
| EVAP DIAG READY | Ignition switch: ON (READY) | | Depending on ready condition of EVAP leak diagnosis |
| UO2 C2 DIAC4 (B4) | DTC P0139 self-diagnosis (delayed | response) is incomplete. | INCMP |
| HO2 S2 DIAG1 (B1) | DTC P0139 self-diagnosis (delayed | response) is complete. | CMPLT |
| HO2 S2 DIAG1 (B2) | DTC P0159 self-diagnosis (delayed | response) is incomplete. | INCMP |
| 102 92 DIAGT (B2) | DTC P0159 self-diagnosis (delayed | response) is complete. | CMPLT |
| HO2 S2 DIAG2 (B1) | DTC P0139 self-diagnosis (slow res | ponse) is incomplete. | INCMP |
| I IOZ OZ DIAGZ (DI) | DTC P0139 self-diagnosis (slow res | ponse) is complete. | CMPLT |
| HO2 S2 DIAG2 (B2) | DTC P0159 self-diagnosis (slow res | ponse) is incomplete. | INCMP |
| . 102 02 DIAG2 (B2) | DTC P0159 self-diagnosis (slow res | CMPLT | |
| A/F SEN1 DIAG2 (B1) | This item is displayed but is not applicable to this model. | | |
| A/F SEN1 DIAG2 (B2) | This item is displayed but is not applicable to this model. | | |
| THRTL STK CNT B1 | This item is displayed but is not applicable to this model. | | |
| THRTL STK CNT B2 | This item is displayed but is not approximately | oplicable to this model. | |
| | | | |

^{*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-152, "How to Handle Battery".

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- ECM is located behind the instrument assist lower panel. For this inspection, remove passenger side instrument lower panel.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT-III.

| | inal No. e color) | Description | | Condition | Value | | | | | | | |
|-----------|----------------------|--|------------------|---|---|--------|-------|------|---------|--|--|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) | | | | | | | |
| 1 (W) | 128 (B) | A/F sensor 1 heater (bank 1) | Output | [Engine is running]Warm-up conditionIdle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★ 50mSec/div 5V/div JMBIA0030GB | | | | | | | |
| 2 | 128 | Throttle control motor | Outout | [Ignition switch: ON]Engine stoppedSelector lever: DAccelerator pedal: Fully depressed | 0 - 14 V★ 500μSec/div 5V/div JMBIA0031GB | | | | | | | |
| (G) | (B) | (Open) (bank 1) | Output | Output | Cupat | Guipar | Сагра | Сара | o sipo. | | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | 0 - 14 V★ 500μSec/div 5V/div JMBIA0032GB |
| 3 (R) | 128 (B) | Throttle control motor power supply (bank 1) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | | | | | | | |
| 4 (BR) | 128 (B) | Throttle control motor (Close) (bank 1) | Output | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500μSec/div 5V/div JMBIA0033GB | | | | | | | |

| < ECU | DIAGN | IOSIS INFORMATIO | N > | ECM | [VQ37VHR] | |
|------------|----------------------|--|------------------|---|---|--------|
| | inal No. e color) | Description | | | Value | А |
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 5 (L) | 128 (B) | A/F sensor 1 heater (bank 2) | Output | [Engine is running]Warm-up conditionIdle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★ 50mSec/div 5V/div JMBIA0030GB | C |
| 8 (B) | _ | ECM ground | _ | _ | _ | E |
| 11 (GR) | | Ignition signal No. 4 | | [Engine is running] | 0 - 0.2 V★ 50mSec/div | _ |
| 12 (L) | | Ignition signal No. 3 | | Warm-up condition Idle speed NOTE: The pulse cycle changes depending on | 5 | F |
| 15 (LG) | 128 | Ignition signal No. 5 | | rpm at idle | 2V/div JMBIA0035GB | G |
| 16 (G) | (B) | Ignition signal No. 2 | Output | | 0.1 - 0.4 V★ 50mSec/div | Н |
| 19 (V) | | Ignition signal No. 6 | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | = | I |
| (Y) | | Ignition signal No. 1 | | | 2V/div JMBIA0036GB | |
| 17 (P) | 128 (B) | Heated oxygen sensor 2 heater (bank 1) | Output | [Engine is running] 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 | 10 V★ 50mSec/div | J K |
| (1) | (3) | neater (bank 1) | | idle for 1 minute under no load [Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm | 5V/div JMBIA0037GB BATTERY VOLTAGE (11 - 14 V) | M |
| | | | | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) | Ν |
| 18 | 128 | Intake valve timing control solenoid valve (bank | Output | | 7 - 12 V★ | 0 |
| (Y) | (B) | 1) | σαιραί | [Engine is running]Warm-up conditionEngine speed: 2,000rpm | 5V/div JMBIA0038GB | Р |

| | inal No. e color) | Description | | Condition | Value |
|-----------|--------------------------------------|--|--|---|--|
| + | | Signal name | Input/ Output | - Condition | (Approx.) |
| | EVAP canister purge vol- | Quitout | [Engine is running]Idle speedAccelerator pedal: Not depressed even slightly, after engine starting | BATTERY VOLTAGE (11 - 14 V) 50mSec/div 10V/div JMBIA0039GB | |
| (GR) | (GR) (B) (B) (Control solenoid valve | Output | [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 | |
| 22 (B) | 128 (B) | Fuel pump relay | Output | [Ignition switch: ON] For 1 second after turning ignition switch ON [Engine is running] [Ignition switch: ON] More than 1 second after turning ignition switch ON | 0 - 1.5 V BATTERY VOLTAGE (11 - 14 V) |
| 24 (W) | 128 (B) | ECM relay (Self shut-off) | Output | [Engine is running] [Ignition switch: OFF] A few seconds after turning ignition switch OFF [Ignition switch: OFF] More than a few seconds after turning ignition switch OFF | 0 - 1.5 V BATTERY VOLTAGE (11 - 14 V) |
| 25 (O) | 128 (B) | Throttle control motor re- lay | Output | [Ignition switch: $ON \rightarrow OFF$] | 0 - 1.0 V ↓ BATTERY VOLTAGE (11 - 14 V) ↓ 0 V |
| 28 (R) | 128 (B) | VVEL actuator motor relay abort signal [VVEL control module] | Output | [Ignition switch: ON] [Engine is running] • Warm-up condition • Idle speed | 0 - 1.0 V 0 V |
| 29 (Y) | 128 (B) | Intake valve timing control solenoid valve (bank 2) | Output | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition Engine speed: 2,000rpm | BATTERY VOLTAGE (11 - 14 V) 7 - 12 V* 5V/div |

Р

| | inal No. e color) | Description | | Condition | Value | , | | | |
|------------|----------------------|--|------------------|---|--|---------------|--|--------------------------------|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) | | | | |
| 30 | 40 | Throttle position sensor | Input | [Ignition switch: ON]Engine stoppedSelector lever: DAccelerator pedal: Fully released | More than 0.36 V | E | | | |
| (O) | (O/L) | 1 (bank 1) | mput | [Ignition switch: ON]Engine stoppedSelector lever: DAccelerator pedal: Fully depressed | Less than 4.75 V | _ | | | |
| 31 | 48 | Throttle position sensor | locut | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | More than 0.36 V | - | | | |
| (O/L) | (O) | 1 (bank 2) | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | Less than 4.75 V | - | | | |
| 33 (LG) | 128 (B) | Heated oxygen sensor 2 heater (bank 2) | Output | [Engine is running] 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 | 10 V★ 50mSec/div 5V/div JMBIA0037GB | | | | |
| | | | | | | | [Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm | BATTERY VOLTAGE (11 - 14 V) | = |
| 34 | 40 | Throttle position sensor | logut | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | Less than 4.75 V | - | | | |
| (W/L) | (O/L) | 2 (bank 1) | Input | [Ignition switch: ON]Engine stoppedSelector lever: DAccelerator pedal: Fully depressed | More than 0.36 V | _ | | | |
| 35 | 48 | Throttle position sensor | Insut | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | Less than 4.75 V | | | | |
| (W) | (O) | 2 (bank 2) | Input | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | More than 0.36 V | - - - (| | | |

| | inal No. e color) | Description | | Condition | Value |
|-------------|----------------------|---|------------------|---|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 37 | 128 | Crankshaft position sen- | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 4.0 - 5.0 V★ 1mSec/div 2V/div JMBIA0041GB |
| (B) | (B) | sor (POS) | три | [Engine is running] • Engine speed: 2,000 rpm | 4.0 - 5.0 V★ 1mSec/div 2V/div JMBIA0042GB |
| 38 | 96 | Manifold absolute pres- | Input | [Engine is running] • Warm-up condition • Idle speed | 1.2 V |
| (L) | (O) | sure (MAP) sensor | iiiput | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.5 V |
| 40 (O/L) | _ | Sensor ground [Throttle position sensor (bank 1)] | | _ | _ |
| 43 (W/L) | 48 (O) | Sensor power supply [Throttle position sensor (bank 2)] | _ | [Ignition switch: ON] | 5 V |
| 44 (W) | 40 (O/L) | Sensor power supply [Throttle position sensor (bank 1)] | _ | [Ignition switch: ON] | 5 V |
| 46 (L) | 128 (B) | Sensor power supply [Crankshaft position sensor (POS)] | _ | [Ignition switch: ON] | 5 V |
| 47 (R) | _ | Sensor ground [Crankshaft position sensor (POS)] | _ | _ | _ |
| 48 (O) | _ | Sensor ground [Throttle position sensor (bank 2)] | _ | _ | _ |
| 49 (LG) | 128 (B) | Throttle control motor (Close) (bank 2) | Output | [Ignition switch: ON] Engine stopped Selector lever: D Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500μSec/div 5V/div JMBIA0033GB |

| Terminal No. (Wire color) Description | | | Condition | Value | |
|--|------------|--|------------------|--|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 50 | 128 | Throttle control motor | | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed | 0 - 14 V★ 500μSec/div 5V/div JMBIA0031GB |
| (V) | (B) | (Open) (bank 2) | Output | [Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released | 0 - 14 V★ 500μSec/div 5V/div JMBIA0032GB |
| 52 (R) | 128 (B) | Throttle control motor power supply (bank 2) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 53 (G) | 128 (B) | Ignition switch | Input | [Ignition switch: OFF] [Ignition switch: ON] | 0 V BATTERY VOLTAGE (11 - 14 V) |
| 54 (L) | _ | CAN communication line [VVEL control module] | Input/ output | _ | _ |
| 55 (Y) | _ | CAN communication line [VVEL control module] | Input/ output | _ | _ |
| 57 (L) | 128 (B) | A/F sensor 1 (bank 1) | Input | [Ignition switch: ON] | 2.2 V |
| 59 | 128 | Camshaft position sen- | loout | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0045GB |
| (L) | (B) | sor (PHASE) (bank 1) | Input | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0046GB |
| 60 (G) | 128 (B) | Sensor power supply [Camshaft position sen- sor (PHASE) (bank 1), Manifold absolute pres- sure (MAP) sensor, Pow- er steering pressure sensor] | _ | [Ignition switch: ON] | 5 V |
| 61 (B/W) | 128 (B) | A/F sensor 1 (bank 1) | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.8 V Output voltage varies with air fuel ratio. |

| | inal No. e color) | Description | | Condition | Value |
|-------------|----------------------|---|---|---|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 63 | 128 | Camshaft position sensor (PHASE) (bank 2) | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0045GB |
| (BR) | (B) | | input | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0046GB |
| 64 (W) | | | _ | [Ignition switch: ON] | 5 V |
| 65 (L/O) | 128 (B) | A/F sensor 1 (bank 2) | Input | [Ignition switch: ON] | 2.2 V |
| 66 (W/L) | 128 (B) | A/F sensor 1 (bank 2) | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 1.8 V Output voltage varies with air fuel ratio. |
| 67 (Y) | 128 (B) | Intake air temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with intake air temperature. |
| 68 (V) | _ | Sensor ground [Mass air flow sensor (bank 1), Intake air tem- perature sensor] | _ | _ | _ |
| 69 (W) | 128 (B) | Knock sensor (bank 2) | Input | [Engine is running] • Idle speed | 2.5 V* ¹ |
| 71 (SB) | 128 (B) | Engine coolant tempera- ture sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine coolant temperature. |
| 72 (—) | _ | Sensor ground (Knock sensor) | | _ | _ |
| 73 (W) | 128 (B) | Knock sensor (bank 1) | Input [Engine is running] • Idle speed | | 2.5 V* ¹ |
| 76 (BR) | 128 (B) | Heated oxygen sensor 2 (bank 1) | Input | [Engine is running] 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 |

| Terminal No. (Wire color) | | Description | | Condition | Value | |
|------------------------------|------------------------|--|---|---|--|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 77 68 | | Mass air flow sensor | Input | [Engine is running]Warm-up conditionIdle speed | 0.7 - 1.2 V | |
| (O) | (V) | (bank 1) | | [Engine is running]Warm-up conditionEngine speed: 2,500 rpm | 1.3 - 1.7 V | |
| 78 (G) | 84 (B/W) | Engine oil temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine oil temperature. | |
| 79 | 94 | Mass air flow sensor | Input | [Engine is running]Warm-up conditionIdle speed | 0.7 - 1.2 V | |
| (BR) | (B) | (bank 2) | при | [Engine is running]Warm-up conditionEngine speed: 2,500 rpm | 1.3 - 1.7 V | |
| 80 128 | Heated oxygen sensor 2 | | [Engine is running] Revving engine from idle to 3,000 rpm quickly after the following conditions are met | | | |
| (L) | | (bank 2) | Input | 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 | |
| 81 (Y) | | Fuel injector No. 3 | | | BATTERY VOLTAGE (11 - 14 V)★ | |
| 82 (V) | | Fuel injector No. 6 | Output - | [Engine is running]Warm-up conditionIdle speedNOTE: | 50mSec/div | |
| 85 (BR) | 128 | Fuel injector No. 2 | | The pulse cycle changes depending on rpm at idle | 10V/div JMBIA0047GB | |
| 86 (R) | (B) | Fuel injector No. 5 | | | BATTERY VOLTAGE (11 - 14 V)★ | |
| 89 GR) 90 | | Fuel injector No. 1 | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 50mSec/div | | |
| 90 (O) | | Fuel injector No. 4 | | | 10V/div JMBIA0048GB | |
| 83 (W) | 128 (B) | Battery temperature sensor | Input | [Engine is running] Battery: Fully charged*² Idle speed | 1.6 V | |
| 84 3/W) | _ | Sensor ground (Heated oxygen sensor 2, Engine coolant tem- perature sensor, Engine oil temperature sensor) | _ | _ | _ | |
| 87 | 96 | Power steering pressure | Output | [Engine is running] • Steering wheel: Being turned | 0.5 - 4.5 V | |
| (V) | (O) | sensor | • | [Engine is running]Steering wheel: Not being turned | 0.4 - 0.8 V | |

< ECU DIAGNOSIS INFORMATION >

| | inal No. e color) | Description | | Condition | Value |
|------------|----------------------|---|-------|--|--------------------------------|
| + | | Signal name Input/ Output | | Condition | (Approx.) |
| 91 (G) | 95 (W) | Battery current sensor | Input | [Engine is running] Battery: Fully charged*² Idle speed | 2.6 - 3.5 V |
| 92 (R) | _ | Sensor ground [Camshaft position sensor (PHASE) (bank 2)] | _ | _ | _ |
| 93 (W) | 128 (B) | Power supply for ECM (Back-up) | Input | [Ignition switch: OFF] | BATTERY VOLTAGE (11 - 14 V) |
| 94 (B) | _ | Sensor ground [Mass air flow sensor — — (bank 2)] | | _ | |
| 95 (W) | _ | Sensor ground (Battery current sensor) | _ | _ | _ |
| 96 (O) | _ | Sensor ground [Camshaft position sensor (PHASE) (bank 1),Manifold absolute pressure (MAP) sensor, Power steering pressure sensor] | _ | _ | _ |
| 97 | 100 | Accelerator pedal posi- | loout | [Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released | 0.45 - 1.00 V |
| (R) | (W) | tion sensor 1 | Input | [Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed | 4.2 - 4.8 V |
| 98 | 104 (BR)*3 | Accelerator pedal posi- | Input | [Ignition switch: ON]Engine stoppedAccelerator pedal: Fully released | 0.22 - 0.50 V |
| (Y) | (B)*4 | tion sensor 2 | Input | [Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed | 2.1 - 2.5 V |
| 99 (G) | 100 (W) | Sensor power supply (Accelerator pedal position sensor 1) | _ | [Ignition switch: ON] | 5 V |
| 100 (W) | _ | Sensor ground (Accelerator pedal position sensor 1) | _ | _ | _ |

| Terminal No. (Wire color) | | Description | | Condition | Value |
|--|------------------------|---|------------------|---|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| | | | | [Ignition switch: ON] • ICC steering switch: OFF | 4.2 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| | | | | [Ignition switch: ON] • DYNAMIC DRIVE ASSISTANCE SYSTEMS switch: Pressed | 1.0 V |
| 101 (SB) | 108 (Y) | ICC steering switch (models with ICC system) | Input | [Ignition switch: ON] • CANCEL switch: Pressed | 1.9 V |
| | | City | | [Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed | 3.7 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 3.2 V |
| | | | | [Ignition switch: ON] • DISTANCE switch: Pressed | 2.6 V |
| | | ASCD steering switch (models with ASCD system) | Input | [Ignition switch: ON] • ASCD steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| 101 (SB) | 108 (Y) | | | [Ignition switch: ON] • CANCEL switch: Pressed | 1 V |
| (36) | (1) | | | [Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed | 3 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 2 V |
| 102 (P) | 112 (V) | EVAP control system pressure sensor | Input | [Ignition switch: ON] | 1.8 - 4.8 V |
| 103 (L) | 104 (BR)*3 (B)*4 | Sensor power supply (Accelerator pedal position sensor 2) | _ | [Ignition switch: ON] | 5 V |
| 104 (BR) ^{*3} (B) ^{*4} | _ | Sensor ground (Accelerator pedal position sensor 2) | _ | _ | _ |
| 105 (LG) | 112 (V) | Refrigerant pressure sensor | Input | [Engine is running]Warm-up conditionBoth A/C switch and blower fan motor switch: ON (Compressor operates) | 1.0 - 4.0 V |
| 106 (P) | 128 (B) | Fuel tank temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with fuel tank temperature. |
| 107 (BG) | 112 (V) | Sensor power supply (EVAP control system pressure sensor, Refrig- erant pressure sensor) | _ | [Ignition switch: ON] | 5 V |
| 108 (Y) | _ | Sensor ground (ASCD/ICC steering switch) | _ | _ | _ |

| | nal No. color) | Description | | Condition | Value | |
|--------------------------|-------------------|---|------------------|---|---------------------------------------|--|
| + | | Signal name | Input/ Output | Condition | (Approx.) | |
| 109 | 128 | PNP signal | Input | [Ignition switch: ON] • Selector lever: P or N | BATTERY VOLTAGE (11 - 14 V) | |
| (BR) | (B) | TWI Signal | при | [Ignition switch: ON] • Selector lever: Except above | 0 V | |
| 110 (V) | 128 | Engine speed output sig- | Quitout | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 1 V★ 10mSec/div 2V/div JMBIA0076G | |
| | (B) | nal | Output | [Engine is running] • Engine speed is 2,000 rpm | 1 V★ 10mSec/div 2V/div JMBIA0077G | |
| 112 (V) | _ | Sensor ground (EVAP control system pressure sensor, Refrig- erant pressure sensor) | _ | _ | _ | |
| 113 (P) | _ | CAN communication line | Input/ Output | _ | _ | |
| 114 (L) | _ | CAN communication line | Input/ Output | _ | _ | |
| 117 (V) | 128 (B) | Data link connector | Input/ Output | _ | _ | |
| 121 (G) | 128 (B) | EVAP canister vent control valve | Output | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 122 | 128 | Stop lamp switch | Input | [Ignition switch: OFF] • Brake pedal: Fully released | 0 V | |
| (P) | (B) | Stop famp Switch | iliput | [Ignition switch: OFF] • Brake pedal: Slightly depressed | BATTERY VOLTAGE (11 - 14 V) | |
| 123 (B) 124 (B) | _ | ECM ground | _ | _ | _ | |
| 125 (SB) | 128 (B) | Power supply for ECM | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 126 (BR) | 128 (B) | ICC brake switch (mod- els with ICC system) ASCD brake switch (models with ASCD sys- tem) | Input | [Ignition switch: ON] • Brake pedal: Slightly depressed [Ignition switch: ON] • Brake pedal: Fully released | 0 V BATTERY VOLTAGE (11 - 14 V) | |
| 127 (B) 128 (B) | _ | ECM ground | _ | _ | _ | |

^{★:} 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-152, "How to Handle Battery".
*3: With ICC

*4: Without ICC

Fail safe INFOID:0000000005914023

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NON DTC RELATED ITEM

| Engine operating condition in fail-safe mode | Detected items | Remarks | Reference page |
|--|------------------------------------|---|----------------|
| Engine speed will not rise more than 2,500 rpm due to the fuel cut | Malfunction indicator lamp circuit | When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction. | EC-516 |

DTC RELATED ITEM

| DTC No. | Detected items | Engine opera | ating condition in fail-safe mode | | | |
|--|--|--|---|--|--|--|
| U1003 U1024 | Can communication circuit | VVEL actuator motor relay is turned Engine speed will not rise more that | d off, and VVEL value is become at a minimum angle in 3,500 rpm due to the fuel cut. | | | |
| 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. | | | | |
| P0102 P0103 P010C P010D | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | |
| P0117 P0118 | Engine coolant tempera- ture sensor circuit | | determined by ECM based on the following condition oolant temperature decided by ECM. | | | |
| | | Condition | Engine coolant temperature decided (CONSULT-III 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 P0227 P0228 P1239 P2132 P2133 P2135 | Throttle position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening i 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. | | | |
| P0524 | Engine oil pressure | The signal is not energized to the in control does not function. Engine speed will not rise more that | take valve timing control solenoid valve and the valve on 2,400 rpm due to the fuel cut. | | | |

< ECU DIAGNOSIS INFORMATION >

| DTC No. | Detected items | Engine opera | ating condition in fail-safe mode | | | | |
|---|------------------------------------|--|--|--|--|--|--|
| P0605 | ECM | (When ECM calculation function is ECM stops the electric throttle cont fixed opening (approx. 5 degrees) b ECM deactivates ASCD operation. | trol actuator control, throttle valve is maintained at a by the return spring. | | | | |
| P0607 | ECM | VVEL actuator motor relay is turned Engine speed will not rise more that | d off, and VVEL value is become at a minimum angle an 2,500 rpm due to the fuel cut. | | | | |
| P0643 | Sensor power supply | ECM stops the electric throttle cont fixed opening (approx. 5 degrees) by | rol actuator control, throttle valve is maintained at a by the return spring. | | | | |
| P1087 P1088 | VVEL control function | VVEL of normal bank is controlled a Engine speed will not rise more that | • | | | | |
| P1089 P1092 | VVEL control shaft position sensor | VVEL value is maintained at a fixed angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut | | | | | |
| P1608 | VVEL control shaft position sensor | • | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum ang Engine speed will not rise more than 3,500 rpm due to the fuel cut | | | | |
| P1090 P1093 | VVEL actuator motor | VVEL of normal bank is controlled a Engine speed will not rise more that | • | | | | |
| | | VVEL actuator motor relay is turned Engine speed will not rise more that | d off, and VVEL value is become at a minimum angle an 3,500 rpm due to the fuel cut. | | | | |
| P1091 | VVEL actuator motor relay | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | | | | |
| P1233 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. | | | | | |
| P1236 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. | | | | | |
| P1238 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 2 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 N or P position, and engine speed will not exceed 1,000 rpm more. | | | | | |
| P1290 P2100 P2103 | Throttle control motor relay | ECM stops the electric throttle cont fixed opening (approx. 5 degrees) b | trol actuator control, throttle valve is maintained at a by the return spring. | | | | |
| P1606 | VVEL control module | VVEL actuator motor relay is turned Engine speed will not rise more that | d off, and VVEL value is become at a minimum angle an 3,500 rpm due to the fuel cut. | | | | |
| P1805 | Brake switch | ECM controls the electric throttle cosmall range. Therefore, acceleration will be poor | ontrol actuator by regulating the throttle opening to a r. | | | | |
| | | Vehicle condition | Driving condition | | | | |
| | | When engine is idling | Normal | | | | |
| | | When accelerating | Poor acceleration | | | | |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | order for the idle position to be with | eed of the throttle valve to be slower than the norma | | | | |

DTC Inspection Priority Chart

INFOID:0000000005914024

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

| Priority | Detected items (DTC) | | | | |
|----------|---|---|--|--|--|
| 1 | U0101 U0164 U1001 U1003 CAN communication line U1024 VVEL CAN communication line P0102 P0103 P010C P010D Mass air flow sensor P010A Marifeld the behavior and AMAD Sensor | С | | | |
| | P010A Manifold absolute pressure (MAP) sensor P0112 P0113 P0127 Intake air temperature sensor P0117 P0118 P0125 Engine coolant temperature sensor P0122 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throttle position sensor | D | | | |
| | P0128 Thermostat function P0181 P0182 P0183 Fuel tank temperature sensor P0196 P0197 P0198 Engine oil temperature sensor P0327 P0328 P0332 P0333 Knock sensor | Е | | | |
| | P0335 Crankshaft position sensor (POS) P0340 P0345 Camshaft position sensor (PHASE) P0460 P0461 P0462 P0463 Fuel level sensor P0500 Vehicle speed sensor | F | | | |
| | P0605 P0607 ECM P0643 Sensor power supply P0700 TCM P0705 Transmission range switch | (| | | |
| | P0850 Park/neutral position (PNP) switch P1089 P1092 P1608 VVEL control shaft position sensor P1606 P1607 VVEL control module | F | | | |
| | P1550 P1551 P1552 P1553 P1554 Battery current sensor P1556 P1557 Battery temperature sensor P1610 - P1615 NATS P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor | I | | | |

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| Priority | Detected items (DTC) | | | | | |
|----------|---|--|--|--|--|--|
| 2 | P0031 P0032 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 P0133 P0150 P0151 P0152 P0153 P2A00 P2A03 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 P0603 ECM power supply P0710 P0717 P0720 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches P1087 P1088 VVEL system P1090 P1093 VVEL actuator motor P1091 VVEL actuator motor relay P1217 Engine over temperature (OVERHEAT) P1233 P2101 Electric throttle control function P1230 P2100 P2103 Throttle control motor relay P1290 P2100 P2103 Throttle control motor relay P1805 Brake switch | | | | | |
| 3 | P0011 P0021 Intake valve timing control P006A P0101 P010B Mass air flow sensor P0106 Manifold absolute pressure (MAP) sensor P0171 P0172 P0174 P0175 Fuel injection system function P0300 - P0306 Misfire P0420 P0430 Three way catalyst function P0456 EVAP control system (VERY SMALL LEAK) P0506 P0507 Idle speed control system P0524 Engine oil pressure P100A P100B VVEL system P1148 P1168 Closed loop control P1211 TCS control unit P1212 TCS communication line P1238 P2119 Electric throttle control actuator P1421 Cold start control P1564 ICC steering switch / ASCD steering switch P1568 ICC command value P1572 ICC brake switch / ASCD brake switch P1574 ICC vehicle speed sensor / ASCD vehicle speed sensor | | | | | |

DTC Index

 \times :Applicable —: Not applicable

| CONSULT-III GST*2 | ECM*3 | Items (CONSULT-III screen terms) | SRT code | Trip | MIL | Permanent DTC group*4 | Reference page |
|-------------------|--------------------|--|-------------|--|------------------------|-----------------------|-------------------|
| U0101 | 0101* ⁵ | CAN COMM CIRCUIT | _ | 1 | × | В | EC-185 |
| U0164 | 0164* ⁵ | CAN COMM CIRCUIT | _ | 1 | × | В | EC-186 |
| U1001 | 1001* ⁵ | CAN COMM CIRCUIT | _ | 2 (with ASCD) 1 or 2 (with ICC) | _ | _ | EC-187 |
| U1003 | 1003 | CAN COMM CIRCUIT | _ | 2 | _ | _ | EC-188 |
| U1024 | 1024 | VVEL CAN COMM CIRCUIT | _ | 1 | × | В | EC-190 |
| P0000 | 0000 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | _ | _ | Flashing* ⁸ | _ | _ |
| P0011 | 0011 | INT/V TIM CONT-B1 | _ | 2 | × | В | EC-192 |

| DTC*1 | | Itama | CDT | | | Permanent DTC | Doforces | |
|----------------------------------|-------|----------------------------------|-------------|------|-----|---------------|-------------------|-----|
| CONSULT-III GST* ² | ECM*3 | Items (CONSULT-III screen terms) | SRT code | Trip | MIL | group*4 | Reference page | / |
| P0021 | 0021 | INT/V TIM CONT-B2 | _ | 2 | × | В | EC-192 | E |
| P0031 | 0031 | A/F SEN1 HTR (B1) | _ | 2 | × | В | EC-196 | |
| P0032 | 0032 | A/F SEN1 HTR (B1) | _ | 2 | × | В | EC-196 | = |
| P0037 | 0037 | HO2S2 HTR (B1) | _ | 2 | × | В | EC-199 | (|
| P0038 | 0038 | HO2S2 HTR (B1) | _ | 2 | × | В | EC-199 | _ |
| P0051 | 0051 | A/F SEN1 HTR (B2) | _ | 2 | × | В | EC-196 | - [|
| P0052 | 0052 | A/F SEN1 HTR (B2) | _ | 2 | × | В | EC-196 | - ' |
| P0057 | 0057 | HO2S2 HTR (B2) | _ | 2 | × | В | EC-199 | _ |
| P0058 | 0058 | HO2S2 HTR (B2) | _ | 2 | × | В | EC-199 | - |
| P006A | 006A | MAP-MAF CORELTION-B1 | _ | 2 | × | В | EC-202 | _ |
| P0075 | 0075 | INT/V TIM V/CIR-B1 | _ | 2 | × | В | EC-208 | - |
| P0081 | 0081 | INT/V TIM V/CIR-B2 | _ | 2 | × | В | EC-208 | - |
| P0101 | 0101 | MAF SEN/CIRCUIT-B1 | _ | 2 | × | В | EC-202 | = |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | _ | 1 | × | В | EC-210 | - (|
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | _ | 1 | × | В | EC-210 | = |
| P0106 | 0106 | ABSL PRES SEN/CIRC | _ | 2 | × | В | EC-216 | - |
| P010A | 010A | ABSL PRES SEN/CIRC | _ | 2 | × | В | EC-220 | _ |
| P010B | 010B | MAF SEN/CIRCUIT-B2 | _ | 2 | × | В | EC-202 | _ |
| P010C | 010C | MAF SEN/CIRCUIT-B2 | _ | 1 | × | В | EC-210 | _ |
| P010D | 010D | MAF SEN/CIRCUIT-B2 | _ | 1 | × | В | EC-210 | - |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | _ | 2 | × | В | EC-223 | _ |
| P0113 | 0113 | IAT SEN/CIRCUIT-B1 | _ | 2 | × | В | EC-223 | _ |
| P0116 | 0116 | ECT SEN/CIRC | _ | 2 | × | В | EC-225 | = |
| P0117 | 0117 | ECT SEN/CIRC | _ | 1 | × | В | EC-227 | - |
| P0118 | 0118 | ECT SEN/CIRC | _ | 1 | × | В | EC-227 | - |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | _ | 1 | × | В | EC-229 | _ |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | _ | 1 | × | В | EC-229 | _ |
| P0125 | 0125 | ECT SENSOR | _ | 2 | × | В | EC-232 | _ |
| P0127 | 0127 | IAT SENSOR-B1 | _ | 2 | × | В | EC-234 | = |
| P0128 | 0128 | THERMSTAT FNCTN | _ | 2 | × | В | EC-236 | _ |
| P0130 | 0130 | A/F SENSOR1 (B1) | _ | 2 | × | Α | EC-238 | - |
| P0131 | 0131 | A/F SENSOR1 (B1) | _ | 2 | × | В | EC-242 | - |
| P0132 | 0132 | A/F SENSOR1 (B1) | _ | 2 | × | В | EC-245 | - |
| P0133 | 0133 | A/F SENSOR1 (B1) | × | 2 | × | A | EC-248 | - |
| P0137 | 0137 | HO2S2 (B1) | × | 2 | × | Α | EC-253 | _ |
| P0138 | 0138 | HO2S2 (B1) | × | 2 | × | Α | EC-259 | _ |
| P0139 | 0139 | HO2S2 (B1) | × | 2 | × | A | EC-267 | _ |
| P0150 | 0150 | A/F SENSOR1 (B2) | _ | 2 | × | A | EC-238 | = |
| P0151 | 0151 | A/F SENSOR1 (B2) | _ | 2 | × | В | EC-242 | _ |
| P0152 | 0152 | A/F SENSOR1 (B2) | _ | 2 | × | В | EC-245 | - |
| P0153 | 0153 | A/F SENSOR1 (B2) | × | 2 | × | A | EC-248 | _ |
| . 0.00 | 0157 | HO2S2 (B2) | ^ | 2 | | A | EC-253 | _ |

DTC*1 Permanent DTC Items SRT Reference Trip MIL CONSULT-III group*4 (CONSULT-III screen terms) code page ECM*3 GST*2 P0158 0158 HO2S2 (B2) 2 Α EC-259 × × P0159 0159 HO2S2 (B2) 2 Α EC-267 × × 0171 **FUEL SYS-LEAN-B1** В P0171 2 EC-274 × P0172 0172 **FUEL SYS-RICH-B1** 2 В EC-278 × P0174 0174 **FUEL SYS-LEAN-B2** 2 X В EC-274 P0175 0175 FUEL SYS-RICH-B2 2 В EC-278 × P0181 0181 FTT SENSOR 2 В EC-282 X P0182 FTT SEN/CIRCUIT 2 0182 В EC-285 × P0183 FTT SEN/CIRCUIT 0183 2 В EC-285 X P0196 0196 **EOT SENSOR** 2 В EC-288 × P0197 0197 **EOT SEN/CIRC** 2 В EC-290 × P0198 0198 **EOT SEN/CIRC** 2 В EC-290 × P0222 0222 TP SEN 1/CIRC-B1 1 × В EC-292 P0223 0223 TP SEN 1/CIRC-B1 В 1 EC-292 P0227 0227 TP SEN 2/CIRC-B2 В EC-229 1 × TP SEN 2/CIRC-B2 В P0228 0228 1 EC-229 × В P0300 0300 MULTI CYL MISFIRE 1 or 2 EC-295 × P0301 0301 CYL 1 MISFIRE 1 or 2 В EC-295 × P0302 0302 CYL 2 MISFIRE В EC-295 1 or 2 × P0303 0303 CYL 3 MISFIRE 1 or 2 × В EC-295 CYL 4 MISFIRE P0304 0304 1 or 2 X В EC-295 P0305 0305 CYL 5 MISFIRE 1 or 2 В EC-295 × P0306 0306 CYL 6 MISFIRE EC-295 1 or 2 В \times P0327 0327 KNOCK SEN/CIRC-B1 2 EC-301 P0328 KNOCK SEN/CIRC-B1 EC-301 0328 2 P0332 0332 KNOCK SEN/CIRC-B2 2 EC-301 P0333 0333 KNOCK SEN/CIRC-B2 2 EC-301 P0335 0335 CKP SEN/CIRCUIT 2 В EC-304 P0340 0340 CMP SEN/CIRC-B1 2 × В EC-308 P0345 0345 CMP SEN/CIRC-B2 2 В X EC-308 P0420 0420 TW CATALYST SYS-B1 2 Α EC-313 × × TW CATALYST SYS-B2 P0430 0430 2 Α EC-313 × × P0441 0441 **EVAP PURG FLOW/MON** 2 Α EC-318 X × P0443 0443 PURG VOLUME CONT/V 2 Α EC-323 × PURG VOLUME CONT/V P0444 0444 2 × В EC-327 PURG VOLUME CONT/V P0445 0445 2 × В EC-327 VENT CONTROL VALVE P0447 0447 2 В EC-330 × P0448 0448 VENT CONTROL VALVE 2 В EC-334 × P0451 0451 **EVAP SYS PRES SEN** 2 Α EC-338 × P0452 **EVAP SYS PRES SEN** 2 В EC-341 0452 × P0453 0453 **EVAP SYS PRES SEN** 2 В EC-346 × P0456 0456 **EVAP VERY SML LEAK** ×*7 2 Α EC-352 ×

| DTC*1 | 1 | Items | SRT | | | Permanent DTC | Reference | |
|----------------------------------|-------|----------------------------|------|--------|--------|---------------------|---------------|---|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | code | Trip | MIL | group* ⁴ | page | |
| P0460 | 0460 | FUEL LEV SEN SLOSH | _ | 2 | × | А | EC-358 | |
| P0461 | 0461 | FUEL LEVEL SENSOR | _ | 2 | × | В | EC-359 | |
| P0462 | 0462 | FUEL LEVL SEN/CIRC | _ | 2 | × | В | EC-361 | • |
| P0463 | 0463 | FUEL LEVL SEN/CIRC | _ | 2 | × | В | EC-361 | = |
| P0500 | 0500 | VEHICLE SPEED SENSOR A*6 | _ | 2 | × | В | EC-362 | |
| P0506 | 0506 | ISC SYSTEM | | 2 | × | В | EC-364 | = |
| P0507 | 0507 | ISC SYSTEM | _ | 2 | × | В | EC-366 | • |
| P0524 | 0524 | ENGINE OIL PRESSURE | | 2 | × | В | EC-368 | - |
| P0550 | 0550 | PW ST P SEN/CIRC | | 2 | _ | _ | EC-371 | = |
| P0603 | 0603 | ECM BACK UP/CIRCUIT | | 2 | × | В | EC-373 | - |
| P0605 | 0605 | ECM | | 1 or 2 | × or — | В | EC-375 | _ |
| P0607 | 0607 | ECM | | 1 | × | В | EC-377 | - |
| P0643 | 0643 | SENSOR POWER/CIRC | | 1 | × | В | EC-378 | - |
| P0705 | 0705 | T/M RANGE SENSOR A | _ | 2 | × | В | TM-107 | = |
| P0710 | 0710 | FLUID TEMP SENSOR A | | 2 | × | В | <u>TM-108</u> | - |
| P0717 | 0717 | INPUT SPEED SENSOR A | | 2 | × | В | <u>TM-110</u> | _ |
| P0720 | 0720 | OUTPUT SPEED SENSOR*6 | _ | 2 | × | В | <u>TM-111</u> | • |
| P0729 | 0729 | 6GR INCORRECT RATIO | | 2 | × | В | <u>TM-115</u> | - |
| P0730 | 0730 | INCORRECT GR RATIO | | 2 | × | В | <u>TM-117</u> | - |
| P0731 | 0731 | 1GR INCORRECT RATIO | _ | 2 | × | В | <u>TM-119</u> | - |
| P0732 | 0732 | 2GR INCORRECT RATIO | _ | 2 | × | В | TM-121 | - |
| P0733 | 0733 | 3GR INCORRECT RATIO | _ | 2 | × | В | TM-123 | - |
| P0734 | 0734 | 4GR INCORRECT RATIO | _ | 2 | × | В | TM-125 | - |
| P0735 | 0735 | 5GR INCORRECT RATIO | | 2 | × | В | TM-127 | = |
| P0740 | 0740 | TORQUE CONVERTER | _ | 2 | × | В | TM-129 | - |
| P0744 | 0744 | TORQUE CONVERTER | | 2 | × | В | TM-130 | - |
| P0745 | 0745 | PC SOLENOID A | | 2 | × | В | TM-132 | - |
| P0750 | 0750 | SHIFT SOLENOID A | _ | 2 | × | В | TM-133 | - |
| P0775 | 0775 | PC SOLENOID B | | 2 | × | В | TM-134 | = |
| P0780 | 0780 | SHIFT | | 1 | × | В | <u>TM-135</u> | - |
| P0795 | 0795 | PC SOLENOID C | | 2 | × | В | <u>TM-137</u> | - |
| P0850 | 0850 | P-N POS SW/CIRCUIT | _ | 2 | × | В | EC-381 | • |
| P100A | 100A | VVEL SYSTEM-B1 | | 2 | × | В | EC-384 | - |
| P100B | 100B | VVEL SYSTEM-B2 | _ | 2 | × | В | EC-384 | - |
| P1087 | 1087 | VVEL SYSTEM-B1 | | 1 | × | В | EC-388 | - |
| P1088 | 1088 | VVEL SYSTEM-B2 | _ | 1 | × | В | EC-388 | • |
| P1089 | 1089 | VVEL POS SEN/CIRC-B1 | _ | 1 | × | В | EC-389 | - |
| P1090 | 1090 | VVEL ACTR MOT-B1 | | 1 | × | В | EC-392 | - |
| P1091 | 1091 | VVEL ACTR MOT PWR | _ | 1 or 2 | × | В | EC-396 | |
| P1092 | 1092 | VVEL POS SEN/CIRC-B2 | _ | 1 | × | В | EC-389 | - |
| P1093 | 1093 | VVEL ACTR MOT-B2 | _ | 1 | × | В | EC-392 | - |
| P1148 | 1148 | CLOSED LOOP-B1 | _ | 1 | × | A | EC-399 | - |

| DTC*1 | l | Items | SRT | | | Permanent DTC | Reference |
|----------------------------------|-------|----------------------------|------|--------|--------|---------------|---|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | code | Trip | MIL | group*4 | page |
| P1168 | 1168 | CLOSED LOOP-B2 | _ | 1 | × | А | EC-399 |
| P1211 | 1211 | TCS C/U FUNCTN | _ | 2 | _ | _ | EC-400 |
| P1212 | 1212 | TCS/CIRC | _ | 2 | _ | _ | EC-401 |
| P1217 | 1217 | ENG OVER TEMP | _ | 1 | × | В | EC-402 |
| P1225 | 1225 | CTP LEARNING-B1 | _ | 2 | _ | _ | EC-406 |
| P1226 | 1226 | CTP LEARNING-B1 | _ | 2 | _ | _ | EC-408 |
| P1233 | 1233 | ETC FNCTN/CIRC-B2 | _ | 1 | × | В | EC-410 |
| P1234 | 1234 | CTP LEARNING-B2 | _ | 2 | _ | _ | EC-406 |
| P1235 | 1235 | CTP LEARNING-B2 | _ | 2 | _ | _ | EC-408 |
| P1236 | 1236 | ETC MOT-B2 | _ | 1 | × | В | EC-414 |
| P1238 | 1238 | ETC ACTR-B2 | _ | 1 | × | В | EC-417 |
| P1239 | 1239 | TP SENSOR-B2 | _ | 1 | × | В | EC-419 |
| P1290 | 1290 | ETC MOT PWR-B2 | _ | 1 | × | В | EC-422 |
| P1421 | 1421 | COLD START CONTROL | _ | 2 | × | А | EC-424 |
| P1550 | 1550 | BAT CURRENT SENSOR | _ | 2 | _ | _ | EC-426 |
| P1551 | 1551 | BAT CURRENT SENSOR | _ | 2 | _ | _ | EC-430 |
| P1552 | 1552 | BAT CURRENT SENSOR | _ | 2 | _ | _ | EC-430 |
| P1553 | 1553 | BAT CURRENT SENSOR | _ | 2 | _ | _ | EC-434 |
| P1554 | 1554 | BAT CURRENT SENSOR | _ | 2 | _ | _ | EC-438 |
| P1556 | 1556 | BAT TMP SEN/CIRC | | 2 | _ | | EC-443 |
| P1557 | 1557 | BAT TMP SEN/CIRC | | 2 | _ | | EC-443 |
| P1564 | 1564 | ASCD SW | _ | 1 | _ | _ | EC-446 (with ASCD) EC-449 (with ICC) |
| P1568 | 1568 | ICC COMMAND VALUE | _ | 1 | _ | _ | EC-453 |
| P1572 | 1572 | ASCD BRAKE SW | _ | 1 | _ | _ | EC-454 (with ASCD) EC-459 (with ICC) |
| P1574 | 1574 | ASCD VHL SPD SEN | _ | 1 | _ | _ | EC-465 (with ASCD) EC-467 (with ICC) |
| P1606 | 1606 | VVEL CONTROL MODULE | _ | 1 or 2 | × or — | В | EC-469 |
| P1607 | 1607 | VVEL CONTROL MODULE | _ | 1 | × | В | EC-470 |
| P1608 | 1608 | VVEL SENSOR POWER/CIRC | _ | 1 | × | В | EC-471 |
| P1610 | 1610 | LOCK MODE | _ | 2 | _ | _ | SEC-55 |
| P1611 | 1611 | ID DISCARD, IMM-ECM | _ | 2 | _ | _ | SEC-56 |
| P1612 | 1612 | CHAIN OF ECM-IMMU | _ | 2 | _ | _ | SEC-58 |
| P1614 | 1614 | CHAIN OF IMMU-KEY | | 2 | _ | _ | <u>SEC-59</u> |
| P1730 | 1730 | INTERLOCK | _ | 2 | × | В | <u>TM-142</u> |
| P1734 | 1734 | 7GR INCORRECT RATIO | _ | 2 | × | В | <u>TM-144</u> |
| P1805 | 1805 | BRAKE SW/CIRCUIT | _ | 2 | _ | _ | EC-474 |
| P1806 | 1806 | BRAKE VACUUM SEN | | 2 | × | | BRC-113 |

| DTC* | 1 | | | | | | | |
|----------------------------------|-------|-------------------------------------|-------------|------|-----|--------------------------------------|-------------------|-----|
| CONSULT-III GST* ² | ECM*3 | Items (CONSULT-III screen terms) | SRT code | Trip | MIL | Permanent DTC group* ⁴ | Reference page | Α |
| P2100 | 2100 | ETC MOT PWR-B1 | _ | 1 | × | В | EC-422 | EC |
| P2101 | 2101 | ETC FNCTN/CIRC-B1 | _ | 1 | × | В | EC-410 | |
| P2103 | 2103 | ETC MOT PWR | _ | 1 | × | В | EC-422 | _ |
| P2118 | 2118 | ETC MOT-B1 | _ | 1 | × | В | EC-414 | С |
| P2119 | 2119 | ETC ACTR-B1 | _ | 1 | × | В | EC-417 | _ |
| P2122 | 2122 | APP SEN 1/CIRC | _ | 1 | × | В | EC-477 | D |
| P2123 | 2123 | APP SEN 1/CIRC | _ | 1 | × | В | EC-477 | |
| P2127 | 2127 | APP SEN 2/CIRC | _ | 1 | × | В | EC-481 | = |
| P2128 | 2128 | APP SEN 2/CIRC | _ | 1 | × | В | EC-481 | Е |
| P2132 | 2132 | TP SEN 1/CIRC-B2 | _ | 1 | × | В | EC-292 | - |
| P2133 | 2133 | TP SEN 1/CIRC-B2 | _ | 1 | × | В | EC-292 | _ |
| P2135 | 2135 | TP SENSOR-B1 | _ | 1 | × | В | EC-419 | - F |
| P2138 | 2138 | APP SENSOR | _ | 1 | × | В | EC-486 | - |
| P2713 | 2713 | PC SOLENOID D | _ | 2 | × | В | TM-152 | G |
| P2722 | 2722 | PC SOLENOID E | _ | 2 | × | В | TM-153 | - |
| P2731 | 2731 | PC SOLENOID F | _ | 2 | × | В | <u>TM-154</u> | |
| P2807 | 2807 | PC SOLENOID G | _ | 2 | × | В | <u>TM-155</u> | Н |
| P2A00 | 2A00 | A/F SENSOR1 (B1) | _ | 2 | × | А | EC-491 | = |
| P2A03 | 2A03 | A/F SENSOR1 (B2) | _ | 2 | × | А | EC-491 | - |

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

Test Value and Test Limit

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. (eg., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

Revision: 2010 June **EC-107** 2011 M37/M56

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INFOID:0000000005914028

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^{*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 <u>EC-61, "Diagnosis Description"</u>, "PERMANENT DIAGNOSTIC TROUBLE CODE (PERMANENT DTC)".

^{*5:} The troubleshooting for this DTC needs CONSULT-III.

^{*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 "How to Display SRT Status".

| ltem | OBD- | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------|------|--|-------|---|--------------------------|--|
| пош | MID | | | TID | Unitand Scaling ID | Description |
| | | 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 |
| | 01H | | P0133 | 87H | 04H | Response rate: Response ratio (Lean to Rich) |
| | | | P0133 | 88H | 04H | Response rate: Response ratio (Rich to Lean) |
| | | | P2A00 | 89H | 84H | The amount of shift in air fuel ratio |
| | | | P2A00 | 8AH | 84H | The amount of shift in air fuel ratio |
| HO2S | | | P0130 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0133 | 8CH | 83H | Response gain at the limited frequency |
| | | Heated oxygen sensor 2 (Bank 1) | P0138 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | 02H | | P0137 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0138 | 80H | 0CH | Sensor output voltage |
| | | | P0139 | 81H | 0CH | Difference in sensor output voltage |
| | | Heated oxygen sensor 3 (Bank 1) | P0143 | 07H | 0CH | Minimum sensor output voltage for test cycle |
| | 03H | | P0144 | 08H | 0CH | Maximum sensor output voltage for test cycle |
| | | | P0146 | 80H | 0CH | Sensor output voltage |
| | | | P0145 | 81H | 0CH | Difference in sensor output voltage |

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|-------|-----------|---------------------------------|-------|-----|-------------------------------|---|---|
| | OBD- | | | li | e and Test mit display) | | Æ |
| Item | MID | Self-diagnostic test item | DTC | TID | Unitand Scaling ID | Description | E |
| | | | 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 | |
| | | Air fuel ratio (A/F) sensor 1 | P0150 | 86H | овн | Maximum sensor output voltage for test cycle | [|
| | 05H | (Bank 2) | P0153 | 87H | 04H | Response rate: Response ratio (Lean to Rich) | |
| | | | P0153 | 88H | 04H | Response rate: Response ratio (Rich to Lean) | |
| | | | P2A03 | 89H | 84H | The amount of shift in air fuel ratio | |
| | | | P2A03 | 8AH | 84H | The amount of shift in air fuel ratio | |
| lO2S | | | P0150 | 8BH | 0BH | Difference in sensor output voltage | |
| | | | P0153 | 8CH | 83H | Response gain at the limited frequency | |
| | | | P0158 | 07H | 0CH | Minimum sensor output voltage for test cycle | |
| | 06H | Heated oxygen sensor 2 (Bank 2) | P0157 | 08H | 0CH | Maximum sensor output voltage for test cycle | |
| | | | P0158 | 80H | 0CH | Sensor output voltage | |
| | | | P0159 | 81H | 0CH | Difference in sensor output voltage | |
| | | | P0163 | 07H | 0CH | Minimum sensor output voltage for test cycle | |
| | 07H | Heated oxygen sensor 3 (Bank2) | P0164 | 08H | 0CH | Maximum sensor output voltage for test cycle | |
| | | | P0166 | 80H | 0CH | Sensor output voltage | |
| | | | P0165 | 81H | 0CH | Difference in sensor output voltage | |
| | | | P0420 | 80H | 01H | O2 storage index | |
| | 24⊔ | Three way catalyst function | P0420 | 82H | 01H | Switching time lag engine exhaust index value | |
| | 21H | (Bank1) | P2423 | 83H | 0CH | Difference in 3rd O2 sensor output voltage | |
| CATA- | | | P2423 | 84H | 84H | O2 storage index in HC trap catalyst | |
| YST | | | P0430 | 80H | 01H | O2 storage index | |
| | 201 | Three way catalyst function | P0430 | 82H | 01H | Switching time lag engine exhaust index value | |
| | 22H | (Bank2) | P2424 | 83H | 0CH | Difference in 3rd O2 sensor output voltage | |
| | | | P2424 | 84H | 84H | O2 storage index in HC trap catalyst | |

| | | | | | e and Test mit | |
|----------------|------|--|-------------------------------------|-----|---------------------------|--|
| Item | OBD- | Self-diagnostic test item | DTC | | display) | Description |
| | MID | Com diagnostic test term | 510 | TID | Unit and Scaling ID | Bookipaon |
| | | | P0400 | 80H | 96H | Low Flow Faults: EGR temp change rate (short term) |
| | | | P0400 | 81H | 96H | Low Flow Faults: EGR temp change rate (long term) |
| EGR SYSTEM | 31H | EGR function | 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 |
| | | | P0011 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | 35H | VVT Monitor (Bank1) | P0014 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | 0011 | VV F Worldon (Barner) | P0011 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| VVT | | | P0014 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| SYSTEM | | | P0021 | 80H | 9DH | VTC intake function diagnosis (VTC alignment check diagnosis) |
| | 36H | VVT Monitor (Bank2) | P0024 | 81H | 9DH | VTC exhaust function diagnosis (VTC alignment check diagnosis) |
| | 3011 | VVI WORKO (Barkz) | P0021 | 82H | 9DH | VTC intake function diagnosis (VTC drive failure diagnosis) |
| | | | P0024 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| | 39H | EVAP control system leak (Cap Off) | P0455 | 80H | 0CH | Difference in pressure sensor output voltage before and after pull down |
| | 3ВН | EVAP control system leak (Small leak) | P0442 | 80H | 05H | Leak area index (for more than 0.04 inch) |
| EVAP SYSTEM | 3СН | EVAP control system leak | P0456 | 80H | 05H | Leak area index (for more than 0.02 inch) |
| | 0011 | (Very small leak) | P0456 | 81H | FDH | Maximum internal pressure of EVAP system during monitoring |
| | 3DH | Purge flow system | P0441 | 83H | 0CH | Difference in pressure sensor output voltage before and after vent control valve close |
| | 41H | A/F sensor 1 heater (Bank 1) | Low Input:P0031 High Input:P0032 | 81H | 0BH | Converted value of Heater electric current to voltage |
| | 42H | Heated oxygen sensor 2 heater (Bank 1) | Low Input:P0037 High Input:P0038 | 80H | 0CH | Converted value of Heater electric current to voltage |
| O2 SEN- SOR | 43H | Heated oxygen sensor 3 heater (Bank 1) | P0043 | 80H | 0CH | Converted value of Heater electric current to voltage |
| HEATER | 45H | A/F sensor 1 heater (Bank 2) | Low Input:P0051 High Input:P0052 | 81H | 0BH | Converted value of Heater electric current to voltage |
| | 46H | Heated oxygen sensor 2 heater (Bank 2) | Low Input:P0057 High Input:P0058 | 80H | 0CH | Converted value of Heater electric current to voltage |
| | 47H | Heated oxygen sensor 3 heater (Bank 2) | P0063 | 80H | 0CH | Converted value of Heater electric current to voltage |

| lá a a a | OBD- | Oalf diamandia to at its an | DTC | li | e and Test mit display) | Donasiakian | А | | | |
|-------------------------|------|--------------------------------|------------------------------|-----|-------------------------------|---|---|--|--|--|
| SEC- OND- ARY AIR | MID | Self-diagnostic test item | DIC | TID | Unitand Scaling ID | Description | | | | |
| | | | P0411 | 80H | 01H | Secondary Air Injection System Incor- rect Flow Detected | | | | |
| | | | Bank1: P0491 Bank2: P0492 | 81H | 01H | Secondary Air Injection System Insufficient Flow | | | | |
| OND- 7 | | | P2445 | 82H | 01H | Secondary Air Injection System Pump Stuck Off | D | | | |
| | 71H | Secondary Air system | P2448 | 83H | 01H | Secondary Air Injection System High Airflow | E | | | |
| 74(1741) | | | 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 | F | | | |
| | | | P2444 | 86H | 01H | Secondary Air Injection System Pump Stuck On | | | | |
| | 0411 | Fuel injection system function | P0171 or P0172 | 80H | 2FH | Long term fuel trim | G | | | |
| FUEL | 81H | (Bank 1) | P0171 or P0172 | 81H | 24H | The number of lambda control clamped | | | | |
| SYSTEM | 82H | Fuel injection system function | P0174 or P0175 | 80H | 2FH | Long term fuel trim | Н | | | |
| | 0∠⊓ | (Bank 2) | P0174 or P0175 | 81H | 24H | The number of lambda control clamped | | | | |

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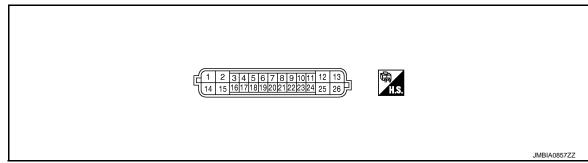
| | ODD | | | li | e and Test mit display) | |
|----------|-------------|----------------------------|-------|-----|-------------------------------|--|
| Item | OBD- MID | Self-diagnostic test item | DTC | TID | Unit and Scaling ID | Description |
| | | | P0301 | 80H | 24H | Misfiring counter at 1000 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 |
| MISFIRE | A1H | Multiple Cylinder Misfires | P0301 | 89H | 24H | Misfiring counter at 200 revolution of th first cylinder |
| WIGI IKL | AIII | Multiple Cylinder Misines | P0302 | 8AH | 24H | Misfiring counter at 200 revolution of th second cylinder |
| | | | P0303 | 8BH | 24H | Misfiring counter at 200 revolution of the third cylinder |
| | | | P0304 | 8CH | 24H | Misfiring counter at 200 revolution of th fourth cylinder |
| | | | P0305 | 8DH | 24H | Misfiring counter at 200 revolution of th fifth cylinder |
| | | | P0306 | 8EH | 24H | Misfiring counter at 200 revolution of th 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 |

| Item | OBD- | Salf diagnostic test item | DTC | li | e and Test mit display) | Description |
|---------|------|---------------------------|-------|-----|-------------------------------|--|
| nem | MID | Self-diagnostic test item | DIC | TID | Unitand Scaling ID | . Безсприон |
| | 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 cy- cles |
| | АЗН | No. 2 Cylinder Misfire | P0302 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0302 | 0CH | 24H | Misfire counts for last/current driving cy- cles |
| | 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 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| MICEIDE | | | P0304 | 0CH | 24H | Misfire counts for last/current driving cy- cles |
| MISFIRE | A6H | No. 5 Cylinder Misfire | P0305 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0305 | 0CH | 24H | Misfire counts for last/current driving cy- cles |
| | А7Н | No. 6 Cylinder Misfire | P0306 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0306 | 0CH | 24H | Misfire counts for last/current driving cy- cles |
| | А8Н | No. 7 Cylinder Misfire | P0307 | 0ВН | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0307 | 0CH | 24H | Misfire counts for last/current driving cy- cles |
| | А9Н | No. 8 Cylinder Misfire | P0308 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0308 | 0CH | 24H | Misfire counts for last/current driving cycles |

VVEL CONTROL MODULE

Reference Value

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- VVEL control module is located behind the IPDM E/R. For this inspection, remove hoodledge cover (RH).
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT-III.

| Term | inal No. | Description | | | Value |
|----------|---|---|------------------|---|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 1 (W) | 14 (B/R) | VVEL actuator motor pow- er supply (bank 2) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 2 | 14 | VVEL actuator motor | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ |
| (L/B) | 1 14 VV (B/R) er 2 14 VV (B/R) (H 3 4 (B) (W) tio | (High lift) (bank 2) | Cupu | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ |
| 3 | 4 | VVEL control shaft posi- | | [Engine is running] • Warm-up condition • Idle speed | Approx.0.25 - 1.40 V |
| (B) | | tion sensor 1 (bank 1) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | Approx.0.25 - 4.75 V |
| 4 (W) | _ | Sensor ground [VVEL control shaft position sensor 1 (bank 1)] | _ | _ | _ |

VVEL CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| Termi | inal No. | Description | | | Value | ٨ |
|-------------|-------------|---|------------------|---|---|----|
| + | | Signal name | Input/ Output | Condition | (Approx.) | Α |
| 5 | 6 | VVEL control shaft posi- | | [Engine is running]Warm-up conditionIdle speed | Approx.0.25 - 1.40 V | EC |
| (W) | (B) | tion sensor 1 (bank 2) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | Approx.0.25 - 4.75 V | С |
| 6 (B) | _ | Sensor ground [VVEL control shaft position sensor 1 (bank 2)] | _ | _ | _ | D |
| 7 (Y) | 6 (B) | Sensor power supply [VVEL control shaft position sensor 1 (bank 2)] | _ | [Ignition switch: ON] | 5 V | Е |
| 8 (R) | 14 (B/R) | Power supply for VVEL control module | _ | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | F |
| 9 (L) | 4 (W) | Sensor power supply [VVEL control shaft posi- tion sensor 1 (bank 1)] | _ | [Ignition switch: ON] | 5 V | G |
| 11 (GR) | _ | CAN communication line [ECM] | Input/ Output | _ | _ | |
| 12 | 14 | VVEL actuator motor | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ | H |
| (L/B) | (B/R) | (High lift) (bank 1) | • | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ | K |
| 13 (W) | 14 (B/R) | VVEL actuator motor power supply (bank 1) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | M |
| 14 (B/R) | _ | VVEL control module ground | _ | [Engine is running] • Idle speed | _ | N |

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< ECU DIAGNOSIS INFORMATION >

| Term | inal No. | Description | | | Value |
|-----------|-------------|---|------------------|---|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 15 | 14 | VVEL actuator motor (Low | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ |
| (L/W) | (B/R) | lift) (bank 2) | Culput | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ |
| 16 | 17 | VV/EL control shoft posi | | [Engine is running] • Warm-up condition • Idle speed | 3.50 - 4.75 V |
| (R) | 17 (G) | VVEL control shaft position sensor 2 (bank 1) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0.25 - 4.75 V |
| 17 (G) | _ | Sensor ground [VVEL control shaft position sensor 2 (bank 1)] | _ | _ | _ |
| 18 (G) | 19 (R) | VVEL control shaft position sensor 2 (bank 2) | Input | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition When revving engine up to 2,000 rpm quickly | 3.50 - 4.75 V 0.25 - 4.75 V |
| 19 (R) | _ | Sensor ground [VVEL control shaft position sensor 2 (bank 2)] | _ | _ | _ |
| 20 (L) | 19 (R) | Sensor power supply [VVEL control shaft posi- tion sensor 2 (bank 2)] | _ | [Ignition switch: ON] | 5 V |
| 21 (V) | 14 (B/R) | VVEL actuator motor relay abort signal | Input | [Engine is running]Warm-up conditionIdle speed | 0 V |
| 22 (Y) | 17 (G) | Sensor power supply [VVEL position sensor 2 (bank 1)] | _ | [Ignition switch: ON] | 5 V |
| 23 (P) | 14 (B/R) | VVEL control motor relay | Output | [Ignition switch: OFF] [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) 0 - 1.0 V |
| 24 (L) | _ | CAN communication line | Input/ Output | — | _ |

VVEL CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[VQ37VHR]

| Termi | inal No. | Description | | | Value |
|-------|----------|-------------------------|------------------|---|---|
| + | | Signal name | Input/ Output | Condition | (Approx.) |
| 25 | 14 | VVEL control motor (Low | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ |
| (L/W) | (B/R) | lift) (bank 1) | Саграс | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ |

 $[\]bigstar$: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

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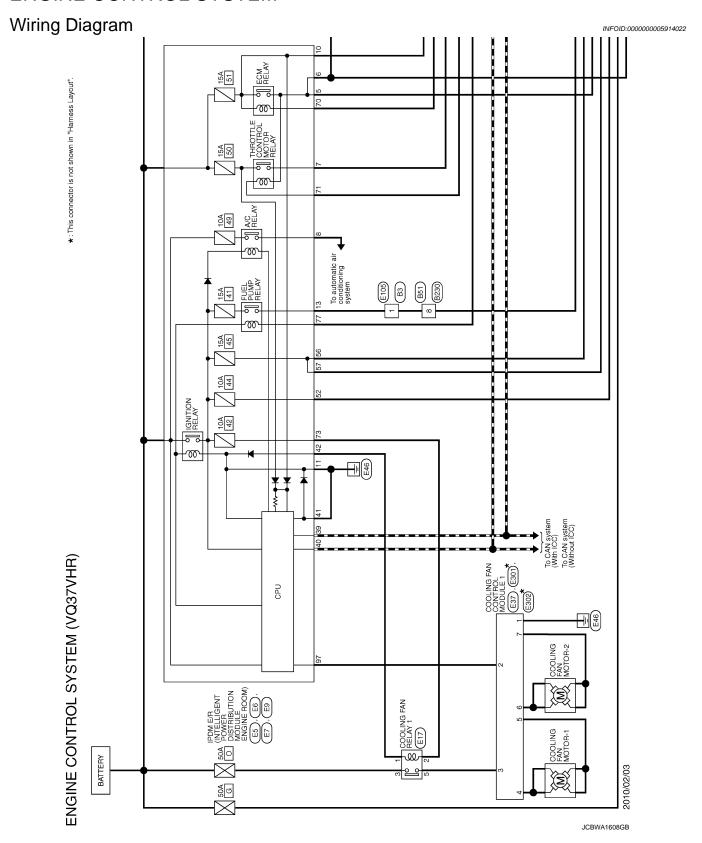
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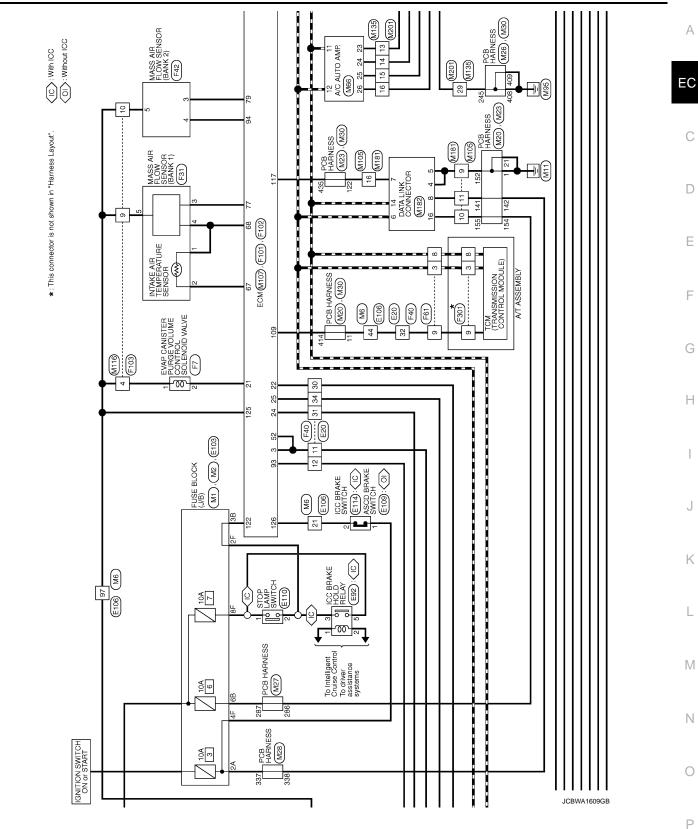
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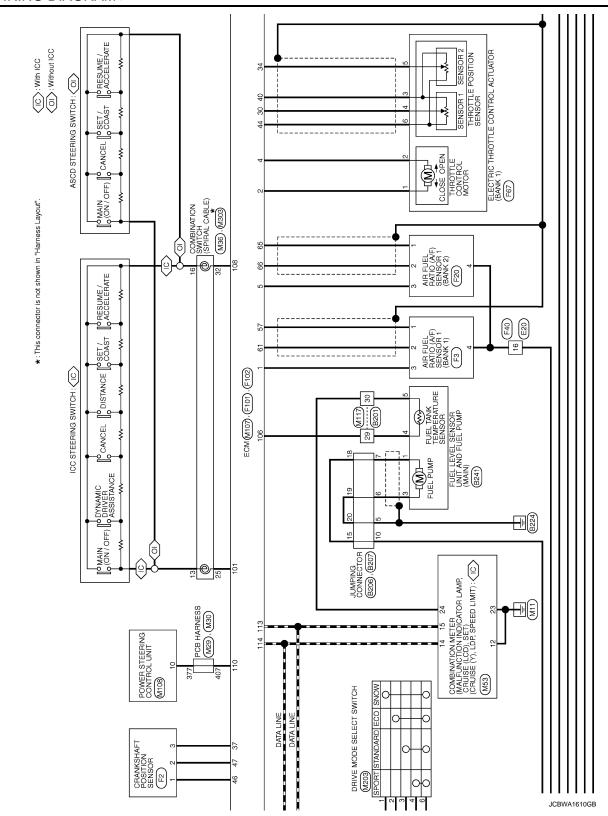
< WIRING DIAGRAM > [VQ37VHR]

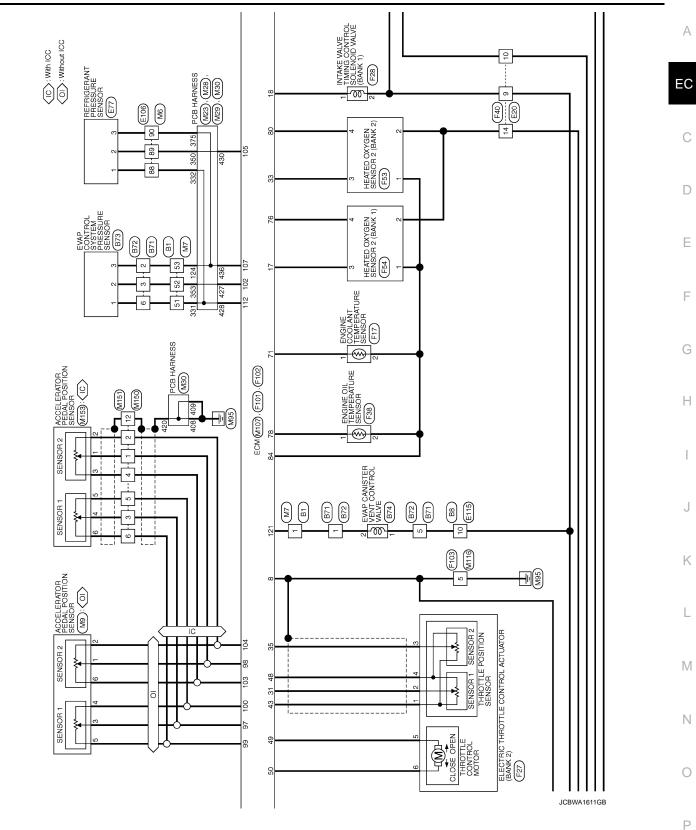
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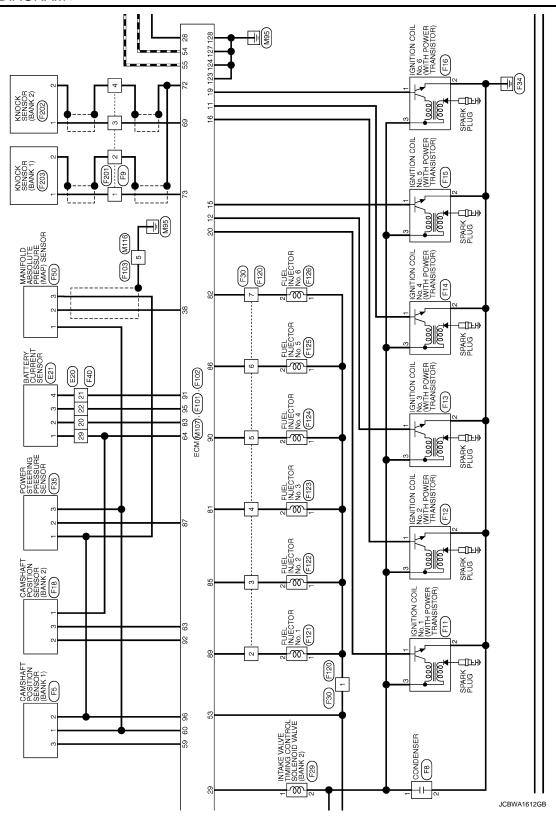
ENGINE CONTROL SYSTEM











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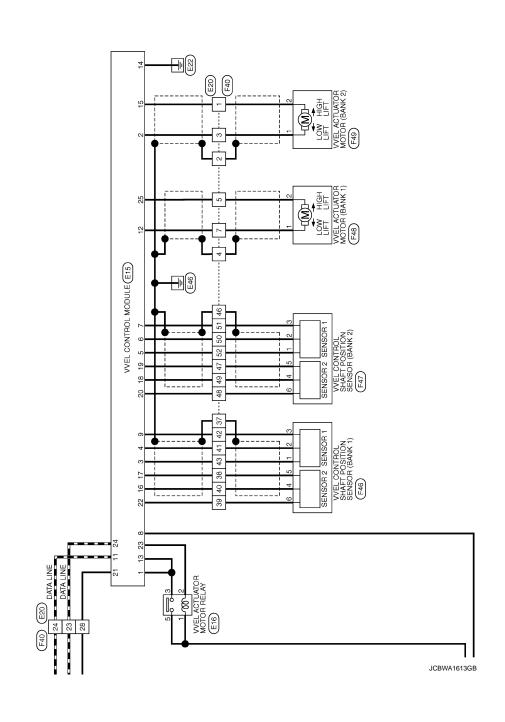
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| ENG | INE C | ENGINE CONTROL SYSTEM (VQ37VH | 7VHR) | | | | |
|----------------|----------------|--|-------|------------|---------------------------------|-------------------------------|--|
| Connector No. | or No. | BI | 37 | SB | 1 | Connector No. B3 | Terminal Color Signal Name [Specification] |
| Connecto | Connector Name | WIRE TO WIRE | 40 | SHIELD | | Connector Name WIRE TO WIRE | |
| Connector Type | or Type | TH80FW-CS16-TM4 | 42 | M/L | - | Connector Type M02FW-LC | ł |
| 1 | | | 45 | > | 1 | | , Married Co |
| | | 11 12 13 13 13 13 13 13 13 13 13 13 13 13 13 | 48 | > | | | Т |
| | _ | | 48 | 띪 | - | <u></u> | |
| | | | 20 | SB | 1 | ֚֚֭֚֭֚֭֚֭֚֭֚֭֚֭֚֓֞֞֞ | Connector Type RS06FB-PR |
| | | 0.000 | 51 | > . | 1 | 7 | • |
| | | | 22 | 2 6 | | | |
| Terminal | Color | L | 299 | ۵ | 1 | Terminal Color | |
| No. | _ | Signal Name [Specification] | 22 | R | - | _ | |
| - | ۳ | 1 | 28 | PT | - | | \$19.00 10.00 |
| 2 | W | 1 | 29 | Υ | 1 | 2 L – |) |
| 4 | ΓG | - | 09 | Μ | - | | |
| 2 | ۵ | 1 | 19 | В | 1 | - 1 | -B |
| 9 | > | 1 | 62 | LG | | Connector No. B8 | No. of Wire |
| 7 | GR | - | 63 | BR | | Connector Name WIRE TO WIRE | |
| 8 | ≻ | 1 | 63 | > | - [Without ICC and 4WAS system] | ┑ | 2 G – |
| 6 | PC | 1 | 65 | 0 | 1 | Connector Type NS12FW-CS | + |
| 10 | > | | 99 | BR | 1 | 1 | |
| Ξ | g | - [Wi | 67 | > | 1 | (AHA) | - ^ 9 |
| Ξ | - | - [With heated seat] | 89 | PC | 1 | | |
| 12 | ۵ | [With Climate controlled seat] | 69 | GR | 1 | 5 4 3 2 1 | |
| 12 | æ | - [With heated seat] | 6 | œ | 1 | 12 11 10 9 8 7 6 | Connector No. B72 |
| 2 | æ | 1 | 72 | - | 1 | | Connector Name WIRE TO WIRE |
| 14 | ۰ | | 73 | ٠ | | | Т |
| 12 | 0 ; | 1 | 74 | - 1 | | ⊢ | Connector Type RS06MB |
| 2 5 | ، ا | | 6/ | ۰ > | | Signal Name [Specification] | |
| 2 | ۰ | | 5 1 | - 0 | | + | |
| 9 | 3 | | 82 | . > | | 1 > | ien l |
| 20 | ۵ | 1 | 79 | g | 1 | W | |
| 21 | В | 1 | 81 | FG | - | | (a) (a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c |
| 22 | PC | 1 | 82 | BR | 1 | 12 SB – | |
| 23 | > | 1 | 83 | SB | - | | |
| 24 | > c | 1 | 8 8 | ≻ } | | O conscience No. | Terminal Color Signal Name [Specification] |
| 800 | 9 6 | | 8 8 | ٥ | | Т | t |
| 2 2 | 5 8 | | 8 28 | 2 د | | Connector Name WIRE TO WIRE | 1 |
| 28 | 3 - | - [With Pre-crash seat belt system] | 8 | , g | | Connector Type M08MB-LC | H |
| 28 | 2 | - | 91 | g | - | | w |
| 58 | _ | - [With Pre-crash seat belt system] | 92 | g | 1 | IF. | > 9 |
| 29 | M/L | - [Without Pre-crash seat belt system] | 96 | > | - | H.S. | |
| 30 | SHIELD | | 97 | 0 | - | 1 2 3 4 | |
| 32 | _ | - | 86 | SB | | 7 | |
| 33 | ۳ | 1 | 66 | LG | 1 | ᆌ | |
| 34 | 1 | - | | | | | |
| 35 | ٠, | - | | | | | |
| gg gg | 5 | | | | | | |

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ENGINE CONTROL SYSTEM

[VQ37VHR] < WIRING DIAGRAM >

| 8230 WINE TO WIRE WARE-LC Signal Name [Specification] Signal Name [Specification] Signal Name [Specification] | A EC |
|--|------------------|
| 18 W 19 B B B B B B B B B | C |
| orification] | Е |
| Color Colo | F |
| Color Colo | G |
| Term Term Term Term Term Term Term Term | Н |
| With Climate controlled seat | I |
| | J |
| (19) (19) (19) (19) (19) (19) (19) (19) | K |
| | L |
| ENGINE CONTROL SYSTEM (VQ37VHR) Connector Name EVAP CONTROL SYSTEM PRESSURE SENSOR Terminal Color No. of Wire Connector Name EVAP CANSTER VEVT CONTROL VALVE Connector Name WIPE TO WIPE Connector Name WIPE Connector Name WIPE TO WIPE Connector Name WIPE TO WIPE Connector Name WIPE Connector Name WIPE TO WIPE Connector Name WIPE Connector | М |
| Signal I Signal I Signal I Signal I | N |
| ENGINE Compactor No. Commactor | O JCBWA1615GB |
| | P |

EC-125 Revision: 2010 June 2011 M37/M56

| [| 22 22 3 | 24 L CAN L 25 L/W MOTOR2-B1 | | Connector No. E16 | | | 修 | #\$P | | H 12 13 1 | ا ا | Terminal Color Signal Name [Specification] | B - | | ; a | | | Connector No. E17 | VK engine] Connector Name COOLING FAN RELAY 1 | Connector Type 24347_9F900 | (engine] | | \ | 3 engine] | | | Terminal Color Signal Name [Specification] | | VQ engine] 2 G - | 8 | _ 5 R _ – | VK engine | V.V. engine] | 2 engine] | _ |
|--|---|--------------------------------|-------------------|-------------------|-------------------|--|-------------------------------|-----------------------------|--------|---|--------|--|-----------------------------|-------------|-----|--------|--------------------------------|-------------------|---|----------------------------|----------------------------|-----------------------------------|------------|-----------|-------------|---|--|----------------------------------|------------------|----------------|----------------|---------------------------------|--------------|-----------------------------|---|
| ************************************** | a of | 94 LG - 96 R - | 97 V – 102 O – | | Connector No. E15 | Connector Name VVEL CONTROL MODULE | Connector Type RH18FB-AJZ8-LH | • | Į v | 1 2 3 4 5 6 7 8 9 10 11 14 15 16 17 18 19 20 21 22 23 24 | | | la l | No. of Wire | 2 | VEL/SI | 3 B VEL/S1-B1 [With VQ engine] | 4 W AGND1 | 5 L VEL/S1-B2 [With VK engine] | . B | 7 W AVCC3 [With VK engine] | 7 Y AVCC3 [With VQ engine] 8 R VB | B AVCC1 [W | Н | 11 GR CAN H | . × | B/R | 15 G VEL /S2-B1 [With VK engine] | o ec | > | 9 | 18 R VEL/S2-B2 [With VK engine] | ם פ | 19 R AGND4 [With VQ engine] | _ |
| | | - 1 | 1 1 | | E7 | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | TH20FW-CS12-M4 | | | ESS 54 55 66 57 58 0870717273 74758787773 81 82 47 48 49 50 51 52 158 301612363 64858657638 79 80 | | | Signal Name [Specification] | | | 1 | ı | ī | | _ | 1 | 1 1 | 1 | ı | | ı | | Fq | Т | П | TH16FW-NH | | | 08 07 06 05 04 03 03 | 000000000000000000000000000000000000000 |
| ŀ | ++ | 43 SB 44 GR | 45 G 46 BR | | Connector No. | Connector Name | Connector Type | E | HS | _ | | | le L | No. of Wire | + | H | Н | _ | 55 56 R | Н | + | 71 O | H | Н | /5 Y | + | | Connector No. | 2 | Connector Name | Connector Type | € | S = | | |
| ⋝⊢ | E-5 IPDM E-/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | | | 37 38 | | | | Signal Name [Specification] | | | | | | | | | | 1 | 1 1 | - | 1 | 1 1 | | | | IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE | | | | | 41 40 | 46 45 44 43 | <u> </u> | | |

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ENGINE CONTROL SYSTEM

[VQ37VHR] < WIRING DIAGRAM >

| | А | L |
|--|-------------|--------|
| Signal Name [Specification] | EC | |
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| Terminal Color Terminal Termina | С |) |
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| SSURE S SURE IN THE LAY I See of The Company of the | F | - |
| Name REFRIGERANT PRE: Type RK03FB RK03 | G |) |
| Connector No. E22 Connector Type RKG Terminal Color No. of Wire Connector No. E22 Connector No. | H | ł |
| E21 BATTERY CURRENT SENSOR SAZD4FGY SAZD4FGY SAZO4FGY SAZO4FGY SAZO4FGY Signal Name [Specification] Signal Name [Specification] Signal Name [Specification] | I | |
| EZI BATTERY CURRENT SENSOR SAZDAFGY SAZDAFGY Signal Name [Specific | J | |
| SHELD SHEL | k | r h |
| 27. CON CONTROL CONTRO | L | |
| WIRE | N | 1 |
| Connector Name E20 Connector Name Connector Name Connector Type SAA30MB-RSS-SH28 Connector Type SAA30MB-RSS-SH28 Connector Type Connector T | N | I |
| Commester No. Commester No. Commester No. Commester No. Commester Type Commeste | C |) |
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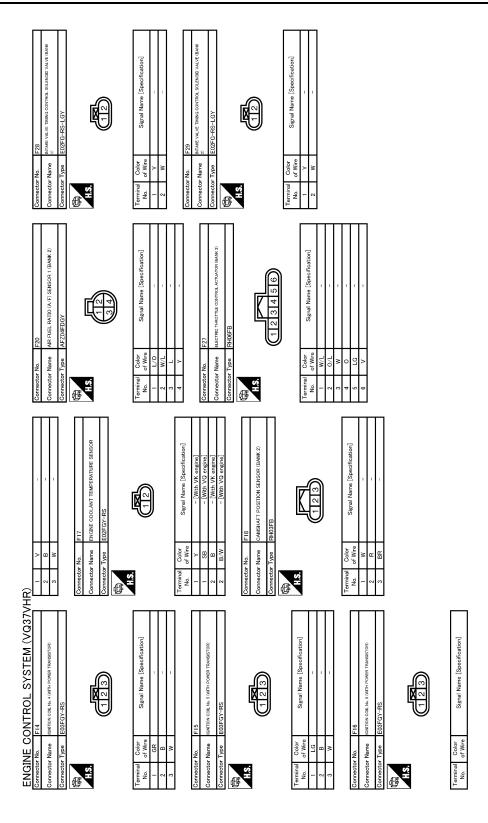
EC-127 Revision: 2010 June 2011 M37/M56

| ENG | INE C | ENGINE CONTROL SYSTEM (VQ37VHR) | ΉR | | | | |
|---------------|----------------|---|----------|----------------|-------------------------------|--|--|
| Connector No. | or No. | E106 | | ΓC | - | Connector No. E110 | la la |
| Connect | Connector Name | WIRE TO WIRE | 60 | ≥ 0 | | Connector Name STOP LAMP SWITCH | No. of Wire |
| Connect | Connector Type | TH80FW-CS16-TM4 | 62 | ╀ | | Connector Type M04FW-LC | ł |
| ą | _ | | 63 | BR | | ą | 10 W – [With VK engine] |
| 厚 | | a f | 64 | а; | 1 | (Type) | H |
| Ę. | _ | | g % | - l° | | | > 03 |
| | | 2 S S S S S S S S S S S S S S S S S S S | 6 6 | + | | 3 4 | ┨ |
| | | 4 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 77 | ╁ | 1 | 12 | |
| | | | 78 | SB | - | | Connector No. E301 |
| | | | 80 | Н | - | | Connector Name COOLING FAN CONTROL MODILIE 1 |
| Terminal | of Wind | Signal Name [Specification] | 8 8 | <u>د</u> (| 1 | Terminal Color Signal Name [Specification] | т |
| - | <u>a</u> | | 8 8 | + | | Ť | ٦. |
| ٠ | . » | | 8 8 | ╀ | 1 | . ^ 6 | • |
| 1 ε | SB | 1 | 82 | ╀ | | 3 W - [With ICC] | - T |
| 4 | Ρ | 1 | 98 | - | 1 | 9 | _ |
| 2 | ٥ | 1 | 87 | > | 1 | SB | (4 5) |
| 7 | GR | 1 | 88 | BR | 1 | 4 Y - [Without ICC] | |
| ∞ | 5 | - | 88 | H | - | | |
| 6 | \ | - | 90 | Α | | | |
| 10 | BR | 1 | 91 | Α | 1 | Connector No. E114 | le |
| 11 | SB | - | 92 | Ь | - | HOTHWO BYAGO OO! | No. of Wire Signal Marile Lopecinication |
| 12 | > | 1 | 93 | PT | 1 | | 4 |
| 13 | GR | ſ | 94 | H | I | Connector Type M02FBR-LC | 1 |
| 14 | GR | ı | 92 | H | ı | 4 | |
| 15 | > | - | 96 | ч | - | 修 | |
| 91 | ٠ | 1 | 97 | œ | _ | [S | Connector No. E302 |
| 17 | GR | 1 | 86 | Υ | - | | 1 JOON LOON DOOL ING EAN CONTROL MODILIE 1 |
| 18 | ۸ | - | 66 | ۸ | - | 7 | |
| 20 | BR | - | 100 | ۸ | - | | Connector Type 6188-0259 |
| 21 | Ь | - | | | | | ģ |
| 22 | 7 | - | | | | | MAT |
| 23 | ۵ | _ | Conne | Connector No. | E109 | <u>a</u> | S |
| 27 | SHIELD | 1 | Conne | Connector Name | ASCD BRAKE SWITCH | -G | |
| 28 | ٦/٥ | 1 | | | | + | (29) |
| 29 | M/L | 1 | Conne | Connector Type | M02FBR-LC | 2 P – |) |
| E 8 | æ « | - | Œ | • | | | |
| 32 | 5 | 1 | Ŧ | _ | | ı | ŀ |
| 8 | 0 | 1 | ξ. | เก๋ | | Connector No. E115 | Terminal Color Signal Name [Specification] |
| 34 | > { | ſ | | | 2 | Connector Name WIRE TO WIRE | or wire |
| 9 5 | ž | 1 | | | · | Occupant Towns | 1 0 |
| 4 5 | ۲ <u>.</u> | | | |] | ٦ | |
| 45 | - | | | | | • | |
| £3 | 1 | | Ĺ | L | - | Att | |
| 44 | χ. | - | Terminal | | r Signal Name [Specification] | | |
| 40 | 7 | | Š, | ō | | 2 | |
| 46 | g: | | 1 | ت ا | | 6 7 8 9 10 11 12 | |
| 47 | > (| | 2 | ۵. | | 1 | |
| 84 6 | g (| | | | | | |
| 48 | ٥ | - | | | | | |

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| Cornector No. F12 Connector Type E03FGY-RS Terminal Color Signal Name [Specification] No. of Wire 3 W Terminal Color Cornector Name [Cornector Name Cornector Name Corn | A EC C |
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| | E |
| RSOMEL-B RSOMEL-B RSOMEL-B Signal Name [Specification] | F |
| | G |
| Connector No. Connector Name Connector Name No. of With SHIEL Onnector Name Connector Name Conne | Н |
| Signal Name [Specification] | I |
| RHOJFB RHOJFB Signal Nam Signal N | J |
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| Connector Name CPAMKSHAFT POSITION SENSOR CPAMK CPAMKSHAFT POSITION SENSOR CPAMKSHA | М |
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Revision: 2010 June **EC-129** 2011 M37/M56

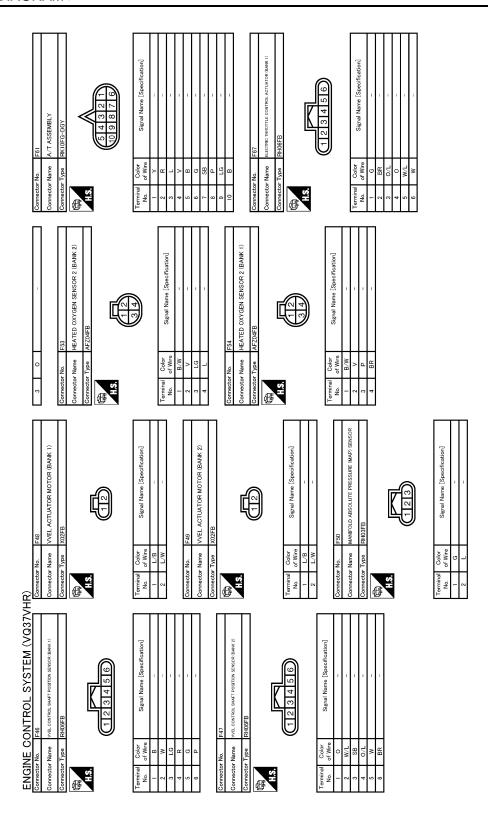


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| - [With VK engine] - [With We ongine] - [With We ongine] - [With We ongine] - [With We ongine] - [With VK ongine] - [With VK ongine] - [With We on | A EC |
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| 39 L/Y 40 W/L 41 W/L 41 W/L 41 W/L 42 L/G 43 W/L 43 W/L 43 W/L 43 W/L 45 SHED 47 L/G 7 L/G 50 W/L 51 SB 52 W 52 W 52 W 64 W/L 51 SB 52 W 74 W/L 52 W 64 W/L 54 W/L 55 W 65 W/L 66 W/L 67 W/L 68 W/L 69 W/L 69 W/L 69 W/L 69 W/L 69 W/L 60 W/L 60 W/L 60 W/L 61 SB 62 W 64 W/L 64 B 65 W/L 65 W 65 W/L 65 W 65 W/L 65 W 66 W/L 66 W/L 66 W/L 67 W/L 67 W/L 68 W/L 68 W/L 69 W/ | C |
| Signal Name [Specification] | E |
| Connector No. F40 | G H |
| F28 POWER STEERING PRESSURE SENSOR RYGGFB Signal Name [Specification] - [With VV engine] | I |
| Connector Name POWER STEE | J |
| Signal Name [Specification] | L |
| Connector Name RH08FB Connector Name Connector Na | N O |
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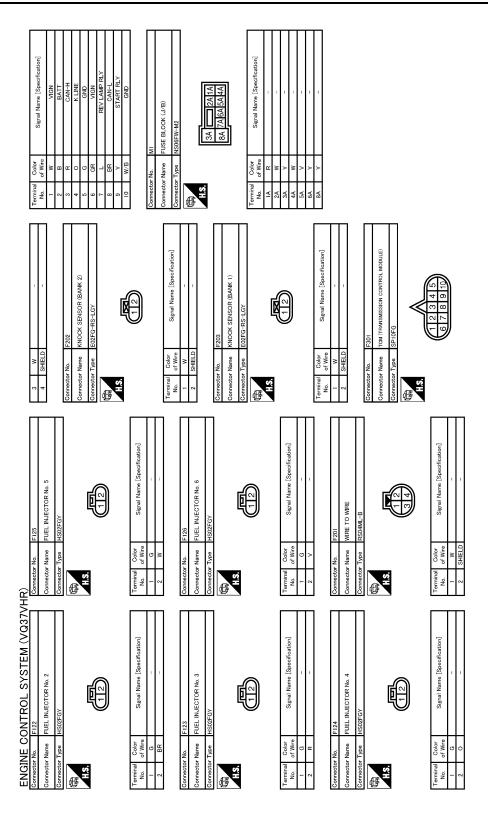
Revision: 2010 June **EC-131** 2011 M37/M56



JCBWA1622GB

| Connector No. F120 Connector Type RHC8/BB Connector Type RHC8/BB T1 2 3 4 | Commetcer No. Color Signal Name [Specification] Color Commetcer No. F121 Commetcer Name Signal Name [Specification] Color | EC C |
|--|--|--------|
| GNDA CURSEN GNDA PHASE#1/PS FR03 WRE TO WRE TKGBFW+HS10 | Color Signal Name [Spacification] Color Signal Name [Spacification] Color | E |
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| 1.2 (1.0 (1.0 (1.0 (1.0 (1.0 (1.0 (1.0 (1.0 | Signal Name [Specification] MOTORI-E2 MOTORI-E2 MOTORI-E2 IGNI SW ENG CANH-II A-F-1 A-F-1 A-F-1 A-C-1 GNDA-CWK TAI GNDA-CWK KNKT TAI GNDA-CWK KNKT OA2+ OA2+ OA2+ OA2+ OA2+ OA2+ OA2+ OA2+ INJEG BATT TEMP GNDA-CWK KNKI OA1+ OA1+ TO OA2+ OA2+ OA2+ OA2+ OA2+ CNESCH INJEG ESPECS INJEG ESPECS INJEG ESPECS INJEG ESPECS INJEG ESPECS INJEG CURSEN GNDA-PHASE#7 GNDA-PHASE#7 GNDA-OA2 GNDA-OA2 | I |
| D. F102 The state of the state | Signal Nam MOI MOI ENG ENG ENG GNDA AVCC PH AVCC PH GNDA | J |
| STVHR) Connector No. Connector Name Connector Type HA. Egg (2) | 7-reminal Color No. 25 | K |
| м м м м м м м м м м м м м м м м м м м | | L |
| OL SYSTEM (VQ3') RZ8-L-RH-Z RZ8-L-RH-Z RZ8-Z0-16-12-8-14 RZ8-1-RH-Z RZ8-Z0-16-12-8-14 RZ8-Z0-16-12-8-14 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-17-18-12 RZ8-Z0-18-12 RZ8-Z0-18-18-12 RZ8-Z0-18-12 R | Signal Name (Specification) AFH I MOTORI-E1 WOTOR2-81 MOTOR2-81 MOTOR2-81 MOTOR2-81 MOTOR2-81 MOTOR2-81 MOTOR2-81 MOTOR2-81 GAM2 GAM3 IGM#2 GAM4 IGM#2 GAM4 IGM#2 CVCT#2 CVCT#2 CVCT#2 TPS2-81 TPS2-81 TPS2-81 TPS2-81 TPS2-81 TPS2-82 TPS3-81 TPS3-81 AVCC-TPS-81 AVCC-TPS-82 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-82 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-81 AVCC-TPS-82 AVCC-TPS-83 AV | М |
| ECM ECM RH40FB- 44 40 36 31 39 35 31 43 38 34 30 41 37 33 29 41 37 33 29 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 24 38 34 30 41 37 38 38 34 30 41 37 38 38 38 38 38 38 38 38 38 38 38 38 38 | | Ν |
| ENGINE Connector No. Connector Name Connector Type HS. HS. | Terminal Color No. of Wire Part 1 | 0 |
| 파이 이 이 18 및 | JCBWA16230 | |
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EC-133 Revision: 2010 June 2011 M37/M56



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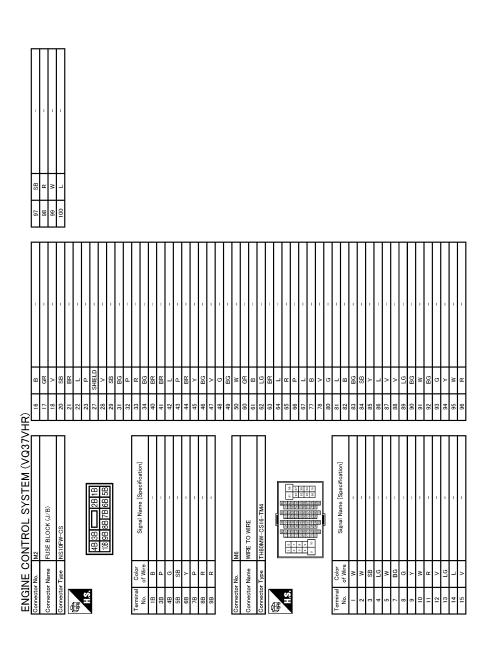
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| | 7 | 36 P | ¥ | | Connector No. M23 | Γ, | | Connector Type TH40FW-NH | ą | | TS. | [40] [53] [53] [53] [53] [53] [53] [53] [53 | 57 156 156 158 158 152 152 151 150 149 148 147 146 145 144 143 | | | la | of Wire | æ | 4 | + | BG | + | 130 B | + | . רפ | | 135 P = | | ۵ | 140 L – | Н | 4 | Д. | 4 | | 14/ B | 140 | | | 2 0 | 2 3 | ╀ | Ł | Ł | · a | В | |
|---|------------------|--|--------------------------------|-----|-------------------|----|--|--------------------------|---|---|--|---|--|--------|-----|----|---------|---|---|-------------------|----------------------------|------|--------------------------|------|------|---|--|---|---|---------|-----|----|----|---|--------|-------|-----|--------|--------|-------|----------|---------|--------|---|--------|---|---|
| | Connector No. M9 | Connector Name ACCELERATOR PEDAL POSITION SENSOR | Connector Type RH06FB | | | | 1 0 3 4 5 6 | <u> </u> | | ١ | Terminal Color Signal Name [Specification] | Ť | 2 B | 3 8 | 4 W | | - T 9 | | | Connector No. M20 | Connector Name PCB HARNESS | П | Connector Type TH40FB-NH | | Atth | | 20 19 18 17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 | 40 39 38 37 36 36 34 33 32 31 30 29 28 27 28 25 24 23 22 21 | | | nal | re | 8 | - | α. | ، د | | × 3 | | × (10 | ł | ╀ | 24 L = | ۵ | SHIELD | > | > |
| | 40 SHIELD | 41 SB – – 42 V – – | W | 7 9 | 48 LG - | H | > 15 | Н | Н | Н | + | - X 69 | - GR | H | | H | M 99 | + | 4 | + | 7 | 70 V | 72 L | 73 b | + | + | 76 G = | 78 SB | ┝ | Н | Н | 4 | В | + | 5 (| Y (8 | 5 % | : 0 | - × 96 | Ŧ | ł | - 57 66 | ł | | | | |
| 히 | Connector No. M7 | Connector Name WIRE TO WIRE | Connector Type TH80MW-CS16-TM4 | | | | 80 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | | | | Terminal Color Signal Name [Specification] | T | - × × | 4 BR – | | L | - G - | - | 4 | > | - [Wi | - | _ [Wr | + | + | + | 15 BG = - | F | 0 | | Н | 4 | + | + | 23 W - | + | | $^{+}$ | - 6 | 29 5 | 30 SHEID | 32 | 33 | H | 35 P | Н | Н |

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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM > [VQ37VHR]

| | CONTROL SYSTEM (VQ3/VHK) | MGS/VIR) | ŀ | ŀ |
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| Separation Control and C | Connector Name DCB HABNESS | و | Н | Н |
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| 1 1 1 1 1 1 1 1 1 1 | ecror iype | Connector Type TH40FB-NH | >>> | X5 a |
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| The control of the | 80 80 80 80 80 80 80 80 80 80 80 80 80 8 | | × × ¬ | x -1 > |
| Control Face Cont | 8 | ess kon ford first and ford mad sing first first first ford. | □ ω > _ | |
| 1 1 1 1 1 1 1 1 1 1 | Color | Terminal Color | - A | Ţ |
| 1 | of Wire | No. of Wire | GR | Т |
| 1 1 1 1 1 1 1 1 1 1 | ١ | Bg | > 9 | ector Type |
| Simple S | x - | 50 | D 0 | |
| 10 | ╀ | Α | . « | |
| 10 | 80 | 287 Y | a | / |
| State Control Contro | LG – [Wi | 288 W | w | 420 419 418 617 418 637 418 435 414 413 412 411 410 408 408 408 408 405 404 410 410 410 410 |
| 1975 | В | 290 B | × (| |
| 19 19 19 19 19 19 19 19 | 249 SHIELD | ם מ | 4 | |
| Simple Control of | SHIELD | 293 B | | Color |
| W - - - - - - - - - | | 295 B | Г | of Wire |
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| 1912 1913 1914 | В | 301 R | | п |
| 10 | В | 302 R | - 1 | > |
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| Connector No. Connector No | SHIELD | + | | + |
| Fig. 10 Fig. | | ┨ | | + |
| Compactor No. Compactor No. Compactor No. Code C | BG | | 560 SW | + |
| Connector Name Conn | Ь | | ALTA SERF SERF SERF SERF SERF SERF SERF SERF | Н |
| No. Color Contractor Type Terminal Color C | GR | | | Н |
| Connected Type Terminal Color Color Cype Name (Specification) Color Cype | Y | | | В |
| No. Color Color | BR | ector Type | Color | SB |
| Column C | 5 0 | | | т |
| Y C C C C C C C C C | £ 00 | | : 3 | + |
| Signature Color | ı | | · > | L |
| Columna Colu | В | 228 227 226 225 224 223 222 | В | L |
| Formula Characteristics | 9 | Ste Ste Ste Ste Ste Ste Ste | В | Н |
| Signal Name (Specification) Terrinal Color Color | ď | | | _ |
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| No. of Ware 1975 Big 1976 1 | œ | Terminal Color | BG | > |
| V | ١ | of Wire | BG | BG |
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|---------------|----------------|--|----------------|---------|---|----------------|----------------|--|----------|----------------|------------------------|
| Connector No. | tor No. | M36 | 23 | В | GROUND | Connector No. | | M105 | S | Connector No. | M107 |
| Connec | Connector Name | COMBINATION SWITCH (SPIRAL CABLE) | 24 | ω ≥ | FUEL LEVEL SENSOR GROUND ALTERNATOR SIGNAL | Connector Name | | WIRE TO WIRE | Š | Connector Name | ne ECM |
| Connec | Connector Type | TK08FGY-1V | 56 | > | PARKING BRAKE SWITCH SIGNAL | Connector Type | Ħ | TH40FW-NH | ે | Connector Type | oe RH24FGY-RZ8-R-RH-Z |
| Œ | | | 27 | > 0 | BRAKE FLUID LEVEL SWITCH SIGNAL SECURITY SIGNAL | B | | | Œ | | |
| Ħ | | | 29 | | WASHER LEVEL SWITCH SIGNAL | H.S. | | | | Ξ. | 124 116112 106 104 |
| | | 24 25 26 | 33 | 5 8 | PADDLE SHIFTER SHIFT DOWN SIGNAL | 122 | 20 19 18 17 16 | 6 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 | | | 123 119 115 111 107 |
| | | 31 32 33 34 | 34 8 | 2 0 | FUEL LEVEL SENSOR SIGNAL | | 40 39 38 37 36 | 6 35 34 33 32 31 30 29 28 27 26 25 24 23 22 21 | | | |
| | | | 35 | ø - | SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE) DASSENGED SEAT BELT WADMING SIGNAL | | | | | | |
| Terminal | _ | | 37 | t | NON-MANUAL MODE SIGNAL | Terminal | Color | | Ţ | [ermina] | Color |
| ŏ | of Wire | Signal Name [Specification] | 38 | > | MANUAL MODE SHIFT DOWN SIGNAL | _ | of Wire | Signal Name [Specification] | | No. of | of Wire |
| 24 | ۵ | 1 | 39 | - | MANUAL MODE SHIFT UP SIGNAL | 2 | œ | 1 | | \dashv | R APS1 |
| 22 | SB | 1 | 40 | Α | MANUAL MODE SIGNAL | က | В | 1 | | + | |
| 56 | ๓ . | | | | | 2 | ار ا | 1 | | 4 | |
| E : | - : - | 1 | | ſ | | 9 | <u>.</u> | 1 | 1 | + | |
| 35 | - · | | Connector No. | T | M66 | , , | ا ر | 1 | 1 | + | SB ASCU SW |
| 8 8 | n 9 | 1 | Connector Name | | A/C AUTO AMP. | × 0 | | 1 | 1 | + | FIFRES |
| 34 | 2 | | 30,000 | Т | THOOPING TO | n Ç | ב מ | 1 | ľ | 201 | |
| | | | connector Type | ٦. | HZUFW=1B0 | 2 : | 4 3 | 1 | 1 | + | BR GND-APSZ [With ICC] |
| 0 | Oceanostor No | 250 | Œ | | | ÷ | ÷ 8 | 1 | <u>T</u> | + | |
| 00 | TO INC. | т | | | | 7 5 | 9 8 | | <u> </u> | + | LG FUFACS |
| Connec | Connector Name | COMBINATION METER | 2 | F | | ŧ ű | 9 8 | 1 1 | 1 | + | P |
| Secre | Connector Type | TUACOMENIE | | 1 2 | 4 5 6 7 1 10 11 12 | 9 | 5 > | | <u>1</u> | + | |
| | adic on | ٦. | | 13 | 17 18 20 21 22 23 24 25 26 | 0 0 | > 0 | ī I | 1 | + | DD NEIT-U |
| 4 | _ | | J | | | 2 5 | , | | ľ | + | |
| * | | | | | | 6 | n > | | 1 | 0 6 | V IACHO |
| Ź | , | | Tomission | volo | | 2 6 | > 6 | | 1 | + | <u> </u> |
| | οı | 3 4 5 6 7 8 9 10 11 12 13 14 15 16 | | of Wire | Signal Name [Specification] | 77 6 | 2 0 | ı | <u> </u> | + | |
| | 21 22 23 | 23 24 25 26 27 28 29 3 29 32 33 34 35 36 37 38 39 40 | + | - | > Iddi is down > day | C7 50 | ٤ | | ľ | * 12 | VENCAINT |
| | | | - 0 | J > | IGNITION DOWER SUPPLY | 62 | 2 0 | | Γ | + | CDCV |
| | | | 1 0 | : 0 | DI OWED MOTOR CONTRA | 3 5 | : 6 | | Ľ | t | |
| Tormina | lo Color | L | 0 | 4- | POWER TRANSISTOR CONTROL SIGNAL | | 5 - | 1 | ľ | + | |
| Ž | | Signal Name [Specification] | 9 | | GBOIND | 33 | | 1 | ľ | ł | |
| - | * | BATTERY POWER SUPPLY | 2 = | | CAN-L | 34 | . 5 | 1 | Γ | ╀ | |
| 2 | BG | | 12 | _ | CAN-H | 35 | × | 1 | Ĺ | ŀ | BR BNC SW |
| က | GR | L | 13 | > | ACC POWER SUPPLY | 36 | P | | L | 127 | B GND |
| 4 | ш | VEHICLE SPEED SIGNAL (8-PULSE) | 17 | BG | ECV CONTROL SIGNAL | 37 | _ | _ | | 128 | B GND |
| 9 | В | Ц | 20 | ۳ | HUMIDITY SENSOR (SCK) SIGNAL | 38 | ۳ | _ | | | |
| 9 | m ! | METE | 21 | > | HUMIDITY SENSOR (DATA) SIGNAL | | | | | | |
| 7 | gg | | 22 | 8 | HUMIDITY SENSOR GROUND | | | | | | |
| ∞ | PP | 7 | 23 | Α | DRIVE MODE SELECT SW (SNOW) | | | | | | |
| တ | g | ┪ | 24 | _ | DRIVE MODE SELECT SW (ECO) | | | | | | |
| 01 | R | ILLUMIP | 25 | g | DRIVE MODE SELECT SW (STANDARD) | | | | | | |
| = | 4 | TRIP RES | 26 | > | DRIVE MODE SELECT SW (SPORT) | | | | | | |
| 15 | ∞ | | | | | | | | | | |
| 4 ; | 4 | | | | | | | | | | |
| 15 | a. (| | | | | | | | | | |
| 91 | r | AIR BAG SIGNAL | | | | | | | | | |

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| Connector No. M135 Connector Name WIRE TO WIRE Connector Type TH32FW-NH H.S. | 16 16 14 13 12 11 11 0 9 8 7 6 5 4 3 2 1 1 32 11 32 11 32 13 13 13 13 13 13 13 13 13 13 13 13 13 | Terminal Color Signal Name [Specification] No. | W - C | × - | 5 L - [With heated seat] 6 P - [With Climate controlled seat] | GR | 7 SB = - Mith Climate controlled seat | GR | - [Wi | 11 BG - [With heated seat] | 13 W = | 7 | 15 7 | 17 W - [With Climate controlled seat] | ۵ | BR | + | 21 B | M | Н | 23 BG - | 4 | - [M | 25 B - [With heated seat] | + | - M | | | n (| - 8 67 × 96 | - | 32 L – | | |
|---|--|--|----------|---|---|-----------|---|-------------------------------------|----------|----------------------------|--------|----|------------|---------------------------------------|----------------------------------|----------------------|-----------|--|-------|------|-------------------------|-------------------------|-------------|---------------------------|-----|-----------------------|---------------------------------|------------------------------|----------------------|---------------------------------|----------------------|--------|------|------|
| | | 1 1 | 1 1 | | | - | 1 1 | | - | 1 | ī | - | | 1 | - [With Climate controlled seat] | - [With heated seat] | 1 1 | | - | - | 1 | | | | | | | | | | | | | |
| 51 SB 52 Y 53 W 56 B 57 G 68 C 68 C 68 C 68 C 68 C 68 C 68 C 68 C | +++ | 68 SB | Ü | \top | 79 K | Н | 81 82 83 | + | Н | 82 LG | 87 R | Н | 88 - BR | 91 Y | Н | 93 | 94 V W | 90 7 | 98 BR | Н | 100 Y | | | | | | | | | | | | | |
| | | | | | | | Γ | | | T | | | T | | П | T | T | T | | | | | T | T | T | | + | 7 | - | at. | I | | | |
| | M117 WIRE TO WIRE | TH80FW-CS16-TM4 | | - % % % % % % % % % % % % % % % % % % % | | | | Signal Name [Specification] | - | 1 1 | - | - | - | - | - | 1 | = - | | _ | - | - | 1 | 1 | 1 | | 1 | - [With Climate controlled sest | res pelionuos ergillio unimi | - [With heated seat] | - [with Climate controlled seat | - [With heated seat] | - | 1 | 1 |
| | | П | | | 0 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 | | | of Wire Signal Name [Specification] | | GR | | | > 9 | | | | M 0 | | | | J | | a | Υ ? | > M | = 8 | ļ | + | + | 1 | | | BG - | - PT |
| 118 LG 21 LG 22 B 23 W 24 W 25 BG | Connector No. M117 Connector Name WIRE TO WIRE | ector Type | | | 0 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 | | | of Wire | X | | BR | + | + | 23 R - | BG | F.G | | x > | . а | B | ŋ | | SHIELD | + | | + | 9 - | 7 8 | gg c | 5 6 | Y5 : | > | BG | |
| BR LG LG LG W W W W BG | | Sonnector Type | EPS SOL+ | TOS SCH | 0 2 2 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 | ENG TACHO | 200 | of Wire | X | TZOSPAMMENICAO | 19 BR | 20 | 21 | + | 24 BG | I LG | 26 W | Odior Signal Name [Specification] 28 V | 29 P | 30 B | - [With VK engine] 31 G | - [With VQ engine] 32 Y | - 40 SHIELD | + | + | - [With VO anging] 45 | - 45 SD | 7 04 | - 46 BG | 5 E | 25 / 4 | > | BG | FG |

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| Connector Name WIRE TO WIRE | 1 | 2 00 | Connector Name WIRE TO WIRE |
| Connector Type RH12FB | | H | Connector Type TH32MW-NH |
| al al | Connector No. M153 | H | q ₁ |
| The state of the s | Connector Name ACCELERATOR PEDAL POSITION SENSOR | В | Anth |
| I S | 7 | ≫ (| Z: Z: |
| 654391 | Connector Type RH06FB | r (| 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 |
| 1 0 | • | 31 BK | 20 21 22 23 24 25 26 27 28 29 |
| 2 | | 33 | |
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| rolog | | ╀ | Tarminal |
| No. of Wire Signal Name [Specification] | (61514131211) | + | |
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| 1 3 | t | Connector No M182 | - 87 |
| + | 9 B SENSOB GEOIND | | 3 |
| 5 (0 | ۵ - | Connector Name DATA LINK CONNECTOR | + |
| + | 1 | | 1 |
| 7 | R ACCELE | SOR 1 Connector Type BD16FW | + |
| J D | 5 W SENSOR GROUND | 1 | 13 W |
| 10 Y = | 6 G SENSOR POWER SUPPLY | | 14 L – |
| - 7 11 | | | - 5 |
| 12 SHIELD | | 11 12 13 14 16 | - × 91 |
| | Connector No. M181 | II۱ | |
| | C C C C C C C C C C C C C C C C C C C | 3 4 5 6 7 8 | BR - |
| Connector No. M151 | | | H |
| MIDE TO WIDE | Connector Type TH40MW-NH | | 20 B – |
| | Q | lal | 21 R - |
| Connector Type RH12MB | 图 | No. of Wire ogner indire capecing | 22 B – |
| đ | [[| 3 LG - | 23 BG - |
| 医 | | 4 B - | 24 V – |
| <u> </u> | 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 | - B 9 | 25 B - |
| J | E1 E2 C3 C4 C5 | - 7 9 | H |
| 123456 | | - ^ L | 27 B - [With Climate controlled seat] |
| 7 8 9 10 11 12 | | - FG - | 27 R - [With heated seat] |
| | lar | | 28 B - |
| | No. of Wire | 12 P – | 29 B – |
| Terminal Color | 2 R - | 13 L - | 30 B |
| of Wire | 3 B - | | 32 R - |
| · - | - L | - M 91 | |
| 2 B – | - BR - | | |
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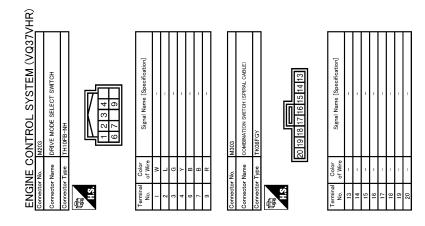
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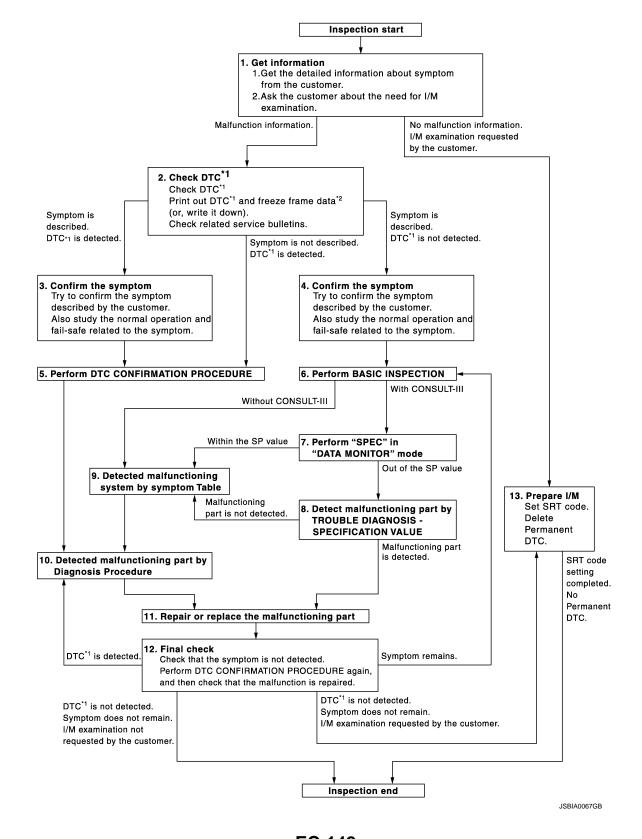
EC-141 Revision: 2010 June 2011 M37/M56

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

OVERALL SEQUENCE



DIAGNOSIS AND REPAIR WORKFLOW

[VQ37VHR] < BASIC INSPECTION >

*1: Include 1st trip DTC.

*2: Include 1st trip freeze frame data.

DETAILED FLOW

1.GET INFORMATION FOR SYMPTOM

Α

- 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-145, "Diagnostic Work Sheet".)
- 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

- Check DTC.
- 2. Perform the following procedure if DTC is displayed.
- Record DTC and freeze frame data. (Print them out with CONSULT-III or GST.)
- Erase DTC. [Refer to EC-70, "On Board Diagnosis Function" (Without CONSULT-III) or EC-73, "CON-SULT-III Function (With CONSULT-III).]
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-524, "Symptom Table".)
- 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-529, "Description" and EC-99, "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.

f 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-529, "Description" and EC-99, "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-101, "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.

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

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DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION > [VQ37VHR]

Is DTC detected?

YES >> GO TO 10.

NO >> Check according to GI-38, "Intermittent Incident".

6. PERFORM BASIC INSPECTION

Perform EC-157, "Work Procedure".

Do you have CONSULT-III?

YES >> GO TO 7. NO >> GO TO 9.

7 PERFORM SPEC IN DATA MONITOR MODE

(P)With CONSULT-III

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-III "SPEC" in "DATA MONITOR" mode. Refer to EC-172, "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-173, "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 <u>EC-524</u>. "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-41, "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 CON-SULT-III. Refer to <u>EC-83</u>, "Reference Value".

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

- 1. Repair or replace the malfunctioning part.
- Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement
- 3. Check DTC. If DTC is displayed, erase it. Refer to EC-70, "On Board Diagnosis Function" (Without CONSULT-III) or EC-73, "CONSULT-III Function" (With CONSULT-III).

>> 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.

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?

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION > [VQ37VHR]

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-70, "On Board Diagnosis Function" (Without CONSULT-III) or EC-73, "CONSULT-III Function" (With CONSULT-III).

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

13. PREPARE FOR I/M EXAMINATION

- Set SRT codes. Refer to EC-163, "Description".
- Erase permanent DTCs. Refer to <u>EC-168</u>, "<u>Description</u>".

>> INSPECTION END.

Diagnostic Work Sheet

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

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Revision: 2010 June **EC-145** 2011 M37/M56

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION >

[VQ37VHR]

WORKSHEET SAMPLE

| Customer name MR/MS | | Model & Year | VIN | |
|----------------------------|----------------|---|--|--|
| Engine # | | Trans. | Mileage | |
| Incident Date | | Manuf. Date | In Service Date | |
| Fuel and fuel filler cap | | ☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on. | | |
| | ☐ Startability | ☐ Impossible to start ☐ No combust ☐ Partial combustion affected by th ☐ Partial combustion NOT affected ☐ Possible but hard to start ☐ Other | nrottle position I by throttle position | |
| Symptoms | □ Idling | ☐ No fast idle ☐ Unstable ☐ H☐ Others [| ligh idle □ Low idle] | |
| | ☐ Driveability | ☐ Stumble ☐ Surge ☐ Knock ☐ Intake backfire ☐ Exhaust backfi ☐ Others [| ☐ Lack of power re] | |
| | ☐ Engine stall | ☐ At the time of start ☐ While idling ☐ While accelerating ☐ While dece ☐ Just after stopping ☐ While loadi | lerating | |
| Incident occurrence | | ☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime | | |
| Frequency | | ☐ All the time ☐ Under certain conditions ☐ Sometimes | | |
| Weather cond | litions | ☐ Not affected | | |
| | Weather | ☐ Fine ☐ Raining ☐ Snowing | Others [| |
| Temperature | | ☐ Hot ☐ Warm ☐ Cool ☐ |] Cold ☐ Humid °F | |
| | | ☐ Cold ☐ During warm-up ☐ / | After warm-up | |
| Engine conditions | | Engine speed0 2,000 | 4,000 6,000 8,000 rpm | |
| Road conditions | | ☐ In town ☐ In suburbs ☐ Hig | hway | |
| Driving conditions | | Not affected At starting While idling At racing While accelerating While decelerating While turning (RH/LH) | | |
| | | Vehicle speed | 30 40 50 60 MPH | |
| Malfunction indicator lamp | | ☐ Turned on ☐ Not turned on | | |

MTBL0017

ADDITIONAL SERVICE WHEN REPLACING ECM

[VQ37VHR] < BASIC INSPECTION > ADDITIONAL SERVICE WHEN REPLACING ECM Α Description INFOID:0000000005913541 When replacing ECM, the following procedure must be performed. EC Work Procedure INFOID:0000000005913542 1.perform initialization of IVIS (NATS) SYSTEM and REGISTRATION OF ALL IVIS (NATS) IGNI-TION KEY IDS Refer to SEC-53, "ECM: Work Procedure". D >> GO TO 2. 2.perform vin registration Е Refer to EC-149, "Work Procedure". F >> GO TO 3. 3.perform accelerator pedal released position learning Refer to EC-150, "Work Procedure". >> GO TO 4. Н 4. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING Refer to EC-151, "Work Procedure". >> GO TO 5. 5. PERFORM IDLE AIR VOLUME LEARNING Refer to EC-152, "Work Procedure". >> END K L M Ν Р

ADDITIONAL SERVICE WHEN REPLACING VVEL CONTROL MODULE

< BASIC INSPECTION > [VQ37VHR]

ADDITIONAL SERVICE WHEN REPLACING VVEL CONTROL MODULE

Description INFOID:0000000005913543

When replacing VVEL control module, the following procedure must be performed.

Work Procedure

1. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure".

>> END

VIN REGISTRATION

[VQ37VHR] < BASIC INSPECTION > VIN REGISTRATION Α Description INFOID:0000000005913549 VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced. EC Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M). Work Procedure INFOID:0000000005913550 1. CHECK VIN D Check the VIN of the vehicle and note it. Refer to GI-20, "Information About Identification or Model Code". >> GO TO 2. Е 2. PERFORM VIN REGISTRATION **With CONSULT-III** 1. Turn ignition switch ON and engine stopped. F Select "VIN REGISTRATION" in "WORK SUPPORT" mode. Follow the instruction of CONSULT-III display. >> END Н K L M Ν

EC-149 Revision: 2010 June 2011 M37/M56

ACCELERATOR PEDAL RELEASED POSITION LEARNING

< BASIC INSPECTION > [VQ37VHR]

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description INFOID:000000005913551

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.

Work Procedure

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

THROTTLE VALVE CLOSED POSITION LEARNING

< BASIC INSPECTION > [VQ37VHR]

THROTTLE VALVE CLOSED POSITION LEARNING

Description INFOID:0000000005913553

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.

INFOID:0000000005913554

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Work Procedure

1.START

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

>> END

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< BASIC INSPECTION > [VQ37VHR]

IDLE AIR VOLUME LEARNING

Description INFOID.000000005913555

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.

Work Procedure

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-III: Drive vehicle until "ATF TEMP SE 1" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9V.
- Without CONSULT-III: Drive vehicle for 10 minutes.

Do you have CONSULT-III?

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

2.PERFORM IDLE AIR VOLUME LEARNING

(P)With CONSULT-III

- 1. Perform Accelerator Pedal Released Position Learning. Refer to EC-150, "Work Procedure".
- Perform Throttle Valve Closed Position Learning. <u>EC-151</u>, "Work Procedure".
- 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-III screen?

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

3. PERFORM IDLE AIR VOLUME LEARNING

Without CONSULT-III

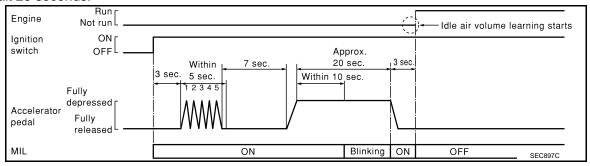
NOTE:

- 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-150, "Work Procedure".
- Perform Throttle Valve Closed Position Learning. <u>EC-151</u>, "Work Procedure".
- 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.
- 7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and illuminates.

IDLE AIR VOLUME LEARNING

[VQ37VHR] < BASIC INSPECTION >

- Fully release the accelerator pedal within 3 seconds after the MIL illuminates.
- Start engine and let it idle.
- 10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

- Start engine and warm it up to normal operating temperature.
- 2. Let it idle for 20 seconds.
- Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications. Refer to EC-540, "Idle Speed" and EC-540, "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.

O.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-172, "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

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VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

< BASIC INSPECTION > [VQ37VHR]

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Description INFOID:000000005913557

VVEL control shaft position sensor adjustment is an operation to adjust the initial position angle that is the basis for the VVEL control shaft position sensor.

It must be performed each time VVEL actuator sub assembly is replaced.

CAUTION:

- It must be performed only on the replaced bank side.
- It must not be performed except when VVEL actuator sub assembly is replaced. If by any chance the
 adjustment is performed, replace VVEL actuator sub assembly.

Work Procedure

1.START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.perform vvel control shaft position sensor adjustment

(P) With CONSULT-III

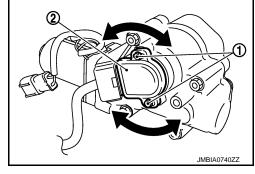
- 1. Turn ignition switch ON.
- Select "VVEL POS SEN ADJ PREP" in "WORK SUPPORT" mode with CONSULT-III.
- 3. Touch "Start" and wait a few seconds.
- 4. Make sure the "CMPLT" is displayed on CONSULT-III screen.
- Select "VVEL POSITION SEN- B1" or "VVEL POSITION SEN- B2" in "DATA MONITOR" mode with CON-SULT-III.
- 6. Loosen the VVEL control shaft position sensor mounting bolt (1).
- 7. Turn the VVEL control shaft position sensor (2) right and left while monitoring the output voltage of "VVEL POSITION SENB1" or "VVEL POSITION SEN-B2" and adjust the output voltage to be within the standard value.

Voltage : $500 \pm 48 \text{ mV}$

8. Tighten the VVEL control shaft position sensor mounting bolt.

: 7.0 N•m (0.71 kg-m, 62 in-lb)

9. Reconfirm that the output voltage of "VVEL POSITION SEN- B1" or "VVEL POSITION SEN- B2" is within the standard value.



Voltage : $500 \pm 48 \text{ mV}$

NOTE:

If it varies from the standard value after the bolt is tightened, perform steps 6 to 8 again.

- 10. Turn ignition switch OFF and wait at least 10 seconds.
- 11. Start engine and warm it up to normal operating temperature.
- 12. Turn ignition switch OFF and wait at least 10 seconds.
- 13. Perform idle air volume learning. Refer to EC-152, "Work Procedure".

>> INSPECTION END

${f 3.}$ PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

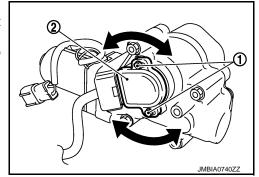
(R) Without CONSULT-III

- 1. Disconnect VVEL control shaft position sensor harness connector.
- Remove VVEL actuator motor relay.
- Turn ignition switch ON, wait at least 5 seconds and then turn OFF.
- 4. Reconnect all harness connectors disconnected.

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

< BASIC INSPECTION > [VQ37VHR]

- Install VVEL actuator motor relay.
- 6. Turn ignition switch ON and wait at least 5 seconds.
- 7. Loosen the VVEL control shaft position sensor mounting bolt (1).
- 8. Turn the VVEL control shaft position sensor (2) right and left while monitoring the output voltage between the VVEL control module terminals with a tester and adjust the output voltage to be within the standard value.



| VVEL control module | | | | |
|---------------------|-------------------|----------|----------|---------------|
| Bank | Connector | + | _ | Voltage |
| Dank | Dalik Collifector | Terminal | Terminal | |
| 1 | E15 | 3 | 4 | 500 ± 48 mV |
| 2 | L 13 | 5 | 6 | 300 ± 46 IIIV |

9. Tighten the VVEL control shaft position sensor mounting bolt.

: 7.0 N•m (0.71 kg-m, 62 in-lb)

10. Reconfirm that the output voltage of VVEL control shaft position sensor is within the standard value.

| VVEL control module | | | | | |
|---------------------|----------------|-------------|----------------|---------------|---------|
| Bank | Bank Connector | + Connector | + | _ | Voltage |
| Dalik | | Terminal | ninal Terminal | | |
| 1 | E15 | 3 | 4 | 500 ± 48 mV | |
| 2 | - 615 | 5 | 6 | 300 ± 46 IIIV | |

NOTE:

If it varies from the standard value after the bolt is tightened, perform steps 7 to 9 again.

- 11. Turn ignition switch OFF and wait at least 10 seconds.
- 12. Start engine and warm it up to normal operating temperature.
- 13. Turn ignition switch OFF and wait at least 10 seconds.
- 14. Perform idle air volume learning. Refer to EC-152, "Work Procedure".

>> INSPECTION END

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MIXTURE RATIO SELF-LEARNING VALUE CLEAR

< BASIC INSPECTION > [VQ37VHR]

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description INFOID:0000000005913559

This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instructions in "Diagnosis Procedure".

Work Procedure

1.START

(P)With CONSULT-III

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

With GST

- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF.
- 3. Disconnect mass air flow sensor (bank 1) harness connector.
- 4. Restart engine and let it idle for at least 5 seconds.
- 5. Stop engine and reconnect mass air flow sensor (bank 1) 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

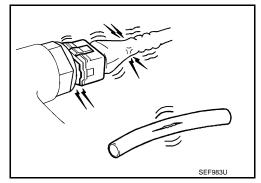
< BASIC INSPECTION > [VQ37VHR]

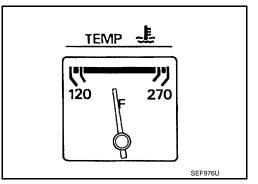
BASIC INSPECTION

Work Procedure

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.
- Start engine and warm it up until engine coolant temperature indicator points the middle of gauge. Ensure engine stays below 1,000 rpm.

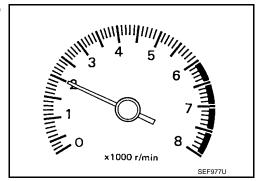




- 5. Run engine at about 2,000 rpm for about 2 minutes under no load.
- 6. Make sure that no DTC is displayed with CONSULT-III or GST.

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.

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Revision: 2010 June EC-157 2011 M37/M56

BASIC INSPECTION

< BASIC INSPECTION > [VQ37VHR]

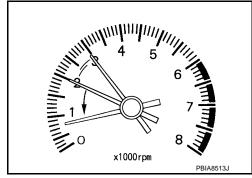
2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.

Check idle speed.

For procedure, refer to <u>EC-530</u>, "<u>Inspection</u>". For specification, refer to <u>EC-540</u>, "<u>Idle Speed</u>".

Is the inspection result normal?

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



4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- 2. Perform EC-150, "Work Procedure".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-151, "Work Procedure".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-152, "Work Procedure".

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.
- 2. Check idle speed.

For procedure, refer to EC-530, "Inspection".

For specification, refer to EC-540, "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-311, "Component Inspection".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-306, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

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

9. 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-147, "Work Procedure".

>> GO TO 4.

10.CHECK IGNITION TIMING

Run engine at idle.

BASIC INSPECTION

[VQ37VHR] < BASIC INSPECTION >

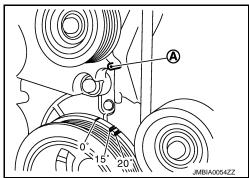
- Check ignition timing with a timing light.
 - A :Timing indicator

For procedure, refer to EC-531, "Inspection".

For specification, refer to EC-540, "Ignition Timing".

Is the inspection result normal?

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



11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- Stop engine.
- Perform EC-150, "Work Procedure".

>> GO TO 12.

12.perform throttle valve closed position learning

Perform EC-151, "Work Procedure".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-152, "Work Procedure".

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

- Start engine and warm it up to normal operating temperature.
- Check idle speed.

For procedure, refer to EC-530, "Inspection".

For specification, refer to EC-540, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 17.

15.CHECK IGNITION TIMING AGAIN

- Run engine at idle.
- Check ignition timing with a timing light.

A :Timing indicator

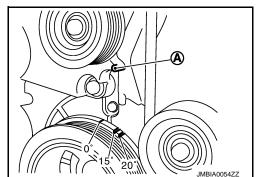
For procedure, refer to EC-531, "Inspection".

For specification, refer to EC-540, "Ignition Timing".

Is the inspection result normal?

>> GO TO 19. YES

NO >> GO TO 16.



16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-53, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair the timing chain installation. Then GO TO 4. EC

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BASIC INSPECTION

< BASIC INSPECTION > [VQ37VHR]

17. DETECT MALFUNCTIONING PART

Check the following.

- Check camshaft position sensor (PHASE) and circuit. Refer to EC-311, "Component Inspection".
- Check crankshaft position sensor (POS) and circuit. Refer to <u>EC-306</u>. "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-147, "Work Procedure".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to EC-147, "Work Procedure".

>> INSPECTION END

[VQ37VHR] < BASIC INSPECTION >

FUEL PRESSURE CHECK

Work Procedure INFOID:0000000006032435

FUEL PRESSURE RELEASE

1. FUEL PRESSURE RELEASE

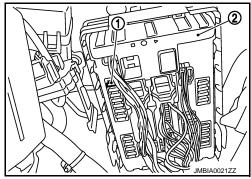
(P)With CONSULT-III

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

Without CONSULT-III

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

>> INSPECTION END



FUEL PRESSURE CHECK

1. FUEL PRESSURE CHECK

- Release fuel pressure to zero.
- 2. Install the inline fuel quick disconnected fitting (A) between fuel damper (1) and injector tube.

CAUTION:

Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.

NOTE:

- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because Y51 models do not have fuel return system.
- Use Fuel Pressure Gauge Kit (J-44321) to check fuel pressure.
- 3. Connect pressure gauge (B) to fuel pressure check adapter.
- 4. Turn ignition switch ON and check for fuel leakage.
- 5. Start engine and check for fuel leakage.
- 6. Read the indication of fuel pressure gauge.



Is the inspection result nomal?

YES >> INSPECTION END

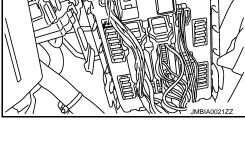
NO >> GO TO 2.

2.CHECK FUEL HOSE AND FUEL TUBE

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

Is the inspection result nomal?

YES >> Replace "fuel filter and fuel pump assembly".



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FUEL PRESSURE CHECK

< BASIC INSPECTION > [VQ37VHR]

NO >> Repair or replace.

HOW TO SET SRT CODE

< BASIC INSPECTION > [VQ37VHR]

HOW TO SET SRT CODE

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-III 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 | P0133, P0153 |
| | Heated oxygen sensor 2 | P0137, P0157 |
| | Heated oxygen sensor 2 | P0138, P0158 |
| | Heated oxygen sensor 2 | P0139, P0159 |
| EGR/VVT SYSTEM | Intake value timing control function | P0011, P0021 |

^{*1:} Though displayed on the CONSULT-III screen, "HO2S HTR" is not SRT item.

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 on the next page.

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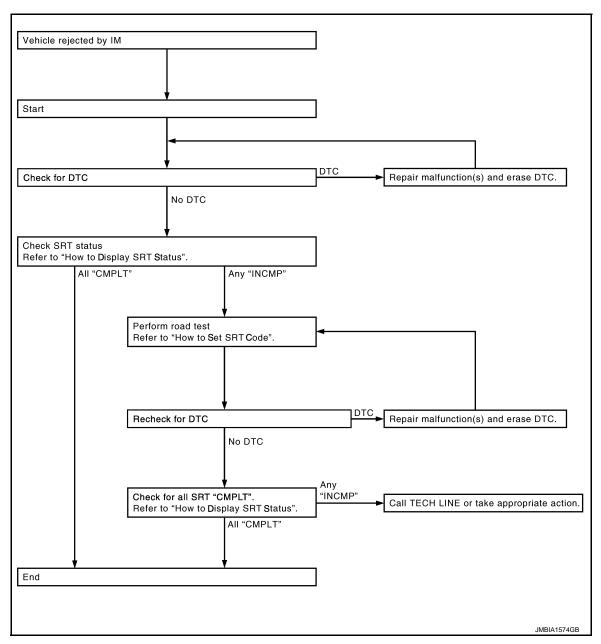
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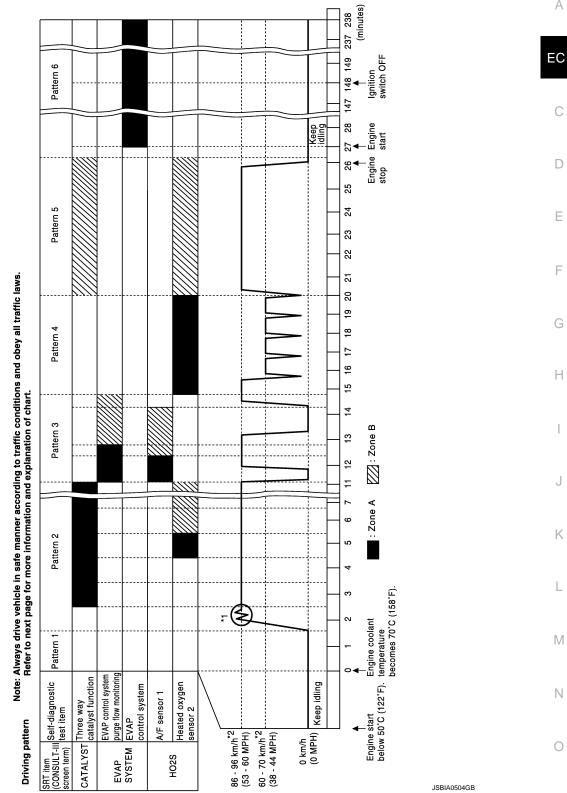
SRT Set Driving Pattern

INFOID:0000000006084327

CAUTION:

[VQ37VHR] < BASIC INSPECTION >

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



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 The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the short-

Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within

- *: Normal conditions refer to the following:
- Sea level

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

Work Procedure

1. CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-102, "DTC Index".

NO >> GO TO 2.

2. CHECK SRT STATUS

WITH CONSULT-III

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT-III.

WITHOUT CONSULT-III

Perform "SRT status" mode with EC-70, "On Board Diagnosis Function".

∰WITH GST

Select Service \$01 with GST (Generic Scan Tool).

Is SRT code(s) set?

YES >> END

NO-1 >> With CONSULT-III: GO TO 3.

NO-2 >> Without CONSULT-III: GO TO 4.

3.DTC CONFIRMATION PROCEDURE

- 1. Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT-III.
- 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 <u>EC-163</u>, "<u>Description</u>".
- 3. Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-102</u>, "DTC Index".

NO >> GO TO 10.

PERFORM ROAD TEST

- Check the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-163</u>, "<u>Description</u>"
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to <u>EC-164</u>, "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

- 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).
- 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 1.4 V
- Fuel tank temperature: Less than 4.1 V

Refer to EC-83, "Reference Value".

>> GO TO 6.

HOW TO SET SRT CODE

< BASIC INSPECTION > [VQ37VHR]

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:

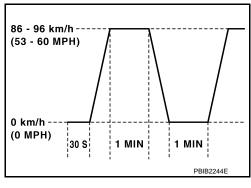
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted.
 In this case, the time required for diagnosis may be extended.

>> 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

- 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 9.

9. PATTERN 5

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

>> GO TO 10.

10.PATTERN 6

Cool down the engine so that the engine coolant temperature lowers between 15 - 35°C (59 - 95°F).
 CAUTION:

Never turn the ignition switch ON while cooling down the engine.

• Engine coolant temperature at engine start is between 15 – 35°C (59 – 95°F) and has lowered 45°C (113°F) or more since the latest engine stop.

>> GO TO 11.

11. CHECK SRT STATUS

(P)WITH CONSULT-III

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT-III.

WITHOUT CONSULT-III

Perform "SRT status" mode with EC-70, "On Board Diagnosis Function".

WITH GST

Select Service \$01 with GST (Generic Scan Tool).

Is SRT(s) set?

YES >> END

NO >> Call TECH LINE or take appropriate action.

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Revision: 2010 June EC-167 2011 M37/M56

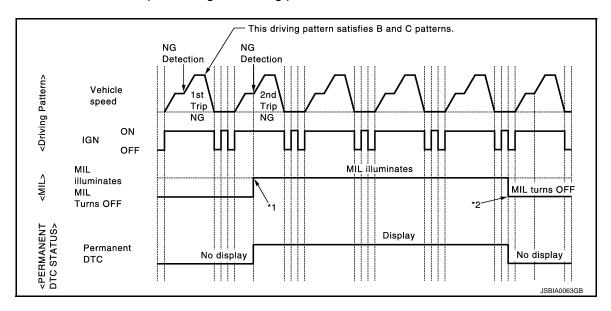
< BASIC INSPECTION > [VQ37VHR]

HOW TO ERASE PERMANENT DTC

Description INFOID:000000005914027

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 raw.



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

When a DTC is not stored in ECM

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

×: Applicable —: Not applicable

| Croup* | Perform "DTC CONFIRMATION PROCEDURE" | Driving pattern | |
|--------|--------------------------------------|-----------------|---|
| Group | for applicable DTCs. | В | D |
| А | × | _ | _ |
| В | _ | × | × |

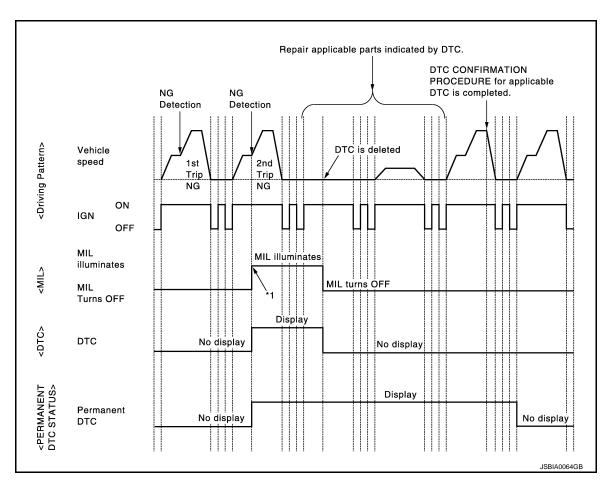
^{*:} For group, refer to EC-102, "DTC Index".

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

[VQ37VHR]

Work Procedure (Group A)

INFOID:0000000006115494



- *1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.
- 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.
- Turn ignition switch ON.
- 5. Check permanent DTC. Refer to EC-61, "Diagnosis Description".
- Perform "DTC CONFIRMATION PROCEDURE" for DTCs which are the same as permanent DTCs stored in ECM.
- 7. Turn ignition switch OFF and wait at least 10 seconds.
- 8. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- 10. Turn ignition switch ON.
- 11. Check permanent DTC. Refer to EC-61, "Diagnosis Description".
- 12. Check that the permanent DTCs have been erased.

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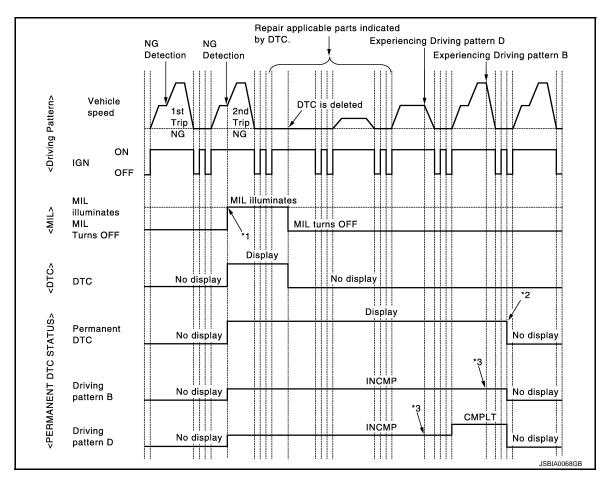
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Work Procedure (Group B)

INFOID:0000000006115495



- *1: When the same malfunction is detected in two consecutive trips, MIL will illuminate.
- *2: After experiencing Driving pattern B *3: and D, permanent DTC is erased.
- 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. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- 3. Turn ignition switch OFF and wait at least 10 seconds.
- 4. Turn ignition switch ON.
- 5. Check permanent DTC. Refer to EC-61, "Diagnosis Description".
- 6. Start engine and warm it up to normal operating temperature.
- 7. Drive the vehicle according to 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 or 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.
- 8. Turn ignition switch OFF and wait at least 10 seconds.
- 9. Turn ignition switch ON.

HOW TO ERASE PERMANENT DTC

[VQ37VHR] < BASIC INSPECTION > 10. Turn ignition switch OFF and wait at least 10 seconds. Α 11. Turn ignition switch ON. 12. Use "PERMANENT DTC WORK SUPPORT" to drive the vehicle according to driving pattern B. **CAUTION:** Always drive at a safe speed. EC 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 or 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. 13. Turn ignition switch OFF and wait at least 10 seconds. D 14. Turn ignition switch ON. 15. Turn ignition switch OFF and wait at least 10 seconds. Turn ignition switch ON. Е 17. Check permanent DTC. Refer to EC-61, "Diagnosis Description". 18. Check that the permanent DTCs have been erased. Driving Pattern INFOID:0000000006115500 DRIVING PATTERN B Driving pattern B means a trip satisfying the following conditions. Engine speed reaches 400 rpm or more. • Water temperature reaches 70°C (158°F) ore 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. **CAUTION:** Always drive at a safe speed. NOTE: K Drive the vehicle at a constant velocity. When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving pattern B. DRIVING PATTERN D Driving pattern D means operating vehicle as per the following. 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. Ν **CAUTION:** Always drive at a safe speed. NOTE: When the same malfunction is detected regardless of driving conditions, reset the counter of driving pattern When the above conditions are satisfied without detecting the same malfunction, reset the counter of driving Р pattern D.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description INFOID:000000005913602

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" in "DATA MONITOR" mode of CONSULT-III 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/B2 (The signal voltage of the mass air flow sensor)

Component Function Check

INFOID:0000000005913603

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

(P)With CONSULT-III

NOTE:

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

- 1. Perform EC-157, "Work Procedure".
- Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2", "MAS A/F SE-B1" and "MAS A/F SE-B2" in "SPEC" of "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that monitor items are within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

NO >> Go to EC-173, "Diagnosis Procedure".

< DTC/CIRCUIT DIAGNOSIS >

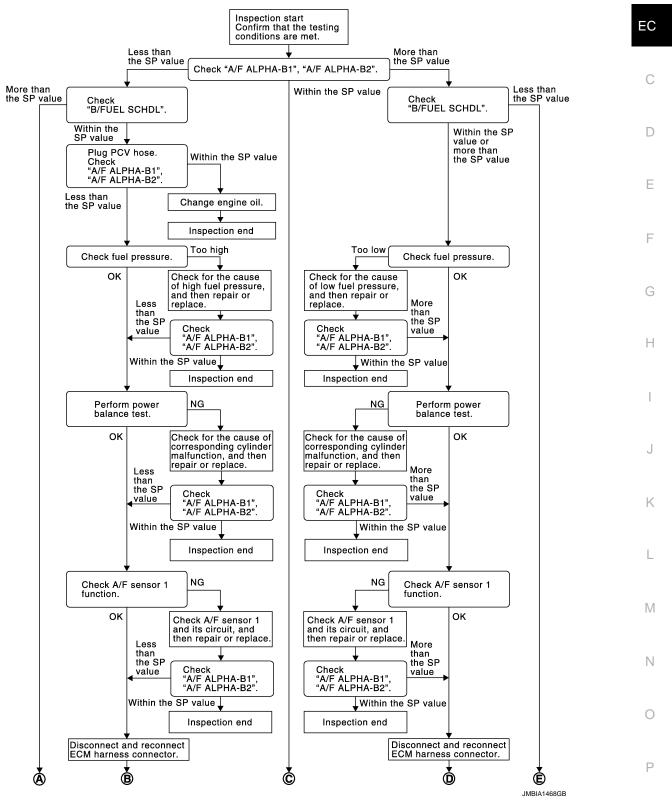
[VQ37VHR]

Diagnosis Procedure

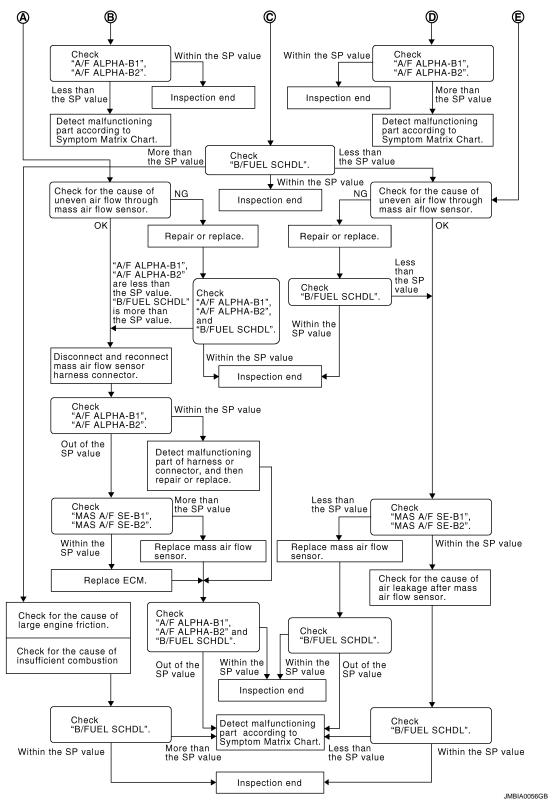
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OVERALL SEQUENCE



[VQ37VHR]



DETAILED PROCEDURE

 ${f 1}$.CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

(E)With CONSULT-III

- Start engine.
- Confirm that the testing conditions are met. Refer to <u>EC-172, "Component Function Check"</u>.
- Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

< DTC/CIRCUIT DIAGNOSIS >

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 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, 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"

Stop the engine.

Disconnect PCV hose, and then plug it. 2.

Start engine. 3.

Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, 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

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

$\mathbf{6}.$ CHECK FUEL PRESSURE

Check fuel pressure. (Refer to EC-161, "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" and then GO TO 8.

NO-2 >> Fuel pressure is too low: GO TO 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" and then GO TO 8.

NO >> Repair or replace and then GO TO 8.

 $oldsymbol{8}.$ CHECK "A/F ALPHA-B1", "A/F ALPHA-B2"

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< DTC/CIRCUIT DIAGNOSIS >

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- Start engine.
- Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, 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

- Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- 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 bellow.

- Ignition coil and its circuit (Refer to <u>EC-511, "Component Function Check"</u>.)
- Fuel injector and its circuit (Refer to EC-504, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to <u>EM-18</u>, "Inspection".)

Is the inspection result normal?

YES >> Replace fuel injector 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"

- Start engine.
- Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, 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 <u>EC-238. "DTC Logic"</u>.
 For DTC P0131, P0151, refer to <u>EC-242, "DTC Logic"</u>.
- For DTC P0132, P0152, refer to <u>EC-245, "DTC Logic"</u>.
- For DTC P0133, P0153, refer to EC-248, "DTC Logic".
- For DTC P2A00, P2A03, refer to <u>EC-491, "DTC Logic"</u>.

Are any DTCs detected?

YES >> GO TO 13.

>> GO TO 15. NO

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.
- Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

>> GO TO 15. NO

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

Stop the engine.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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"

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- Start engine.
- Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, 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 <a>EC-524, "Symptom Table".

17 CHECK "B/FUEL SCHDL"

Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, 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

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 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. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

- Stop the engine.
- Disconnect mass air flow sensor harness connector. Check pin terminal and connector for damage and then reconnect it again.

>> GO TO 22.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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 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-211, "Diagnosis Procedure". Then GO TO 29.

NO >> GO TO 23.

23. CHECK "MAS A/F SE-B1", "MAS A/F SE-B2"

Select "MAS A/F SE-B1", "MAS A/F SE-B2" in "SPEC" of "DATA MONITOR" mode, 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, and then GO TO 29.

24.REPLACE ECM

- Replace ECM.
- Go to <u>EC-147</u>, "Work Procedure".

>> 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 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", "MAS A/F SE-B2"

Select "MAS A/F SE-B1", "MAS A/F SE-B2" in "SPEC" of "DATA MONITOR" mode, 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, 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
- 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.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Α >> GO TO 30. $29.\mathsf{CHECK}$ "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 EC make sure that each indication is within the SP value. Is the measurement value within the SP value? >> INSPECTION END YES C NO >> Detect malfunctioning part according to <a>EC-524, "Symptom Table". 30.CHECK "B/FUEL SCHDL" D Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and then make sure that the indication is within the SP value. Is the measurement value within the SP value? Е YES >> INSPECTION END >> Detect malfunctioning part according to EC-524, "Symptom Table". NO F Н K

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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000005913605

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-I

- 1. Disconnect ECM harness connector.
- 2. Check the continuity between ECM harness connector and ground.

| Е | CM | Ground | Continuity | |
|-----------|----------|---------|------------|--|
| Connector | Terminal | Giodila | Continuity | |
| F101 | 8 | | Existed | |
| | 123 | | | |
| M107 | 124 | Ground | | |
| WITO7 | 127 | | | |
| | 128 | | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F103, M116
- · Harness for open or short between ECM and ground
 - >> Repair open circuit or short to power in harness or connectors.

4. CHECK ECM POWER SUPPLY CIRCUIT-I

- 1. Reconnect ECM harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between ECM harness connector and ground.

| | + | _ | | Voltage |
|-----------|----------|-----------|----------|-----------------|
| Connector | Terminal | Connector | Terminal | |
| F102 | 53 | M107 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between ECM and fuse

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

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>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK ECM POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Check the voltage between ECM harness connector terminals as follows.

| ECM | | | |
|-----------|----------|----------|---|
| Connector | + - | | Voltage |
| Connector | Terminal | Terminal | |
| M107 | 125 | 128 | After turning ignition switch OFF, battery voltage will exist for a few seconds, then dropto approximately 0 V. |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 9.

7. CHECK ECM POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch ON.
- 2. Check the voltage between IPDM E/R harness connector and ground.

| IPDN | /I E/R | Ground | Voltage | |
|-----------|----------|--------|-----------------|--|
| Connector | Terminal | Oround | voltage | |
| E5 | 5 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace IPDM E/R.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-41, "Circuit Inspection".

>> INSPECTION END

9. CHECK ECM POWER SUPPLY CIRCUIT-IV

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Check the voltage between ECM harness connector terminals as follows.

| | + | _ | | Voltage |
|-----------|----------|-----------|----------|-----------------|
| Connector | Terminal | Connector | Terminal | |
| F101 | 24 | M107 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 10.

10.CHECK ECM POWER SUPPLY CIRCUIT-V

- 1. Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

| ECM | | IPDN | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F101 | 24 | E7 | 70 | Existed |

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E20, F40
- Harness for open or short between ECM and IPDM E/R
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK 15 A FUSE

- 1. Disconnect 15 A fuse (No. 51) from IPDM E/R.
- 2. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace 15 A fuse.

13. CHECK ECM POWER SUPPLY CIRCUIT-VI

- 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.

| ECM | | IPDI | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M107 | 125 | E5 | 6 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 15. NO >> GO TO 14.

14. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E106, M6
- Harness for open or short between ECM and IPDM E/R
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

15. CHECK INTERMITTENT INCIDENT

Refer to GI-38. "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

Diagnosis Procedure

INFOID:0000000005913606

1. CHECK GROUND CONNECTION

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- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK VVEL CONTROL MODULE GROUND CIRCUIT FOR OPEN AND SHORT

- Disconnect VVEL control module harness connector.
- Check the continuity between VVEL control module harness connector and ground.

| VVEL con | trol module | Ground | Continuity |
|-----------|-------------|--------|------------|
| Connector | Terminal | Glound | Continuity |
| E15 | 14 | Ground | Existed |

Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to power in harness connectors.

3.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-I

- Reconnect VVEL control module harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between VVEL control module harness connector and ground.

| VVEL control module | | | |
|---------------------|----------|----------|--|
| Connector | + | _ | Voltage |
| Connector | Terminal | Terminal | |
| E15 | 8 | 14 | After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V. |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

f 4.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF and wait at least 10 seconds.
- Disconnect VVEL control module harness connector. 2.
- Disconnect IPDM E/R harness connector.
- Check the continuity between VVEL control module harness connector and IPDM E/R harness connector.

| VVEL control module | | IPDI | Continuity | |
|---------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E15 | 8 | E7 | 49 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

>> EC-180, "Diagnosis Procedure" YES

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

${f 5.}$ CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

EC-183 Revision: 2010 June 2011 M37/M56

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POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

U0101 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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U0101 CAN COMM CIRCUIT

Description INFOID:000000005913607

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

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------|--|---|
| U0101 | 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. | CAN communication line between TCM and ECM (CAN communication line is open or shorted) |

EC-185

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 3 seconds.
- Check DTC.

Is DTC detected?

YES >> EC-185, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

Go to LAN-25, "Trouble Diagnosis Flow Chart".

INFOID:0000000005913609

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Revision: 2010 June

[VQ37VHR]

U0164 CAN COMM CIRCUIT

Description INFOID:0000000005913610

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

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------------|--|---|
| U0164 | Lost communication with A/C auto amp. | When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with A/C auto amp. for 2 seconds or more. | CAN communication line between A/C auto amp. 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.
- Check DTC.

Is DTC detected?

YES >> EC-186, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

Go to LAN-25, "Trouble Diagnosis Flow Chart".

INFOID:0000000005913612

U1001 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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U1001 CAN COMM CIRCUIT

Description INFOID:0000000005913613

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

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|---|---|
| U1001 | CAN communication line | When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more. | 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 >> EC-187, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

Go to LAN-25, "Trouble Diagnosis Flow Chart".

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[VQ37VHR]

U1003 CAN COMM CIRCUIT

Description INFOID:0000000005913616

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. ECM and VVEL control module are connected with two communication lines (CAN H line and CAN L line) and transmit/receive data. ECM shares information and links with the VVEL control module during operation.

DTC Logic (INFOID:000000005913617

DTC DETECTION LOGIC

NOTE:

If DTC U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| U1003 | Lost communication with VVEL control module | CAN communication signal other than OBD (emission related diagnosis) is not received between VVEL control module and ECM for 2 seconds or more. | Harness or connectors (VVEL CAN communication line is open or shorted) ECM VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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 and wait at least 3 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-188, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913618

1. CHECK VVEL CAN COMMUNICATION CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Disconnect VVEL control module harness connector.
- 4. Check the continuity between ECM harness connector and VVEL control module harness connector.

| ECM | | VVEL con | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F102 | 54 | E15 | 24 | Existed |
| 1 102 | 55 | LIS | 11 | LAISIEU |

5. Also check harness for short to ground and power.

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

Harness connector E20, F40

U1003 CAN COMM CIRCUIT

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > • Harness for open or short between ECM and VVEL control module Α >> Repair open circuit or short to ground or short to power in harness or connectors. 3. CHECK INTERMITTENT INCIDENT EC Refer to GI-38, "Intermittent Incident". Is the inspection result normal? >> GO TO 4. YES NO >> Repair or replace. 4. REPLACE VVEL CONTROL MODULE D 1. Replace VVEL control module. 2. Go to EC-148, "Work Procedure". Е >> GO TO 5. 5. PERFORM DTC CONFIRMATION PROCEDURE Reconnect all harness connectors disconnected. 2. Turn ignition switch ON. 3. Erase DTC. 4. Perform DTC Confirmation Procedure. See EC-188, "DTC Logic". 5. Check DTC. Is the DTC U1003 displayed again? Н YES >> GO TO 6. NO >> INSPECTION END 6. REPLACE ECM Replace ECM. Go to EC-147, "Work Procedure". >> INSPECTION END K L Ν

EC-189 Revision: 2010 June 2011 M37/M56

[VQ37VHR]

U1024 CAN COMM CIRCUIT

Description INFOID:0000000005913619

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. ECM and VVEL control module are connected with two communication lines (CAN H line and CAN L line) and transmit/receive data. ECM shares information and links with the VVEL control module during operation.

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|---|---|
| U1024 | VVEL CAN communication | When VVEL control module cannot transmit/receive can communication signal from ECM. When detecting error during the initial diagnosis of CAN controller of VVEL control module. | Harness or connectors (CAN communication line is open or shorted) ECM VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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 and wait at least 3 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-190, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913621

1. CHECK VVEL CAN COMMUNICATION CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Disconnect VVEL control module harness connector.
- 4. Check the continuity between ECM harness connector and VVEL control module harness connector.

| ECM | | VVEL con | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F102 | 54 | E15 | 24 | Existed |
| 1 102 | 55 | LIS | 11 | LXISIEU |

5. Also check harness for short to ground and power.

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

U1024 CAN COMM CIRCUIT

| U1024 CAN COMM CIRCUIT | |
|---|-----------|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| Check the following. | |
| Harness connector E20, F40 Harness for open or short between ECM and VVEL control module | A |
| Trainess for open of short between Lewistina VVLL sentior module | |
| >> Harness for open or short between ECM and VVEL control module | EC |
| 3. CHECK INTERMITTENT INCIDENT | |
| Refer to GI-38, "Intermittent Incident". | C |
| Is the inspection result normal? | |
| YES >> GO TO 4. | |
| NO >> Repair or replace. | D |
| 4.REPLACE VVEL CONTROL MODULE | |
| Replace VVEL control module. Go to <u>EC-148</u>, "Work <u>Procedure"</u>. | Е |
| 2. Go to Lo 140, Work Flocodate. | |
| >> GO TO 5. | |
| 5.PERFORM DTC CONFIRMATION PROCEDURE | F |
| Reconnect all harness connectors disconnected. | |
| Turn ignition switch ON. Erase DTC. | G |
| 4. Perform DTC Confirmation Procedure. | |
| See EC-190, "DTC Logic". | Н |
| Is the DTC U1024 displayed again? | |
| YES >> GO TO 6. | |
| NO >> INSPECTION END | I |
| 6.REPLACE ECM | |
| 1. Replace ECM. | J |
| 2. Go to EC-147, "Work Procedure". | |
| >> INSPECTION END | K |
| >> INGI EGHON END | N |
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Revision: 2010 June **EC-191** 2011 M37/M56

P0011, P0021 IVT CONTROL

DTC Logic

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 <u>EC-208, "DTC Logic"</u>.
- If DTC P0011 or P0021 is displayed with DTC P0524, first perform the trouble diagnosis for DTC P0524. Refer to EC-368, "DTC Logic".

| DTC No. | Trouble diagnosis name | Detecting condition | Possible cause |
|---------|--|--|--|
| P0011 | Intake valve timing control performance (bank 1) | | Crankshaft position sensor (POS) Camshaft position sensor (PHASE) Intake valve control solenoid valve |
| P0021 | Intake valve timing control performance (bank 2) | There is a gap between angle of target and phase-control angle degree. | 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 |

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-I

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to the normal operating temperature.
- Maintain the following conditions for at least 6 consecutive seconds. Hold the accelerator pedal as steady as possible.

| ENG SPEED | 525 - 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-193, "Diagnosis Procedure"

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- 2. Maintain the following conditions for at least 20 consecutive seconds.

| ENG SPEED | 1,700 - 3,175 rpm (A constant rotation is maintained.) |
|---------------|--|
| COOLAN TEMP/S | More than 70°C (158°F) |

P0011, P0021 IVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Selector lever | 1st or 2nd position |
|------------------|--|
| Driving location | Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) |

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CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-193, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913623

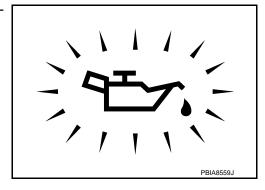
1. CHECK OIL PRESSURE WARNING LAMP

- 1. Start engine.
- Check oil pressure warning lamp and confirm it is not illuminated.

Is oil pressure warning lamp illuminated?

YES >> Go to <u>LU-7</u>, "Inspection".

NO >> GO TO 2.



2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-194, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-306, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS).

4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE).

5. CHECK CAMSHAFT (INTAKE)

Check the following.

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[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

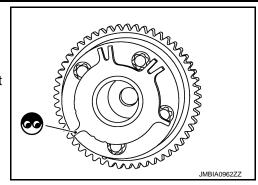
- Accumulation of debris on the signal plate of camshaft front end
- · Chipping signal plate of camshaft front end

Is the inspection result normal?

YES >> GO TO 6.

NO

>> Remove debris and clean the signal plate of camshaft front end or replace camshaft.



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-53, "Removal and Installation".

NO >> GO TO 7.

7.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-106, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913624

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

- Turn ignition switch OFF.
- Disconnect intake valve timing control solenoid valve harness connector.
- 3. Check resistance between intake valve timing control solenoid valve terminals as follows.

| Terminals | Resistance (Ω) |
|-------------------|------------------------------------|
| 1 and 2 | 7.0 - 7.7 [at 20°C (68°F)] |
| 1 or 2 and ground | ∞ (Continuity should not exist) |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- 1. Remove intake valve timing control solenoid valve.
- 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.

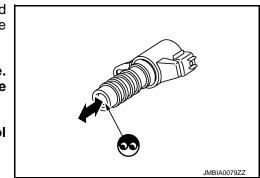
CAUTION:

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?



P0011, P0021 IVT CONTROL

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

>> INSPECTION END YES

NO >> Replace malfunctioning intake valve timing control solenoid valve.

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P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0031 | 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.) | Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) A/F sensor 1 heater |
| P0032 | 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.) | Harness or connectors (The A/F sensor 1 heater circuit is shorted.) A/F sensor 1 heater |
| P0051 | 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.) | Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) A/F sensor 1 heater |
| P0052 | 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.) | 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 procedure before conducting the next test.

- 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-196, "Diagnosis Procedure".

NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913627

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between A/F sensor 1 harness connector and ground.

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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| | 1 | | | | | | | |
|--|---|---|--|---|--------------------------|---------------------------------|-----------------|-------|
| DTC | A/F sensor 1 | | Ground | Voltage | | | | |
| | Bank | Connector | Terminal | | | | | |
| P0031, P0032 | 1 | F3 | 4 | Ground | Battery volta | age | | |
| P0051, P0052 | 2 | F20 | 4 | | , | | | |
| s the inspect | | | | | | | | |
| | 60 TO 4 60 TO 3 | | | | | | | |
| 3.DETECT | | | 2 DART | | | | | |
| | | VO I IOIVII VO | JIAKI | | | | | |
| Check the fol Harness co | | s E20, F40 | | | | | | |
| IPDM E/R h | arness | | E7 | | | | | |
| 15 A fuse (IHarness for | | r short hetw | veen A/F s | ensor 1 an | d fuse | | | |
| 1 10111000 101 | орон о | . Short betv | , JOII / VI 3 | onder i dii | a 1000 | | | |
| >> F | Repair or | replace ha | arness or c | connectors. | | | | |
| | • | • | | | | | | |
| T.UHEUN A | F SENS | SOR 1 HEA | TER OUT | PUT SIGNA | AL CIRCUI | Γ | | |
| | | OR 1 HEA | MER OUT | PUT SIGNA | AL CIRCUI | Γ | | |
| 1. Turn igni 2. Disconne | tion swit | ch OFF. harness co | onnector. | | | | | |
| 1. Turn igni | tion swit | ch OFF. harness co | onnector. | | | | harness conne | ctor. |
| 1. Turn igni | tion swit | ch OFF. harness co uity betwee | onnector. en A/F sen | sor 1 harne | ess connect | | harness conne | ctor. |
| 1. Turn igni | tion swit ect ECM e contin | ch OFF. harness co uity betwee | onnector. en A/F sen | sor 1 harne | ess connect | | harness conne | ctor. |
| Turn igni Disconne Check th | cion switect ECM e contin | ch OFF. harness couity between | onnector. en A/F sen 1 | sor 1 harne | ess connect | or and ECM | harness conne | ctor. |
| Turn ignit Disconne Check th DTC P0031, P0032 | ect ECM e contin | ch OFF. harness couity between A/F sensor Connector F3 | onnector. en A/F sen 1 Terminal | sor 1 harne | ess connect M Terminal | or and ECM | harness conne | ctor. |
| DTC P0031, P0052 | ect ECM e contin | ch OFF. harness couity between A/F sensor Connector F3 F20 | onnector. en A/F sen 1 Terminal 3 3 | Sor 1 harne | M Terminal 1 5 | or and ECM | l harness conne | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also check | ect ECM e contin Bank 1 2 ck harne | ch OFF. harness couity between A/F sensor Connector F3 F20 ess for shore | onnector. en A/F sen 1 Terminal 3 3 | sor 1 harne | M Terminal 1 5 | or and ECM | harness conne | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also checks the inspect | Bank 1 2 ck harne | ch OFF. harness couity between A/F sensor Connector F3 F20 ess for shor It normal? | onnector. en A/F sen 1 Terminal 3 3 | Sor 1 harne | M Terminal 1 5 | or and ECM | harness conne | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also check the inspect the in | Bank 1 2 ck harne ion resu GO TO 5 | A/F sensor Connector F3 F20 ess for shor It normal? | onnector. en A/F sen Terminal 3 3 t to ground | Sor 1 harned EC Connector F101 d and short | M Terminal 1 5 to power. | Or and ECM Continuity Existed | harness conne | ctor. |
| DTC P0031, P0032 P0051, P0052 Also check s the inspect YES >> C NO >> F | Bank 1 2 Ck harne ion resu GO TO 5 | A/F sensor Connector F3 F20 ess for shorlt normal? . | onnector. en A/F sen Terminal 3 3 t to ground | Sor 1 harned EC Connector F101 d and short | M Terminal 1 5 to power. | Or and ECM Continuity Existed | | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also check s the inspect YES >> C NO >> F CHECK A | Bank 1 2 Ck harne ion resu GO TO 5 Repair op | A/F sensor Connector F3 F20 ess for shor It normal? coen circuit, | onnector. en A/F sen Terminal 3 3 t to ground short to gr | Sor 1 harned EC Connector F101 d and short round or sh | M Terminal 1 5 to power. | Or and ECM Continuity Existed | | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also check the inspector YES >> Control Con | Bank 1 2 ck harne ion resu GO TO 5 Repair op /F SENS | ch OFF. harness couity between A/F sensor Connector F3 F20 ess for shore It normal? coen circuit, SOR 1 HEA | onnector. en A/F sen Terminal 3 3 t to ground short to gr | Sor 1 harned EC Connector F101 d and short round or sh | M Terminal 1 5 to power. | Or and ECM Continuity Existed | | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also chect inspect is the inspect i | Bank 1 2 Ck harne ion resu 6O TO 5 Repair op 7F SENS 98. "Co ion resu 6O TO 7 | A/F sensor Connector F3 F20 ess for shore It normal? COR 1 HEA mponent Ir It normal? | onnector. en A/F sen Terminal 3 3 t to ground short to gr | Sor 1 harned EC Connector F101 d and short round or sh | M Terminal 1 5 to power. | Or and ECM Continuity Existed | | ctor. |
| 1. Turn ignir 2. Disconne 3. Check th DTC P0031, P0032 P0051, P0052 4. Also chect inspect YES >> CON >> F 5. CHECK A. Refer to EC-1 Is the inspect YES >> CON SECON SEC | Bank 1 2 ck harne ion resu 6O TO 5 8epair op 7F SENS 98. "Co ion resu GO TO 7 6O TO 6 | ch OFF. harness couity between A/F sensor Connector F3 F20 ess for shore It normal? COR 1 HEAR It normal? It normal? | onnector. en A/F sen 1 Terminal 3 3 t to ground short to gr | sor 1 harned EC Connector F101 d and short round or sh | M Terminal 1 5 to power. | Or and ECM Continuity Existed | | ctor. |

(commercial service tool).

\rightarrow INSPECTION END 7.CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

>> Repair or replace.

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Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Component Inspection

INFOID:0000000005913628

1.CHECK AIR FUEL RATIO (A/F) SENSOR 1

- 1. Turn ignition switch OFF.
- 2. Disconnect A/F sensor 1 harness connector.
- 3. Check resistance between A/F sensor 1 terminals as follows.

| Terminal | Resistance (Ω) |
|------------|-------------------------------|
| 3 and 4 | 1.98 - 2.66 [at 25°C (77°F)] |
| 3 and 1, 2 | ∞ |
| 4 and 1, 2 | (Continuity should not exist) |

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.

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 >

[VQ37VHR]

P0037, P0038, P0057, P0058 HO2S2 HEATER

DTC Logic INFOID:0000000005913630

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0037 | 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.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) Heated oxygen sensor 2 heater |
| P0038 | 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.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) Heated oxygen sensor 2 heater |
| P0057 | 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.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) Heated oxygen sensor 2 heater |
| P0058 | 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.) | 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.

- 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 between 11 V and 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and warm it up to the normal operating temperature.
- 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 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.
- Check 1st trip DTC.

Is 1st tip DTC detected?

YES >> Go to EC-199, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913631

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2.check ho2s2 power supply circuit

- 1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between HO2S2 harness connector and ground.

| | | HO2S2 | | Ground | Voltage | |
|--------------|------|-----------|----------|---------|-----------------|--|
| ыс | Bank | Connector | Terminal | Giodila | voltage | |
| P0037, P0038 | 1 | F54 | 2 | Ground | Battery voltage | |
| P0057, P0058 | 2 | F53 | 2 | Ground | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 45)
- · Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. 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 | HO2S2 | | E | Continuity | | |
|--------------|-------|-----------|----------|------------|----------|------------|
| DIO | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0037, P0038 | 1 | F54 | 3 | F101 | 17 | Existed |
| P0057, P0058 | 2 | F53 | 3 | 1 101 | 33 | LAISIEU |

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.

CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-201, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

7. CHECK INTERMITTENT INCIDENT

P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913632

1. CHECK HEATED OXYGEN SENSOR 2 HEATER

- 1. Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 harness connector.
- Check resistance between HO2S2 terminals as follows.

| Terminal | Resistance (Ω) |
|---------------|-------------------------------|
| 2 and 3 | 3.4 - 4.4 [at 25°C (77°F)] |
| 1 and 2, 3, 4 | ∞ |
| 4 and 1, 2, 3 | (Continuity should not exist) |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE HEATED OXYGEN SENSOR 2

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Replace malfunctioning heated oxygen sensor 2.

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

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[VQ37VHR]

P006A, P0101, P010B MAF SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P006A, P0101 or P010B is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P006A | Manifold absolute pressure - mass air flow correlation | A difference exceeding the specified value develops between a value transmitted from the manifold absolute pressure (MAP) sensor to ECM and an estimated intake pressure of intake manifold calculated by ECM, based on a mass sir flow sensor signal. | Harness or connectors (The sensor circuit is open or shorted.) Mass air flow sensor Manifold absolute pressure (MAP) sensor EVAP control system pressure sensor Intake air leaks Intake air temperature sensor |
| P0101 | P0101 Mass air flow sensor (bank 1) circuit range/ performance A difference exceeding the specified value develops between a signal transmitted from the mass air flow | Mass air flow sensor (bank 1) | |
| P010B | Mass air flow sensor (bank 2) circuit range/ performance | ensor (bank 1) to ECM and a signal transmitted from the mass air flow sensor (bank 2) to ECM. | Mass air flow sensor (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.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

(P) With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Accelerate the vehicle from 0 to 88 km/h (0 to 55 MPH) under the following conditions:

CAUTION:

Always drive at a safe speed.

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

| ACCEL SEN 1 | 1.4 – 2.0 V |
|----------------|-------------|
| Selector lever | D position |

4. Check 1st trip DTC.

⋈ Without CONSULT-III

- Start engine and warm it up to normal operating temperature.
- With selector lever in D position, accelerate the vehicle from 0 to 88 km/h (0 to 55 MPH) under the following conditions:

CAUTION:

Always drive at a safe speed.

P006A, P0101, P010B MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

| Accelerator peda | l position sensor 1 | Ground | Voltage (V) |
|--|------------------------------------|--------|-------------|
| Connector | Terminal | Ground | voitage (v) |
| M153 ^{*1} M9 ^{*2} | 4 ^{*1} 3 ^{*2} | Ground | 1.4 – 2.0 |

*1: With ICC

*2: Without ICC

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-203, "Diagnosis Procedure".

NO >> INSPECTION END

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 GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

3.CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between mass air flow sensor harness connector and ground.

| DTC | Ma | ass air flow se | Ground | Voltage | |
|--------------|------|-----------------|----------|---------|---------|
| ыс | Bank | Connector | Terminal | Ground | voltage |
| P006A, P0101 | 1 | F31 | 5 | Ground | Battery |
| P006A, P010B | 2 | F42 | 5 | Ground | voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

Revision: 2010 June

- Harness connectors E106, M6
- Harness connectors M116, F103
- 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, short to ground or short to power in harness or connectors.

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5. CHECK MASS AIR FLOW SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 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.

| DTC | Mass air flow sensor | | | EC | Continuity | |
|--------------|----------------------|-----------|----------|-----------|------------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P006A, P0101 | 1 | F31 | 4 | E102 | 68 | Existed |
| P006A, P010B | 2 | F42 | 4 | F102 | 94 | LAISIEU |

^{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 MASS AIR FLOW SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between mass air flow sensor harness connector and ECM harness connector.

| DTC | Mass air flow sensor | | | EC | Continuity | |
|--------------|----------------------|-----------|----------|-----------|------------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P006A, P0101 | 1 | F31 | 3 | F102 | 77 | Existed |
| P006A, P010B | 2 | F42 | 3 | F102 | 79 | EXISTECT |

^{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 ground or short to power in harness or connectors.

7.CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Check manifold absolute pressure (MAP) sensor. Refer to EC-218, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace manifold absolute pressure (MAP) sensor.

8.CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to EC-224, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1).

9.check evap control system pressure sensor

Refer to EC-340, "Component Inspection".

Is the inspection result normal?

YES-1 (Only DTC P006A is detected)>>GO TO 10.

YES-2 (DTC P006A and P0101 are detected)>>GO TO 11.

YES-3 (DTC P006A and P010B are detected)>>GO TO 12.

NO >> Replace EVAP control system pressure sensor.

10.CHECK MASS AIR FLOW SENSOR

Refer to EC-205, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace mass air flow sensor (bank 1) and (bank 2).

11. CHECK MASS AIR FLOW SENSOR (BANK 1)

P006A, P0101, P010B MAF SENSOR

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Check mass air flow sensor (bank 1). Refer to EC-212, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace mass air flow sensor (bank 1).

12.CHECK MASS AIR FLOW SENSOR (BANK 2)

Check mass air flow sensor (bank 2). Refer to EC-212, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace mass air flow sensor (bank 2).

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913636

1. CHECK MASS AIR FLOW SENSOR-I

(P)With CONSULT-III

- Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Start engine and warm it up to normal operating temperature.
- 4. Connect CONSULT-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Without CONSULT-III

- 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 under the following conditions.

| | ECM | | | | |
|-----------|---------------------------------------|----------|--|---------------------------|--|
| Connector | + | _ | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 77 [MAF sensor (bank 1) signal] | 68 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 | |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| F102 | | 4 10 | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| [I | 79 | | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 | |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

*: 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.
- 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-II

(P)With CONSULT-III

- Repair or replace malfunctioning part.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Connect CONSULT-III and select "DATA MONITOR" mode.
- 4. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

⋈Without CONSULT-III

- 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 under the following conditions.

| | ECM | | | |
|-----------|------------------------------|----------|--|---------------------------|
| Connector | + | _ | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 77 [MAF sensor (bank 1) | 68 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | signal] | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |
| F102 | 79 | 94 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | [MAF sensor (bank 2) signal] | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 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.

P006A, P0101, P010B MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

4. CHECK MASS AIR FLOW SENSOR-III

(II) With CONSULT-III

- 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-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Without CONSULT-III

- 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 under the following conditions.

| | ECM | | | | |
|-----------|---------------------------------------|----------|--|---------------------------|--|
| Connector | + | _ | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 77 [MAF sensor (bank 1) signal] | 68 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 | |
| | | 00 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F102 | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| F 102 | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| [t | 79 [MAF sensor (bank 2) | 94 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 | |
| | signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 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 malfunctioning mass air flow sensor.

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Revision: 2010 June **EC-207** 2011 M37/M56

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0075, P0081 IVT CONTROL SOLENOID VALVE

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0075 | Intake valve timing control so- lenoid valve (bank 1) circuit | An improper voltage is sent to the ECM | Harness or connectors (Intake valve timing control solenoid) |
| P0081 | Intake valve timing control so- lenoid valve (bank 2) circuit | through intake valve timing control solenoid valve. | valve circuit is open or shorted.) • Intake valve timing control solenoid 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.
- Turn ignition switch ON.
- 3. 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 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-208, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913639

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 | IVT | control soleno | oid valve | Ground | Voltage | |
|-------|------|----------------|-----------|---------|-----------------|--|
| DIC | Bank | Connector | Terminal | Giodila | | |
| P0075 | 1 | F28 | 2 | Ground | Battery voltage | |
| P0081 | 2 | F29 | 2 | Giodila | Ballery vollage | |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

| DTC | IVT | control solen | oid valve | E | Continuity | |
|-------|------|---------------|-----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0075 | 1 | F28 | 1 | F101 | 18 | Existed |
| P0081 | 2 | F29 | 1 | 1 101 | 29 | LXISIEU |

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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-209, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

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 follows.

| Terminals | Resistance (Ω) |
|-------------------|-------------------------------|
| 1 and 2 | 7.0 - 7.7 [at 20°C (68°F)] |
| 1 or 2 and ground | (Continuity should not exist) |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- Remove intake valve timing control solenoid valve.
- 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.

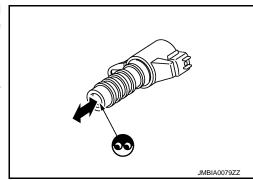
NOTE:

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.



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[VQ37VHR]

P0102, P0103, P010C, P010D MAF SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0102 | Mass air flow sensor (bank 1) circuit low input | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) Intake air leaks Mass air flow sensor |
| P0103 | Mass air flow sensor (bank 1) circuit high input | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) Mass air flow sensor |
| P010C | Mass air flow sensor (bank 2) circuit low input | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) Intake air leaks Mass air flow sensor |
| P010D | Mass air flow sensor (bank 2) circuit high input | An excessively high voltage from the sensor is sent to ECM. | 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 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, P010C>>GO TO 2.

P0103, P010D>>GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102 AND P010C

- 1. Start engine and wait at least 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-211, "Diagnosis Procedure".

NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-I

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-211, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-II

- 1. Start engine and wait at least 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-211, "Diagnosis Procedure".

NO >> INSPECTION END

| < DTC/CIRCU | IIT DIA | | | , P0100 | C, P010D M | AF SENSOR | [VQ37VHR] | |
|--|---|---|-------------------|----------|---------------------------------|--------------------------|-------------------------|----|
| Diagnosis I | | | • | | | | INFOID:0000000005913643 | |
| 1.INSPECTION | ON STA | .RT | | | | | | Α |
| Confirm the de | etected | DTC. | | | | | | |
| Which DTC is | | | | | | | | EC |
| P0102, P010 P0103, P010 | | | | | | | - | |
| 2.CHECK IN | TAKE S | SYSTEM | | | | | | С |
| Check the follo Air duct Vacuum hos Intake air pa | ses | | | ako mani | fold | | | D |
| Is the inspection YES >> G | on resu O TO 3 | lt normal? | | ake mam | iolu | | | Е |
| 3.CHECK GF | | • | | | | | | F |
| Is the inspecti | ound co <u>on resu</u> | nnection Mi It normal? | 95. Refer to | o Ground | Inspection in G | I-41, "Circuit Inspectio | <u>n"</u> . | G |
| | • | replace gro | | | JIT | | | Н |
| Turn igniti | ion swit | | , | | connector. s connector and | ground. | | I |
| | | MAF sens | or | | | | | J |
| DTC | Bank | Connector | Terminal | - Ground | Voltage | | | |
| P0102, P0103 | 1 | F31 | 5 | Ground | Battery voltage | | | |
| P010C, P010D | 2 | F42 | 5 | Crouna | Buttery Voltage | | | K |
| | O TO 6 O TO 5 | | i PART | | | | | L |
| Check the followard the Harness cores Harness for | owing. nnectors nnectors open or | s E106, M6 s M116, F10 r short betw | 03 reen mass a | | ensor and ECM ensor and IPDM | E/R | | M |
| ^ | | | _ | | nort to power in OPEN AND SH | harness or connectors | 3. | 0 |

Turn ignition switch OFF. Disconnect ECM harness connector.

- 2.
- 3. Check the continuity between MAF sensor harness connector and ECM harness connector.

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| DTC | MAF sensor | | | EC | Continuity | |
|--------------|------------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0102, P0103 | 1 | F31 | 4 | F102 | 68 | Existed |
| P010C, P010D | 2 | F42 | 4 | 1 102 | 94 | LXISIEU |

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 MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

| DTC | | MAF senso | or | EC | Continuity | |
|--------------|------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0102, P0103 | 1 | F31 | 3 | F102 | 77 | Existed |
| P010C, P010D | 2 | F42 | 3 | F102 | 79 | EXISTEC |

2. 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 MASS AIR FLOW SENSOR

Refer to EC-212, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace malfunctioning mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK MASS AIR FLOW SENSOR-I

(II) With CONSULT-III

- 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-III and select "DATA MONITOR" mode.
- Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Start engine and warm it up to normal operating temperature.

P0102, P0103, P010C, P010D MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | |
|-----------|---------------------------------|----------|--|---------------------------|
| Connector | + | _ | Condition | Voltage (V) |
| | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| F102 | 77 | 68 | Idle (Engine is warmed-up to normal operating temperature.) | erat- 0.7 - 1.2 |
| | [MAF sensor (bank 1) signal] | 00 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 79 | 94 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 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 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
- 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-II

(P)With CONSULT-III

- Repair or replace malfunctioning part.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Connect CONSULT-III and select "DATA MONITOR" mode.
- 4. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|--------------------------------|--|---------------------------|
| MAS A/F SE-B1 MAS A/F SE-B2 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Without CONSULT-III

- 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 under the following conditions.

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| ECM | | | | | |
|-----------|--|-----------|--|---|--|
| Connector | + | - | Condition | Voltage (V) | |
| | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| F102 - | 77 [MAF sensor (bank 1) signal] 68 Idle (Engine is warmed-up to normal operating temperature.) 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 | | | |
| | | 00 | 1 1 = | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 79 | 94 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 1.3 - 1.7 0.7 - 1.2 to Approx. 2.4* | |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* Approx. 0.4 0.7 - 1.2 1.3 - 1.7 | |

^{*:} 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-III

(I) With CONSULT-III

- 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-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|--------------------------------|--|---------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 MAS A/F SE-B2 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Without CONSULT-III

- 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 under the following conditions.

P0102, P0103, P010C, P010D MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| ECM | | | | |
|-----------|---------------------------------------|----------|--|---------------------------|
| Connector | + | - | Condition | Voltage (V) |
| | Terminal | Terminal | | |
| F102 - | 77 [MAF sensor (bank 1) signal] | 68 | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 to Approx. 2.4* |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 79 | 94 | Idle (Engine is warmed-up to normal operating temperature.) | 0.7 - 1.2 |
| | [MAF sensor (bank 2) signal] | 94 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.7 - 1.2 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 malfunctioning mass air flow sensor.

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P0106 MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0106 MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0106 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0106 | Manifold absolute pressure (MAP) circuit range/performance | A difference exceeding the specified value develops between a value transmitted from the manifold absolute pressure (MAP) sensor to ECM and an estimated intake pressure of intake manifold calculated by ECM. | Harness or connectors (The sensor circuit is open or shorted.) Manifold absolute pressure (MAP) sensor Intake air 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.

If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch ON) instead of running engine at idle speed.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

(II) With CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Accelerate the vehicle from 0 to 88 km/h (0 to 55 MPH) under the following conditions:

CAUTION:

Always drive at a safe speed.

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

| ACCEL SEN 1 | 1.4 – 2.0 V |
|----------------|-------------|
| Selector lever | D position |

4. Check 1st trip DTC.

⋈ Without CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- With selector lever in D position, accelerate the vehicle from 0 to 88 km/h (0 to 55 MPH) under the following conditions:

CAUTION:

Always drive at a safe speed.

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

| Accelerator peda | l position sensor 1 | Ground | Voltage (V) |
|--|------------------------------------|--------|-------------|
| Connector Terminal | | Ground | voltage (v) |
| M153 ^{*1} M9 ^{*2} | 4 ^{*1} 3 ^{*2} | Ground | 1.4 – 2.0 |

P0106 MANIFOLD ABSOLUTE PRESSURE SENSOR [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > *1: With ICC *2: Without ICC Α Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-217, "Diagnosis Procedure". EC NO >> INSPECTION END Diagnosis Procedure INFOID:0000000005913647 CHECK INTAKE SYSTEM Check the following for connection. D Air duct Vacuum hoses Intake air passage between air duct and intake manifold. Е Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection". Is the inspection result normal? YES >> GO TO 3. NO >> Repair or replace ground connection. Н 3.CHECK MAP SENSOR POWER SUPPLY CIRCUIT Disconnect manifold absolute pressure (MAP) sensor harness connector. Turn ignition switch ON. 2. Check the voltage between MAP sensor harness connector and ground. MAP sensor Ground Voltage (V) Connector Terminal F50 Ground 1 Approx. 5 Is the inspection result normal? YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. f 4.CHECK MAP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect ECM harness connector. 2. Check the continuity between MAP sensor harness connector and ECM harness connector. N

| MAP | sensor | ECM | | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F50 | 3 | F102 | 96 | Existed |

Also check harness for short to ground and 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.

${f 5.}$ CHECK MAP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between MAP sensor harness connector and ECM harness connector.

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P0106 MANIFOLD ABSOLUTE PRESSURE SENSOR

[VQ37VHR]

| MAP | MAP sensor ECM | | ECM | |
|-----------|----------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F50 | 2 | F101 | 38 | Existed |

2. Also check harness for short to ground and 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 MAP SENSOR

Refer to EC-218, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace MAP sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913648

1.CHECK MAP SENSOR-I

- 1. Turn ignition switch OFF.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

| ECM | | | |
|-----------|----------|-----------|----------|
| | + | - | _ |
| Connector | Terminal | Connector | Terminal |
| F101 | 38 | F102 | 96 |

NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.
- 5. Measure the atmospheric pressure.

NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

| Altitude (m) | Compensated pressure (hPa) |
|--------------|----------------------------|
| 0 | 0 |
| 200 | -24 |
| 400 | -47 |
| 600 | -70 |
| 800 | -92 |
| 1000 | -114 |
| 1500 | -168 |
| 2000 | -218 |

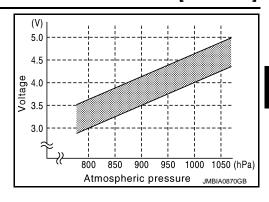
^{6.} Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

P0106 MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| 1050 | 4.2 – 4.8 |
|----------------------------|-------------|
| 1000 | 4.0 – 4.6 |
| 950 | 3.8 – 4.3 |
| 900 | 3.5 – 4.1 |
| 850 | 3.3 - 3.9 |
| 800 | 3.1 – 3.7 |
| Atmospheric pressure (hPa) | Voltage (V) |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace MAP sensor.

2.CHECK MAP SENSOR-II

- Start engine and let it idle.
- 2. Check intake manifold vacuum.
- 3. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | |
|-----------|----------|-----------|----------|
| | + | | _ |
| Connector | Terminal | Connector | Terminal |
| F101 | 38 | F102 | 96 |

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

| Intake manifold vacuum [kPA (mmHg)] | Voltage difference (V) |
|-------------------------------------|------------------------|
| -40 (-300) | 1.5 – 2.0 |
| -53.3 (-400) | 2.0 – 2.6 |
| -66.7 (-500) | 2.6 – 3.2 |
| -80 (-600) | 3.2 – 3.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace MAP sensor.

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P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P010A is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P010A | Manifold absolute pressure sensor circuit | An excessively low voltage from the sensor is sent to ECM. An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) Manifold absolute pressure (MAP) 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 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-220, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913651

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK MAP SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect manifold absolute pressure (MAP) sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between MAP sensor harness connector and ground.

| MAP sensor | | Ground | Voltage (V) |
|------------|----------|--------|-------------|
| Connector | Terminal | Ground | voilage (v) |
| F50 | 1 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

${f 3.}$ CHECK MAP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Disconnect ECM harness connector.

Check the continuity between MAP sensor harness connector and ECM harness connector.

| MAP | MAP sensor | | ECM | |
|-----------|------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F50 | 3 | F102 | 96 | Existed |

Also check harness for short to ground and 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.

f 4.CHECK MAP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between MAP sensor harness connector and ECM harness connector.

| MAP | MAP sensor | | ECM | |
|-----------|------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F50 | 2 | F101 | 38 | Existed |

Also check harness for short to ground and power.

Is the inspection result normal?

>> GO TO 5. YES

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK MAP SENSOR

Refer to EC-221, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace MAP sensor.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.CHECK MAP SENSOR-I

- Turn ignition switch OFF.
- 2. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
- Check the voltage between ECM harness connector terminals as follows.

| ECM | | | |
|-----------|----------|-----------|----------|
| + | | | - |
| Connector | Terminal | Connector | Terminal |
| F101 | 38 | F102 | 96 |

NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.
- 5. Measure the atmospheric pressure.

NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

EC-221 Revision: 2010 June 2011 M37/M56

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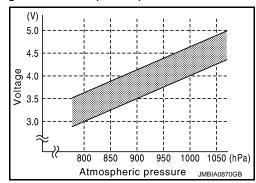
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< DTC/CIRCUIT DIAGNOSIS >

| Altitude (m) | Compensated pressure (hPa) |
|--------------|----------------------------|
| 0 | 0 |
| 200 | -24 |
| 400 | -47 |
| 600 | -70 |
| 800 | -92 |
| 1000 | -114 |
| 1500 | -168 |
| 2000 | -218 |

6. Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

| Atmospheric pressure (hPa) | Voltage (V) |
|----------------------------|-------------|
| 800 | 3.1 – 3.7 |
| 850 | 3.3 – 3.9 |
| 900 | 3.5 – 4.1 |
| 950 | 3.8 – 4.3 |
| 1000 | 4.0 – 4.6 |
| 1050 | 4.2 – 4.8 |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace MAP sensor.

2.CHECK MAP SENSOR-II

- 1. Start engine and let it idle.
- 2. Check intake manifold vacuum.
- 3. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | |
|-----------|----------|-----------|----------|--|
| | + | | _ | |
| Connector | Terminal | Connector | Terminal | |
| F101 | 38 | F102 | 96 | |

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

| Intake manifold vacuum | Voltage difference (V) |
|------------------------|------------------------|
| -40kPa (-300mmHg) | 1.5 – 2.0 |
| -53.3kPa (-400mmHg) | 2.0 – 2.6 |
| -66.7kPa (-500mmHg) | 2.6 – 3.2 |
| -80kPa (-600mmHg) | 3.2 – 3.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace MAP sensor.

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0112, P0113 IAT SENSOR

DTC Logic INFOID:0000000005913654

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0112 | Intake air 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 short- |
| P0113 | Intake air temperature sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | ed.) • 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

- Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

>> Go to EC-223, "Diagnosis Procedure". YES

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

$oldsymbol{2}.$ CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow (MAF) sensor (intake air temperature sensor is built-into) harness connector.
- Turn ignition switch ON.
- Check the voltage between mass air flow sensor (bank 1) harness connector and ground.

| MAF sensor (bank 1) | | Ground | Voltage (V) |
|---------------------|----------|--------|-------------|
| Connector | Terminal | Ground | voltage (v) |
| F31 | 2 | Ground | Approx. 5 |

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 ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between mass air flow sensor (bank 1) harness connector and ECM harness connector.

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| MAF sensor (bank 1) | | ECM | | Continuity |
|---------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F31 | 1 | F102 | 68 | 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 INTAKE AIR TEMPERATURE SENSOR

Refer to EC-224, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1).

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913656

1. CHECK INTAKE AIR TEMPERATURE 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.

| Terminals | Condition | | Resistance (k Ω) |
|-----------|-----------------------|---------|--------------------------|
| 1 and 2 | 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).

P0116 ECT SENSOR

DTC Logic INFOID:0000000005913658

DTC DETECTION LOGIC

NOTE:

If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-227, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0116 | Engine coolant temperature sensor circuit range/performance | Engine coolant temperature signal from engine coolant temperature sensor does not fluctuate, even when some time has passed after starting the engine with pre-warming up condition. | Harness or connectors (High or low resistance in the circuit) Engine coolant 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.

TEST CONDITION:

Before performing the following procedure, do not add fuel.

>> GO TO 2.

2.perform dtc confirmation procedure

- Start engine and warm it up to normal operating temperature.
- 2. Rev engine up to 2,000 rpm for more than 10 minutes.
- 3. Move the vehicle to a cool place, then stop engine.
- 4. Check resistance between "fuel level sensor unit and fuel pump (main)" terminals 4 and 5.
- 5. Soak the vehicle until the resistance between "fuel level sensor unit and fuel pump (main)" terminals 4 and 5 becomes 0.5 k Ω higher than the value measured before soaking.

CAUTION:

Never turn ignition switch ON during soaking.

Soak time changes depending on ambient air temperature. It may take several hours.

- 6. Start engine and let it idle for 20 minutes.
- 7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-225, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

CHECK GROUND CONNECTIONS

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

OK >> GO TO 2.

NG >> Repair or replace ground connections.

2.check engine coolant temperature sensor

Refer to EC-226, "Component Inspection".

Is the inspection result normal?

>> GO TO 3. OK

EC-225 Revision: 2010 June 2011 M37/M56

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< DTC/CIRCUIT DIAGNOSIS >

NG >> Replace engine coolant temperature sensor.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

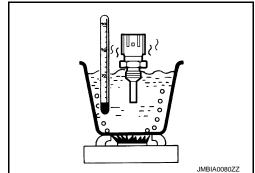
Component Inspection

INFOID:0000000005913660

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.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance ($k\Omega$) |
|-----------|-----------------------|----------|--------------------------|
| | | 20 (68) | 2.37 - 2.63 |
| 1 and 2 | Temperature [°C (°F)] | 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.

P0117, P0118 ECT SENSOR

DTC Logic INFOID:0000000005913662

DTC DETECTION LOGIC

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| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause | |
|---------|--|---|--|--|
| P0117 | Engine coolant tem- perature sensor cir- cuit low input | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) | |
| P0118 | Engine coolant tem- perature sensor cir- cuit high input | An excessively high voltage from the sensor is sent to ECM. | È | |

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 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-227, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005913663

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

- Disconnect engine coolant temperature (ECT) sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between ECT sensor harness connector and ground.

| ECT: | sensor | Ground | Voltage (V) | |
|-----------|----------|--------|-------------|--|
| Connector | Terminal | Ground | voltage (v) | |
| F17 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 4. >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors F106, F107

EC-227 Revision: 2010 June 2011 M37/M56

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P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Harness for open or short between engine coolant temperature sensor and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between ECT sensor harness connector and ECM harness connector.

| ECT s | ensor | EC | CM | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F17 | 2 | F102 | 84 | 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 ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-228, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace engine coolant temperature sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38. "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913664

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

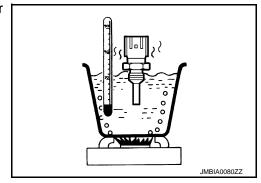
- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (k Ω) | |
|-----------|---------------------|--------------------------|---------------|
| | | 20 (68) | 2.37 - 2.63 |
| 1 and 2 | Temperature °C (°F) | 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.



P0122, P0123, P0227, P0228 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0122, P0123, P0227, P0228 TP SENSOR

DTC Logic INFOID:0000000005913666

DTC DETECTION LOGIC

NOTE:

If DTC P0122, P0123, P0227 or P0228 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0122 | Throttle position sensor 2 (bank 1) circuit low input | An excessively low voltage from the TP sensor 2 is sent to ECM. | |
| P0123 | Throttle position sensor 2 (bank 1) circuit high input | An excessively high voltage from the TP sensor 2 is sent to ECM. | Harness or connectors (TP sensor 2 circuit is open or shorted.) |
| P0227 | Throttle position sensor 2 (bank 2) circuit low input | An excessively low voltage from the TP sensor 2 is sent to ECM. | Electric throttle control actuator (TP sensor 2) |
| P0228 | Throttle position sensor 2 (bank 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.
- 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 >> Go to EC-229, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

Revision: 2010 June

NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between electric throttle control actuator harness connector and ground.

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EC-229

| DTC | DTC Electric throttle co | | | Ground | Voltage (V) |
|--------------|--------------------------|-----------|----------|---------|-------------|
| ыс | Bank | Connector | Terminal | Giodila | voltage (v) |
| P0122, P0123 | 1 | F67 | 6 | Ground | Approx. 5 |
| P0227, P0228 | 2 | F27 | 1 | Ground | дрріох. 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 throttle position sensor 2 ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electri | c throttle cont | rol actuator | ECM | | Continuity |
|--------------|---------|-----------------|--------------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0122, P0123 | 1 | F67 | 3 | F101 | 40 | Existed |
| P0227, P0228 | 2 | F27 | 4 | FIUI | 48 | 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 THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric | c throttle cont | rol actuator | ECM | | Continuity | |
|--------------|----------|-----------------|--------------|-----------|----------|------------|--|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0122, P0123 | 1 | F67 | 5 | F101 | 34 | Existed | |
| P0227, P0228 | 2 | F27 | 3 | 1 101 | 35 | LAISIEU | |

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 THROTTLE POSITION SENSOR

Refer to EC-231, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- Go to EC-231, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0122, P0123, P0227, P0228 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Component Inspection

INFOID:0000000005913668

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1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform EC-151, "Work Procedure".
- 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 | | | | |
|-----------|-----------------------------|----------|-----------------------------|-----------------|----------------|
| Connector | Connector + | | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| | 30 [TP sensor 1 (bank 1)] | | | Fully released | More than 0.36 |
| | SO [TF Selisor T (Dank T)] | 40 | Accelerator pedal | Fully depressed | Less than 4.75 |
| | 31 [TP sensor 1 (bank 2)] | 48 | | Fully released | More than 0.36 |
| F101 | 31 [17 Selisor I (balik 2)] | | | Fully depressed | Less than 4.75 |
| FIUI | 34 [TP sensor 2 (bank 1)] | 40 | | Fully released | Less than 4.75 |
| | 54 [TF Selisor 2 (Darik 1)] | 40 | | Fully depressed | More than 0.36 |
| | 35 [TP sensor 2 (bank 2)] | 40 | | Fully released | Less than 4.75 |
| | 35 [17 Selisol 2 (Dalik 2)] | 48 | | Fully depressed | More than 0.36 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- 2. Go to EC-231, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-151, "Work Procedure"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure"

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P0125 ECT SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to EC-227, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0125 | Insufficient engine cool- ant temperature for closed loop fuel control | 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. | 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

- 1. Turn ignition switch ON.
- 2. Select "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "COOLAN TEMP/S" is above -5°C (23°F).

Is the temperature above -5°C (23°F)?

YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

Start engine and run it for 65 minutes at idle speed.

If "COOLAN TEMP/S" increases to more than -5°C (23°F) within 65 minutes, stop engine because the test result will be OK.

CAUTION:

Be careful not to overheat engine.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-232, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913672

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-233, "Component Inspection".

P0125 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine coolant temperature sensor.

3. 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 >> GO TO 4.

NO >> Repair or replace thermostat. Refer to CO-22, "Removal and Installation".

4. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

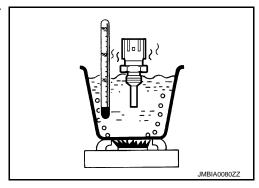
- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance (k Ω) |
|-----------|-----------------------|----------|--------------------------|
| | | 20 (68) | 2.37 - 2.63 |
| 1 and 2 | Temperature [°C (°F)] | 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.



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INFOID:0000000005913673

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P0127 IAT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------------|---|---|
| P0127 | 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. | 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 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

- 1. Wait until engine coolant temperature is less than 96°C (205°F)
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- 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-III.
- 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.

Is 1st trip DTC detected?

YES >> Go to EC-234, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913676

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.check intake air temperature sensor

Refer to EC-235, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

P0127 IAT SENSOR [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). 3. CHECK INTERMITTENT INCIDENT Α Refer to GI-38, "Intermittent Incident". EC >> INSPECTION END Component Inspection INFOID:0000000005913677 1. CHECK INTAKE AIR TEMPERATURE SENSOR Turn ignition switch OFF. D 2. Disconnect mass air flow sensor (bank 1) harness connector. Check resistance between mass air flow sensor (bank 1) terminals as follows. Е Condition Resistance (kΩ) **Terminals** 1.800 - 2.200 1 and 2 Temperature [°C (°F)] 25 (77) Is the inspection result normal? F YES >> INSPECTION END NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Н K L M Ν

Revision: 2010 June **EC-235** 2011 M37/M56

P0128 THERMOSTAT FUNCTION

DTC Logic

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, P0306. Refer to <u>EC-295</u>.

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 | DTC detecting condition | Possible cause |
|---------|------------------------|--|---|
| P0128 | Thermostat function | The engine coolant temperature does not reach to specified temperature even though the engine has run long enough. | Thermostat Leakage from sealing portion of thermostat Engine coolant 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:

- For best results, perform at ambient temperature of -10°C (14°F) or higher.
- For best results, perform at engine coolant temperature of −10°C (14°F) to 56°C (133°F).
- · Before performing the following procedure, do not add fuel.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn A/C switch OFF.
- 2. Turn blower fan switch OFF.
- 3. Turn ignition switch ON.
- Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III.
- 5. Check the indication of "COOLAN TEMP/S".
 - If it is below 56°C (133°F), go to the next steps.
 - If it is above 56°C (133°F), cool engine down to less than 56°C (133°F). Then go to next step.
- Start engine.
- 7. Drive vehicle for 10 consecutive minutes under the following condition.

| VHCL SPEED SE | More than 50 km/h (35 mph) | |
|---------------|----------------------------|--|
| | | |

If "COOLAN TEMP/S" increases to more than 75°C (167°F) within 10 minutes, turn ignition switch OFF because the test result will be OK.

CAUTION:

Always drive vehicle at safe speed.

8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-236, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913679

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-237, "Component Inspection".

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace thermostat.

Component Inspection

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

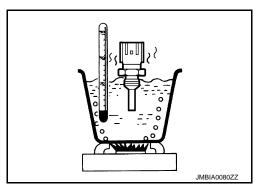
- 1. Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance ($k\Omega$) |
|-----------|-----------------------|----------|--------------------------|
| | T | 20 (68) | 2.37 - 2.63 |
| 1 and 2 | Temperature [°C (°F)] | 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.



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[VQ37VHR]

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P0130, P0150 A/F SENSOR 1

DTC Logic

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 | | DTC detecting condition | Possible Cause |
|--|--|----|--|---|
| P0130 | P0130 Air fuel ratio (A/F) sensor 1 (bank 1) circuit | | 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. | |
| | | | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V. | Harness or connectors (The A/F sensor 1 circuit is open |
| P0150 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. | 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 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 >> Go to EC-240, "Diagnosis Procedure".

NO-1 >> With CONSULT-III: GO TO 3.

NO-2 >> Without CONSULT-III: GO TO 7.

3.CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

- Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT-III.
- 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 >> Go to EC-240, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

- 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-III.
- 2. Touch "START".
- 3. When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen.

| ENG SPEED | 1,100 - 3,200 rpm | Α |
|---|---|-------|
| VHCL SPEED SE | More than 64 km/h (40 mph) | |
| B/FUEL SCHDL | 1.0 - 8.0 msec | FC |
| Selector lever | D position | EC |
| CAUTION: | ot displayed after 20 seconds, retry from step 2. | С |
| • | d on CONSULT-III screen? | |
| YES >> GO TO 5. NO >> Check A/F | sensor 1 function again. GO TO 3. | D |
| _ | ONFIRMATION PROCEDURE FOR MALFUNCTION B-II | |
| Release accelerator pe | | Е |
| NOTE: | sual fully. | |
| • • • | en releasing the accelerator pedal. | _ |
| Which does "TESTING | | F |
| COMPLETED>>GO TO OUT OF CONDITION | IO 6. I>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4. | |
| ^ | ONFIRMATION PROCEDURE FOR MALFUNCTION B-III | G |
| Touch "SELF-DIAG RE | | |
| Which is displayed on | | Н |
| OK >> INSPECTI | ON END | |
| _ | 240, "Diagnosis Procedure". | |
| / .PERFORM COMPO | ONENT FUNCTION CHECK FOR MALFUNCTION B | |
| | nction check. Refer to EC-239, "Component Function Check". | |
| NOTE: Use component function 1st trip DTC might not | on check to check the overall function of the A/F sensor 1 circuit. During this check, a be confirmed. | J |
| Is the inspection result | normal? | |
| YES >> INSPECTI | | K |
| · · · · · · · · · · · · · · · · · · · | 240, "Diagnosis Procedure". | |
| Component Funct | tion Check INFOID:000000005913683 | L |
| 1.PERFORM COMPO | ONENT FUNCTION CHECK | |
| With GST | | 1. // |
| | varm it up to normal operating temperature. | M |
| | at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position. lever to D position, then release the accelerator pedal fully until the vehicle speed m/h (30 MPH). | Ν |
| | icle at a safe speed. | |
| NOTÉ: | | 0 |
| Never apply brake 4. Repeat steps 2 and | when releasing the accelerator pedal. d 3 for five times. | |
| 5. Stop the vehicle ar | nd turn ignition switch OFF. | Р |
| 6. Turn ignition switch7. Turn ignition switch | h ON. h OFF and wait at least 10 seconds. | |
| 8. Restart engine. | | |
| Repeat steps 2 and Stop the vehicle ar | d 3 for five times. nd connect GST to the vehicle. | |
| 11. Check 1st trip DTC | | |
| Is 1st trip DTC detected | <u>d?</u> | |

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P0130, P0150 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> Go to EC-240, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913684

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect A/F sensor 1 harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor | Ground | Voltage | |
|-------|------|------------|----------|---------|-----------------|
| ыс | Bank | Connector | Terminal | Glodila | voltage |
| P0130 | 1 | F3 | 4 | Ground | Battery voltage |
| P0150 | 2 | F20 | 4 | Giouna | battery voltage |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 45)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | | | A/F sensor 1 ECM | | CM | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------------|--|----|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | |
| P0130 | 1 | F3 | 1 | | 57 | | | | |
| F0130 | Į. | гэ | 2 | F102 | 61 | Existed | | | |
| P0150 | 2 F20 | E20 | 1 | F102 | 65 | Existed | | | |
| F0150 | | 2 | | 66 | | | | | |

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 | | |
|-------|--------------|------------------------|---|---------|-------------|--------|-------------|
| DIC | Bank | Bank Connector Termina | | Giouna | Continuity | | |
| P0130 | 1 | F3 | 1 | | | | |
| F0130 | ' | ' | ' | 13 | 2 | Ground | Not existed |
| P0150 | 2 | F20 | 1 | Giodila | Not existed | | |
| F0150 | 2 | F20 | 2 | | | | |

| DTC | | ECM | | Ground | Continuity |
|----------------|------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Giodila | Continuity |
| P0130 P0150 | 1 | | 57 | Ground | Not existed |
| | | F102 | 61 | | |
| | 2 | F102 | 65 | Giodila | |
| | | | 66 | 1 | |

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 INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.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

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EC-241 Revision: 2010 June 2011 M37/M56

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P0131, P0151 A/F SENSOR 1

DTC Logic

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 | DTC detecting condition | Possible Cause |
|---------|--|--|--|
| P0131 | Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage | The A/F signal computed by ECM from the A/ | Harness or connectors (The A/F sensor 1 circuit is open or |
| P0151 | Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage | F sensor 1 signal is constantly approx. 0 V. | shorted.) • A/F sensor 1 |

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.
- 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 with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 0 V?

YES >> Go to EC-243, "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.
- Restart engine.
- Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.

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
- 7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-243, "Diagnosis Procedure".

NO >> INSPECTION END

P0131, P0151 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Diagnosis Procedure

INFOID:0000000005913687

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect A/F sensor 1 harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F senso | r 1 | Ground | Voltage | |
|-------|------|-------------------------|-----|--------|-----------------|--|
| ыс | Bank | Bank Connector Terminal | | Glound | voltage | |
| P0130 | 1 | F3 | 4 | Ground | Battery voltage | |
| P0150 | 2 | F20 | 4 | Glound | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 45)

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· Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | | A/F sensor | 1 | EC | Continuity | |
|-------|---------------|------------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0130 | 1 | F3 | 1 | | 57 | |
| F0130 | Į į | FS | F102 | 61 | Existed | |
| D0150 | P0150 2 F20 1 | 1 | 1 102 | 65 | LAISIEU | |
| F0130 | | 120 | 2 | • | 66 | |

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 |
|-------|--------------|-----------|----------|---------|-------------|
| DIO | Bank | Connector | Terminal | Giodila | Continuity |
| P0130 | 1 | F3 | 1 | | Not existed |
| F0130 | ' | 13 | 2 | Ground | |
| P0150 | 2 | F20 | 1 | Giodila | Not existed |
| F0150 | 2 F20 | F20 | 2 | | |

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| DTC | ECM | | | Ground | Continuity |
|-------|------|-----------|--------------------|--------|-------------|
| DIC | Bank | Connector | or Terminal Ground | | Continuity |
| P0130 | 1 | 1 F102 | 57 | Ground | Not existed |
| F0130 | ' | | 61 | | |
| P0150 | 2 | | 65 | | |
| F0150 | 2 | | 66 | | |

5. 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 INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6. 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

P0132, P0152 A/F SENSOR 1

DTC Logic INFOID:0000000005913689

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 | DTC detecting condition | Possible Cause |
|---------|---|---|--|
| P0132 | Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage | The A/F signal computed by ECM from the A/F | Harness or connectors (The A/F sensor 1 circuit is open or |
| P0152 | Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage | sensor 1 signal is constantly approx. 5 V. | shorted.) • A/F sensor 1 |

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.
- 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 at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

- Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT-III. 2.
- Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Is the indication constantly approx. 5V?

YES >> Go to EC-246, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform dtc confirmation procedure

- 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.
- 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
- Check 1st trip DTC.

Is 1st trip DTC detected?

>> Go to EC-246, "Diagnosis Procedure". YES

NO >> INSPECTION END

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P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Diagnosis Procedure

INFOID:0000000005913690

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.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 | Voltago | |
|-------|--------------|-----------|----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Glound | Voltage | |
| P0130 | 1 | F3 | 4 | Ground | Battery voltage | |
| P0150 | 2 | F20 | 4 | Glound | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 45)
- · Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | | |
|-------|--------------|-----------|----------|-----------|------------|------------|--|
| DIC | | Connector | Terminal | Connector | Terminal | Continuity | |
| P0130 | 1 | F3 | 1 | | 57 | | |
| F0130 | | гэ | 2 | F102 | 61 | Existed | |
| D0150 | P0150 2 F20 | E20 | 1 | 1 102 | 65 | LXISIGU | |
| F0130 | | F20 | 2 | | 66 | | |

 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 |
|-------|--------------|-----------|----------|---------|-------------|
| ыс | Bank | Connector | Terminal | Oround | Continuity |
| P0130 | 1 | F3 | 1 | | Not existed |
| F0130 | ' | гэ | 2 | Ground | |
| P0150 | 2 | F20 | 1 | Giodila | Not existed |
| P0150 | 2 F20 | F20 | 2 | | |

P0132, P0152 A/F SENSOR 1

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| DTC | ECM | | | Ground | Continuity | |
|---------------------------------------|------|-----------|----------|---------|-------------|--|
| DIC | Bank | Connector | Terminal | Giodila | Continuity | |
| P0130 | 1 | | 57 | Ground | Not existed | |
| F0130 | ' | F102 | 61 | | | |
| P0150 | 2 | F102 | 65 | | | |
| P0150 | | | 66 | | | |
| Also shook harroon for short to nower | | | | | | |

5. 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 INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.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

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P0133, P0153 A/F SENSOR 1

DTC Logic

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 |
|---------|--|---|---|
| P0133 | Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response | | Harness or connectors (The A/F sensor 1 circuit is open or shorted.) |
| P0153 | Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response | The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time. | A/F sensor 1 A/F sensor 1 heater Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks PCV 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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.

Do you have CONSULT-III?

YES >> GO TO 2. NO >> GO TO 5.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

(P)With CONSULT-III

- 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.
- Select A/F SEN1(B1) P1278/P1279" (for DTC P0133) or "A/F SEN1(B2) P1288/P1289" (for DTC P0153) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 8. Touch "START".

Is "COMPLETED" displayed on CONSULT-III screen?

YES >> GO TO 3 NO >> GO TO 4.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-249, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. After perform the following procedure, "TESTING" will be displayed on the CONSULT-III screen.

P0133, P0153 A/F SENSOR 1

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Increase the engine speed up to about 3,600 rpm and maintain that speed for 10 seconds. Fully release accelerator pedal and then let engine idle for about 10 seconds. Α If "TESTING" is not displayed after 10 seconds, go to EC-172, "Component Function Check". 2. Wait for about 20 seconds at idle under the condition that "TESTING" is displayed on the CONSULT-III screen. EC Make sure that "TESTING" changes to "COMPLETED". 3. If "TESTING" changed to "OUT OF CONDITION", go to EC-172, "Component Function Check". Touch "SELF-DIAG RESULT". Which is displayed on CONSULT-III screen? OK >> INSPECTION END NG >> Go to EC-249, "Diagnosis Procedure". D 5.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE 1. Start engine and warm it up to normal operating temperature. Е Select Service \$01 with GST. Calculate the total value of "Short term fuel trim" and "Long term fuel trim" indications. Is the total percentage within $\pm 15\%$? F YES >> GO TO 7. NO >> GO TO 6. 6. DETECT MALFUNCTIONING PART Check the following. Intake air leaks · Exhaust gas leaks Н Incorrect fuel pressure Lack of fuel Fuel injector Incorrect PCV hose connection PCV valve · Mass air flow sensor >> Repair or replace malfunctioning part. 7.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. Let engine idle for 1 minute. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds. Fully release accelerator pedal and then let engine idle for about 1 minute. Check 1st trip DTC. Is 1st trip DTC detected? N YES >> Go to EC-249, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure INFOID:0000000005913693 CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection". Is the inspection result normal? YES >> GO TO 2. NO >> Repair or replace ground connection. 2.RETIGHTEN A/F SENSOR 1

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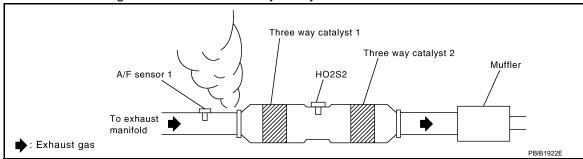
Loosen and retighten the A/F sensor 1. Refer to EM-36, "Removal and Installation".

>> 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

- Clear the mixture ratio self-learning value. Refer to <u>EC-156</u>, "Work Procedure".
- 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 <u>EC-274, "DTC Logic"</u> or <u>EC-278, "DTC Logic"</u>.

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 | |
|-------|--------------|-----------|----------|--------|-----------------|--|
| DIC | Bank | Connector | Terminal | Glound | voitage | |
| P0133 | 1 | F3 | 4 | Ground | Battery voltage | |
| P0153 | 2 | F20 | 4 | Ground | | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 45)
- 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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC Ba | A/F sensor 1 | | | EC | Continuity | |
|---------|--------------|-----------|----------|-----------|------------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0133 | 1 F3 | 1 | | 57 | | |
| F0133 | ' | гэ | 2 | E400 | 61 | Existed |
| D0152 | 2 520 | | 1 | F102 | 65 | Existed |
| P0153 2 | 2 | 2 F20 | 2 | | 66 | |

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 |
|-------|--------------|-------------------------|---|---------|-------------|
| DIC | Bank | Bank Connector Terminal | | Giodila | Continuity |
| P0133 | 1 | F3 | 1 | | Not existed |
| | | 13 | 2 | Ground | |
| D0153 | P0153 2 F20 | E20 | 1 | | |
| F0133 | | 2 | | | |

| DTC | ECM | | | Ground | Continuity |
|-------|------|-----------|----------|---------|-------------|
| | Bank | Connector | Terminal | Giodila | Continuity |
| P0133 | 1 | F102 | 57 | Ground | Not existed |
| | | | 61 | | |
| P0153 | 2 | | 65 | | |
| | | | 66 | | |

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.

$oldsymbol{9}.$ CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to EC-198, "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-205, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning mass air flow sensor.

11. CHECK PCV VALVE

Refer to EC-534, "Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace PCV valve.

12.check intermittent incident

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P0133, P0153 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Perform GI-38, "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

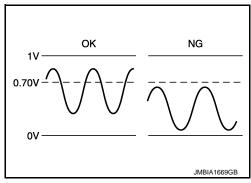
[VQ37VHR]

P0137, P0157 HO2S2

DTC Logic INFOID:0000000005913695

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.



| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|---|--|--|
| P0137 | Heated oxygen sensor 2 (bank 1) circuit low voltage | The maximum voltage from the sensor does not | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 | |
| P0157 | Heated oxygen sensor 2 (bank 2) circuit low voltage | The maximum voltage from the sensor does not reach the specified voltage. | Fuel pressureFuel injectorIntake air leaks | |

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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.

- 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:

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

(P)With CONSULT-III

- <u>ĭ</u>. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 3.
- 4. Turn ignition switch ON.
- 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.
- 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).
- Open engine hood.

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EC-253 Revision: 2010 June 2011 M37/M56

- 10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 11. Start engine and follow the instruction of CONSULT-III display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-255, "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-254, "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 >> Go to EC-255, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005913696

${f 1}$.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. 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.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

| | | ECM | | | | |
|-------|-------------------|-----|-------------|--|---------------------------------------|--|
| DTC | Connector | + | - Condition | | Voltage | |
| | Terminal Terminal | | | | | |
| P0137 | F102 | 76 | 84 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.70 V at | |
| P0157 | | | 04 | least 10 times | least once during this procedure. | |

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 condition.

| | | ECM | | | | |
|-------|-----------|----------|----------|---|---------------------------------------|--|
| DTC | Connector | + | - | Condition | Voltage | |
| | Connector | Terminal | Terminal | | | |
| P0137 | F102 | 76 | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.70 V at | |
| P0157 | 1 102 | 80 | 04 | Respiring engine at lute for 10 minutes | least once during this procedure. | |

Is the inspection result normal?

P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000005913697

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YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following condition.

| | ECM | | | | | |
|-------|-------------|----------|----------|---|---------------------------------------|--|
| DTC | Connector | + | _ | Condition | Voltage | |
| | Connector - | Terminal | Terminal | | | |
| P0137 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) in D po- | The voltage should be above 0.70 V at | |
| P0157 | F102 | 80 | 04 | sition | least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-255, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".
- 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-274, "DTC Logic".

NO >> GO TO 3.

3.check ho2s2 ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0157 | 2 | F53 | 1 | 1 102 | 04 | LXISIEU |

5. 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 | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F54 | 4 | F102 | 76 | Existed |
| P0157 | 2 | F53 | 4 | 1 102 | 80 | LXISIEU |

Check the continuity between HO2S2 harness connector and ground, or ECM harness conector and ground.

| DTC | | HO2S2 | Ground | Continuity | | |
|-------|------|-----------|----------|------------|-------------|--|
| DIC | Bank | Connector | Terminal | Giodila | Continuity | |
| P0137 | 1 | F54 | 4 | Ground | Not existed | |
| P0157 | 2 | F53 | 4 | Giodila | NOI EXISTED | |

| DTC | | ECM | Ground | Continuity | | |
|-------|------|-----------|----------|------------|-------------|--|
| DIC | Bank | Connector | Terminal | Oround | Continuity | |
| P0137 | 1 | F102 | 76 | Ground | Not existed | |
| P0157 | 2 | 1 102 | 80 | Giodila | | |

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

Refer to EC-256, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6.replace heated oxygen sensor 2

Replace malfunctioning heated oxygen sensor 2.

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

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913698

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.CHECK HEATED OXYGEN SENSOR $^{ m 2}$

(I) With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 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.

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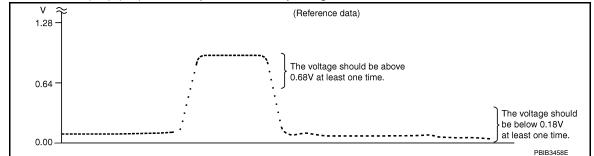
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< DTC/CIRCUIT DIAGNOSIS >

- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-III.
- 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"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-I

Without CONSULT-III

- 1. 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.
- 5. Check the voltage between ECM harness connector terminals under the following condition.

| | ECM | | | | |
|-----------|---------------------------|----------|---|---|--|
| Connector | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F102 | 76 [HO2S2 (bank 1)] | 9.4 | 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. | |
| F102 - | 80 [HO2S2 (bank 2)] | 84 | | The voltage should be below 0.18 V at least once during this procedure. | |

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 condition.

| ECM | | | Condition | Voltage | |
|---------------------------|---------------------------|----------|---------------------------------------|---|--|
| Connector | + - | | | | |
| Connector | Terminal | Terminal | | | |
| 76 [HO2S2 (bank 1)] | | 9.4 | Kanain namina at idla fau 40 minuta | The voltage should be above 0.70 V at least once during this procedure. | |
| F102 | 80 [HO2S2 (bank 2)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. | |

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 condition.

| | ECM | | | | |
|-----------|---------------------------|----------|--|---|--|
| Connector | + - | | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| E102 | 76 [HO2S2 (bank 1)] | 84 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be above 0.70 V at least once during this procedure. | |
| F102 - | 80 [HO2S2 (bank 2)] | 84 | | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

[VQ37VHR]

P0138, P0158 HO2S2

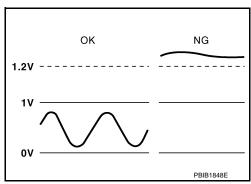
DTC Logic INFOID:0000000005913700

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.

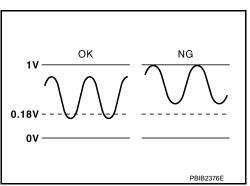
MALFUNCTION A

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 | | DTC detecting condition | Possible cause |
|---|------------------------|--|--|--|
| Heated awaren asses | | A) | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 |
| P0138 Heated oxygen sensor 2 (bank 1) circuit high voltage | B) | The minimum voltage from the sensor is not reached to the specified voltage. | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 Fuel pressure Fuel injector | |
| | | A) | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 |
| P0158 Heated oxygen sensor: (bank 2) circuit high vol age | B) | The minimum voltage from the sensor is not reached to the specified voltage. | 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 procudure before conducting the next test.

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

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>> GO TO 2.

2.perform dtc confirmation procedure for malfunction a

- 1. Start engine and warm it up to the normal operating temperature.
- 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 minuites.
- 7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-261, "Diagnosis Procedure".

NO-1 >> With CONSULT-III: GO TO 3.

NO-2 >> Without CONSULT-III: 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).

- Select "DATA MONITOR" mode with CONSULT-III.
- 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.
- Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Start engine and follow the instruction of CONSULT-III display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-261, "Diagnosis Procedure".

CON NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

- 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-260, "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 >> Go to EC-261, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005913701

1. PERFORM COMPONENT FUNCTION CHECK-I

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

Without CONSULT-III

- 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.

Check the voltage between ECM harness connector terminals under the following condition.

| | | ECM | | | | |
|-------|-------------------|-----|----|--|---------------------------------------|--|
| DTC | Connector | + | _ | Condition | Voltage | |
| | Terminal Terminal | | | | | |
| P0138 | F102 | 76 | 84 | Revving up to 4,000 rpm under no load at | The voltage should be below 0.18 V at | |
| P0158 | 1 102 | 80 | 04 | least 10 times | least once during this procedure. | |

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 condition.

| | | ECM | | | | |
|-------|-----------|----------|----------|--|---------------------------------------|--|
| DTC | Connector | + | _ | Condition | Voltage | |
| | Connector | Terminal | Terminal | | | |
| P0138 | F102 | 76 | 84 | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at | |
| P0158 | 1 102 | 80 | 04 | Reeping engine at fulle for 10 minutes | least once during this procedure. | |

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 condition.

| | | ECM | | | |
|-------|-----------|----------|----------|---|---------------------------------------|
| DTC | Connector | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0138 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) in D po- | The voltage should be below 0.18 V at |
| P0158 | 1 102 | 80 | 04 | sition | least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

>> Go to EC-261, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-259, "DTC Logic".

Which malfunction is detected?

Α >> GO TO 2

В >> GO TO 9.

2.CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

EC-261

Is the inspection result normal?

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INFOID:0000000005913702

YES >> GO TO 3.

NO >> Repair or replace ground connection.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | ECM | | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0158 | 2 | F53 | 1 | F 102 | 04 | 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 HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | ECM | | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F54 | 4 | F102 | 76 | Existed |
| P0158 | 2 | F53 | 4 | F102 | 80 | Existed |

Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | | HO2S2 | | Ground | Continuity |
|-------|------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Oround | Continuity |
| P0138 | 1 | F54 | 4 | Ground | Not existed |
| P0158 | 2 | F53 | 4 | Sibulia | NOT EXISTED |

| DTC | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|---------|--------------|
| DIC | Bank | Connector | Terminal | Giodila | Continuity |
| P0138 | 1 | F102 | 76 | Ground | Not existed |
| P0158 | 2 | 1 102 | 80 | Sibula | INOL EXISTED |

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 HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace harness or connectors.

6.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-264, "Component Inspection".

P0138, P0158 HO2S2 [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Is the inspection result normal? Α YES >> GO TO 8. NO >> GO TO 7. 7.REPLACE HEATED OXYGEN SENSOR 2 EC Replace malfunctioning heated oxygen sensor 2. **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). D >> INSPECTION END Е 8.CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". F >> INSPECTION END 9. CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection". Is the inspection result normal? Н YES >> GO TO 10. NO >> Repair or replace ground connection. 10.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".

- 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-278, "DTC Logic".

NO >> GO TO 11.

11. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F54 | 1 | F102 | 84 | Existed |
| P0158 | 2 | F53 | 1 | 1 102 | 04 | LXISIEU |

Also check harness for short to ground and short to power.

Is the inspection result normal?

>> GO TO 12. YES

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between HO2S2 harness connector and ECM harness connector.

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| DTC | | HO2S2 | | EC | CM | Continuity | |
|-------|----------------|-------|----------|-----------|----------|------------|--|
| ыс | Bank Connector | | Terminal | Connector | Terminal | Continuity | |
| P0138 | 1 | F54 | 4 | F102 | 76 | Existed | |
| P0158 | 2 | F53 | 4 | 1 102 | 80 | LAISIGU | |

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

| DTC | | HO2S2 | | Ground | Continuity |
|-------|------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Oround | Continuity |
| P0138 | 1 | F54 | 4 | Ground | Not existed |
| P0158 | 2 | F53 | 4 | Giodila | Not existed |

| DTC | | ECM | | Ground | Continuity |
|-------|------|----------------|----|---------|--------------|
| DIO | Bank | Bank Connector | | Ground | Continuity |
| P0138 | 1 | F102 | 76 | Ground | Not existed |
| P0158 | 2 | 1 102 | 80 | Giodila | INOL EXISTED |

3. Also check harness for 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 HEATED OXYGEN SENSOR 2

Refer to EC-260, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 15. NO >> GO TO 14.

14. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

15. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.CHECK HEATED OXYGEN SENSOR 2

(P)With CONSULT-III

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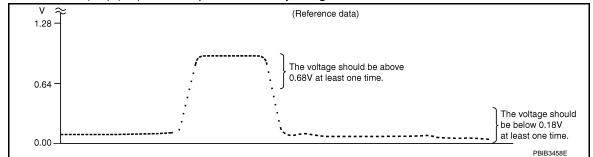
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P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 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-III.
- 7. Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"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-III

- 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 condition.

| | ECM | | | | |
|-----------|---------------------------|----------|--|---|--|
| Connector | + | _ | Condition | Voltage | |
| Terminal | | Terminal | | | |
| F102 | 76 [HO2S2 (bank 1)] | 84 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.70 V at least once during this procedure. | |
| 1 102 | 80 [HO2S2 (bank 2)] | 04 | least 10 times | The voltage should be below 0.18 V at least once during this procedure. | |

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 condition.

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| ECM | | | | | |
|-----------|---------------------------|----------|---------------------------------------|---|--|
| Connector | + - | | Condition | Voltage | |
| | Terminal | Terminal | | | |
| F102 | 76 [HO2S2 (bank 1)] | 84 | Keeping engine at idle for 10 minutes | The voltage should be above 0.70 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. | |

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 condition.

| ECM | | | | | |
|-------------|---------------------------|----------|--|---|--|
| Connector | + - | | Condition | Voltage | |
| Connector - | Terminal | Terminal | | | |
| F102 - | 76 [HO2S2 (bank 1)] | 84 | Coasting from 80 km/h (50 MPH) in D position | The voltage should be above 0.70 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

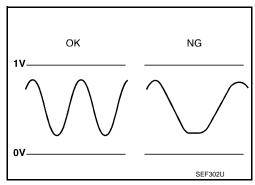
[VQ37VHR]

P0139, P0159 HO2S2

DTC Logic INFOID:0000000006134017

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 | DTC detecting condition | Possible cause | |
|---------|---|---|--|--|
| P0139 | 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 | Harness or connectors (The sensor circuit is open or shorted) Heated oxygen sensor 2 Fuel system EVAP system Intake air system | |
| P0159 | Heated oxygen sensor 2 (bank 2) circuit slow response | than the specified time computed by ECM. | | |

DTC CONFIRMATION PROCEDURE

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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.

- 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:

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

(P)With CONSULT-III

- <u>ĭ</u>. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 3.
- 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.
- Make sure that "COOLAN TEMP/S" indicates more than 70°C (158°F).
- Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed. **CAUTION:**

Always drive vehicle at a safe speed.

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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 | |
| F0139 | HO2 S2 DIAG2 (B1) | | |
| P0159 | HO2 S2 DIAG1 (B2) | | |
| F0139 | HO2 S2 DIAG2 (B2) | | |

Is "CMPLT" displayed on CONSULT-III 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.
- Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Start engine and follow the instruction of CONSULT-III display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

Is "COMPLETED" displayed on CONSULT-III screen?

YES >> GO TO 6.

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

- 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

(P)With CONSULT-III

Perform ECM self-diagnosis.

Is DTC "P0139" or "P0159" detected?

YES >> Proceed to EC-269, "Diagnosis Procedure".

NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-268, "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-269, "Diagnosis Procedure".

Component Function Check

INFOID:0000000006134018

1.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.

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[VQ37VHR]

- 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.

5. Check the voltage between ECM harness connector terminals under the following condition.

| | ECM | | | | | |
|-------|------------|----------|----|--|--|--|
| DTC | Connector | Terminal | | Condition | Voltage | |
| | Cominector | + | _ | | | |
| P0139 | F102 | 76 84 | | Revving up to 4,000 rpm under no load at | A change of voltage should be more than | |
| P0159 | 1102 | 80 | 34 | least 10 times | 0.08 V for 1 second during this procedure. | |

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 condition.

| | ECM | | | | | |
|-------|-----------|----------|----|---------------------------------------|--|--|
| DTC | Connector | Terminal | | Condition | Voltage | |
| | + - | | | | | |
| P0139 | F102 | 76 | 84 | Keeping engine at idle for 10 minutes | A change of voltage should be more than | |
| P0159 | | | 04 | reeping engine at fale for 10 minutes | 0.08 V for 1 second during this procedure. | |

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 condition.

| DTC | Connector | + | _ | Condition | Voltage | |
|-------|-----------|----------|----------|---------------------------------------|--|--|
| | Connector | Terminal | Terminal | | | |
| P0139 | F102 | 76 | 84 | Coasting from 80 km/h (50 MPH) on the | A change of voltage should be more than | |
| P0159 | 80 | | 04 | suitable gear position | 0.08 V for 1 second during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-269, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".
- 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?

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INFOID:0000000006134019

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to <u>EC-274, "DTC Logic"</u> or <u>EC-278, "DTC Logic"</u>.

NO >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

- 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 | | HO2S2 | | EC | Continuity | | |
|-------|------|-------------------|---|-----------|------------|---------|--|
| ыс | Bank | Connector Termina | | Connector | Terminal | | |
| P0139 | 1 | F54 | 1 | F102 | 84 | Existed | |
| P0159 | 2 | 2 F53 1 | | 1 102 | 04 | LAISIEU | |

5. 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 | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0139 | 1 | F54 | 4 | F102 | 76 | Existed |
| P0159 | 2 | F53 | 4 | 1 102 | 80 | LAISIEU |

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | | HO2S2 | Ground | Continuity | |
|-------|------|-----------|----------|------------|-------------|
| DIC | Bank | Connector | Terminal | Giodila | Continuity |
| P0139 | 1 | F54 | 4 | Ground | Not existed |
| P0159 | 2 | F53 | 4 | Giodila | |

| DTC | | ECM | Ground | Continuity | |
|-------|------|-----------|----------|------------|-------------|
| DIC | Bank | Connector | Terminal | Giodila | Continuity |
| P0139 | 1 | F102 | 76 | Ground | Not existed |
| P0159 | 2 | 1 102 | 80 | | |

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.

${f 5.}$ CHECK HEATED OXYGEN SENSOR 2

Refer to EC-271, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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).

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>> INSPECTION END

7.check intermittent incident

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000006134020

1.INSPECTION START

Do you have CONSULT-III?

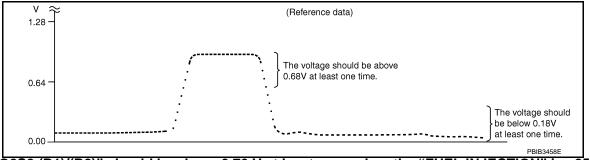
Do you have CONSULT-III?

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

2 .CHECK HEATED OXYGEN SENSOR 2

(P)With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to the normal operating temperature. 2.
- 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.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-III.
- Check "HO2S2 (B1) / (B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"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-I

Without CONSULT-III

- Start engine and warm it up to the normal operating temperature. 1.
- 2. 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. 3.
- Let engine idle for 1 minute.
- Check the voltage between ECM harness connector terminals under the following condition.

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Revision: 2010 June

| ECM | | | | | |
|-------------|---------------------------|----------|---|---|--|
| Connector - | + - | | Condition | Voltage | |
| | Terminal | Terminal | | | |
| F102 - | 76 [HO2S2 (bank 1)] | 84 | 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. | |
| | 80 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. | |

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 condition.

| ECM | | | | | |
|-----------|---------------------------|----------|---------------------------------------|---|--|
| Connector | + - | | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F102 | 76 [HO2S2 (bank 1)] | - 84 | Kaaning angina at idla for 10 minutes | The voltage should be above 0.70 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. | |

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 condition.

| ECM | | | | | |
|-----------|---------------------------|----------|--|---|--|
| Connector | + - | | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F102 — | 76 [HO2S2 (bank 1)] | - 84 | Coasting from 80 km/h (50 MPH) on the suitable gear position | The voltage should be above 0.70 V at least once during this procedure. | |
| | 80 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic (INFOID:000000005913709

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 | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0171 | Fuel injection system too lean (bank 1) | | Intake air leaks A/F sensor 1 |
| P0174 | Fuel injection system too lean (bank 2) | Fuel injection system does not operate properly. The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | Fuel injector Exhaust gas leaks Incorrect fuel pressure Lack of fuel Mass air flow sensor Incorrect PCV hose connection |

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. Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".
- 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 >> Go to EC-275, "Diagnosis Procedure".

NO >> Check exhaust and intake air leak visually.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

- Keep engine idle for at least 5 minutes.
- Check 1st trip DTC.

Is 1st trip DTC detected?

< DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 5.

YES >> Go to EC-275, "Diagnosis Procedure".

${f 5.}$ PERFORM DTC CONFIRMATION PROCEDURE-III

Turn ignition switch OFF and wait at least 10 seconds.

Start engine. 2.

Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pdal 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 >> Go to EC-275, "Diagnosis Procedure".

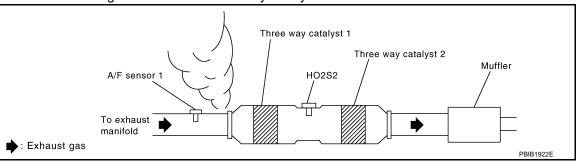
NO >> INSPECTION END

Diagnosis Procedure

1. CHECK EXHAUST GAS LEAK

Start engine and run it at idle.

Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

YES >> Repair or replace.

NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAK

- Listen for an intake air leak after the mass air flow sensor.
- Check PCV hose connection.

Is intake air leak detected?

YES >> Repair or replace.

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. 2.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | | |
|-------|----------------|-------|----------|-----------|------------|------------|--|
| DIC | Bank Connector | | Terminal | Connector | Terminal | Continuity | |
| P0171 | 1 | F3 | 1 | | 57 | | |
| F0171 | ! | 13 | 2 | F102 | 61 | Existed | |
| P0174 | 2 | 2 F20 | 1 | | 65 | | |
| 10174 | | | 2 | | 66 | | |

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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 |
|-------|--------------|-------------------------|---|---------|-------------|
| DIC | Bank | Bank Connector Terminal | | Giodila | Continuity |
| P0171 | 1 | F3 | 1 | Ground | Not existed |
| FUITI | ' | гэ | 2 | | |
| P0174 | 2 | F20 | 1 | | |
| F0174 | 2 | 1 20 | 2 | | |

| DTC | ECM | | | Ground | Continuity |
|-------|------|------|----|--------|-------------|
| DIC | Bank | | | | |
| P0171 | 1 | F102 | 57 | Ground | Not existed |
| FUITI | ' | | 61 | | |
| P0174 | _ | F102 | 65 | | |
| P0174 | 2 | | 66 | | |

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-161, "Work Procedure".
- 2. Install fuel pressure gauge and check fuel pressure. Refer to EC-161, "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.

DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".

NO >> Repair or replace.

6.CHECK MASS AIR FLOW SENSOR

(I) With CONSULT-III

- Install all removed parts.
- Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III. For specification, refer to <u>EC-540</u>, "Mass Air Flow Sensor".

With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to <u>EC-540</u>, "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-211, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

(II) With CONSULT-III

1. Start engine.

< DTC/CIRCUIT DIAGNOSIS >

- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.

⋈Without CONSULT-III

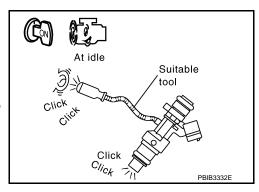
- 1. Start engine and let it idle.
- Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>EC-504</u>, "<u>Diagnosis Procedure</u>".



8. CHECK FUEL INJECTOR

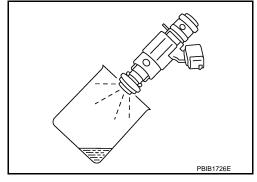
- Turn ignition switch OFF.
- 2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
- Disconnect all fuel injector harness connectors.
- Remove fuel tube assembly. Refer to <u>EM-39</u>, "<u>Removal and Installation</u>".
 Keep fuel hose and all fuel injectors connected 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.
- Crank engine for about 3 seconds.For DTC P0171, make sure that fuel sprays out from fuel injec
 - tors on bank 1. For DTC P0174, make sure that fuel sprays out from fuel injectors on bank 2.



Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.



9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

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 | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0172 | Fuel injection system too rich (bank 1) | Fuel injection system does not operate properly. | A/F sensor 1 Fuel injector |
| P0175 | Fuel injection system too rich (bank 2) | The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.) | Exhaust gas leaks Incorrect fuel pressure 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".
- 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 >> Go to EC-279, "Diagnosis Procedure".

NO >> Remove spark plugs and check for fouling, etc.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Keep engine idle for at least 10 minutes.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-279, "Diagnosis Procedure".

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

< DTC/CIRCUIT DIAGNOSIS >

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.

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-279, "Diagnosis Procedure".

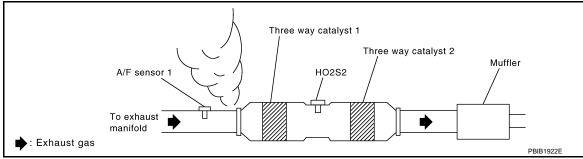
NO >> INSPECTION END

Diagnosis Procedure

1. CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.

Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

YES >> Repair or replace.

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.

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.

3. Disconnect ECM harness connector.

Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | |
|-------|--------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0172 | 1 | F3 | 1 | | 57 | Existed |
| F0172 | | гэ | 2 | F102 | 61 | |
| P0175 | 2 | F20 | 1 | 1 102 | 65 | |
| F0173 | | | 2 | | 66 | |

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

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| DTC | A/F sensor 1 | | | Ground | Continuity |
|-------|--------------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Giodila | Continuity |
| P0172 | 1 | F3 | 1 | Ground | Not existed |
| FUITZ | ' | 13 | 2 | | |
| P0175 | 0 | F20 | 1 | | |
| FU1/5 | 2 F20 | | 2 | | |

| DTC | ECM | | | Ground | Continuity |
|-------|------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Giodila | Continuity |
| P0172 | 1 | F102 | 57 | Ground | Not existed |
| F0172 | ' | | 61 | | |
| P0175 | 2 | F102 | 65 | | |
| F0175 | 2 | | 66 | | |

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

- Release fuel pressure to zero. Refer to <u>EC-161, "Work Procedure"</u>.
- Install fuel pressure gauge and check fuel pressure. Refer to <u>EC-161</u>. "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".

CHECK MASS AIR FLOW SENSOR

(P)With CONSULT-III

- 1. Install all removed parts.
- Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III. For specification, refer to <u>EC-540</u>, "Mass Air Flow Sensor".

With GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in "Service \$01" with GST. For specification, refer to <u>EC-540</u>, "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 <u>EC-211, "Diagnosis Procedure".</u>

6. CHECK FUNCTION OF FUEL INJECTOR

(P)With CONSULT-III

- Start engine.
- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.

⋈Without CONSULT-III

1. Start engine and let it idle.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Listen to each fuel injector operating sound.

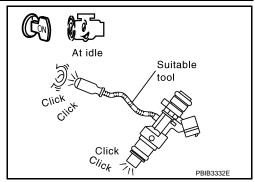
Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Perform

>> Perform trouble diagnosis for FUEL INJECTOR, refer to <u>EC-504</u>, "Diagnosis Procedure".



7. CHECK FUEL INJECTOR

- Remove fuel injector assembly. Refer to <u>EM-39</u>, "<u>Removal and Installation</u>". 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 injector.
- Crank engine for about 3 seconds.
 Make sure fuel that does not drip from fuel injector.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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P0181 FTT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0181 | Fuel tank temperature sensor circuit range/per-formance | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | I The sensor circuit is onen or shorted) |

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. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-282, "Diagnosis Procedure".

NO >> GO TO 3.

3.CHECK ENGINE COOLANT TEMPERATURE

- 1. Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT-III.
- 2. Check "COOLAN TEMP/S" value.

"COOLAN TEMP/S" less than 60°C (140°F)?

YES >> INSPECTION END

NO >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
- Wait at least 10 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-282, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913715

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

P0181 FTT SENSOR [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > YES >> GO TO 3. NO >> Go to MWI-73, "Component Function Check". Α ${f 3.}$ CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT Turn ignition switch OFF. EC Disconnect "fuel level sensor unit and fuel pump" harness connector. 2. Turn ignition switch ON. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground. Fuel level sensor unit and fuel pump Voltage (V) Ground D Connector **Terminal** B241 Ground Approx. 5 Is the inspection result normal? Е YES >> GO TO 5. NO >> GO TO 4. 4. DETECT MALFUNCTIONING PART F Check the following. Harness connectors M117, B201 Harness for open or short between ECM and "fuel level sensor unit and fuel pump" >> Repair open circuit, short to ground or short to power in harness or connector. Н 5.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. Disconnect "combination meter" harness connector. 3. Check the continuity between "fuel level sensor unit and fuel pump" harness connector and "combination meter" harness connector. Fuel level sensor unit Combination meter and fuel pump Continuity Connector Terminal Connector **Terminal** B241 M53 Existed Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 7. NO >> GO TO 6. 6.DETECT MALFUNCTIONING PART M Check the following. Harness connectors M117, B201 N Harness for open or short between "fuel level sensor unit and fuel pump" and "combination meter" >> Repair open circuit, short to ground or short to power in harness or connector. 7 . CHECK FUEL TANK TEMPERATURE SENSOR Refer to EC-284, "Component Inspection". Р Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump".

 $oldsymbol{8}.$ CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

[VQ37VHR]

>> INSPECTION END

Component Inspection

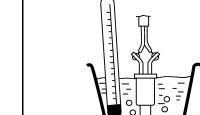
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1.CHECK FUEL TANK TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Remove fuel level sensor unit.
- 4. Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance (kΩ) |
|-----------|-----------------------|----------|-----------------|
| 4 and 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".

[VQ37VHR]

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P0182, P0183 FTT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0182 | 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.) |
| P0183 | Fuel tank temperature sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | Fuel tank 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.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-285, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to MWI-73, "Component Function Check".

${f 3.}$ CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

| Fuel level sensor unit and fuel pump | | Ground | Voltage (V) |
|--------------------------------------|----------|--------|-------------|
| Connector | Terminal | | |
| B241 | 4 | Ground | Approx. 5 |

Is the inspection result normal?

P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M117, B201
- Harness for open or short between ECM and "fuel level sensor unit and fuel pump"
 - >> Repair open circuit, short to ground or short to power in harness or connector.

5. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 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.

| Fuel level sensor unit and fuel pump | | Combination meter | | Continuity |
|--------------------------------------|----------|-------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| B241 | 5 | M53 | 24 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M117, B201
- Harness for open or short between "fuel level sensor unit and fuel pump" and "combination meter"
 - >> Repair open circuit, short to ground or short to power in harness or connector.

.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-286, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace "fuel level sensor unit and fuel pump".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913720

1. CHECK FUEL TANK TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- Remove fuel level sensor unit.

P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

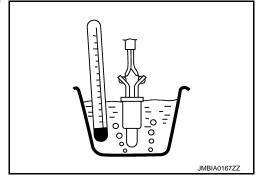
 Check resistance between "fuel level sensor unit and fuel pump" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | | Resistance (k Ω) |
|-----------|-----------------------|----------|--------------------------|
| 4 and 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".



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P0196 EOT SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198. Refer to EC-290, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0196 | Engine oil temperature sensor range/performance | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | Harness or connectors (The sensor circuit is open or shorted) Engine oil 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:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> 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. Start engine and let it idle for 5 minutes and 10 seconds.
- 6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-289, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- Check that "COOLAN TEMP/S" indicates above 70°C (158°F).

If it is above 70°C (158°F), go to the following steps.

If it is below 70°C (158°F), warm engine up until "COOLAN TEMP/S" indicates more than 70°C (158°F). Then perform the following steps.

- 3. Turn ignition switch OFF and soak the vehicle in a cool place.
- 4. Turn ignition switch ON.
- 5. Turn ignition switch OFF and wait at least 10 seconds.
- 6. Turn ignition switch ON.

NOTF.

Do not turn ignition switch OFF until step 10.

- 7. Select "DATA MONITOR" mode with CONSULT-III.
- Check the following.

| COOLAN TEMP/S | Below 40°C (104°F) |
|--|--------------------|
| INT/A TEMP SE | Below 40°C (104°F) |
| Difference between "COOLAN TEMP/S" and "INT/A TEMP SE" | Within 6°C (11°F) |

P0196 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

If they are within the specified range, perform the following steps.

If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.

NOTE:

- · Do not turn ignition switch OFF.
- If it is supposed to need a long period of time, do not deplete the battery.
- 9. Start engine and let it idle for 5 minutes.
- 10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-289, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

Turn ignition switch OFF.

2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-289, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace engine oil temperature sensor.

3.check intermittent incident

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK ENGINE OIL TEMPERATURE SENSOR

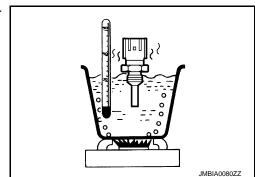
- Turn ignition switch OFF.
- Disconnect engine oil temperature sensor harness connector.
- 3. Remove engine oil temperature sensor.
- 4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|---------------|
| | | 20 (68) | 2.1 - 2.9 |
| 1 and 2 | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | 0.236 - 0.260 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



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[VQ37VHR]

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P0197, P0198 EOT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---------|--|---|--|
| P0197 | Engine oil tempera- ture 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.) |
| P0198 | Engine oil tempera- ture sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | Engine oil 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and wait at least 5 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-290, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913727

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK EOT SENSOR POWER SUPPLY CIRCUIT

- Disconnect engine oil temperature (EOT) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between EOT sensor harness connector and ground.

| EOT : | sensor | Ground | Voltage (V) | |
|-----------|----------|---------|-------------|--|
| Connector | Terminal | Giodila | voltage (v) | |
| F38 | 1 | Ground | Approx. 5 | |

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 EOT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.

P0197, P0198 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

3. Check the continuity between EOT sensor harness connector and ECM harness connector.

| EOT s | ensor | EC | CM | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F38 | 2 | F102 | 84 | 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 ENGINE OIL TEMPERATURE SENSOR

Refer to EC-291, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace engine oil temperature sensor.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913728

1. CHECK ENGINE OIL TEMPERATURE SENSOR

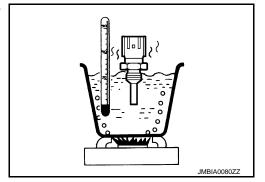
- 1. Turn ignition switch OFF.
- Disconnect engine oil temperature sensor harness connector.
- 3. Remove engine oil temperature sensor.
- 4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|----------------------|-----------------|---------------|
| | | 20 (68) | 2.1 - 2.9 |
| 1 and 2 | Temperature °C (°F)] | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | 0.236 - 0.260 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



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[VQ37VHR]

P0222, P0223, P2132, P2133 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0222, P0223, P2132 or P2133 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0222 | Throttle position sensor 1 (bank 1) circuit low input | An excessively low voltage from the TP sensor 1 is sent to ECM. | |
| P0223 | Throttle position sensor 1 (bank 1) circuit high input | An excessively high voltage from the TP sensor 1 is sent to ECM. | Harness or connectors (TP sensor 1 circuit is open or shorted.) |
| P2132 | Throttle position sensor 1 (bank 2) circuit low input | An excessively low voltage from the TP sensor 1 is sent to ECM. | Electric throttle control actuator (TP sensor 1) |
| P2133 | Throttle position sensor 1 (bank 2) 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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

- 1. Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

YES >> Go to EC-292, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913731

CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between electric throttle control actuator harness connector and ground.

[VQ37VHR]

| DTC | Electr | ic throttle cont | rol actuator | - Ground Voltage (V) | | |
|--------------|--------|------------------|--------------|----------------------|-------------|--|
| ыс | Bank | Connector | Terminal | Giodila | voltage (v) | |
| P0222, P0223 | 1 | F67 | 6 | Ground | Approx. 5 | |
| P2132, P2133 | 2 | F27 | 1 | Giodila | дриох. 3 | |

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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 throttle position sensor 1 ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electri | Electric throttle control actuator | | | CM | Continuity |
|--------------|---------|------------------------------------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0222, P0223 | 1 | F67 | 3 | F101 | 40 | Existed |
| P2132, P2133 | 2 | F27 | 4 | FIUI | 48 | 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 THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric | c throttle conti | rol actuator | EC | Continuity | |
|--------------|----------|------------------|--------------|-----------|------------|------------|
| DIO | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0222, P0223 | 1 | F67 | 4 | F101 | 30 | Existed |
| P2132, P2133 | 2 | F27 | 2 | 1 101 | 31 | LAISIEU |

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.

${f 5.}$ CHECK THROTTLE POSITION SENSOR

Refer to EC-294, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace malfunctioning electric throttle control actuator.
- Go to EC-294, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Component Inspection

INFOID:0000000005913732

1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Perform EC-151, "Work Procedure".
- 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 | | | | |
|-----------|-----------------------------|----|-------------------|-----------------|----------------|
| Connector | + - | | Condition | | Voltage (V) |
| Connector | Terminal | | | | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | Fully released | More than 0.36 |
| | SO [TF Selisor (Dank 1)] | | Fully depressed | Less than 4.75 | |
| | 31 [TP sensor 1 (bank 2)] | 48 | 48 | Fully released | More than 0.36 |
| F101 | | | | Fully depressed | Less than 4.75 |
| FIUI | 34 [TP sensor 2 (bank 1)] | 40 | Accelerator pedar | Fully released | Less than 4.75 |
| | 34 [TP Selisor 2 (Darik T)] | 40 | | Fully depressed | More than 0.36 |
| | 35 [TP sensor 2 (bank 2)] | 40 | | Fully released | Less than 4.75 |
| | 30 [TF Selisor 2 (Dank 2)] | 40 | 48 | Fully depressed | More than 0.36 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- 2. Go to EC-294, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005913733

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-151, "Work Procedure"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure"

>> END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic INFOID:0000000005913734

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.

1. 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 | DTC detecting condition | Possible cause |
|---------|-------------------------------------|-----------------------------|--|
| P0300 | Multiple cylinder misfires detected | Multiple cylinders misfire. | Improper spark plug |
| P0301 | No.1 cylinder misfire detected | No. 1 cylinder misfires. | Insufficient compression Incorrect fuel pressure |
| P0302 | No. 2 cylinder misfire detected | No. 2 cylinder misfires. | The fuel injector circuit is open or shorted |
| P0303 | No. 3 cylinder misfire detected | No. 3 cylinder misfires. | Fuel injector Intake air leak |
| P0304 | No. 4 cylinder misfire detected | No. 4 cylinder misfires. | The ignition signal circuit is open or shorted |
| P0305 | No. 5 cylinder misfire detected | No. 5 cylinder misfires. | Lack of fuel Signal plate |
| P0306 | No. 6 cylinder misfire detected | No. 6 cylinder misfires. | A/F sensor 1 Incorrect PCV hose connection |

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-I

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- 3. 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?

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> Go to EC-296, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

- 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 $\pm400~\text{rpm}$ | | |
|--|--|--|--|
| Vehicle speed in the freeze frame data ± 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 |

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-296, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913735

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

- 1. Start 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?

YES >> Discover air leak location and repair.

NO >> GO TO 2.

2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 3.

YES-2 >> Without CONSULT-III: GO TO 4.

NO >> Repair or replace it.

3.perform power balance test

(P)With CONSULT-III

- Start engine.
- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.

< DTC/CIRCUIT DIAGNOSIS >

Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 4.

4. CHECK FUNCTION OF FUEL INJECTOR-I

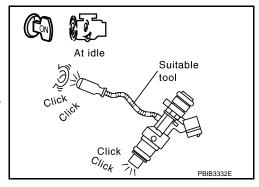
- Start engine and let it idle.
- Listen to each fuel injector operation sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-504, "Diagnosis Procedure".



${f 5}$.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

- Turn ignition switch OFF.
- Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- 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.



- 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.

EC-297

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 6.

13 - 17 mm (0.52-0.66 in) Grounded metal portion (Cylinder head, cylinder block, etc.) JMBIA0066GB

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

6. CHECK FUNCTION OF IGNITION COIL-II

- 1. Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 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 7.

NO >> Check ignition coil, power transistor and their circuits. Refer to EC-511, "Diagnosis Procedure".

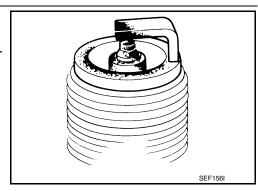
7. CHECK SPARK PLUG

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-26, "Inspection".

NO >> Repair or clean spark plug. Then GO TO 8.



8. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- 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-25, "Removal and Installation".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-18, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10.CHECK FUEL PRESSURE

- Install all removed parts.
- Release fuel pressure to zero. Refer to <u>EC-161, "Work Procedure"</u>.
- Install fuel pressure gauge and check fuel pressure. Refer to <u>EC-161</u>, "Work Procedure".

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

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace "fuel filter and fuel pump assembly".

NO >> Repair or replace.

Revision: 2010 June **EC-298** 2011 M37/M56

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

12. CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to EC-157, "Work Procedure".

For specification, refer to EC-540, "Idle Speed" and EC-540, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Follow the EC-157, "Work Procedure".

13. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect corresponding A/F sensor 1 harness connector.
- Disconnect ECM harness connector. 3.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| A/F sensor 1 | | | ECM | | Continuity | | | |
|--------------|-----------|----------|--------------------|----|------------|------|----|---------|
| Bank | Connector | Terminal | Terminal Connector | | Continuity | | | |
| 1 | F3 | 1 | | 57 | | | | |
| ļ | 13 | 2 | 2 | 2 | | E102 | 61 | Existed |
| 2 | F20 1 2 | 1 | 1 102 | 65 | LAISIEU | | | |
| 2 | | | 66 | | | | | |

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| | A/F sensor 1 | | | Continuity | |
|------|----------------------|---|--------|-------------|--|
| Bank | k Connector Terminal | | Ground | Continuity | |
| 1 | F3 | 1 | | | |
| ļ | 1 F3 | 2 | Ground | Not existed | |
| 2 | 2 F20 | 1 | | | |
| 2 | | 2 | | | |

| | ECM Bank Connector Terminal | | Ground | Continuity |
|------|-----------------------------|----|---------|-------------|
| Bank | | | Giodila | Continuity |
| 1 | | 57 | | |
| ı | F102 | 61 | Ground | Not existed |
| 2 | 2 | 65 | Giodila | NOI EXISIEU |
| 2 | | 66 | | |

Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

14. CHECK A/F SENSOR 1 HEATER

Refer to EC-198, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

>> Replace (malfunctioning) A/F sensor 1. NO

15. CHECK MASS AIR FLOW SENSOR

(P)With CONSULT-III

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-III.

For specification, refer to EC-540, "Mass Air Flow Sensor".

With GST

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check mass air flow sensor signal in Service \$01 with GST.

For specification, refer to EC-540, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 16.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-211, "Diagnosis Procedure".

16. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in EC-524, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 17.

NO >> Repair or replace.

17. 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 <u>EC-70</u>, "On <u>Board Diagnosis Function"</u> (Without CONSULT-III) or <u>EC-73</u>, "CONSULT-III Function" (With CONSULT-III).

>> GO TO 18.

18. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0327, P0328, P0332, P0333 KS

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | DTC detected condition | Possible cause |
|---------|--|---|--|
| P0327 | Knock sensor (bank 1) circuit low input | An excessively low voltage from the sensor is sent to ECM. | |
| P0328 | Knock sensor (bank 1) circuit high input | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The sensor circuit is open or shorted.) |
| P0332 | Knock sensor (bank 2) circuit low input | An excessively low voltage from the sensor is sent to ECM. | Knock sensor |
| P0333 | 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 >> Go to EC-301, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913738

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Disconnect knock sensor harness connector and ECM harness connector.
- Check the continuity between knock sensor harness connector and ECM harness connector.

| DTC | | Knock sensor | | ECM | | Continuity | |
|--------------|------|--------------|----------|-----------|----------|------------|--|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0327, P0328 | 1 | F203 | 2 | F102 | 72 | Existed | |
| P0332, P0333 | 2 | F202 | 2 | 1 102 | 12 | LAISIEU | |
| | | | | | | | |

3. Also check harness for short to ground and short to power.

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F9, F201
- · Harness for open or short between knock sensor and ECM
 - >> Repair open circuit or short to power in harness or connectors.

4. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between knock sensor harness connector and ECM harness connector.

| DTC | Knock sensor | | ECM | | Continuity | |
|--------------|--------------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0327, P0328 | 1 | F203 | 1 | F102 | 73 | Existed |
| P0332, P0333 | 2 | F202 | 1 | 1 102 | 69 | LAISIEU |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F9, F201
- · Harness for open or short between ECM and knock sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK KNOCK SENSOR

Refer to EC-302, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning knock sensor.

7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913739

1. CHECK KNOCK SENSOR

- 1. Turn ignition switch OFF.
- Disconnect knock sensor harness connector.
- Check resistance between knock sensor terminals as per the following.

NOTE:

It is necessary to use an ohmmeter which can measure more than 10 M Ω .

| Terminals | Resistance ($k\Omega$) |
|-----------|------------------------------------|
| 1 and 2 | Approx. 532 - 588 [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?

P0327, P0328, P0332, P0333 KS

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

YES >> INSPECTION END

NO >> Replace malfunctioning knock sensor.

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[VQ37VHR]

P0335 CKP SENSOR (POS)

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0335 | Crankshaft position sensor (POS) circuit | 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. | Harness or connectors [CKP sensor (POS) circuit is open or shorted.] [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Battery current sensor circuit is shorted) (Refrigerant pressure sensor circuit is shorted.) Crankshaft position sensor (POS) Camshaft position sensor (PHASE) (bank 2) Accelerator pedal position sensor EVAP control system pressure sensor Battery current sensor Refrigerant pressure sensor 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.
- 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

- 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 >> Go to EC-304, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913742

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

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- 1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between CKP sensor (POS) harness connector and ground.

| CKP sensor (POS) | | Ground | Voltage (V) | |
|--------------------|---|--------|-------------|--|
| Connector Terminal | | Ground | | |
| F2 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

3.check crankshaft position (ckp) sensor (pos) power supply circuit-ii

- 1. Turn ignition switch ON.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sensor (POS) | | EC | Continuity | |
|------------------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F2 | 1 | F101 | 46 | Existed |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| E | CM | Sensor | | |
|-----------|----------|-------------------------------------|--|------------------------------------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 46 | CKP sensor (POS) | F2 | 1 |
| F102 | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 |
| F102 | 04 | Battery current sensor | E21 | 1 |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} |
| IVITOT | 107 | EVAP control system pressure sensor | B73 | 3 |
| | 107 | Refrigerant pressure sensor | E77 | 3 |

^{*1:} With ICC

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.

- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- Battery current sensor (Refer to EC-429, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-340, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-522, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

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^{*2:} Without ICC

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 7.

7.replace accelerator pedal assembly

- 1. Replace accelerator pedal assembly.
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

8. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sens | or (POS) | ECM | | Continuity |
|-----------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F2 | 2 | F101 | 47 | Existed |

4. 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 CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

| CKP sens | CKP sensor (POS) | | ECM | |
|-----------|------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F2 | 3 | F101 | 37 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.check crankshaft position sensor (pos)

Refer to EC-306, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace crankshaft position sensor (POS).

11. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace the signal plate.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913743

1. CHECK CRANKSHAFT POSITION SENSOR (POS)-I

P0335 CKP SENSOR (POS)

< DTC/CIRCUIT DIAGNOSIS >

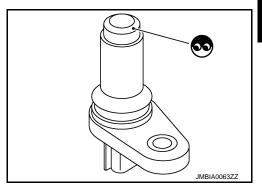
[VQ37VHR]

- Turn ignition switch OFF.
- Loosen the fixing bolt of the sensor.
- 3. Disconnect crankshaft position sensor (POS) harness connector.
- 4. Remove the sensor.
- 5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace crankshaft position sensor (POS).



$2.\mathsf{CHECK}$ CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as follows.

| Terminals (Polarity) | Resistance (Ω) |
|----------------------|--------------------------------|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace crankshaft position sensor (POS).

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[VQ37VHR]

P0340, P0345 CMP SENSOR (PHASE)

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0340 or P0345 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-378</u>, "<u>DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0340 | Camshaft position sensor (PHASE) (bank 1) circuit | | Harness or connectors [CMP sensor (PHASE) (bank 1) circuit is open or shorted.] Camshaft position sensor (PHASE) (bank 1) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery |
| P0345 | Camshaft position sensor (PHASE) (bank 2) circuit | 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. | Harness or connectors [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] [CKP sensor (POS) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Battery current sensor circuit is open or shorted.) (Refrigerant pressure sensor circuit is shorted.) Camshaft position sensor (PHASE) (bank 2) Crankshaft position sensor (POS) Accelerator pedal position sensor EVAP control system pressure sensor Battery current sensor Refrigerant pressure sensor Camshaft (INT) Starter motor Starting system circuit 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.
- 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.

P0340, P0345 CMP SENSOR (PHASE) [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Is 1st trip DTC detected? Α YES >> Go to EC-309, "Diagnosis Procedure". NO >> GO TO 3. 3.perform dtc confirmation procedure-ii EC Maintaining engine speed at more than 800 rpm for at least 5 seconds. 2. Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-309, "Diagnosis Procedure". NO >> INSPECTION END Diagnosis Procedure D INFOID:0000000006134049 CHECK STARTING SYSTEM Е Turn ignition switch to START position. Does the engine turn over? Does the starter motor operate? YES >> GO TO 2. F NO >> Check starting system. (Refer to EC-142, "Work Flow".) 2.CHECK GROUND CONNECTION Turn ignition switch OFF. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection". Is the inspection result normal? YES >> GO TO 3. Н NO >> Repair or replace ground connection. 3.CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT-I Disconnect camshaft position (CMP) sensor (PHASE) harness connector. Turn ignition switch ON. 2. Check the voltage between CMP sensor (PHASE) harness connector and ground. CMP sensor (PHASE) DTC Ground Voltage (V) Bank Connector **Terminal** P0340 1 F5 1 Ground Approx. 5 P0345 2 F18 1 Is the inspection result normal? YES >> GO TO 9. NO-1 >> P0340: Repair open circuit, short to ground or short to power in harness or connectors. NO-2 >> P0345: GO TO 4. f 4.CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT-II 1. Turn ignition switch OFF. Ν 2. Disconnect ECM harness connector. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector. CMP sensor (PHASE) **ECM** Р

| | | | | | Continuity |
|------|-----------|----------|-----------|----------|------------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity |
| 2 | F18 | 1 | F102 | 64 | Existed |

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair open circuit.

${f 5.}$ CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

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| E | CM | Sensor | | | |
|-----------|----------|-------------------------------------|--|------------------------------------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 46 | CKP sensor (POS) | F2 | 1 | |
| F102 | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 | |
| 1 102 | 04 | Battery current sensor | E21 | ' | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | |
| IVI I U / | 107 | EVAP control system pressure sensor | B73 | 3 | |
| | 107 | Refrigerant pressure sensor | E77 | 3 | |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

6. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-306, "Component Inspection".)
- Battery current sensor (Refer to EC-429, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-340, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-522, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 8.

8.replace accelerator pedal assembly

- Replace accelerator pedal assembly.
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

$9.\mathsf{check}$ cmp sensor (phase) ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| DTC | CI | MP sensor (Pl | HASE) | EC | CM | Continuity |
|-------|------|---------------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0340 | 1 | F5 | 2 | F102 | 96 | Existed |
| P0345 | 2 | F18 | 2 | 1 102 | 92 | LAISIEU |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

 $10. \mathsf{check}\ \mathsf{cmp}\ \mathsf{sensor}\ (\mathsf{phase})\ \mathsf{input}\ \mathsf{signal}\ \mathsf{circuit}\ \mathsf{for}\ \mathsf{open}\ \mathsf{and}\ \mathsf{short}$

^{*2:} Without ICC

P0340, P0345 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

| DTC | CI | MP sensor (Pl | HASE) | ECM | | Continuity |
|-------|------|---------------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0340 | 1 | F5 | 3 | F102 | 59 | Existed |
| P0345 | 2 | F18 | 3 | 1 102 | 63 | LAISIEU |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace malfunctioning camshaft position sensor (PHASE).

12. CHECK CAMSHAFT (INTAKE)

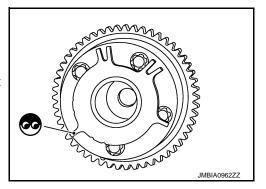
Check the following.

- Accumulation of debris to the signal plate of camshaft front end
- · Chipping signal plate of camshaft front end

Is the inspection result normal?

YES >> GO TO 13.

>> Remove debris and clean the signal plate of camshaft NO front end or replace camshaft.



13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

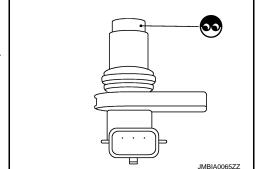
1. CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

- Turn ignition switch OFF.
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor (PHASE) harness connector.
- Remove the sensor.
- 5. Visually check the sensor for chipping.

Is the inspection result normal?

>> GO TO 2. YES

>> Replace malfunctioning camshaft position sensor NO (PHASE).



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

EC-311 Revision: 2010 June 2011 M37/M56

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P0340, P0345 CMP SENSOR (PHASE)

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Terminals (Polarity) | Resistance (Ω) |
|----------------------|--------------------------------|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning camshaft position sensor (PHASE).

[VQ37VHR]

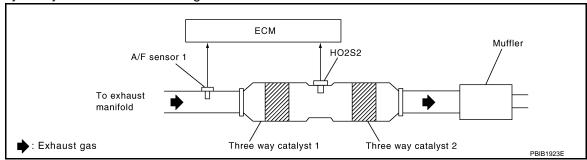
P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic INFOID:0000000005913748

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 1 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 1 malfunction is diagnosed.



| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0420 | Catalyst system efficiency below threshold (bank 1) | Three way catalyst (manifold) does not op- | Three way catalyst (manifold) Exhaust tube |
| P0430 | Catalyst system efficiency below threshold (bank 2) | erate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity. | Intake air leaksFuel injectorFuel injector leaksSpark plugImproper ignition timing |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- 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-I

(P)With CONSULT-III

- Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 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.
- Let engine idle for 1 minute.

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P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 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).
- Open engine hood.
- 10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-III.
- 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-III screen?

CMPLT>> GO TO 6.

INCMP >> GO TO 4.

f 4 PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Wait 5 seconds at idle.
- 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.

${f 5.}$ 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 >> Go to EC-315, "Diagnosis Procedure".

NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-314, "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 >> Go to EC-315, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005913749

1. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

- 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.
- Let engine idle for 1 minute.
- 5. Open engine hood.
- 6. Check the voltage between ECM harness connector terminals under the following condition.

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Р

| | | ECM | | | |
|--------------------|-----------------------|-----------------------------------|---------------|-----------------------------------|--|
| DTC | Connector - | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0420 | F102 | 76 [HO2S2 (bank 1)] | 84 | Keeping engine speed at 2,500 rpm | The voltage fluctuation cycle takes more than 5 seconds. |
| P0430 | 1 102 | 80 [HO2S2 (bank 2)] | 0.7 | constant under no load | • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0 |
| the in | • | sult normal? | | | |
| YES NO Nagar | >> Go to <u>E</u> | CTION END C-315, "Dia | | <u>cedure"</u> . | |
| _ | osis Proc | | | | INFOID:0000000005913750 |
| .CHE | CK EXHAU | ST SYSTEM | 1 | | |
| sually | check exha | ust tubes ar | nd muffler fo | or dents. | |
| | | sult normal? | | | |
| YES NO | >> GO TO >> Repair | | | | |
| | • | or replace. ST GAS LE <i>l</i> | ٨٧ | | |
| | | | | | |
| | | d run it at idl haust gas le | | he three way catalyst 1. | |
| | | <u> </u> | | | |
| | | | | Three way catalyst 1 | |
| | | | | Three way o | atalyst 2 Muffler |
| | | A/F sen | sor 1 | HO2S2 | wunter / |
| | | | 1 | | |
| | | To exhau manifold | st 🗭 | | → |
| | : Exhaust | | | | PBIB1922E |
| exha | ust gas leak | detected? | | | TODTSEEL |
| YES | >> Repair | | | | |
| NO | >> GO TO | | | | |
| .CHE | CK INTAKE | AIR LEAK | | | |
| | | | r the mass | air flow sensor. | |
| <u>intake</u> | <u>e air leak de</u> | tected? | | | |
| YES | >> Repair | | | | |

YES >> Repair or replace.

NO >> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to EC-157, "Work Procedure".

For specification, refer to EC-540, "Idle Speed" and EC-540, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Follow the <u>EC-157</u>, "Work Procedure".

5. CHECK FUEL INJECTORS

- 1. Stop engine and then turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as per the following.

Revision: 2010 June **EC-315** 2011 M37/M56

| ECM | | | | |
|-----------|----------|-----------|----------|-----------------|
| + - | | _ | Voltage | |
| Connector | Terminal | Connector | Terminal | |
| | 81 | | | |
| F102 | 82 | M107 | 128 | Battery voltage |
| | 85 | | | |
| | 86 | | | |
| | 89 | | | |
| | 90 | | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform <u>EC-504</u>, "Diagnosis Procedure".

6.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

- Turn ignition switch OFF.
- 2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT-III 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.
- 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:

- 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.

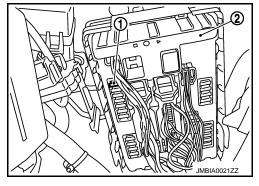
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

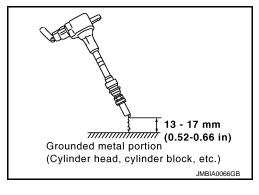
Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 7.

7.CHECK FUNCTION OF IGNITION COIL-II

Turn ignition switch OFF.





P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

Disconnect spark plug and connect a non-malfunctioning 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-511, "Diagnosis Procedure".

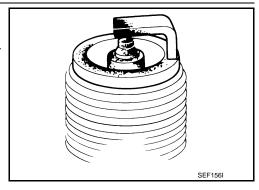
8. CHECK SPARK PLUG

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-26, "Inspection".

NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

Reconnect the initial spark plugs.

2. Crank engine for about three 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-25, "Removal and Installation".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.

Remove fuel injector assembly.

Refer to EM-39, "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.

6. Check that fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping.

NO >> GO TO 11.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace three way catalyst assembly.

NO >> Repair or replace harness or connector.

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P0441 EVAP CONTROL SYSTEM

DTC Logic

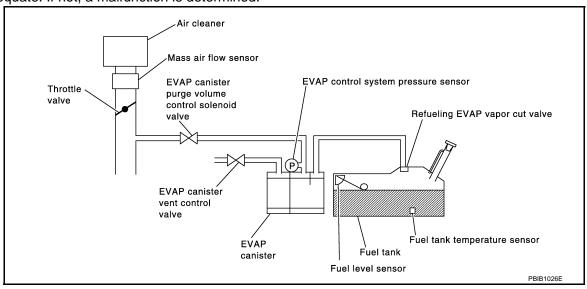
DTC DETECTION LOGIC

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 | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0441 | EVAP control system in- correct purge flow | EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. | 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-III?

Do you have CONSULT-III?

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.

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

P0441 EVAP CONTROL SYSTEM

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch ON.
- 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

(P)With CONSULT-III

- Start engine and warm it up to normal operating temperature.
- 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.
- Start engine and let it idle for at least 70 seconds.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CON-SULT-III.
- Touch "START".

Is "COMPLETED" displayed on CONSULT-III 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-III 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-III 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-III screen?

OK >> INSPECTION END

NG >> Go to EC-320, "Diagnosis Procedure".

6.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-319, "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 >> Go to EC-320, "Diagnosis Procedure".

Component Function Check

1. PERFORM COMPONENT FUNCTION CHECK

Lift up drive wheels.

EC-319 Revision: 2010 June 2011 M37/M56

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[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

- 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 | + | _ | | |
| Connector | Terminal | Terminal | | |
| M107 | 102 (EVAP control system pressure sensor signal) | 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 >> Go to EC-320, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913753

1. CHECK EVAP CANISTER

- 1. Turn ignition switch OFF.
- 2. Check EVAP canister for cracks.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 2.

YES-2 >> Without CONSULT-III: GO TO 3.

NO >> Replace EVAP canister.

2. CHECK PURGE FLOW

(P)With CONSULT-III

- Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port.
- Start engine and let it idle.
- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- 4. Touch "Qd" and "Qu" on CONSULT-III 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

⋈ Without CONSULT-III

P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Start engine and warm it up to normal operating temperature.
- Stop engine. 2.
- 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-51, "EVAPORATIVE EMISSION SYSTEM: System Diagram".
- Start engine and let it idle.

Do not depress accelerator pedal even slightly.

Check vacuum gauge indication before 60 seconds passed after starting engine.

Vacuum should not exist.

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

- Turn ignition switch OFF.
- Check EVAP purge line for improper connection or disconnection. Refer to EC-51, "EVAPORATIVE EMISSION SYSTEM: System Diagram".

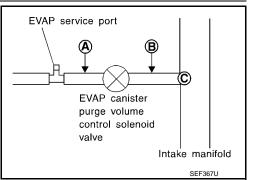
Is the inspection result normal?

>> GO TO 5. YES

NO >> Repair it.

${f 5.}$ CHECK EVAP PURGE HOSE AND PURGE PORT

- Disconnect purge hoses connected to EVAP service port A and EVAP canister purge volume control solenoid valve **B**.
- Blow air into each hose and EVAP purge port **C**.



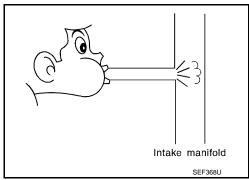
Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 6.

YES-2 >> Without CONSULT-III: GO TO 7.

NO >> Repair or clean hoses and/or purge port.



6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

(P)With CONSULT-III

- Start engine.
- 2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.

EC-321 Revision: 2010 June 2011 M37/M56

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P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> GO TO 7.

7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-326, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve.

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.

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-341, "DTC Logic" for DTC P0452, EC-346, "DTC Logic" for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace EVAP control system pressure sensor.

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-332, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace EVAP canister vent control valve.

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to EC-51, "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

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|--|---|--|
| P0443 | EVAP canister purge volume control solenoid valve | The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | 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.) | |

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.

Do you have CONSULT-III

YES >> GO TO 2.

NO >> GO TO 3.

2.perform dtc confirmation procedure

(P)With CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Turn ignition switch ON.
- 6. Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.
- Touch "START".
- 8. Start engine and let it idle until "TESTING" on CONSULT-III changes to "COMPLETED". (It will take approximately 10 seconds.)

If "TESTING" is not displayed after 5 minutes, retry from step 2.

Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Go to EC-324, "Diagnosis Procedure".

3. 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. 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.
- Check 1st trip DTC.

Is 1st trip DTC displayed?

YES >> Go to EC-324, "Diagnosis Procedure".

Revision: 2010 June **EC-323** 2011 M37/M56

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913756

[VQ37VHR]

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 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.

| EVAP canister purge volun | Ground | Voltage | |
|---------------------------|----------|---------|-----------------|
| Connector | Terminal | | voltage |
| F7 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

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.
- Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| EVAP canister purge volume control solenoid valve | | ECM | | Continuity |
|---|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F7 | 2 | F101 | 21 | 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 connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace EVAP control system pressure sensor.

CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-340, "Component Inspection".

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 6.

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

[VQ37VHR1 < DTC/CIRCUIT DIAGNOSIS >

YES-2 >> Without CONSULT-III: GO TO 7.

>> Replace EVAP control system pressure sensor.

$oldsymbol{6}$.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

- Turn ignition switch OFF.
- Reconnect harness connectors disconnected.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. 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

Refer to EC-326, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve.

8.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?

YFS >> GO TO 9.

NO >> Clean the rubber tube using an air blower.

$\mathbf{9}.$ CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-332, "Component Inspection".

Is the inspection result normal?

>> GO TO 10. YES

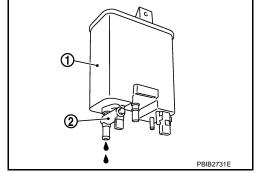
NO >> Replace EVAP canister vent control valve.

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.
- 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 11. NO >> GO TO 13.



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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

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EC-325 Revision: 2010 June 2011 M37/M56

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

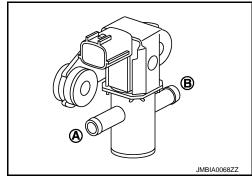
INFOID:0000000005913757

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

(P)With CONSULT-III

- 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. Turn ignition switch ON.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- Touch "Qd" and "Qu" on CONSULT-III 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-III

- 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) |
|---|--|
| 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

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID **VALVE**

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID **VALVE**

DTC Logic INFOID:0000000005913759

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0444 | EVAP canister purge volume control solenoid valve circuit open | An excessively low voltage signal is sent to ECM through the valve | Harness or connectors (The solenoid valve circuit is open or shorted.) EVAP canister purge volume control solenoid valve |
| P0445 | EVAP canister purge volume control solenoid valve circuit shorted | An excessively high voltage signal is sent to ECM through the valve | 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.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-327, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913760

1.check evap canister purge volume control solenoid valve power supply circuit

- Turn ignition switch OFF.
- 2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| | ter purge vol- solenoid valve | Ground | Voltage |
|-----------|----------------------------------|--------|-----------------|
| Connector | Terminal | | |
| F7 | 1 | Ground | Battery voltage |

Is the inspection result normal?

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

2 .DETECT MALFUNCTIONING PART

Check the following.

EC-327 Revision: 2010 June 2011 M37/M56

Ν

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID **VALVE**

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| EVAP canister purge vol- ume control solenoid valve | | EC | Continuity | |
|--|----------|--------------------|------------|---------|
| Connector | Terminal | Connector Terminal | | |
| F7 | 2 | F101 | 21 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 4.

YES-2 >> Without CONSULT-III: GO TO 5.

>> Repair open circuit, short to ground or short to power in harness or connectors.

f 4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

(P)With CONSULT-III

- Reconnect all harness connectors disconnected.
- 2. Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 6. >> GO TO 5. NO

${f 5.}$ CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-328, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace EVAP canister purge volume control solenoid valve.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913761

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

(P)With CONSULT-III

- 1. Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
- Turn ignition switch ON.
- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.

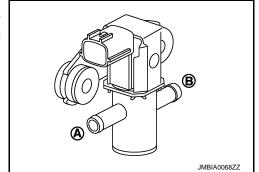
P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

 Touch "Qd" and "Qu" on CONSULT-III 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-III

- 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.
- 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

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P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0447 | EVAP canister vent control valve circuit open | An improper voltage signal is sent to ECM through EVAP canister vent control valve. | Harness or connectors (The 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 >> Go to EC-330, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913764

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

(P)With CONSULT-III

- 1. Turn ignition switch OFF and then ON.
- 2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Touch "ON/OFF" on CONSULT-III screen.
- 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.

${f 3.}$ CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect EVAP canister vent control valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between EVAP canister vent control valve harness connector and ground.

P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| EVAP canis | ter vent con | | \/-\t | | | Α |
|---|--|-------------------------|------------------|--------------|--|-----|
| Connector | Terminal | Ground | Voltag | je | | |
| B74 | 1 | Ground | Battery vo | oltage | | EC |
| Is the inspe | ection resu | ult normal? | ? | | | · |
| | GO TO 9 | | | | | С |
| 4.DETEC | Γ MALFU | NCTIONIN | IG PART | | | |
| Check the f Harness Harness | connector connector | s B71, B7 | 2 | AP caniste | r vent control valve and IPDM E/R | D |
| Tiamoss | ог орон с | or short be | tween E v | ti cariiste | vent control valve and it bivi E/IX | Е |
| _ | • | - | | • | short to power in harness or connectors. LVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT | F |
| Discon Check | | 1 harness | | | ent control valve harness connector and ECM harness con- | G |
| nector. | | | | | | |
| EVAP cani | | EC | CM | Continuity | | Н |
| Connector | Terminal | Connector | Terminal | | | |
| B74 | 2 | M107 | 121 | Existed | | - 1 |
| Is the inspe | ection results GO TO | ult normal? 7. 6. | 2 | | ort to power. | J |
| Check the | | INC HONII | IG FART | | | K |
| Harness | connector | | | | | |
| • Harness | | , | | ND conicto | r vent control valve and ECM | L |
| • пашеза | or open c | n short be | tween E v | AF Cariiste | Veril Control valve and ECIVI | |
| 7.CHECK | | | | | short to power in harness or connectors. | M |
| 1. Discon | nect rubb | er tube co | nnected to | EVAP cai | nister vent control valve. | N |
| | | r tube for | 00 0 | | | 1/1 |
| Is the inspe | | | <u>?</u> | | | |
| | • GO TO 8 • Clean th | | ube usina | an air blow | ver. | 0 |
| 8.CHECK | | | J | | | |
| Refer to EC | | | | | | Р |
| Is the inspe | | | | - | | |
| | GO TO | | | | h | |
| NO >> 9.CHECK | • | | | control va | IVE. | |
| | | | | | | |
| Refer to GI | <u>-38, "Intel</u> | mittent Inc | <u>cident"</u> . | | | |

Revision: 2010 June **EC-331** 2011 M37/M56

[VQ37VHR]

>> INSPECTION END

Component Inspection

INFOID:0000000005913765

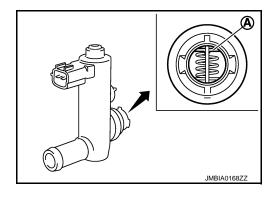
1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister.
- 3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve.

NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

(I) With CONSULT-III

- 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.

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-III

- 1. Disconnect EVAP canister vent control valve harness connector.
- 2. Check air passage continuity and operation delay time under 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.

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT-III

- 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.

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P0447 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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-III

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

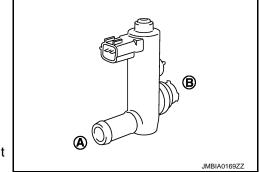
| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve.



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[VQ37VHR]

P0448 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0448 | EVAP canister vent control valve close | EVAP canister vent control valve remains closed under specified driving conditions. | 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.

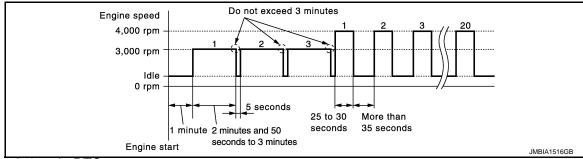
>> GO TO 2.

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 >> Go to EC-334, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913768

1. CHECK RUBBER TUBE

- 1. Turn ignition switch OFF.
- Disconnect rubber tube connected to EVAP canister vent control valve.
- Check the rubber tube for clogging.

P0448 EVAP CANISTER VENT CONTROL VALVE [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Is the inspection result normal? Α YES >> GO TO 2. NO >> Clean rubber tube using an air blower. 2.CHECK EVAP CANISTER VENT CONTROL VALVE EC Refer to EC-336, "Component Inspection". Is the inspection result normal? YES >> GO TO 3. NO >> Replace EVAP canister vent control valve. 3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER D Remove EVAP canister with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached. 2. Check if water will drain from the EVAP canister (1). Е Does water drain from EVAP canister? (T) >> GO TO 4. YES NO >> GO TO 6. F PRIR2731F 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 2.1 kg (4.6 lb). Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. ${f 5.}$ 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. 6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR Disconnect EVAP control system pressure sensor harness connector. 2. Check connectors for water. Water should not exist. Is the inspection result normal? N YES >> GO TO 7. NO >> Replace EVAP control system pressure sensor. .CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-340, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP control system pressure sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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P0448 EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Component Inspection

INFOID:0000000005913769

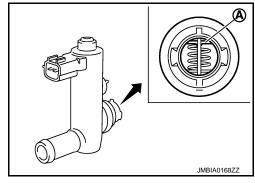
1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister.
- 3. Check portion (A) of EVAP canister vent control valve for being rusted.

Is it rusted?

YES >> Replace EVAP canister vent control valve.

NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

(II) With CONSULT-III

- 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.

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-III

- 1. Disconnect EVAP canister vent control valve harness connector.
- 2. Check air passage continuity and operation delay time under 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?

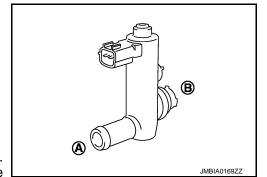
YES >> INSPECTION END

NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE-III

(II) With CONSULT-III

- 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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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 | |
|--|-------------|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Without CONSULT-III

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 2. Check air passage continuity and operation delay time under the following conditions.

Make sure that new O-ring is installed properly.

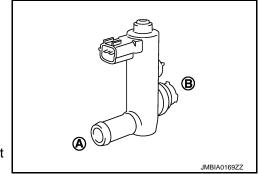
| Condition | Air passage continuity between (A) and (B) |
|--|--|
| 12 V direct current supply between terminals 1 and 2 | Not existed |
| OFF | Existed |

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister vent control valve.



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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0451 | EVAP control system pressure sensor performance | ECM detects a sloshing signal from the EVAP control system pressure sensor | Harness or connectors (EVAP control system pressure sensor circuit is shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] (Battery current sensor circuit is open or shorted.) (Refrigerant pressure sensor circuit is shorted.) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Camshaft position sensor (PHASE) (bank 2) Battery current 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.
- 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 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 >> Go to EC-338, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913772

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 2. Check sensor harness connector for water.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

${f 3.}$ CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

Check the voltage between EVAP control system pressure sensor harness connector and ground. 2.

| | trol system e sensor | Ground | Voltage (V) |
|-----------|-------------------------|--------|-------------|
| Connector | Terminal | | |
| B73 | 3 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 4.

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 |
| F101 | 46 | 6 CKP sensor (POS) | | 1 |
| F102 64 | | CMP sensor (PHASE) (bank 2) | F18 | 1 |
| F102 | 04 | Battery current sensor | E21 | ı |
| 103 M107 | | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} |
| IVITO7 | 107 | EVAP control system pressure sensor | B73 | 3 |
| | | Refrigerant pressure sensor | E77 | 3 |

^{*1:} With ICC

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.

- Crankshaft position sensor (POS) (Refer to EC-306, "Component Inspection".)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- Battery current sensor (Refer to <u>EC-429</u>, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

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^{*2:} Without ICC

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Replace accelerator pedal assembly
- Go to <u>EC-479</u>, "Special Repair Requirement".

>> INSPECTION END

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-340, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace EVAP control system pressure sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913773

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.
- Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | |
|-----------|----------|----------|--|-----------------------------------|
| Connector | + | _ | Condition [Applied vacuum kPa (kg/cm², psi)] | Voltage (V) |
| Connector | Terminal | Terminal | [tppnou tuouum m m (mg/om , po//] | |
| M107 | 102 | 112 | Not applied | 1.8 - 4.8 |
| 101107 | 102 | 112 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 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

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic INFOID:0000000005913775

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0452 | EVAP control system pressure sensor low input | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] (Battery current sensor circuit is open or shorted.) (Refrigerant pressure sensor circuit is shorted.) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Camshaft position sensor (PHASE) (bank 2) Battery current 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.

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

(P)With CONSULT-III

- 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.
- Turn ignition switch ON.
- 6. Select "DATA MONITOR" mode with CONSULT-III.
- 7. Make sure 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 as per the following.

| ECM | | | | |
|-----------|--|--------------------|--|--|
| Connector | + | - | | |
| Connector | Terminal | Terminal | | |
| M107 | 106 (Fuel tank temperature sensor signal) | 128 (ECM gound) | | |

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 3. Make sure 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-342, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913776

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- 2. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| | trol system e sensor | Ground | Voltage (V) |
|-----------|-------------------------|--------|-------------|
| Connector | Terminal | | |
| B73 | 3 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 4.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| | EVAP control system pressure sensor | | ECM | |
|-----------|-------------------------------------|--------------------|-----|---------|
| Connector | Terminal | Connector Terminal | | |
| B73 | 3 | M107 | 107 | Existed |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

< DTC/CIRCUIT DIAGNOSIS >

Check the following.

- Harness connectors M7, B1
- Harness connectors B71, B72
- · Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| E | CM | Sensor | | | |
|-----------|-------------------------------------|-----------------------------|--|------------------------------------|---|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 46 | CKP sensor (POS) | F2 | 1 | |
| F102 | CMP sensor (PHASE) (bank 2) | | C4 | F18 | 1 |
| F102 04 | Battery current sensor | E21 | | | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | |
| | EVAP control system pressure sensor | | B73 | 3 | |
| | 107 | Refrigerant pressure sensor | E77 | 3 | |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair short to ground or short to power in harness or connectors.

7. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-306, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- Battery current sensor (Refer to EC-429, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

10.check evap control system pressure sensor ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

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[VQ37VHR]

| EVAP cont | • | ECM | | Continuity |
|-----------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | |
| B73 | 1 | M107 | 112 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M7
- Harness connectors B71, B72
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| | EVAP control system pressure sensor | | ECM | |
|-----------|-------------------------------------|--------------------|-----|---------|
| Connector | Terminal | Connector Terminal | | |
| B73 | 2 | M107 | 102 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M7
- Harness connectors B71, B72
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

14. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-344, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace EVAP control system pressure sensor.

15. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Turn ignition switch OFF.

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 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 under the following conditions.

| ECM Connector + - Terminal Terminal | | | Condition | Voltage (V) | |
|---|---------------|----------|---|-----------------------------------|--|
| | | _ | Condition [Applied vacuum kPa (kg/cm ² , psi)] | | |
| | | Terminal | [, ipplied vacadili iii a (iig/oiii ; pol/j | | |
| M107 | 102 | 112 | Not applied | 1.8 - 4.8 | |
| WITOT | W1107 102 112 | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 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

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic (INFOID:000000005913779

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P0453 | EVAP control system pressure sensor high input | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] (Battery current sensor circuit is open or shorted.) (Refrigerant pressure sensor circuit is shorted.) EVAP control system pressure sensor Crankshaft position sensor (POS) Accelerator pedal position sensor Camshaft position sensor (PHASE) (bank 2) Battery current sensor Refrigerant 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 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

(II) With CONSULT-III

- 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-III.
- 7. Make sure 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.
- Set voltmeter probes to ECM harness connector terminals as per the following.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | E | СМ | | F |
|--|--|----------------|---|----|
| Connector | + | | | |
| Connocion | Terminal | | Terminal | ΕŒ |
| M107 | 106 (Fuel tank temperature se | nsor signa | 128 (ECM ground) | |
| 4. Turn iç 5. Turn iç 6. Turn iç | sure that the voltage is gnition switch OFF and gnition switch ON. gnition switch OFF and | wait at | east 10 seconds. | (|
| | engine and wait at leas a 1st trip DTC. | t 20 seco | onds. | |
| YES >: | OTC detected? > Go to <u>EC-347, "Diag</u> > INSPECTION END | nosis Pr | ocedure". | [|
| Diagnos | is Procedure | | INFOID:000000005913780 | |
| 1. снеск | GROUND CONNEC | ΓΙΟΝ | | |
| 2. Check | gnition switch OFF. ground connection Mection result normal? | 95. Refe | r to Ground Inspection in GI-41, "Circuit Inspection". | (|
| NO >: | > GO TO 2. > Repair or replace gro CONNECTOR | ound cor | nection. | |
| 1. Discor | | | ssure sensor harness connector. water. | |
| Wa | ter should not exist. | | | , |
| s the insp | ection result normal? | | | |
| | > GO TO 3. | wa a a a a a a | nno ator | |
| _ | > Repair or replace ha | | | |
| | | STEMP | RESSURE SENSOR POWER SUPPLY CIRCUIT | |
| | gnition switch ON. the voltage between I | EVAP co | ntrol system pressure sensor harness connector and ground. | |
| | ol system pressure sensor | Ground | Voltage (V) | |
| Connec | | | | |
| B73 | | Ground | Approx. 5 | |
| YES > | ection result normal? > GO TO 10. > GO TO 4. | | | |
| 4 | | STEM P | RESSURE SENSOR POWER SUPPLY CIRCUIT-II | (|
| 1. Turn iç 2. Discor | gnition switch OFF. nnect ECM harness co | nnector. | control system pressure sensor harness connector and ECM har- | |

| Connector | Terminal | Connector | Terminal | Continuity |
|-----------|----------|-----------|----------|------------|
| B73 | 3 | M107 | 107 | Existed |
| | | | | |

EVAP control system pressure sensor

ECM

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M7, B1
- Harness connectors B71, B72
- Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| E | CM | Sensor | | |
|-----------|------------------------|-------------------------------------|--|------------------------------------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 46 | CKP sensor (POS) | F2 | 1 |
| F102 | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 |
| F102 64 | Battery current sensor | E21 | 1 | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} |
| WITO | 107 | EVAP control system pressure sensor | B73 | 3 |
| | 107 | Refrigerant pressure sensor | E77 | 3 |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair short to ground or short to power in harness or connectors.

7. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-306. "Component Inspection".)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- Battery current sensor (Refer to EC-429, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning component.

8. CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 20.

NO >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly
- Go to <u>EC-479</u>, "Special Repair Requirement".

>> INSPECTION END

10.check evap control system pressure sensor ground circuit for open and short

1. Turn ignition switch OFF.

^{*2:} Without ICC

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Disconnect ECM harness connector.

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control system | EC | M | Continuity | |
|---------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B73 | 1 | M107 | 112 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M7
- Harness connectors B71, B72
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.check evap control system pressure sensor input signal circuit for open and SHORT

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control syster | EC | M | Continuity | |
|---------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B73 | 2 | M107 | 102 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

>> GO TO 14. YES NO >> GO TO 13.

13.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B1, M7
- Harness connectors B71, B72
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

14. CHECK RUBBER TUBE

- 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 15.

NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

15. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-332, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP canister vent control valve.

16.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Refer to EC-350, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 17.

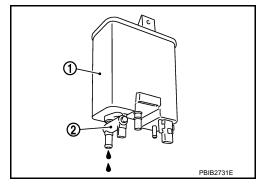
NO >> Replace EVAP control system pressure sensor.

17. 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.
- 2. Check if water will drain from the EVAP canister (1).
 - 2 : EVAP canister vent control valve

Does water drain from EVAP canister?

YES >> GO TO 18. NO >> GO TO 20.



18. 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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 20. NO >> GO TO 19.

19. 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.

20. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913781

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 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.
- Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | |
|-----------|----------|----------|---|-----------------------------------|
| Connector | + | _ | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) |
| | Terminal | Terminal | | |
| M107 | 102 | 112 | Not applied | 1.8 - 4.8 |
| | | | -26.7 (-0.272, -3.87) | 2.1 to 2.5 lower than above value |

CAUTION:

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Always calibrate the vacuum pump gauge when using it.
- Do not 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.

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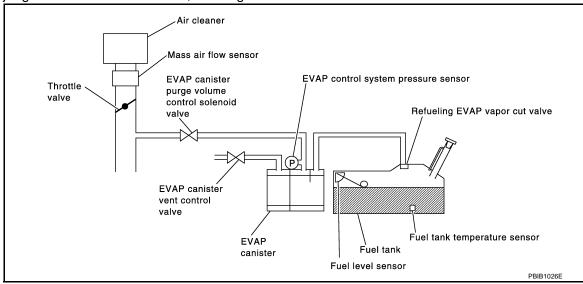
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DTC Logic

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 | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0456 | Evaporative emission control system very small leak (negative pressure check) | EVAP system has a very small leak. EVAP system does not operate properly. | 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

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > 1.PRECONDITIONING Α 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. EC Turn ignition switch ON. Turn ignition switch OFF and wait at least 10 seconds. Do you have CONSULT-III? YES >> GO TO 2. NO >> GO TO 4. 2.PERFORM DTC CONFIRMATION PROCEDURE-I (P)With CONSULT-III Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode with CONSULT-III. Start engine and wait at idle until "OFF" of "EVAP DIAG READY" changes to "ON". Е NOTE: It will take at most 2 hours until "OFF" of "EVAP DIAG READY" changes to "ON". Turn ignition switch OFF and wait at least 90 minutes. F NOTE: Never turn ignition switch ON during 90 minutes. 4. Turn ignition switch ON and select "EVAP LEAK DIAG" in "DATA MONITOR" mode with CONSULT-III. Check that "EVAP LEAK DIAG" indication. Which is displayed on CONSULT-III? CMPLT>> GO TO 3. >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1. Н 3.perform component function check-ii Check 1st trip DTC. Is 1st trip DTC detected? YES >> Go to EC-353, "Diagnosis Procedure". NO >> INSPECTION END 4. PERFORM DTC CONFIRMATION PROCEDURE K 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? M YES >> Go to EC-353, "Diagnosis Procedure". >> INSPECTION END NO Diagnosis Procedure N INFOID:0000000005913783 1.CHECK FUEL FILLER CAP DESIGN 1. Turn ignition switch OFF.

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< DTC/CIRCUIT DIAGNOSIS >

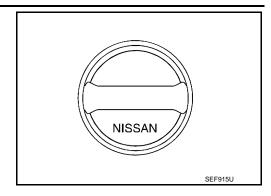
[VQ37VHR]

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-519, "Component Inspection".

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-532, "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 EC-539, "Removal and Installation".

EVAP canister vent control valve.

Refer to EC-332, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace EVAP canister vent control valve and O-ring.

7.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

< DTC/CIRCUIT DIAGNOSIS >

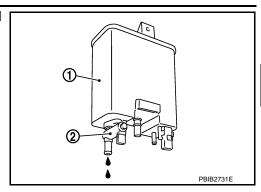
[VQ37VHR]

- Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.
- Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

>> GO TO 8. YES

NO-1 >> With CONSULT-III: GO TO 10. NO-2 >> Without CONSULT-III: 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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 10.

YES-2 >> Without CONSULT-III: 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.

10.check evap canister purge volume control solenoid valve operation

(P)With CONSULT-III

- Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
- Start engine and let it idle.
- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- Touch "Qu" on CONSULT-III screen to increase "PURG VOL C/V" opening to 100%.
- 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-III

- Start engine and warm it up to normal operating temperature. 1.
- 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 13. NO >> GO TO 12.

12. CHECK VACUUM HOSE

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check vacuum hoses for clogging or disconnection. Refer to <u>EC-51</u>, <u>"EVAPORATIVE EMISSION SYSTEM :</u> 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

Refer to EC-326, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace EVAP canister purge volume control solenoid valve.

14.check fuel tank temperature sensor

Refer to EC-284, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel level sensor unit.

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-340, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP control system pressure sensor.

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-51, "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-517, "Diagnosis Procedure".

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 tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-519, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 21.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

21.CHECK FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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Refer to MWI-74, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 22.

NO >> Replace fuel level sensor unit.

22. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

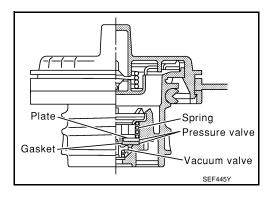
>> INSPECTION END

Component Inspection

INFOID:0000000005913784

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.

Vacuum/Pressure gauge Vacuum/ Pressure pump One-way valve Fuel filler cap adapter

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.

EC-357

>> INSPECTION END

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[VQ37VHR]

P0460 FUEL LEVEL SENSOR

DTC Logic

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 <u>EC-377</u>, "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 | DTC detecting condition | Possible cause |
|---------|---------------------------------|---|---|
| P0460 | Fuel level sensor circuit noise | Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM. | 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 >> Go to EC-358, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913787

1. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to MWI-73, "Component Function Check".

2. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0461 FUEL LEVEL SENSOR

DTC Logic INFOID:0000000005913789

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-377, "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 | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0461 | 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. | 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-359, "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?

>> INSPECTION END YES

NO >> Go to EC-360, "Diagnosis Procedure".

Component Function Check

1.PRECONDITIONING

WARNING:

When performing the following procedure, always observe the handling of the fuel. Refer to FL-6, "Removal and Installation".

TESTING CONDITION:

Before starting component function check, preparation of draining fuel and refilling fuel is required.

Do you have CONSULT-III?

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

2. PERFORM COMPONENT FUNCTION CHECK

(P)With CONSULT-III

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.
- Release fuel pressure from fuel line, refer to EC-161, "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.
- Turn ignition switch OFF and wait at least 10 seconds then turn ON.
- Select "FUEL LEVEL SE" in "DATA MONITOR" mode with CONSULT-III.
- Check "FUEL LEVEL SE" output voltage and note it. 7.
- Select "FUEL PUMP RELAY" in "ACTIVE TEST" mode with CONSULT-III.

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EC-359

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P0461 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 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 >> Go to EC-360, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 $\,\ell$ (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-161, "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).
- Confirm that the fuel gauge indication varies.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-360, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913791

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1. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to MWI-73, "Component Function Check".

2.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0462, P0463 FUEL LEVEL SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P0462, P0463 FUEL LEVEL SENSOR

DTC Logic INFOID:0000000005913793

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-377, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|--------------------------------------|---|---|--|
| P0462 | Fuel level sensor circuit low input | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The CAN communication line is open or | |
| P0463 | Fuel level sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | 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.
- 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 ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 5 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-361, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

>> GO TO 2. YES

NO >> Go to MWI-73, "Component Function Check".

2.CHECK INTERMITTENT INCIDENT

Refer to GI-38. "Intermittent Incident".

>> INSPECTION END

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EC-361 Revision: 2010 June

[VQ37VHR]

P0500 VSS

Description

The vehicle speed signal is sent to the "combination meter" from the "ABS actuator and electric unit (control unit)" via the CAN communication line. The "combination meter" then sends a signal to the ECM via the CAN communication line.

DTC Logic (INFOID:000000005913796

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 <u>EC-377, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|--|
| P0500 | Vehicle speed sensor | The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven. | Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (The vehicle speed signal circuit is open or shorted) Wheel sensor Combination meter ABS actuator and electric unit (control unit) |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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.

- 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 VEHICLE SPEED SIGNAL

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.

(P)With CONSULT-III

- 1. Start engine (VDC switch OFF).
- Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. The vehicle speed on CON-SULT-III should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Go to EC-363, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- 2. Warm engine up to normal operating temperature.

| < DTC/CIRCUIT | DIAGNOSIS > [VQ37VH | R] |
|------------------|--|-------|
| CAUTION: | following conditions for at least 50 consecutive seconds. e vehicle at a safe speed. | А |
| ENG SPEED | 1,500 - 6,000 rpm | EC |
| COOLAN TEMP/S | More than 70°C (158°F) | |
| B/FUEL SCHDL | 6.5 - 31.8 msec | |
| Selector lever | Except P or N position | С |
| PW/ST SIGNAL | OFF | |
| 4. Check 1st tri | p DTC. | D |
| NO >> INSF | D <u>EC-363, "Diagnosis Procedure"</u> . PECTION END OMPONENT FUNCTION CHECK | E |
| Use component | ent function check. Refer to <u>EC-363, "Component Function Check"</u> . function check to check the overall function of the vehicle speed signal circuit. During to DTC might not be confirmed. | his F |
| | result normal? PECTION END D <u>EC-363, "Diagnosis Procedure"</u> . | G |
| Component F | Function Check INFOID:00000000055 | 13797 |
| 1.PERFORM CO | OMPONENT FUNCTION CHECK | |
| | | |

The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END

>> Go to EC-363, "Diagnosis Procedure". NO

Diagnosis Procedure

 $1.\mathsf{check}\ \mathsf{dtc}\ \mathsf{with}\ \mathsf{``abs}\ \mathsf{actuator}\ \mathsf{and}\ \mathsf{electric}\ \mathsf{unit}\ \mathsf{(control}\ \mathsf{unit)''}$

Refer to BRC-41, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

>> INSPECTION END

EC-363 Revision: 2010 June 2011 M37/M56

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INFOID:0000000005913798

P0506 ISC SYSTEM

Description INFOID:000000005913799

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

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 | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P0506 | Idle speed control sys- tem RPM lower than ex- pected | The idle speed is less than the target idle speed by 100 rpm or more. | 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 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 <u>EC-152</u>, <u>"Work Procedure"</u>, 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

- 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-364, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913801

1. CHECK INTAKE AIR LEAK

- Start engine and let it idle.
- Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

| P0506 ISC SYSTEM | | |
|--|-----------|--|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| YES >> Discover air leak location and repair. NO >> GO TO 2. | А | |
| 2.REPLACE ECM | | |
| Stop engine. Replace ECM. Go to <u>EC-147</u>, "Work Procedure". | EC | |
| >> INSPECTION END | С | |
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[VQ37VHR]

P0507 ISC SYSTEM

Description INFOID:0000000005913802

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

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 | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0507 | Idle speed control sys- tem RPM higher than expected | The idle speed is more than the target idle speed by 200 rpm or more. | 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform <u>EC-152</u>, <u>"Work Procedure"</u>, 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-366, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913804

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.

| P0507 ISC SYSTEM | [VQ37VHR] | |
|--|------------|----|
| < DTC/CIRCUIT DIAGNOSIS > NO >> Repair or replace. | [VQ5/VIII] | |
| 2. CHECK INTAKE AIR LEAK | | А |
| Start engine and let it idle. | | |
| Listen for an intake air leak after the mass air flow sensor. | E | С |
| Is intake air leak detected? YES >> Discover air leak location and repair. | | |
| YES >> Discover air leak location and repair. NO >> GO TO 3. | | С |
| 3.REPLACE ECM | | _ |
| Stop engine. Replace ECM. Go to <u>EC-147</u>, "Work Procedure". | I | D |
| >> INSPECTION END | I | Е |
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Revision: 2010 June **EC-367** 2011 M37/M56

P0524 ENGINE OIL PRESSURE

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0524 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to EC-208, "DTC Logic"

| DTC No. | Trouble diagnosis name | Detecting condition | Possible cause |
|---------|--------------------------------|--|---|
| P0524 | Engine oil pressure too low | Engine oil pressure is low because there is a gap between angle of target and phase-control angle. | Engine oil pressure or level too low 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 |

DTC CONFIRMATION 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.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-7, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to <u>LU-7</u>, "Inspection".

3.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- 2. Maintain the following conditions for at least 20 consecutive seconds.

| ENG SPEED | More than 1,700 rpm | |
|------------------|--|--|
| 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.

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-369, "Diagnosis Procedure"

NO >> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Diagnosis Procedure

INFOID:0000000005913806

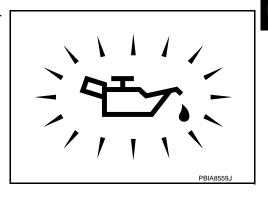
1. CHECK OIL PRESSURE WARNING LAMP

- Start engine.
- Check oil pressure warning lamp and confirm it is not illumi-

Is oil pressure warning lamp illuminated?

YES >> Go to LU-7, "Inspection".

NO >> GO TO 2.



2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-194, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

${f 3.}$ CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-306, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor (POS).

4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor (PHASE).

5.CHECK CAMSHAFT (INTAKE)

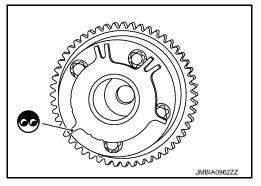
Check the following.

- · Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end

Is the inspection result normal?

YES >> GO TO 6.

NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft.



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-53, "Removal and Installation".

>> GO TO 7. NO

.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-106, "Inspection". Is the inspection result normal?

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P0524 ENGINE OIL PRESSURE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 8.

NO >> Clean lubrication line.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913807

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

- 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.

| Terminals | Resistance (Ω) | |
|-------------------|---------------------------------|--|
| 1 and 2 | 7.0 - 7.7 [at 20°C (68°F)] | |
| 1 or 2 and ground | ∞ (Continuity should not exist) | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- Remove intake valve timing control solenoid valve.
- 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:

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.

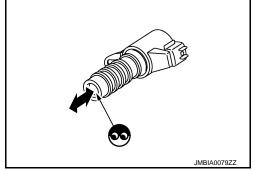
NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve.



[VQ37VHR]

P0550 PSP SENSOR

DTC Logic INFOID:0000000005913809

DTC DETECTION LOGIC

NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0550 | Power steering pressure sensor circuit | An excessively low or high voltage from the sensor is sent to ECM. | 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 >> Go to EC-371, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

Turn ignition switch OFF.

Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK PSP SENSOR POWER SUPPLY CIRCUIT

- Disconnect power steering pressure (PSP) sensor harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between PSP sensor harness connector and ground.

| PSP : | sensor | Ground | Voltage (V) |
|--------------------|--------|--------|-------------|
| Connector Terminal | | Ground | voltage (v) |
| F35 | 3 | Ground | Approx. 5 |

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 PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.

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< DTC/CIRCUIT DIAGNOSIS >

3. Check the continuity between PSP sensor harness connector and ECM harness connector.

| PSP sensor | | EC | Continuity | |
|------------|--------------------|------|------------|------------|
| Connector | Connector Terminal | | Terminal | Continuity |
| F35 | 1 | F102 | 96 | 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 short to power in harness or connectors.

4. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between PSP sensor harness connector and ECM harness connector.

| • | PSP s | ensor | EC | Continuity | |
|--------------------|-------|-----------|----------|------------|---------|
| Connector Terminal | | Connector | Terminal | Continuity | |
| | F35 | 2 | F102 | 87 | 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 PSP SENSOR

Refer to EC-372, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace PSP sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913811

1. CHECK POWER STEERING PRESSURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Start engine and let it idle.
- 4. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|---------------------------|----------|---------------------------------|--------------|-------------|
| Connector | + | _ | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| F102 | F102 87 96 Steering wheel | | Stooring whool | Being turned | 0.5 - 4.5 |
| 1 102 | 07 | 90 | Steering wheel Not being turned | | 0.4 - 0.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace power steering pressure sensor.

[VQ37VHR]

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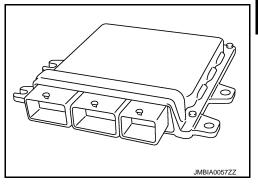
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P0603 ECM POWER SUPPLY

Description

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

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--------------------------|--|--|
| P0603 | ECM power supply circuit | ECM back up RAM system does not function properly. | Harness or connectors [ECM power supply (back up) circuit is open or shorted.] 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 10 seconds.
- 2. Turn ignition switch OFF and wait at least 5 minutes.
- 3. Turn ignition switch ON and wait at least 10 seconds.
- Repeat steps 2 and 3 for five times.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-373, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK ECM POWER SUPPLY

Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the voltage between ECM harness connector terminals as per the following.

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| + | | _ | | Voltage |
|-----------|----------|-----------|----------|-----------------|
| Connector | Terminal | Connector | Terminal | |
| F102 | 93 | M107 | 128 | Battery voltage |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- 15 A fuse (No. 51)
- IPDM E/R harness connector E5
- · Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure.

See EC-373, "DTC Logic".

Is the 1st trip DTC P0603 displayed again?

YES >> GO TO 5.

NO >> INSPECTION END

5.REPLACE ECM

- 1. Replace ECM.
- 2. Go to EC-147, "Work Procedure".

>> INSPECTION END

P0605 ECM

DTC Logic INFOID:0000000005913820

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---------|------------------------|-------------------------|---|----------------|
| | | A) | ECM calculation function is malfunctioning. | |
| P0605 | Engine control module | B) | ECM EEP-ROM system is malfunctioning. | • ECM |
| | | C) | ECM self shut-off function is malfunctioning. | |

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. 2.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.perform dtc confirmation procedure for malfunction a

- Turn ignition switch ON.
- Check 1st trip DTC. 2.

Is 1st trip DTC detected?

YES >> Go to EC-375, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform dtc confirmation procedure for malfunction b

- Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-375, "Diagnosis Procedure".

>> GO TO 4. NO

f 4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- Turn ignition switch ON and wait at least 1 second.
- Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- Repeat step 2 for 32 times.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-375, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1.INSPECTION START

- Turn ignition switch ON.
- Erase DTC.
- Perform DTC Confirmation Procedure.

See EC-375, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

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2.REPLACE ECM

- 1. Replace ECM.
- 2. Go to EC-147, "Work Procedure".

>> INSPECTION END

P0607 ECM

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

P0607 ECM

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|---|----------------|
| P0607 | CAN communication bus | When detecting error during the initial diagnosis of CAN controller of ECM. | • ECM |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-377, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. INSPECTION START

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-377</u>, "<u>DTC Logic"</u>.
- 4. Check DTC.

Is the DTC P0607 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

- 1. Replace ECM.
- 2. Go to EC-147, "Work Procedure".

>> INSPECTION END

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[VQ37VHR]

P0643 SENSOR POWER SUPPLY

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------------|---|---|
| P0643 | Sensor power supply circuit short | ECM detects that the voltage of power source for sensor is excessively low or high. | Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 1) circuit is shorted.] [Manifold absolute pressure (MAP) sensor circuit is shorted.] (PSP sensor circuit is shorted.) Accelerator pedal position sensor Throttle position sensor Camshaft position sensor (PHASE) (bank 1) Manifold absolute pressure (MAP) sensor 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.
- 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 >> Go to EC-378, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913826

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground.

| APP | sensor | Ground | Voltage (V) |
|--|------------------------------------|--------|-------------|
| Connector | Terminal | Glound | voltage (v) |
| M153 ^{*1} M9 ^{*2} | 6 ^{*1} 5 ^{*2} | Ground | Approx. 5 |

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

*1: With ICC

*2: Without ICC

Is the inspection result normal?

>> GO TO 7. YES NO >> GO TO 3.

3.check sensor power supply circuits

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | | | |
|-----------|----------|---|--|------------------------------------|--|--|
| Connector | Terminal | Name | Connector | Terminal | | |
| F101 | 43 | Electric throttle control actuator (bank 2) | F27 | 1 | | |
| | 44 | Electric throttle control actuator (bank 1) | F67 | 6 | | |
| F102 | 60 | CMP sensor (PHASE) (bank 1) | F5 | 1 | | |
| | | Manifold absolute pressure (MAP) sensor | F50 | 1 | | |
| | | PSP sensor | F35 | 3 | | |
| M107 | 99 | APP sensor | M153 ^{*1} M9 ^{*2} | 6 ^{*1} 5 ^{*2} | | |

*1: With ICC

*2: Without ICC

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (PHASE) (bank 1) (Refer to <u>EC-311, "Component Inspection"</u>.)
- Manifold absolute pressure (MAP) sensor (Refer to EC-221, "Component Inspection".)
- Power steering pressure sensor (Refer to EC-372, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

${f 5}.$ CHECK TP SENSOR

Refer to EC-231, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 6.

$\mathsf{6}.\mathsf{REPLACE}$ ELECTRIC THROTTLE CONTROL ACTUATOR

- Replace electric throttle control actuator.
- Go to EC-231, "Special Repair Requirement".

>> INSPECTION END

7.CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9. >> GO TO 8. NO

8.replace accelerator pedal assembly

Replace accelerator pedal assembly.

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P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

[VQ37VHR]

P0850 PNP SWITCH

Description INFOID:0000000005913827

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.

INFOID:0000000005913828

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------------|--|--|
| P0850 | Park/neutral position switch | The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started. | Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] TCM |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3.CHECK PNP SIGNAL

(P)With CONSULT-III

- 1. Turn ignition switch ON.
- Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. 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?

YFS >> GO TO 4.

NO >> Go to EC-382, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode with CONSULT-III.
- 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) |

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P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| 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 >> Go to EC-382, "Diagnosis Procedure".

NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-382, "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 >> Go to EC-382, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005913829

1. PERFORM COMPONENT FUNCTION CHECK

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|----------|----------|-----------------------|--------------|-----------------|
| Connector | + | - | Condition Voltage (V) | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M107 | 109 | 128 | Selector lever P or N | | Battery voltage |
| IVI 107 | 109 | 120 | Selector level | Except above | Approx. 0 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-382, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913830

1. CHECK DTC WITH TCM

Refer to TM-56, "Diagnosis Description".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

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 <u>BCS-13</u>, "<u>COMMON ITEM</u>: CONSULT-III Function (<u>BCM - COM-MON ITEM</u>)".

3. Check PNP switch input signal circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect A/T assembly harness connector.
- Disconnect ECM harness connector.
- Check the continuity between A/T assembly harness connector and ECM harness connector.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| A/T ass | sembly | EC | CM | | | А |
|---|------------|--------------|----------------|-------------|--|-----|
| Connector | Terminal | Connector | Terminal | Continuity | | |
| F61 | 9 | M107 | 109 | Existed | | EC |
| | | | _ | nd and sho | ort to power. | |
| Is the inspe | | | 2 | | | |
| | > GO TO : | | | | | С |
| 4.DETEC | | | IG PART | | | |
| Check the | | | | | | D |
| Harness | connecto | | | | | |
| HarnessHarness | | | | | | Е |
| Harness | | | | assembly | and ECM | |
| | Donoire | non oirouit | b | around or a | | F |
| 5.CHECK | | | | ground or s | short to power in harness or connectors. | Г |
| Refer to GI | | | | | | |
| Neier to on | -50, IIIIe | inittent int | <u>Juent</u> . | | | G |
| >> | > INSPEC | TION END | | | | |
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P100A, P100B VVEL SYSTEM

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P100A or P100B is displayed with DTC P1090 or P1093, first perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-396, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------------------|--|---|
| P100A | VVEL response malfunction (bank 1) | | Harness or connectors (VVEL potuntor motor circuit is |
| P100B | VVEL response malfunction (bank 2) | Actual event response to target is poor. | (VVEL actuator motor circuit is open or shorted.) VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module |

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.
- 2. 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

- 1. Start engine.
- Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.
- 3. Wait at idle for 5 seconds or more.
- 4. Repeat steps 2 to 3 for three times.
- 5. Check 1st trip DTC.

Is DTC detected?

YES >> Go to EC-384, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913832

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.vvel actuator motor output signal circuit for open and short

- Disconnect VVEL control module harness connector.
- Disconnect VVEL actuator motor harness connector.
- Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

| DTC No. | , | VVEL control modu | le | VVEL actu | ator motor | Continuity | |
|---------------------------------------|-------------------------|---------------------|---------------|-----------------|---------------|-------------|---|
| DIC NO. | Bank | Connector | Terminal | Connector | Terminal | Continuity | _ |
| | | | 10 | | 1 | Existed | |
| D400A | 4 | | 12 | F40 | 2 | Not existed | |
| P100A | 1 | | 0.5 | - F48 | 1 | Not existed | |
| | | | 25 | | 2 | Existed | |
| | | E15 | | | 1 | Existed | |
| 5 5 | _ | | 2 | | 2 | Not existed | |
| P100B | 2 | | | - F49 | 1 | Not existed | |
| | | | 15 | | 2 | Existed | |
| ۷O >> G | | ONING PART | | | | | |
| | • | circuit, short to o | ground or sho | ort to power in | harness or | connectors. | |
| · · · · · · · · · · · · · · · · · · · | • | nent Inspection | (VVEL ACT | UATOR MOTO | <u>)R)"</u> . | | |
| the inspection | on result no O TO 6. | <u>rmai?</u> | | | | | |
| | O TO 5. | | | | | | |
| .REPLACE | VVEL ACT | JATOR SUB AS | SEMBLY | | | | |
| | | or sub assembl | | | | | |
| Go to EC- | 387, "Speci | al Repair Requi | rement". | | | | |
| >> IN | ISPECTION | I END | | | | | |
| .CHECK IN | TERMITTE | NT INCIDENT | | | | | |
| efer to GI-38 | , "Intermitte | nt Incident". | | | | | |
| the inspection | on result no O TO 7. | rmal? | | | | | |
| // G | epair or rep | lace. | | | | | |
| NO >> R | | | _ | | | | |
| | VVEL CON | TROL MODULE | = | | | | |
| REPLACE Replace \ | /VEL contro | l module. | = | | | | |
| REPLACE Replace \ | /VEL contro | | = | | | | |

- $8.\mathsf{PERFORM}$ DTC CONFIRMATION PROCEDURE
- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-384, "DTC Logic"</u>.

Is the DTC P100A or P100B displayed again?

YES >> GO TO 9.

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P100A, P100B VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> INSPECTION END

9. CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-386, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 11. NO >> GO TO 10.

10.replace vvel actuator sub assembly

- 1. Replace VVEL actuator sub assembly.
- 2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

11. CHECK VVEL LADDER ASSEMBLY

Refer to EM-106, "Inspection".

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12.REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly.
- 2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000005913833

1. CHECK VVEL ACTUATOR MOTOR

- 1. Turn ignition switch OFF.
- Disconnect VVEL actuator motor harness connector.
- 3. Check resistance between VVEL actuator motor terminals as follows.

| VVEL actuator motor | Resistance | |
|---------------------|--------------|--|
| Terminal | Resistance | |
| 1 and 2 | 16 Ω or less | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.replace vvel actuator sub assembly

- 1. Replace VVEL actuator sub assembly.
- 2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:0000000005913834

1. CHECK VVEL ACTUATOR SUB ASSEMBLY

- Turn ignition switch OFF.
- Remove VVEL actuator sub assembly. Refer to EM-97, "Disassembly and Assembly".

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P100A, P100B VVEL SYSTEM

| P100A, P100B VVEL SYSTEM | | |
|---|-------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| 3. Turn the ball screw shaft to check that it works smoothly. | | |
| Is the inspection result normal? | | Α |
| YES >> INSPECTION END NO >> GO TO 2. | | |
| 2. REPLACE VVEL ACTUATOR SUB ASSEMBLY | | EC |
| Replace VVEL actuator sub assembly. Go to <u>EC-387</u>, "Special Repair Requirement". | | С |
| >> INSPECTION END | | |
| Special Repair Requirement | INFOID:0000000005913835 | D |
| 1. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT | | |
| Refer to EC-154, "Work Procedure". | | Е |
| >> GO TO 2. | | _ |
| 2.PERFORM IDLE AIR VOLUME LEARNING | | F |
| Refer to EC-152. "Work Procedure". | | G |
| >> END | | G |
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P1087, P1088 VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1087, P1088 VVEL SYSTEM

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.

Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-392, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1087 | VVEL small event angle malfunction (bank 1) | | Harness or connectors (VVEL actuator motor circuit is |
| P1088 | VVEL small event angle malfunction (bank 2) | The event angle of VVEL control shaft is always small. | open or shorted.) VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module |

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

DTC Logic INFOID:0000000005913838

DTC DETECTION LOGIC

NOTE:

If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608. Refer to EC-471, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---|--|---|---|
| P1089 | VVEL control shaft position sensor (bank 1) circuit | An excessively low voltage from the sensor is sent to VVEL control module. | | • |
| P1092 | VVEL control shaft position sensor (bank 2) circuit | An excessively high voltage from the sensor is sent to VVEL control module. Rationally incorrect voltage is sent to VVEL control module compared with the signals from VVEL control shaft position sensor 1 and VVEL control shaft position sensor 2. | Harness or connectors (VVEL control shaft position sensor circuit is open or shorted.) VVEL control shaft position sensor VVEL control module | |

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.
- 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.
- 2. Check DTC.

Is DTC detected?

>> Go to EC-389, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.vvel control shaft position sensor power supply circuit

- Disconnect VVEL control shaft position sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between VVEL control shaft position sensor harness connector and ground.

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INFOID:0000000005913839

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P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| DTC No. | VVEL co | ontrol shaft position | Ground | Voltage (V) | |
|---------|---------|-----------------------|----------|-------------|-------------|
| DIC No. | Bank | Connector | Terminal | Giodila | voltage (v) |
| P1089 | 1 | F46 | 3 | | |
| F 1009 | | 1 40 | 6 | Ground | Approx. 5 |
| P1092 | 2 | F47 | 3 | Giodila | Арргох. 3 |
| F 1092 | 2 | F47 | 6 | | |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E20
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK VVEL CONTROL SHAFT POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL control module harness connector.
- Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

| DTC No. | VVEL control shaft position sensor | | | VVEL con | trol module | Continuity |
|---------|------------------------------------|-------------|----------|-----------|-------------|------------|
| DIC No. | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1089 | 1 F | F46 | 2 | | 4 | |
| F 1069 | | F40 | 1 40 | 5 | E15 | 17 |
| P1092 | P1092 2 F47 | | 2 | LIS | 6 | LXISIEU |
| F 1092 | P1092 2 | F4 <i>1</i> | 5 | | 19 | l |

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E20
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

6.vvel control shaft position sensor input signal circuit for open and short

1. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

| DTC No. | VVEL control shaft position sensor | | | VVEL control module | | Continuity |
|---------|------------------------------------|-----------|----------|---------------------|----------|------------|
| DIC No. | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1089 | 1 | F46 | 1 | | 3 | |
| F 1009 | ' | 1 40 | 4 | E15 | 16 | Existed |
| P1092 | D1002 2 5 | | 1 | LIJ | 5 | LAISIEU |
| F 1092 | 2 | F47 | 4 | | 18 | |

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

| F1009, F1092 VVEL CONTROL SHAFT FOSITION SENSOR | |
|---|--------|
| < DTC/CIRCUIT DIAGNOSIS > [VQ37VHR] | _ |
| 2. Also check harness for short to ground and power. | Δ. |
| Is the inspection result normal? | Α |
| YES >> GO TO 8. NO >> GO TO 7. | |
| 7. DETECT MALFUNCTIONING PART | EC |
| | |
| Check the following. • Harness connectors F40, E20 | |
| Harness connectors F40, E20 Harness for open or short between VVEL control shaft position sensor and VVEL control module | С |
| | |
| >> Repair open circuit, short to ground or short to power in harness or connectors. | Б |
| 8. CHECK INTERMITTENT INCIDENT | D |
| Refer to GI-38, "Intermittent Incident". | _ |
| Is the inspection result normal? | Е |
| YES >> GO TO 9. | |
| NO >> Repair or replace. | |
| 9. REPLACE VVEL CONTROL MODULE | F |
| Replace VVEL control module. | = |
| 2. Go to EC-148. "Work Procedure". | G |
| | |
| >> GO TO 10. | |
| 10. PERFORM DTC CONFIRMATION PROCEDURE | Н |
| 1. Turn ignition switch ON. | = |
| 2. Erase DTC. | 1 |
| 3. Perform DTC Confirmation Procedure. See EC-389, "DTC Logic". | |
| Is the DTC P1089 or P1092 displayed again? | |
| YES >> GO TO 11. | J |
| NO >> INSPECTION END | |
| 11. REPLACE VVEL ACTUATOR SUB ASSEMBLY | K |
| Replace VVEL actuator sub assembly. | |
| 2. Go to EC-391, "Special Repair Requirement". | |
| | L |
| >> INSPECTION END | |
| Special Repair Requirement | о М |
| 1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT | IVI |
| | - |
| Refer to EC-154, "Work Procedure". | Ν |
| >> GO TO 2. | |
| 2.PERFORM IDLE AIR VOLUME LEARNING | 0 |
| | _ |
| Refer to EC-152, "Work Procedure". | |
| SS END | Р |
| >> END | |

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P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1090, P1093 VVEL ACTUATOR MOTOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1090 or P1093 is displayed with DTC P1091, first perform the trouble diagnosis for DTC P1091. Refer to EC-396, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|----------------------------------|---|---|--|
| P1090 | VVEL system performance (bank 1) | | Harness or connectors | |
| P1093 | VVEL system performance (bank 2) | Event angle difference between the actual and the target is detected. Abnormal current is sent to VVEL actuator motor. | (VVEL actuator motor circuit is open or shorted.) VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module | |

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.
- 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 10 second.
- 2. Keep the engine speed at about 3,500 rpm for at least 10 seconds under no load.
- Check DTC.

Is DTC detected?

YES >> Go to EC-392, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913843

CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.vvel actuator motor output signal circuit for open and short

- Disconnect VVEL control module harness connector.
- Disconnect VVEL actuator motor harness connector.
- Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

[VQ37VHR]

| DTO 11 | VVEL control module | | | VVEL actuator motor | | O and time of the | |
|-----------------------------------|---------------------------|---------------------|------------------|---------------------|---------------|-------------------|---|
| DTC No. | Bank | Connector | Terminal | Connector | Terminal | Continuity | _ |
| | | | 40 | | 1 | Existed | |
| P1090 | 1 | | 12 | F48 | 2 | Not existed | |
| | ı | | | 1 | Not existed | | |
| | | E15 | 25 | | 2 | Existed | |
| | | | 2 | F49 | 1 | Existed | |
| P1093 | 2 | | | | 2 | Not existed | |
| 1 1093 | 2 | | 15 | 149 | 1 | Not existed | |
| | | | 10 | | 2 | Existed | |
| . Also chec | k harness fo | or short to grour | nd and powe | r. | | | |
| the inspecti | | <u>rmal?</u> | | | | | |
| | O TO 4. O TO 3. | | | | | | |
| _ | | | | | | | |
| | | ONING PART | | | | | |
| heck the folk Harness cor | |) F20 | | | | | |
| | | ort between VVE | L actuator n | notor and VVE | L control mo | dule | |
| | • | | | | | | |
| >> R | epair open o | circuit, short to g | ground or she | ort to power in | harness or o | connectors. | |
| $oldsymbol{1}.$ check v $arkappa$ | /EL ACTUA | TOR MOTOR | | | | | |
| Refer to EC-3 | 94, "Compo | nent Inspection | (VVEL ACT | UATOR MOTO | <u>)R)"</u> . | | |
| s the inspecti | | | • | | | | |
| | O TO 6. | | | | | | |
| _ | O TO 5. | | | | | | |
|). REPLACE | VVEL ACTU | JATOR SUB AS | SSEMBLY | | | | |
| . Replace \ | /VEL actuat | or sub assembl | y. | | | | _ |
| Go to <u>EC</u> - | -395, "Speci | al Repair Requi | <u>rement"</u> . | | | | |
| c IN | ISPECTION | END | | | | | |
| _ | | NT INCIDENT | | | | | |
| | | | | | | | |
| Refer to GI-38 | | | | | | | |
| s the inspecti | | <u>rmai?</u> | | | | | |
| | O TO 7. epair or repl | ace. | | | | | |
| _ | | TROL MODULE | = | | | | |
| | | | _ | | | | |
| | VEL contro -148, "Work | | | | | | |
| | , | | | | | | |
| >> G | O TO 8. | | | | | | |
| 3.PERFORM | 1 DTC CONF | FIRMATION PR | OCEDURE | | | | |
| | ion switch O | | | | | | |
| 2. Erase DT | C. | | | | | | |
| | | ation Procedur | e. | | | | |

 Perform DTC Confirmation Procedure. See <u>EC-392</u>, "<u>DTC Logic</u>".

Is the DTC P1090 or P1093 displayed again?

YES >> GO TO 9.

P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> INSPECTION END

9. CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-394, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 11. NO >> GO TO 10.

10.replace vvel actuator sub assembly

- Replace VVEL actuator sub assembly.
- 2. Go to EC-395, "Special Repair Requirement".

>> INSPECTION END

11. CHECK VVEL LADDER ASSEMBLY

Refer to EM-106, "Inspection".

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12.REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly.
- 2. Go to EC-395, "Special Repair Requirement".

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000005913844

1. CHECK VVEL ACTUATOR MOTOR

- 1. Turn ignition switch OFF.
- Disconnect VVEL actuator motor harness connector.
- 3. Check resistance between VVEL actuator motor terminals as follows.

| VVEL actuator motor | - Resistance | |
|---------------------|---------------------|--|
| Terminal | | |
| 1 and 2 | 16 Ω or less | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.replace vvel actuator sub assembly

- 1. Replace VVEL actuator sub assembly.
- 2. Go to EC-395, "Special Repair Requirement".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:0000000005913845

1. CHECK VVEL ACTUATOR SUB ASSEMBLY

- Turn ignition switch OFF.
- Remove VVEL actuator sub assembly. Refer to EM-97, "Disassembly and Assembly".

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P1090. P1093 VVEL ACTUATOR MOTOR

| P1090, P1093 VVEL ACTUATOR MOTOR | | |
|---|------------------------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| 3. Turn the ball screw shaft to check that it works smoothly. | | |
| Is the inspection result normal? | | Α |
| YES >> INSPECTION END NO >> GO TO 2. | | |
| 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY | | EC |
| Replace VVEL actuator sub assembly. Go to <u>EC-395</u>, "Special Repair Requirement". | | С |
| >> INSPECTION END | | |
| Special Repair Requirement | INFOID:000000005913846 | D |
| 1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT | | |
| Refer to EC-154, "Work Procedure". | · | Е |
| >> GO TO 2. | | _ |
| 2.PERFORM IDLE AIR VOLUME LEARNING | | F |
| Refer to EC-152, "Work Procedure". | | 0 |
| >> END | | G |
| >> EIND | | |
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P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1091 VVEL ACTUATOR MOTOR RELAY

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------------|--|--|
| P1091 | VVEL actuator motor relay circuit | VVEL control module detects the VVEL actuator motor relay is stuck OFF. VVEL control module detects the VVEL actuator motor relay is stuck ON. | Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.) VVEL actuator motor relay VVEL control module 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.
- 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 and wait at least 1 seconds.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON and wait at least 1 seconds.
- Check DTC.

Is DTC detected?

YES >> Go to EC-396, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913849

1. VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor relay.
- 3. Check the voltage between VVEL actuator motor relay harness connector and ground.

| VVEL actuat | or motor relay | Ground | Voltage | |
|--------------------|----------------|--------|-----------------|--|
| Connector Terminal | | Glound | vollage | |
| E16 | 1 | Ground | Battery voltage | |
| LIU | 5 | Glound | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- 50 A fusible link (letter G)
- Harness for open or short between VVEL actuator motor relay and battery

P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

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>> Repair open circuit, short to ground or short to power in harness or connectors.

3. VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-II

- Disconnect VVEL control module harness connector.
- Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

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| VVEL con | trol module | VVEL actuator motor relay | | VVEL actuator motor relay Continuity | | Continuity |
|-----------|-------------|---------------------------|----------|---------------------------------------|--|------------|
| Connector | Terminal | Connector | Terminal | Continuity | | |
| E15 | 23 | E16 | 2 | Existed | | |

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.

>> Repair open circuit, short to ground or short to power in harness or connectors. NO

f 4.VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

| V | VEL control mod | ule | VVEL actuate | or motor relay | Continuity |
|------|-----------------|----------|--------------|----------------|------------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | E15 | 13 | E16 | 2 | Existed |
| 2 | LIS | 1 | LIO | 3 | LXISIEU |

2. Also check harness for short to ground and 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.

${f 5.}$ CHECK VVEL ACTUATOR MOTOR RELAY

Refer to EC-398, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace VVEL actuator motor relay.

6.CHECK ABORT CIRCUIT FOR OPEN AND SHORT

- Disconnect ECM harness connector.
- 2. Check the continuity between VVEL control module harness connector and ECM harness connector.

| VVEL con | trol module | E | CM | Continuity |
|-----------|-------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E15 | 21 | F101 | 28 | Existed |

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

.DTECT MALFUNCTIONING PART

Check the following.

- Harness connector E20, F40
- Harness for open or short between ECM and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

$oldsymbol{8}.$ CHECK INTERMITTENT INCIDENT

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P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

9. REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module.
- 2. Go to EC-148, "Work Procedure".

>> GO TO 10.

10. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-396</u>, "<u>DTC Logic"</u>.

Is the DTC P1091 displayed again?

YES >> GO TO 11.

NO >> INSPECTION END

11.REPLACE ECM

- Replace ECM.
- 2. Go to EC-147, "Work Procedure".

>> INSPECTION END

Component Inspection

INFOID:0000000005913850

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1. CHECK VVEL ACTUATOR MOTOR RELAY

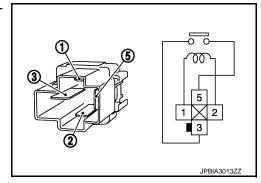
- 1. Turn ignition switch OFF.
- 2. Remove VVEL actuator motor relay.
- 3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.

| Terminal | Condition | Continuity |
|----------|--|-------------|
| | 12 V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace VVEL actuator motor relay.



P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

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 | DTC detecting condition | Possible cause |
|---------|---------------------------------------|--|--|
| P1148 | 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. | Harness or connectors (The A/F sensor 1 circuit is open or shorted.) |
| P1168 | 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. | A/F sensor 1A/F sensor 1 heater |

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[VQ37VHR]

INFOID:0000000005913854

P1211 TCS CONTROL UNIT

Description INFOID:000000005913852

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

DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|---|
| P1211 | TCS control unit | ECM receives malfunction information from "ABS actuator and electric unit (control unit)". | ABS actuator and electric unit (control unit) TCS related parts |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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 60 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-400, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

Go to BRC-64, "Work Flow".

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P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

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P1212 TCS COMMUNICATION LINE

Description INFOID:0000000005913855

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

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 <u>EC-377</u>, "<u>DTC Logic</u>".

Freeze frame data is not stored in the ECM for this self-diagnosis.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|---|--|
| P1212 | TCS communication line | ECM cannot receive the information from "ABS actuator and electric unit (control unit)" continuously. | 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

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 >> Go to EC-401, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

Go to BRC-64, "Work Flow".

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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000005913859

P1217 ENGINE OVER TEMPERATURE

DTC Logic

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 <u>EC-377</u>, "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 | DTC detecting condition | Possible cause |
|---------|------------------------------------|---|--|
| P1217 | Engine over temperature (Overheat) | 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. | 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 <u>CO-8, "Draining"</u> and <u>CO-9, "Refilling"</u>. Also, replace the engine oil. Refer to <u>LU-9, "Draining"</u> and <u>LU-9, "Refilling"</u>.

- 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-13, "Anti-Freeze Coolant Mixture Ratio".
- 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-402, "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 >> Go to EC-403, "Diagnosis Procedure".

Component Function Check

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.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

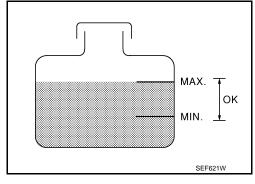
Check the coolant level in the reservoir tank and radiator.

Allow engine to cool before checking coolant level.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Go to EC-403, "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 >> Go to EC-403, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform component function check-iii

(P)With CONSULT-III

- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT-III

Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-11, "Diagnosis Description".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-403, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913860

1. CHECK COOLING FAN OPERATION

(II) With CONSULT-III

- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT-III.
- Make sure that cooling fan speed varies according to the percentage.

Without CONSULT-III

- 1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-11, "Diagnosis Description".
- Make sure that cooling fan operates.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-498, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-8, "Inspection".

Is leakage detected?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak.

- Hose
- Radiator
- Water pump

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>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap. Refer to CO-11, "RADIATOR CAP: Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap.

5. CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-228, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor.

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

| Engine | Step | Inspection item | Equipment | Standard | Reference page |
|-------------------|------|---|---|--|---------------------------------------|
| OFF | 1 | Blocked radiator Blocked condenser Blocked radiator grille Blocked bumper | Visual | No blocking | _ |
| | 2 | Coolant mixture | Coolant tester | MA-13, "Anti-Freeze Coola | nnt Mixture Ratio" |
| | 3 | Coolant level | Visual | Coolant up to MAX level in reservoir tank and radiator filler neck | CO-8, "Inspection" |
| | 4 | Radiator cap | Pressure tester | 107 kPa | CO-11, "RADIATOR CAP |
| | | | | (1.1 kg/cm ² , 16 psi) (Limit) | : Inspection" |
| ON* ² | 5 | Coolant leaks | • Visual | No leaks | CO-8, "Inspection" |
| ON* ² | 6 | Thermostat | Touch the upper and lower radiator hoses | Both hoses should be hot | CO-23, "Inspection" |
| ON*1 | 7 | Cooling fan | CONSULT-III | Operating | EC-498, "Component Function Check" |
| OFF | 8 | Combustion gas leak | Color checker chemical tester 4 Gas analyzer | Negative | _ |
| ON* ³ | 9 | Coolant temperature gauge | Visual | Gauge less than 3/4 when driving | _ |
| | | Coolant overflow to reservoir tank | Visual | No overflow during driving and idling | CO-8, "Inspection" |
| OFF* ⁴ | 10 | Coolant return from reservoir tank to radiator | Visual | Should be initial level in reservoir tank | CO-8, "Inspection" |
| OFF | 11 | Cylinder head | Straight gauge feeler gauge | 0.1 mm (0.004 in) Maximum distortion (warping) | EM-119, "Inspection" |
| | 12 | Cylinder block and pistons | Visual | No scuffing on cylinder walls or piston | EM-132, "Inspection" |

^{*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.

^{*4:} After 60 minutes of cool down time.

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[VQ37VHR]

For more information, refer to CO-6, "Troubleshooting Chart".

>> INSPECTION END

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P1225, P1234 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|------------------------------------|
| P1225 | Closed throttle position learning per- formance (bank 1) | Closed throttle position learning value | Electric throttle control actuator |
| P1234 | Closed throttle position learning per- formance (bank 2) | is excessively low. | (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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-406, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913863

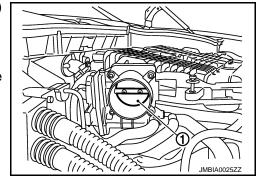
1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) 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.



2.replace electric throttle control actuator

- 1. Replace malfunctioning electric throttle control actuator.
- 2. Go to EC-407, "Special Repair Requirement".

>> INSPECTION END

| P1225, P1234 TP SENSOR | |
|---|------------------------|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] |
| Special Repair Requirement | INFOID:000000005913864 |
| 1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING | r |
| Refer to EC-151, "Work Procedure" | E |
| >> GO TO 2. | |
| 2.PERFORM IDLE AIR VOLUME LEARNING | |
| Refer to EC-152, "Work Procedure" | |
| >> END | Ε |
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P1226, P1235 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|------------------------------------|
| P1226 | Closed throttle position learning performance (bank 1) | Closed throttle position learning is not performed | Electric throttle control actuator |
| P1235 | Closed throttle position learning performance (bank 2) | successfully, repeatedly. | (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.
- 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 >> Go to EC-408, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913867

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

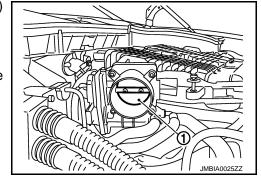
- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO

>> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- 2. Go to EC-409, "Special Repair Requirement".

>> INSPECTION END

| P1226, P1235 TP SENSOR | | | |
|--|-------------------------|----|--|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | | |
| Special Repair Requirement | INFOID:0000000005913868 | А | |
| 1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING | | | |
| Refer to EC-151, "Work Procedure" | | EC | |
| >> GO TO 2. | | | |
| 2.PERFORM IDLE AIR VOLUME LEARNING | | С | |
| Refer to EC-152, "Work Procedure" | | | |
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< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1233 or P2101 is displayed with DTC P1238, P1290, P2100 or 2119, first perform the trouble diagnosis for DTC P1238, P2119 or P1290, P2100. Refer to EC-417, "DTC Logic" or <a href="EC-422, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P1233 | Electric throttle control performance (bank 2) | Electric throttle control function does not oper- | Harness or connectors (Throttle control motor circuit is open or |
| P2101 | Electric throttle control performance (bank 1) | ate properly. | 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.
- Check DTC.

Is DTC detected?

YES >> Go to EC-410, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913871

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector terminals as per the following.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | E | СМ | | | | | |
|----------|-----------|----------|-----------|----------|-----------------|--------|-----------------|--|
| DTC | + | | _ | | Con | dition | Voltage (V) | |
| | Connector | Terminal | Connector | Terminal | | | | |
| P1233 | F102 | 52 | | | | OFF | Approx. 0 | |
| 1 1200 | | | M107 128 | M107 | Ignition switch | ON | Battery voltage | |
| P2101 | F101 | 3 | IVITOT | 120 | ignition switch | OFF | Approx. 0 | |
| F 2 10 1 | 1 101 | 7101 3 | | ON | Battery voltage | | | |

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Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 3. D

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3.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector E7. 3.
- Check the continuity between IPDM E/R harness connector and ECM harness connector.

| IPDM | E/R | EC | Continuity | | |
|-----------|----------|--------------------|------------|-------------|--|
| Connector | Terminal | Connector Terminal | | Outilitally | |
| E7 | 71 | F101 | 25 | Existed | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between ECM and IPDM E/R

K

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

Check the continuity between IPDM E/R harness connector and ECM harness connector.

| DTC | IPDM | E/R | EC | Continuity | |
|-------|-----------|----------|-----------|------------|------------|
| DIO | Connector | Terminal | Connector | Terminal | Continuity |
| P1233 | E5 | 7 | F102 | 52 | Existed |
| P2101 | LJ | , | F101 | 3 | LAISIEU |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

NO >> GO TO 6.

YES >> GO TO 7.

O. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

.CHECK FUSE

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2011 M37/M56

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Disconnect 15 A fuse (No. 50) from IPDM E/R.
- Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace 15 A fuse.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connectors.

9.check throttle control motor output signal circuit for open or short

- Turn ignition switch OFF.
- 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.

| DTC | Electri | Electric throttle control actuator ECM | | | Continuity | | | | | | | | | | | | | | | |
|--------|---------|--|----------|-----------|------------|-------------|-------------|---------|---|---|---|---|---------|---|---|---|---|---|-------|----|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | | | | | | | | | | | | |
| | | | 5 | | 49 | Existed | | | | | | | | | | | | | | |
| P1233 | 2 | F27 | 3 | F102 | 50 | Not existed | | | | | | | | | | | | | | |
| F 1233 | | 2 | 1 21 | 121 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 6 | 1 102 | 49 |
| | | | В | 0 | | | 50 | Existed | | | | | | | | | | | | |
| | 1 | | | 1 | | 2 | Existed | | | | | | | | | | | | | |
| P2101 | | F67 | 2 | | F101 | 4 | Not existed | | | | | | | | | | | | | |
| F2101 | ' | 107 | | 1 101 | 2 | Not existed | | | | | | | | | | | | | | |
| | | | | 2 | 2 | 2 | 2 | 2 | 2 | 2 | | 4 | Existed | | | | | | | |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

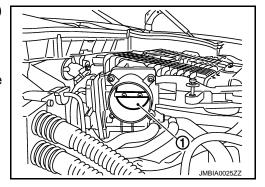
- Remove the intake air duct.
- Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 11.

NO

>> Remove the foreign matter and clean the electric throttle control actuator inside.



11. CHECK THROTTLE CONTROL MOTOR

Refer to EC-413, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12. >> GO TO 13. NO

12. CHECK INTERMITTENT INCIDENT

| • | 01 ELECTRIC THROTTLE CONTROL FUNCT | [VQ37VHR] | | | | | | |
|--|---|-------------------------|--|--|--|--|--|--|
| < DTC/CIRCUIT DIAGNOSI Refer to GI-38. "Intermittent I | | [VQ3/VIIIV] | | | | | | |
| Is the inspection result norma | | А | | | | | | |
| YES >> GO TO 13. | | | | | | | | |
| | e harness or connectors. | Fo | | | | | | |
| 13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR | | | | | | | | |
| Replace malfunction elect Go to <u>EC-413</u>, "Special F | ctric throttle control actuator. Repair Requirement". | | | | | | | |
| >> INSPECTION EN | ND | | | | | | | |
| Component Inspection | | INFOID:0000000005913872 | | | | | | |
| 1.check throttle con | TROL MOTOR | | | | | | | |
| 1. Turn ignition switch OFF. | | E | | | | | | |
| | le control actuator harness connector. | ina | | | | | | |
| 5. Check resistance between | en electric throttle control actuator terminals as per the follow | F | | | | | | |
| Electric throttle control actuator | _ | | | | | | | |
| Bank Terminals | Resistance (Ω) | | | | | | | |
| 1 1 and 2 | Approx 1 45 lot 25°C (77°C) | G | | | | | | |
| 2 5 and 6 | Approx. 1 - 15 [at 25°C (77°F)] | | | | | | | |
| Is the inspection result norma | | Н | | | | | | |
| YES >> INSPECTION EN NO >> GO TO 2. | ND | | | | | | | |
| _ | ROTTLE CONTROL ACTUATOR | | | | | | | |
| | | | | | | | | |
| Replace malfunctioning e Go to <u>EC-413</u>, "Special F | electric throttle control actuator. Repair Requirement". | | | | | | | |
| | | J | | | | | | |
| >> INSPECTION EN | ND | | | | | | | |
| Special Repair Require | ement | INFOID:000000005913873 | | | | | | |
| 1.PERFORM THROTTLE V | ALVE CLOSED POSITION LEARNING | | | | | | | |
| Refer to EC-151, "Work Proc | edure" | | | | | | | |
| | | | | | | | | |
| >> GO TO 2. | | IV | | | | | | |
| 2.PERFORM IDLE AIR VOL | LUME LEARNING | | | | | | | |
| Refer to EC-152, "Work Proc | <u>edure"</u> | N | | | | | | |
| >> END | | | | | | | | |
| | | 0 | | | | | | |
| | | | | | | | | |
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| | | Р | | | | | | |
| | | | | | | | | |

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[VQ37VHR]

P1236, P2118 THROTTLE CONTROL MOTOR

DTC Logic (INFOID:000000005913875

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P1236 | Throttle control motor (bank 2) circuit short | ECM detects short in both circuits between | Harness or connectors (Throttle control motor circuit is shorted.) |
| P2118 | Throttle control motor (bank 1) circuit short | ECM and throttle control motor. | 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.
- Check DTC.

Is DTC detected?

YES >> Go to EC-414, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913876

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.check throttle control motor output signal circuit for open and short

- 1. Disconnect electric throttle control actuator harness connector.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electri | c throttle cont | rol actuator | EC | Continuity | | | | | |
|--------|---------|-----------------|--------------|-----------|------------|-------------|---|---|----|---------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | | |
| | | 0 | | - | - | E | - | | 49 | Existed |
| P1236 | | | 3 | F102 | 50 | Not existed | | | | |
| F 1230 | | Γ21 | 6 | F102 | 49 | Not existed | | | | |
| | | | | б | 0 | O | O | U | | 50 |

P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| < DTC/CI | RCUII | DIAGNOS |)IS > | | | | [٧&3/ ٧١١١٨] |
|----------------|--|--------------------|-------------|------------------|--------------|--------------|----------------------------|
| | Electri | c throttle conti | ol actuator | EC | CM | a | - |
| DTC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| | | | | | 2 | Existed | - |
| D0440 | _ | F07 | 1 | F404 | 4 | Not existed | - |
| P2118 | 1 | F67 | 0 | F101 | 2 | Not existed | - |
| | | | 2 | | 4 | Existed | - |
| 4. Also | check h | arness for | short to g | round and | short to p | ower. | • |
| s the insp | ection | result norm | <u>al?</u> | | | | |
| _ | ·> <u>G</u> O ⁻ | | | | | | |
| _ | • | air or replac | | | | | |
| S. CHEC | K THRO | OTTLE COI | NTROL M | IOTOR | | | |
| | | "Compone | | tion". | | | |
| • | | result norm | <u>ial?</u> | | | | |
| | ·> GO ⁻ ·> GO ⁻ | | | | | | |
| 4 | | RMITTENT | INCIDE | JT | | | |
| | | ntermittent | | | | | |
| | | result norm | | • | | | |
| • | >> GO ⁻ | | <u></u> | | | | |
| | | air or replac | e harnes | s or conne | ctors. | | |
| 5.REPLA | CE EL | ECTRIC TH | HROTTLE | CONTRO | DL ACTUA | TOR | |
| | | functioning | | | | or. | |
| 2. Go to | EC-41 | <u>5, "Special</u> | Repair Re | <u>equiremen</u> | <u>t"</u> . | | |
| | . INICE | PECTION E | ND | | | | |
| | | | | | | | |
| compoi | ient ii | nspection | 1 | | | | INFOID:0000000005913877 |
| 1.CHEC | K THRO | OTTLE COI | NTROL M | IOTOR | | | |
| 1. Turn | gnition | switch OFF | <u> </u> | | | | |
| 2. Disco | nnect e | electric thro | ttle contro | | | | |
| 3. Chec | k resist | ance betwe | en electri | c throttle c | control act | uator termin | nals as per the following. |
| Flectric th | rottle co | ntrol actuator | | | | | |
| Bank | | erminals | | Resistance | (Ω) | | |
| 1 | | 1 and 2 | | | | | |
| 2 | | 5 and 6 | Appro | x. 1 - 15 [at 2 | 25°C (77°F)] | | |
| | | result norm | a ? | | | | |
| | | ECTION E | | | | | |
| | > GO | | | | | | |
| 2.repla | CE EL | ECTRIC TH | HROTTLE | CONTRO | DL ACTUA | TOR | |
| | | functioning | | | | | |
| | | <u>5, "Special</u> | | | | | |
| | | | | | | | |
| > | > INSF | PECTION E | ND | | | | |
| Spacial | Repa | ir Requir | ement | | | | INFOID:0000000005913878 |

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

P1236, P2118 THROTTLE CONTROL MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Refer to EC-151, "Work Procedure"

>> GO TO 2.

$2.\mathsf{PERFORM}$ IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure"

>> END

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic INFOID:0000000005913880

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | | DTC detecting condition | Possible cause | |
|---|---------------------------|---|---|---|------------------------------------|
| | Electric throttle control | Electric throttle control actuator does not function properly due to the return spring malfunction. | | | |
| P1238 | actuator (bank 2) | actuator (bank 2) | | Throttle valve opening angle in fail-safe mode is not in specified range. | Electric throttle control actuator |
| | | C) | ECM detect the throttle valve is stuck open. | | |
| P2119 Electric throttle control actuator (bank 1) | Electric throttle control | A) | Electric throttle control actuator does not function properly due to the return spring malfunction. | Electric unotile 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.

- 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 for malfunction a and b

- 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.
- 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 >> Go to EC-418, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform dtc confirmation procedure for malfunction ${ t c}$

- Turn ignition switch ON and wait at least 1 second.
- Shift selector lever to D position and wait at least 3 seconds. 2.
- 3. Shift selector lever to P position.
- 4. Start engine and let it idle for 3 seconds.
- Check DTC.

Is DTC detected?

Revision: 2010 June

YES >> Go to EC-418, "Diagnosis Procedure".

NO >> INSPECTION END

EC-417

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P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Diagnosis Procedure

INFOID:0000000005913881

1.check electric throttle control actuator visually

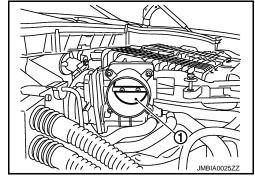
- 1. Turn ignition switch OFF.
- 2. Remove the intake air duct.
- 3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Remov

>> Remove the foreign matter and clean the electric throttle control actuator inside.



2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- 2. Go to EC-418. "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005913882

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-151, "Work Procedure"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure"

>> END

[VQ37VHR]

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INFOID:0000000005913885

P1239, P2135 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1239 or P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-378</u>, "<u>DTC Logic"</u>.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1239 | Throttle position sensor (bank 2) circuit range/ performance | Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 | Harness or connector (TP sensor 1 or 2 circuit is open or shorted.) |
| P2135 | Throttle position sensor (bank 1) circuit range/ performance | and TP sensor 2. | 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.
- Check DTC.

Is DTC detected?

YES >> Go to EC-419, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector and ground.

| DTC | Electr | ic throttle cont | Ground | Voltage (V) | |
|-------|--------|------------------|----------|-------------|-------------|
| | Bank | Connector | Terminal | Giodila | voitage (v) |
| P1239 | 2 | F27 | 1 | Ground | Approx. 5 |
| P2135 | 1 | F67 | 6 | Ground | дрргох. 3 |

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 3.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.check throttle position sensor ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|-------|------------------------------------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | F27 | 4 | F101 | 48 | Existed |
| P2135 | 1 | F67 | 3 | 1 101 | 40 | LAISIEU |

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 THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|---------|------------------------------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | 2 F27 | 2 | F101 | 31 | |
| 1 1233 | | | 3 | | 35 | Existed |
| P2135 1 | F67 | 4 | 1 101 | 30 | LAISIGU | |
| | 1 F67 | 107 | 5 | | 34 | |

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.

${f 5.}$ CHECK THROTTLE POSITION SENSOR

Refer to EC-420, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- 2. EC-421, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913886

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.

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P1239, P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

- Reconnect all harness connectors disconnected.
- Perform <u>EC-151, "Work Procedure"</u>.
- Turn ignition switch ON.
- 5. Set selector lever to D position.
- 6. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | Condition | | | |
|-----------|-----------------------------|----------|-------------------|-----------------|----------------|--|
| Connector | + | _ | | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| | 30 [TP sensor 1 (bank 1)] | 40 | | Fully released | More than 0.36 | |
| | SO [TF Selisor I (Darik 1)] | 40 | Accelerator pedal | Fully depressed | Less than 4.75 | |
| | 31 [TP sensor 1 (bank 2)] | 48 | | Fully released | More than 0.36 | |
| F101 | 31 [TF Selisor I (balik 2)] | | | Fully depressed | Less than 4.75 | |
| FIUI | 34 [TP sensor 2 (bank 1)] | 40 | | Fully released | Less than 4.75 | |
| - | | | | Fully depressed | More than 0.36 | |
| | 35 [TP sensor 2 (bank 2)] | 48 | | Fully released | Less than 4.75 | |
| | | | | Fully depressed | More than 0.36 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

- 1. Replace malfunctioning electric throttle control actuator.
- Go to <u>EC-421</u>, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-151, "Work Procedure"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure"

>> END

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P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P1290 | Throttle control motor relay circuit open (bank 2) | ECM detects a voltage of power source for | Harness or connectors (Throttle control motor relay circuit is |
| P2100 | Throttle control motor relay circuit open (bank 1) | throttle control motor is excessively low. | open) • Throttle control motor relay |
| P2103 | Throttle control motor relay circuit short | ECM detect the throttle control motor relay is stuck ON. | 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?

P1290, P2100>>GO TO 2.

P2103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1290 AND P2100

- 1. Turn ignition switch ON and wait at least 2 seconds.
- 2. Start engine and let it idle for 5 seconds.
- Check DTC.

Is DTC detected?

YES >> Go to EC-422, "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 >> Go to EC-422, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913890

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector E7.
- 4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

| IPDM | E/R | EC | Continuity | |
|-----------|----------|-----------|------------|---------|
| Connector | Terminal | Connector | | |
| E7 | 71 | F101 | 25 | Existed |

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

| < DTC/CII | P129(RCUIT DIA | • | • | 3 THRO | TTLE CONTRO | OL MOTOR RELAY [VQ | 37VHR] |
|---|--------------------------------|-------------|---------------|------------|----------------------|------------------------------|--------|
| | | | | nd and sho | ort to power. | | |
| Is the insp | ection resu | ılt normal' | ? | | · | | Α |
| | > GO TO 3 | | | | | | |
| _ | > GO TO 2 | | IO DADT | | | | EC |
| | T MALFUN | NC HONIN | NG PART | | | | |
| Check theHarness | tollowing. connectors | s E20. F4 | 0 | | | | |
| | for open o | | | M and IPD | M E/R | | С |
| | _ | | | | | | |
| _ | | | | - | • | arness or connectors. | D |
| | | | | | Y INPUT SIGNAL (| | |
| 1. Check | k the contin | uity betwe | een IPDM I | E/R senso | r harness connecto | or and ECM harness connector | E |
| | IPDM | E/R | EC | CM | | | |
| DTC | Connector | Terminal | Connector | Terminal | Continuity | | _ |
| P1290 | | | F102 | 52 | | | F |
| P2100 | E5 | 7 | F101 | 3 | Existed | | |
| P2103 | E0 | , | F101 | 3 | Existed | | G |
| 1 2 100 | | | F102 | 52 | | | |
| | | | _ | nd and sho | ort to power. | | Н |
| | ection resu >> GO TO 5 | | <u> </u> | | | | |
| _ | > GO TO 4 | | | | | | 1 |
| 4.DETEC | T MALFUN | NCTIONIN | NG PART | | | | ı |
| Check the | | | _ | | | | |
| | connectors for open o | | | M and IPD | M F/R | | J |
| | | | | | ··· <u> </u> / · · · | | |
| | | oen circui | t, short to (| ground or | short to power in ha | arness or connectors. | K |
| 5.check | K FUSE | | | | | | |
| | nnect 15 A | | | PDM E/R. | | | L |
| | < 15 A fuse pection results | | | | | | |
| - | > GO TO 6 | | <u>:</u> | | | | M |
| NO > | > Replace | 15A fuse. | | | | | IVI |
| 6.CHEC | K INTERMI | TTENT IN | ICIDENT | | | | |
| · · · · · · · · · · · · · · · · · · · | I-38, "Inter | | | | | | N |
| • | ection resu | | | | | | |
| | > Replace > Repair o | | | connecto | ·S. | | 0 |
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Revision: 2010 June **EC-423** 2011 M37/M56

[VQ37VHR]

P1421 COLD START CONTROL

Description INFOID:000000005913891

ECM controls ignition timing and engine idle speed when engine is started with prewarming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Logic

DTC DETECTION LOGIC

NOTE:

• If DTC P1421 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1421 | Cold start emission reduction strategy monitoring | ECM does not control ignition timing and engine idle speed properly when engine is started with prewarming up condition. | Lack of intake air volume Fuel injection system 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 idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- 4. Check the indication of "COOLAN TEMP/S".

If it is between 7°C (45°F) and 36°C (97°F), go to the following steps.

If it is below 7°C (45°F), warm engine up to more than 7°C (45°F) and retry from step 1.

If it is above 36°C (97°F), cool engine down to less than 36°C (97°F) and retry from step 1.

- 5. Start engine and let it idle for 5 minutes.
- 6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-424, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913893

1.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-152, "Work Procedure".

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

P1421 COLD START CONTROL

| P1421 COLD START CONTROL | | |
|--|-----------|----|
| < DTC/CIRCUIT DIAGNOSIS > | [VQ37VHR] | |
| Is the inspection result normal? | | Λ |
| YES >> GO TO 3. NO >> Repair or replace malfunctioning part | | Α |
| 3.CHECK FUEL INJECTION SYSTEM FUNCTION | | |
| Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-274, "DTC Logic". | | C |
| Is the inspection result normal? | | |
| YES >> GO TO 4. | | С |
| NO >> Go to EC-275, "Diagnosis Procedure" for DTC P0171, P0174. | | |
| 4.PERFORM DTC CONFIRMATION PROCEDURE | | D |
| Turn ignition switch ON. Erase DTC. | | |
| 3. Perform DTC Confirmation Procedure. | | |
| See <u>EC-424, "DTC Logic"</u> . <u>Is the 1st trip DTC P1421 displayed again?</u> | | Е |
| YES >> GO TO 5. | | |
| NO >> INSPECTION END | | F |
| 5.REPLACE ECM | | |
| Replace ECM. Go to EC-147, "Work Procedure". | | G |
| 2. Go to <u>LC-147, Work Procedure</u> . | | |
| >> INSPECTION END | | Н |
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Revision: 2010 June **EC-425** 2011 M37/M56

[VQ37VHR]

P1550 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P1550 | Battery current sensor circuit range/performance | The output voltage of the battery current sensor remains within the specified range while engine is running. | Harness or connectors (Battery current sensor circuit is open or shorted.) [CKP sensor (POS) circuit is open or shorted.] [CMP sensor (PHASE) (bank 2) 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.) Battery current sensor Crankshaft position sensor (POS) Camshaft position sensor (PHASE) (bank 2) Accelerator pedal position sensor EVAP control system 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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

- 1. Start engine and wait at least 10 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-426, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000006134334

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between battery current sensor harness connector and ground.

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Battery cur | rent sensor | Ground | Voltage (V) | |
|-------------|-------------|---------|-------------|--|
| Connector | Terminal | Giodila | | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 3.

3.check battery current sensor power supply circuit-ii

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery curr | ent sensor | EC | Continuity | |
|--------------|------------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E21 | 1 | F102 | 64 | Existed |

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E20
- Harness for open between battery current sensor and ECM

>> Repair open circuit.

5. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| E | CM | Sensor | | |
|-------------|-----------------------------|-------------------------------------|--|------------------------------------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 46 | CKP sensor (POS) | F2 | 1 |
| F102 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 | |
| | 04 | Battery current sensor | E21 | ı |
| 103 M107 | | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} |
| WITO7 | 107 | EVAP control system pressure sensor | B73 | 3 |
| | | Refrigerant pressure sensor | E77 | 3 |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

6. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-306, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- EVAP control system pressure sensor (Refer to <u>EC-340, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

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^{*2:} Without ICC

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-429, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

9.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|---|-----------|----------|------------|
| Connector Terminal Con | | Connector | Terminal | Continuity |
| E21 | 3 | F102 | 95 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between battery current sensor and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | EC | CM | Continuity |
|------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 4 | F102 | 91 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-429, "Component Inspection".

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

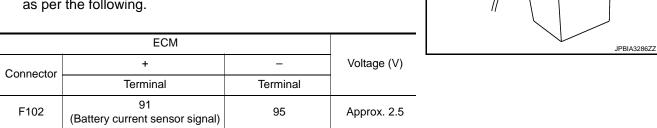
>> INSPECTION END

Component Inspection

1. CHECK BATTERY CURRENT SENSOR

- Turn ignition switch OFF.
- Reconnect harness connectors disconnected. 2.
- Disconnect battery negative cable (1).
 - To body ground
- Install jumper cable (A) between battery negative terminal and body ground.
- Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

| Connector | + | _ | Voltage (V) |
|-----------|---------------------------------------|----------|-------------|
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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EC-429 Revision: 2010 June 2011 M37/M56

[VQ37VHR]

P1551, P1552 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P1551 | Battery current sensor circuit low input An excessively low voltage from the ser sor is sent to ECM. | | Harness or connectors (Battery current sensor circuit is open |
| P1552 | Battery current sensor circuit high input | An excessively high voltage from the sensor is sent to ECM. | or shorted.) [CKP sensor (POS) circuit is open or shorted.] [CMP sensor (PHASE) (bank 2) 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.) • Battery current sensor • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) (bank 2) • Accelerator pedal position sensor • EVAP control system 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 8 V with ignition switch ON

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-430, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000006134341

CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Check the voltage between battery current sensor harness connector and ground.

| Battery cur | rent sensor | Ground | Voltage (V) | |
|-------------|--------------------|--------|-------------|--|
| Connector | Connector Terminal | | voltage (v) | |
| E21 | 1 | Ground | Approx. 5 | |

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Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 3.

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3.check battery current sensor power supply circuit-ii

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 1 | F102 | 64 | Existed |

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E20
- Harness for open between battery current sensor and ECM

>> Repair open circuit.

${f 5.}$ CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| EC | CM | Sensor | | | |
|-----------|----------|-------------------------------------|--|------------------------------------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 46 | CKP sensor (POS) | F2 | 1 | |
| F400 04 | | CMP sensor (PHASE) (bank 2) | F18 | 1 | |
| F102 64 | 04 | Battery current sensor | E21 | ı | |
| 103 AF | | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | |
| WHO | 107 | EVAP control system pressure sensor | B73 | 3 | |
| | 107 | Refrigerant pressure sensor | E77 | 3 | |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-306, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to <u>EC-311, "Component Inspection"</u>.)
- EVAP control system pressure sensor (Refer to EC-340, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-522, "Diagnosis Procedure".)

Is the inspection result normal?

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^{*2:} Without ICC

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-441, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 8.

NO >> GO 10 6.

8.replace accelerator pedal assembly

- 1. Replace accelerator pedal assembly.
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

9. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|---|-----------|----------|------------|
| Connector Terminal Cor | | Connector | Terminal | Continuity |
| E21 | 3 | F102 | 95 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between battery current sensor and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | EC | CM | Continuity |
|------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 4 | F102 | 91 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-441, "Component Inspection".

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

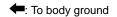
>> INSPECTION END

INFOID:0000000006134342

Component Inspection

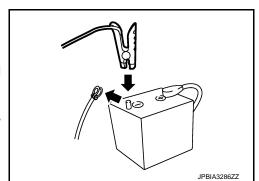
1. CHECK BATTERY CURRENT SENSOR

- Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- Disconnect battery negative cable (1).



- Install jumper cable (A) between battery negative terminal and body ground.
- Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

| Connector | + | _ | Voltage (V) |
|-----------|---------------------------------------|----------|-------------|
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

Is the inspection result normal?

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YES >> INSPECTION END

NO >> Replace battery negative cable assembly. K

EC-433

2011 M37/M56

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[VQ37VHR]

P1553 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------------------|--|--|
| P1553 | Battery current sensor performance | The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation. | Harness or connectors (Battery current sensor circuit is open or shorted.) [CKP sensor (POS) circuit is open or shorted.] [CMP sensor (PHASE) (bank 2) 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.) Battery current sensor Crankshaft position sensor (POS) Camshaft position sensor (PHASE) (bank 2) Accelerator pedal position sensor EVAP control system 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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

- 1. Start engine and wait at least 10 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-434, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000006134343

1. CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between battery current sensor harness connector and ground.

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Battery cur | rent sensor | Ground | Voltage (V) | |
|-------------|-------------|--------|-------------|--|
| Connector | Terminal | | | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 3.

3.check battery current sensor power supply circuit-ii

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E21 | 1 | F102 | 64 | Existed |

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E20
- Harness for open between battery current sensor and ECM

>> Repair open circuit.

5. 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 | |
| F101 | 46 | 46 CKP sensor (POS) | | 1 | |
| F102 64 | | CMP sensor (PHASE) (bank 2) | F18 | 1 | |
| F 102 | 04 | Battery current sensor | E21 | ' | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | |
| WITO | 107 | EVAP control system pressure sensor | | 3 | |
| | Refrigerant pressure sensor | E77 | 3 | | |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

6. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-306, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- EVAP control system pressure sensor (Refer to <u>EC-340, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

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^{*2:} Without ICC

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-441, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

9.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E21 | 3 | F102 | 95 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between battery current sensor and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| ٠ | Battery current sensor | | ECM | | Continuity |
|---|------------------------|----------|-----------|----------|------------|
| | Connector | Terminal | Connector | Terminal | Continuity |
| | E21 | 4 | F102 | 91 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-441, "Component Inspection".

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000006134344

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

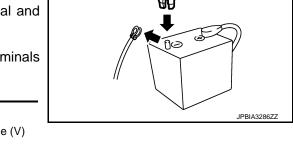
>> INSPECTION END

Component Inspection

1. CHECK BATTERY CURRENT SENSOR

- Turn ignition switch OFF.
- Reconnect harness connectors disconnected. 2.
- Disconnect battery negative cable (1).
 - To body ground
- Install jumper cable (A) between battery negative terminal and body ground.
- Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

| Connector | + | _ | Voltage (V) |
|-----------|---------------------------------------|----------|-------------|
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

EC-437 Revision: 2010 June 2011 M37/M56

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[VQ37VHR]

P1554 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------------------|--|--|
| P1554 | Battery current sensor performance | The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough. | Harness or connectors (Battery current sensor circuit is open or shorted.) [CKP sensor (POS) circuit is open or shorted.] [CMP sensor (PHASE) (bank 2) 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.) Battery current sensor Crankshaft position sensor (POS) Camshaft position sensor (PHASE) (bank 2) Accelerator pedal position sensor EVAP control system pressure sensor Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-438, "Component Function Check".

NOTE:

Use component function check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-439, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005913908

1.PRECONDITIONING

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is more than 12.8 V at idle.
- Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

(P)With CONSULT-III

- Start engine and let it idle.
- 2. Select "BAT CUR SEN" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BAT CUR SEN" indication for 10 seconds.
 - "BAT CUR SEN" should be above 2,300 mV at least once.

Without CONSULT-III

- 1. Start engine and let it idle.
- Check the voltage between ECM harness connector terminals as per the following.

P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Connector + - Voltage (V) Terminal Terminal F102 91 (Battery current sensor signal) 95 Above 2.3 at least once | EC | | | | | |
|---|-----------|--|--|--|--|--|
| F102 Terminal Terminal 91 (Battery current sensor signal) 95 Above 2.3 at least once | | | | | | |
| F102 (Battery current sensor signal) 95 Above 2.3 at least once | | | | | | |
| | С | | | | | |
| Is the inspection result normal? | | | | | | |
| YES >> INSPECTION END NO >> Go to EC-439. "Diagnosis Procedure" | | | | | | |
| Diagnosis Procedure | D | | | | | |
| 1. CHECK GROUND CONNECTION | | | | | | |
| Turn ignition switch OFF. | Е | | | | | |
| 2. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection". | | | | | | |
| Is the inspection result normal? YES >> GO TO 2. | F | | | | | |
| NO >> Repair or replace ground connection. | | | | | | |
| 2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I | G | | | | | |
| Disconnect battery current sensor harness connector. | | | | | | |
| Turn ignition switch ON. Check the voltage between battery current sensor harness connector and ground. | Н | | | | | |
| | 11 | | | | | |
| Battery current sensor Ground Voltage (V) | | | | | | |
| Connector Terminal | | | | | | |
| E21 1 Ground Approx. 5 | | | | | | |
| <u>Is the inspection result normal?</u> YES >> GO TO 9. | J | | | | | |
| NO >> GO TO 3. | | | | | | |
| 3. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II | K | | | | | |
| Turn ignition switch OFF. | | | | | | |
| Disconnect ECM harness connector. Check the continuity between battery current sensor harness connector and ECM harness connector. | 1 | | | | | |
| | _ | | | | | |
| Battery current sensor ECM Continuity | | | | | | |
| Connector Terminal Connector Terminal | M | | | | | |
| E21 1 F102 64 Existed | | | | | | |
| Is the inspection result normal? | Ν | | | | | |
| YES >> GO TO 5. NO >> GO TO 4. | | | | | | |
| 4. DETECT MALFUNCTIONING PART | | | | | | |
| Check the following. | | | | | | |
| Harness connectors F40, E20 Harness for open between battery current sensor and ECM | Р | | | | | |

>> Repair open circuit.

${\bf 5.} {\tt CHECK \, SENSOR \, POWER \, SUPPLY \, CIRCUIT}$

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | | |
|-----------|----------|-------------------------------------|--|------------------------------------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F101 | 46 | CKP sensor (POS) | F2 | 1 | |
| F102 | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 | |
| F102 | 04 | Battery current sensor | E21 | ı | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | |
| W107 | 107 | EVAP control system pressure sensor | B73 | 3 | |
| | | Refrigerant pressure sensor | E77 | 3 | |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

6. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-306, "Component Inspection".)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-340, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-522</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-441, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 8.

8.replace accelerator pedal assembly

- 1. Replace accelerator pedal assembly.
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

$9.\mathsf{check}$ battery current sensor ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| , | Battery current sensor | | ECM | | Continuity |
|---|------------------------|----------|-----------|----------|------------|
| | Connector | Terminal | Connector | Terminal | Continuity |
| | E21 | 3 | F102 | 95 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

• Harness connectors E20, F40

^{*2:} Without ICC

P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Harness for open or short between battery current sensor and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 4 | F102 | 91 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

>> GO TO 13. YES NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- · Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-441, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

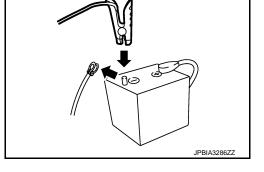
>> INSPECTION END

Component Inspection

1. CHECK BATTERY CURRENT SENSOR

- Turn ignition switch OFF.
- Reconnect harness connectors disconnected.
- Disconnect battery negative cable (1).
 - To body ground
- Install jumper cable (A) between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals as per the following.

| Connector | + | + - | |
|-----------|---------------------------------------|----------|-------------|
| Connector | Terminal | Terminal | |
| F102 | 91 (Battery current sensor signal) | 95 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

Is the inspection result normal?

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P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS > [VQ37VHR]

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

P1556, P1557 BATTERY TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1556, P1557 BATTERY TEMPERATURE SENSOR

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | С |
|---------|---|---|--|-------------|
| P1556 | BAT TMP SEN/CIRC (Battery temperature sensor circuit low input) | Signal voltage from Battery temperature sensor remains 0.16V or less for 5 seconds or more. | Harness or connectors [Battery current sensor (Battery temperature sensor) circuit is shorted.] (Capalabatt position appear signification) | D |
| P1557 | BAT TMP SEN/CIRC (Battery temperature sensor circuit high input) | Signal voltage from Battery temperature sensor remains 4.84V or more for 5 seconds or more. | (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 2) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Battery current sensor (Battery temperature sensor) Crankshaft position sensor Camshaft position sensor (bank 2) Accelerator pedal position sensor 2 EVAP control system pressure sensor Refrigerant pressure sensor | E F G |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start the engine and let it idle at least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-443, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

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1. CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-I

- Disconnect battery current sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between battery current sensor hrness connector and ground.

| Battery current sensor | | Ground | Voltage (V) | |
|------------------------|----------|---------|-------------|--|
| Connector | Terminal | Giodila | voltage (v) | |
| E21 | 2 | Ground | Approx. 5 V | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 2.

2.CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch ON.

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P1556, P1557 BATTERY TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 2 | F102 | 83 | Existed |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit.

3. 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 | |
| F101 | 46 | CKP sensor (POS) | F2 | 1 | |
| E102 | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 | |
| F102 64 | 04 | Battery current sensor | E21 | ı | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | |
| IVITO7 | 107 | EVAP control system pressure sensor | B73 | 3 | |
| | 107 | Refrigerant pressure sensor | E77 | 3 | |

^{*1:} With ICC

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 2) (Refer to EC-311, "Component Inspection".)
- CKP sensor (Refer to EC-306, "Component Inspection".)
- Battery current sensor sensor (Refer to EC-429, "Component Inspection".)
- EVAP control system pressure sensor (Refer to <u>EC-340, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-479, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

>> INSPECTION END

7.CHECK BATTERY TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

^{*2:} Without ICC

P1556, P1557 BATTERY TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| | | | | | _ | | |
|-----------------|---------------------|---------------|------------------|------------|---|-------------------------|----|
| Battery curr | ent sensor | EC | CM | Continuity | | | А |
| Connector | Terminal | Connector | Terminal | | <u> </u> | , | |
| E21 | 3 | M160 | 150 | Existed | _ | | EC |
| | | | _ | nd and sh | nort to power. | | |
| Is the inspe | oction res GO TO | | <u>'</u> | | | | |
| | | | , short to | ground or | short to power in harness or connectors. | | С |
| 8.CHECK | • | - | | • | · | | |
| Refer to E0 | C-445, "C | omponent | Inspection | (Battery | Temprature Sensor)". | | D |
| Is the inspe | | | | • | | | |
| | GO TO | | | | | | Е |
| _ | • | battery ne | • | ole assem | nbly. | | |
| 9.CHECK | | | | | | | |
| Refer to GI | <u>-38, "Inte</u> | rmittent Inc | <u>cident"</u> . | | | | F |
| | NSPEC | TION END | , | | | | |
| | | _ | | Tomoro | itura Canaar) | | G |
| Compon | eni msp | ection (| Dallery | тетпрга | ture Sensor) | INFOID:0000000006134349 | |
| 1. CHECK | BATTER | Y TEMPER | RATURE | SENSOR | | | Н |
| | nition swi | | | | | | |
| | | ery current | | v current | sensor connector terminals. | | |
| J. CHECK | 116 163131 | ance betw | cen balle | y current | sensor connector terminals. | | I |
| | Battery | current senso | or | | | | |
| | + | | _ | | Resistance | | J |
| | ٦ | Terminal | | | | | |
| | 2 | | 3 | | tinuity with the resis- ce value 100 Ω or more | | K |
| Is the inspe | ection res | ult normal? |) | | | | |
| | | TION END | | | | | ı |
| NO >> | > Replace | battery ne | gative cal | ble assem | nbly. | | |
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[VQ37VHR]

P1564 ASCD STEERING SWITCH

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|---|
| P1564 | ASCD steering switch | 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. | Harness or connectors (The 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 procedure before conducting the next test.

- 1. 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. 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.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Check DTC.

Is DTC detected?

YES >> Go to EC-446, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913913

1.CHECK GROUND CONNECTION

- 1. Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK ASCD STEERING SWITCH CIRCUIT

(P) With CONSULT-III

- Turn ignition switch ON.
- Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check each item indication under the following conditions.

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Monitor item | Condition | | Indication |
|---------------|-------------------|----------|------------|
| MAIN SW | MAIN switch | Pressed | ON |
| WAIN SW | WAIN SWILCH | Released | OFF |
| CANCEL SW | CANCEL switch | Pressed | ON |
| CANCLL SW | CANCLE SWILLI | Released | OFF |
| RESUME/ACC SW | RESUME/ACCEL- | Pressed | ON |
| RESONE/ACC SW | ERATE switch | Released | OFF |
| SET SW | SET/COAST switch | Pressed | ON |
| JL1 344 | SE 1/COAST SWIICH | Released | OFF |

Without CONSULT-III

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|-----------------------------------|----------------------------------|--------------------------------------|-------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | 101 ASCD steering switch signal) | MAIN switch: Pressed | Approx. 0 | |
| M107 | 101 (ASCD steering switch signal) | | CANCEL switch: Pressed | Approx. 1 | |
| | | | SET/COAST switch: Pressed | Approx. 2 | |
| | (, to ob stooming owner digital) | | RESUME/ACCELERATE switch: Pressed | Approx. 3 | |
| | | | All ASCD steering switches: Released | Approx. 4 | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 3.

3.check ascd steering switch ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect combination switch harness connector.
- Check the continuity between combination switch and ECM harness connector.

| Combination switch | ECM | | Continuity |
|--------------------|-----------|----------|------------|
| Terminal | Connector | Terminal | Continuity |
| 16 | M107 | 108 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- · Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

${f 5.}$ CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

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P1564 ASCD STEERING SWITCH

[VQ37VHR]

| Combination switch | ECM | | Continuity | |
|--------------------|--------------------|-----|------------|--|
| Terminal | Connector Terminal | | Continuity | |
| 13 | M107 | 101 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- · Harness for open and short between ECM and combination switch
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK ASCD STEERING SWITCH

Refer to EC-448, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ASCD steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913914

1. CHECK ASCD STEERING SWITCH

- 1. Turn ignition switch OFF.
- 2. Disconnect combination switch (spiral cable) harness connector M303.
- Check resistance between combination switch harness connector terminals under the following conditions.

| Combination switch | | Condition | Resistance (Ω) | |
|--------------------|-----------|--------------------------------------|-------------------|--|
| Connector | Terminals | Condition | ivesistatice (22) | |
| M303 | 13 and 16 | MAIN switch: Pressed | Approx. 0 | |
| | | CANCEL switch: Pressed | Approx. 250 | |
| | | SET/COAST switch: Pressed | Approx. 660 | |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 1,480 | |
| | | All ASCD steering switches: Released | Approx. 4,000 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch

P1564 ICC STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1564 ICC STEERING SWITCH

DTC Logic INFOID:0000000005913916

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|---|--|
| P1564 | ICC steering switch | An excessively high voltage signal from the ICC steering switch is sent to ECM. ECM detects that input signal from the ICC steering switch is out of the specified range. ECM detects that the ICC steering switch is stuck ON. | Harness or connectors (The switch circuit is open or shorted.) ICC steering switch ECM |

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 DYNAMIC DRIVE ASSISTANCE SYSTEMS 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 sec-
- 6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 7. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- Check DTC.

Is DTC detected?

YES >> Go to EC-449, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.check icc steering switch circuit

(P) With CONSULT-III

- Turn ignition switch ON.
- Select "MAIN SW", "DYNAMIC DRIVE ASSISTANCE SYSTEMS SW", "CANCEL SW", "RESUME/ACC SW", "SET SW" and "DIST SW" in "DATA MONITOR" mode with CONSULT-III.

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Check each item indication under the following conditions.

| Monitor item | Condition | | Indication |
|----------------------------|--------------------------------|----------|------------|
| MAIN SW | MAIN switch | Pressed | ON |
| MAIN SW | WAIN SWICH | Released | OFF |
| DYNAMIC DRIVE | DYNAMIC DRIVE | Pressed | ON |
| ASSISTANCE SYS- TEMS SW | ASSISTANCE SYS- TEMS switch | Released | OFF |
| CANCEL SW | CANCEL switch | Pressed | ON |
| CANCLL SW | | Released | OFF |
| RESUME/ACC SW | RESUME/ACCEL- ERATE switch | Pressed | ON |
| RESOME/ACC SW | | Released | OFF |
| SET SW | SET/COAST switch | Pressed | ON |
| SL1 SW | SET/COAST SWITCH | Released | OFF |
| DIST SW | DISTANCE switch | Pressed | ON |
| | DIGITATIOE SWITCH | Released | OFF |

(R) Without CONSULT-III

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | |
|-----------|-----------------------------------|----------|--|-------------|
| Connector | + | _ | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | M107 (ICC steering switch signal) | | MAIN switch: Pressed | Approx. 0 |
| | | 108 | DYNAMIC DRIVE ASSISTANCE SYSTEMS switch: Pressed | Approx. 1.0 |
| | | | CANCEL switch: Pressed | Approx. 1.9 |
| M107 | | | DISTANCE switch: Pressed | Approx. 2.6 |
| | | | SET/COAST switch: Pressed | Approx. 3.2 |
| | | | RESUME/ACCELERATE switch: Pressed | Approx. 3.7 |
| | | | All ICC steering switches: Released | Approx. 4.2 |

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 3.

${f 3.}$ CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect combination switch harness connector.
- 4. Check the continuity between combination switch and ECM harness connector.

| Combination switch | ECM | | Continuity | |
|--------------------|-----------|----------|------------|--|
| Terminal | Connector | Terminal | Continuity | |
| 16 | M107 | 108 | Existed | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

P1564 ICC STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.check icc steering switch input signal circuit for open and short

Check the continuity between combination switch and ECM harness connector.

| Combination switch | EC | Continuity | |
|--------------------|-----------|------------|------------|
| Terminal | Connector | Terminal | Continuity |
| 13 | M107 | 101 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK ICC STEERING SWITCH

Refer to EC-451, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace ICC steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK ICC STEERING SWITCH

- Turn ignition switch OFF.
- Disconnect combination switch (spiral cable) harness connector M303.
- Check resistance between combination switch harness connector terminals under the following conditions.

| Combination switch | | Condition | Resistance (Ω) | |
|--------------------|-----------|--|-------------------|--|
| Connector | Terminals | Condition | 110313181100 (22) | |
| | | MAIN switch: Pressed | Approx. 0 | |
| | | DYNAMIC DRIVE ASSISTANCE SYSTEMS switch: Pressed | Approx. 270 | |
| 14000 | 13 and 16 | CANCEL switch: Pressed | Approx. 620 | |
| M303 | | DISTANCE switch: Pressed | Approx. 1,090 | |
| | | SET/COAST switch: Pressed | Approx. 1,810 | |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 2,990 | |
| | | All ICC steering switches: Released | Approx. 5,420 | |

Is the inspection result normal?

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P1564 ICC STEERING SWITCH

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

NO >> Replace ICC steering switch

P1568 ICC FUNCTION

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

P1568 ICC FUNCTION

DTC Logic INFOID:0000000005913919

DTC DETECTION LOGIC

NOTE:

- If DTC P1568 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P1568 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".
- If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".

| _ | DTC No. | Trouble Diagnosis Name | DTC Detecting Condition | Possible Cause |
|---|---------|---------------------------|--|--|
| | P1568 | ICC function | ECM detects a difference between signals from ADAS control unit is out of specified range. | Harness or connectors (The CAN communication line is open or shorted.) ADAS control unit 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.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Step 4 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

- Turn ignition switch ON.
- 2. Press MAIN switch on ICC steering switch.
- 3. Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION:

Always drive vehicle at a safe speed.

- Press SET/COAST switch.
- 5. Check DTC.

Is DTC detected?

YES >> Go to EC-453, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. REPLACE ADAS CONTROL UNIT

- 1. Replace ADAS control unit.
- Perform CCS-80, "Work Procedure (Vehicle-To-Vehicle Distance Control Mode)".
- Check DTC of ADAS control unit. Refer to CCS-30, "On Board Diagnosis Function".

>> INSPECTION END

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EC-453 Revision: 2010 June 2011 M37/M56

P1572 ASCD BRAKE SWITCH

Description INFOID:000000005913921

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-49, "AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description" for the ASCD function.

DTC Logic INFOID:000000005913922

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "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 | | DTC detecting condition | Possible cause |
|---------|-------------------------|----|--|---|
| | | 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. | Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors (The ASCD brake switch circuit is shorted.) |
| P1572 | P1572 ASCD brake switch | В) | ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | Stop lamp switch ASCD brake switch Incorrect stop lamp switch installation Incorrect ASCD brake switch installation ECM |

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.
- 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.

| Vehicle speed | More than 30 km/h (19 mph) |
|----------------|----------------------------|
| Selector lever | Suitable position |

Check 1st trip DTC.

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is 1st trip DTC detected?

YES >> Go to EC-455, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

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 >> Go to EC-455, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK OVERALL FUNCTION-I

(P) With CONSULT-III

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| | Brake pedal | Fully released | ON |

(R) Without CONSULT-III

- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|----------------------------|----------|-------------|--------------------|-----------------|
| Connector | + | _ | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M107 | 126 | 128 | Brake pedal | Slightly depressed | Approx. 0 |
| IVI TO 7 | (ASCD brake switch signal) | 128 | Brake pedal | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

(P) With CONSULT-III

Select "BRAKE SW2" and check indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| BRARE 3W2 | | Fully released | OFF |

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< DTC/CIRCUIT DIAGNOSIS >

⋈ Without CONSULT-III

Check the voltage between ECM harness connector terminals as per the following.

| | ECM | Condition | | | |
|-------------|---------------------------|-----------|-------------|--------------------|-----------------|
| Connector + | | | | _ | Voltage (V) |
| Connector | Terminal Terminal | | | | |
| M107 | 122 | 128 | Brake pedal | Slightly depressed | Battery voltage |
| IVITO7 | (Stop lamp switch signal) | 120 | Diake pedal | Fully released | Approx. 0 |

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 8.

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.

| ASCD bra | ake switch | Ground | Voltage | |
|-----------|--------------------|--------|-----------------|--|
| Connector | Connector Terminal | | voltage | |
| E109 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ASCD brake switch and fuse
 - >> Repair open circuit or short to ground in harness or connectors.

5.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

| ASCD bra | ake switch | E | Continuity | |
|--------------------|------------|-----------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| E109 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ECM and ASCD brake switch
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

.CHECK ASCD BRAKE SWITCH

P1572 ASCD BRAKE SWITCH

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > Refer to EC-458, "Component Inspection (ASCD Brake Switch)" Α Is the inspection result normal? YES >> GO TO 13. NO >> Replace ASCD brake switch. EC 8.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT Turn ignition switch OFF. Disconnect stop lamp switch harness connector. Check the voltage between stop lamp switch harness connector and ground. Stop lamp switch D Ground Voltage Connector Terminal F110 Ground 1 Battery voltage Е Is the inspection result normal? YES >> GO TO 10. >> GO TO 9. NO F 9. DETECT MALFUNCTIONING PART Check the following. Fuse block (J/B) connector E103 10A fuse (No. 7) Harness for open or short between stop lamp switch and battery Н >> Repair open circuit, short to ground or short to power in harness or connectors. 10.check stop lamp switch input signal circuit for open and short Disconnect ECM harness connector. Check the continuity between stop lamp switch harness connector and ECM harness connector. **ECM** Stop lamp switch Continuity Connector Connector **Terminal Terminal** E110 2 M107 122 Existed Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 12. NO >> GO TO 11. 11. DETECT MALFUNCTIONING PART Check the following. Fuse block (J/B) connectors E103, M2 · Harness for open or short between ECM and stop lamp switch Ν >> Repair open circuit, short to ground or short to power in harness or connectors. 12. CHECK STOP LAMP SWITCH Refer to EC-458, "Component Inspection (Stop Lamp Switch)" Is the inspection result normal? Р YES >> GO TO 13. NO >> Replace stop lamp switch. 13. CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident".

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>> INSPECTION END

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Component Inspection (ASCD Brake Switch)

INFOID:0000000005913924

1. CHECK ASCD BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | Бтаке рецаг | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

- 1. Adjust ASCD brake switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | С | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | вгаке редаг | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch.

Component Inspection (Stop Lamp Switch)

INFOID:0000000005913926

1. CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | вгаке редаг | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

- Adjust stop lamp switch installation. Refer to <u>BR-19</u>, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| 1 4114 2 | Бтакс редаг | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1572 ICC BRAKE SWITCH

DTC Logic INFOID:0000000005913928

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "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 | DTC detecting condition | | Possible cause |
|---------|------------------------|-------------------------|--|---|
| | | A) | ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time. | Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors |
| P1572 | ICC brake switch | B) | ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven | (The ICC brake switch circuit is shorted.) Stop lamp switch ICC brake switch ICC brake hold relay Incorrect stop lamp switch installation Incorrect ICC brake switch installation ECM |

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. 2.
- 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

- 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.

| Vehicle speed | More than 30 km/h (19 mph) |
|----------------|----------------------------|
| Selector lever | Suitable position |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-460, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

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< DTC/CIRCUIT DIAGNOSIS >

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 >> Go to EC-460, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913929

1. CHECK OVERALL FUNCTION-I

(II) With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- 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-III

- Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following condtions.

| | ECM | | | | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|--|
| Connector | + | _ | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| M107 | 126 | 128 | Brake pedal | Slightly depressed | Approx. 0 | |
| IVITO7 | (ICC brake switch signal) | 120 | Brake pedal | Fully released | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

(P) With CONSULT-III

Select "BRAKE SW2" and check indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-------------|--------------------|------------|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| | втаке редаг | Fully released | OFF |

⋈ Without CONSULT-III

Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | | |
|-----------|-------------------------------|------------------------|-------------|--------------------|-----------------|--|
| Connector | + | _ | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| M107 | 122 | 122 128 Brake pedal | | Slightly depressed | Battery voltage | |
| IVITO7 | (Stop lamp switch signal) 128 | | brake pedal | Fully released | Approx. 0 | |

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Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 8.

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3.check icc brake switch power supply circuit

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ICC brake switch harness connector and ground.

| ICC brak | e switch | Ground | Voltage | |
|-----------|----------|---------|-----------------|--|
| Connector | Terminal | Giodila | Voltage | |
| E114 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 5. NO >> GO TO 4. Н

4. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse

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>> Repair open circuit or short to ground in harness or connectors.

5.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brak | e switch | EC | CM | Continuity | |
|-----------|----------|--------------------|-----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| E114 | 2 | M107 | 126 | Existed | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6. Ν

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK ICC BRAKE SWITCH

Refer to EC-463, "Component Inspection (ICC Brake Switch)".

Revision: 2010 June **EC-461** 2011 M37/M56

P1572 ICC BRAKE SWITCH

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace ICC brake switch.

8. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

- 2. Disconnect stop lamp switch harness connector.
- 3. Disconnect ICC brake hold relay harness connector.
- 4. Check the voltage between stop lamp switch harness connector and ground.

| Stop lam | p switch | Ground | Voltage | |
|-----------|----------|---------|-----------------|--|
| Connector | Terminal | Giodila | voltage | |
| E110 | 1 | Ground | Battery voltage | |

5. Check the voltage between ICC brake hold relay harness connector and ground.

| ICC brake | hold relay | Ground | Voltage |
|-----------|------------|---------|-----------------|
| Connector | Terminal | Giodila | voltage |
| E92 | 5 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between battery and stop lamp switch
- Harness for open or short between battery and ICC brake hold relay

>> Repair open circuit or short to ground in harness or connectors.

10. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- Check the continuity between stop lamp switch harness connector and ECM harness connector.

| Stop lamp switch | | EC | Continuity | |
|------------------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E110 | 2 | M107 | 122 | Existed |

3. Check the continuity between ICC brake hold relay harness connector and ECM harness connector.

| ICC brake hold relay | | ECM | | Continuity |
|----------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E92 | 3 | M107 | 122 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103, M2
- Harness for open or short between ECM and stop lamp switch
- Harness for open or short between ECM and ICC brake hold relay

P1572 ICC BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000005913932

| >: | > Repair ope | en circuit, short to | ground or sh | ort to power in harness or connectors. | Α |
|--------------------|----------------------------|--------------------------|---------------|--|----|
| | | AMP SWITCH | J | · | |
| Refer to E | C-463, "Con | nponent Inspection | (Stop Lamp | Switch)". | EC |
| Is the insp | ection result | normal? | | | |
| | > GO TO 13 | | | | |
| | - | top lamp switch. | _ | | С |
| | | AKE HOLD RELAY | | | |
| · | | nponent Inspection | n (ICC Brake | Hold Relay)". | D |
| | ection result | | | | |
| | > GO TO 14 > Replace I0 | ⊦. CC brake hold rela | IV. | | |
| | = | ITTENT INCIDEN | - | | Е |
| | | nittent Incident". | • | - | |
| ivelel to <u>o</u> | i-oo, intern | interit iriciderit. | | | F |
| >: | > INSPECT | ION END | | | |
| Compon | ent Insne | ection (ICC Bra | ake Switch | 1 | |
| | • | , | ano Ownor |) INFOID:0000000005913930 | G |
| 1.CHECK | ICC BRAK | E SWITCH-I | | | |
| | nition switc | | | | Н |
| | | rake switch harnes | | erminals under the following conditions. | |
| J. CHECK | tile continu | ity between icc b | iake switch t | erminals under the following conditions. | |
| Terminals | (| Condition | Continuity | | ı |
| | | Fully released | Existed | | |
| 1 and 2 | Brake pedal | Slightly depressed | Not existed | | J |
| Is the insp | ection result | normal? | | | |
| | > INSPECT | ION END | | | K |
| ^ | > GO TO 2. | | | | 11 |
| Z.CHECK | ICC BRAK | E SWITCH-II | | | |
| 1. Adjust | ICC brake | switch installation. | Refer to BR | 19, "Inspection and Adjustment". | L |
| 2. Check | tne continu | ity between ICC b | rake switch t | erminals under the following conditions. | |
| Terminals | (| Condition | Continuity | | M |
| | | Fully released | Existed | | |
| 1 and 2 | Brake pedal | Slightly depressed | Not existed | | |
| Is the insp | ection result | normal? | | | Ν |
| YES > | > INSPECT | ION END | | | |
| NO >: | > Replace I | CC brake switch. | | | 0 |
| Compon | ent Insne | ection (Stop La | mn Switch | n) | |

Component Inspection (Stop Lamp Switch)

1. CHECK STOP LAMP SWITCH-I

- Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- Check the continuity between stop lamp switch terminals under the following conditions.

< DTC/CIRCUIT DIAGNOSIS >

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | brake pedar | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-19, "Inspection and Adjustment".

2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch.

Component Inspection (ICC Brake Hold Relay)

INFOID:0000000005913933

2011 M37/M56

1. CHECK ICC BRAKE HOLD RELAY

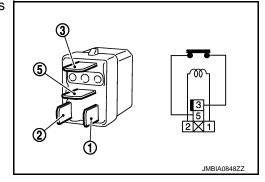
- 1. Turn ignition switch OFF.
- 2. Remove ICC brake hold relay.
- 3. Check the continuity between ICC brake hold relay terminals under the following conditions.

| Terminals | Condition | Continuity |
|-----------|---|-------------|
| 3 and 5 | 12V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake hold relay



< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1574 ASCD VEHICLE SPEED SENSOR

Description INFOID:0000000005913934

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-49, "AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description" for ASCD functions.

INFOID:0000000005913935

DTC Logic

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-362, "DTC Logic".
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------|---|---|
| P1574 | ASCD vehicle speed sensor | The difference between the two vehicle speed signals is out of the specified range. | 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.

- 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 (VDC switch OFF).
- 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 >> Go to EC-465, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-56, "Diagnosis Description".

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INFOID:0000000005913936

P1574 ASCD VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

 $2.\mathsf{CHECK}$ DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-41, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3.CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

>> INSPECTION END

[VQ37VHR]

INFOID:0000000005913938

P1574 ICC VEHICLE SPEED SENSOR

Description INFOID:0000000005913937

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 ICC control. Refer to CCS-12, "System Description" for ICC functions.

DTC Logic

DTC DETECTION LOGIC

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-362, "DTC Logic".
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--------------------------|---|---|
| P1574 | ICC vehicle speed sensor | The difference between the two vehicle speed signals is out of the specified range. | 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.

- 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 (VDC switch OFF).
- Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION:

Always drive vehicle at a safe speed.

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.

Check DTC.

Is DTC detected?

YES >> Go to EC-467, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-56, "Diagnosis Description".

Is the inspection result normal?

EC-467 Revision: 2010 June 2011 M37/M56

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INFOID:0000000005913939

P1574 ICC VEHICLE SPEED SENSOR

[VQ37VHR]

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

 $2. {\sf CHECK} \ {\sf DTC} \ {\sf WITH} \ "{\sf ABS} \ {\sf ACTUATOR} \ {\sf AND} \ {\sf ELECTRIC} \ {\sf UNIT} \ ({\sf CONTROL} \ {\sf UNIT})"$

Refer to BRC-41, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

 $3. {\sf CHECK} \ {\sf DTC} \ {\sf WITH} \ "COMBINATION METER"$

Check combination meter function.

Refer to MWI-30, "CONSULT-III Function".

>> INSPECTION END

P1606 VVEL CONTROL MODULE

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

P1606 VVEL CONTROL MODULE

DTC Logic INFOID:0000000005913941

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|--|---------------------|
| P1606 | VVEL control module | VVEL control module calculation function is malfunctioning. VVEL EEP-ROM system is malfunctioning. | VVEL control module |

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.
- 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

- Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-469, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

$oldsymbol{1}$. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Erase DTC.
- Perform DTC Confirmation Procedure. See EC-469, "DTC Logic".

Is the DTC P1606 displayed again?

YES >> GO TO 2. NO >> INSPECTION END

2.replace vvel control module

- Replace VVEL control module.
- Go to EC-148, "Work Procedure".

>> INSPECTION END

EC-469 Revision: 2010 June 2011 M37/M56

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P1607 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

P1607 VVEL CONTROL MODULE

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------|--|---------------------|
| P1607 | VVEL control module circuit | The internal circuit of the VVEL control module is malfunctioning. | VVEL control module |

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 at least 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-470, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913945

1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-470</u>, "<u>DTC Logic"</u>.

Is the DTC P1607 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.replace vvel control module

- 1. Replace VVEL control module.
- 2. Go to EC-148, "Work Procedure".

>> INSPECTION END

P1608 VVEL SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

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P1608 VVEL SENSOR POWER SUPPLY

DTC Logic INFOID:0000000005913946

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|----------------------------------|--|--|
| P1608 | VVEL sensor power supply circuit | VVEL control module detects a voltage of power source for sensor is excessively low or high. | Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) VVEL control shaft position sensor VVEL control module |

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.
- 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

- Turn ignition switch ON and wait at least 1 second.
- Check DTC.

Is DTC detected?

YES >> Go to EC-471, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

>> GO TO 2. YES

NO >> Repair or replace ground connection.

2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

- Disconnect VVEL control shaft position sensor harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between VVEL control shaft position sensor harness connector and ground.

| VVEL | VVEL control shaft position sensor | | | Voltage (V) |
|------|------------------------------------|---|--------|-------------|
| Bank | k Connector Terminal | | Ground | voltage (v) |
| 1 | F46 | 3 | Ground | Approx. 5 |
| , | 1 40 | 6 | | |
| 2 | F47 | 3 | | |
| 2 | | 6 | | |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

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[VQ37VHR]

3.check vvel control shaft position sensor power supply circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL control module harness connector.
- Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

| VVEL control shaft position sensor | | | VVEL control module | | Continuity |
|------------------------------------|-----------|----------|---------------------|----------|------------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F46 | 3 | E15 | 9 | |
| 1 | F40 | 6 | | 22 | Existed |
| - | F47 | 3 | | 7 | Existed |
| 2 | | 6 | | 20 | |

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module.
- 2. Go to EC-148, "Work Procedure".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace.

8.REPLACE VVEL ACTUATOR SUB ASSEMBLY

- 1. Replace VVEL actuator sub assembly.
- Go to EC-472, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005913948

1. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-154, "Work Procedure".

P1608 VVEL SENSOR POWER SUPPLY [VQ37VHR] < DTC/CIRCUIT DIAGNOSIS > >> GO TO 2. 2.PERFORM IDLE AIR VOLUME LEARNING Α Refer to EC-152, "Work Procedure". EC >> END D Е F Н

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[VQ37VHR]

P1805 BRAKE SWITCH

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|------------------------|---|--|
| P1805 | Brake switch | A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | I Ston Jamn switch circuit is onen or short- |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Fully depress the brake pedal for at least 5 seconds.
- Erase the DTC.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-474, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913951

1. CHECK STOP LAMP SWITCH CIRCUIT

- Turn ignition switch OFF.
- 2. 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

- 1. Disconnect stop lamp switch harness connector.
- 2. Check the voltage between stop lamp switch harness connector and ground.

| Stop lan | np switch | Ground | Voltage |
|--------------------|-----------|--------|-----------------|
| Connector Terminal | | Ground | Voltage |
| E110 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

${f 4.}$ CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect stop lamp switch harness connector.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between stop lamp switch harness connector and ECM harness connector.

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| Stop lamp switch | | ECM | | Continuity |
|------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E110 | 2 | M107 | 122 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103, M2
- · Harness for open or short between ECM and stop lamp switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK STOP LAMP SWITCH

Refer to EC-475, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace stop lamp switch.

.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000005913952

1. CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---------------------|-------------|--------------------|-------------|
| 1 and 2 | Proko podal | Fully released | Not existed |
| 1 and 2 Brake pedal | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity | |
|-----------|-------------|--------------------|-------------|--|
| 1 and 2 | Brake pedal | Fully released | Not existed | |
| 1 and 2 | brake pedar | Slightly depressed | Existed | |
| | | | | |

Is the inspection result normal?

P1805 BRAKE SWITCH

[VQ37VHR]

YES >> INSPECTION END

NO >> Replace stop lamp switch.

[VQ37VHR]

P2122, P2123 APP SENSOR

DTC Logic INFOID:0000000005913954

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-378, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P2122 | Accelerator pedal position sensor 1 circuit low input | An excessively low voltage from the APP sensor 1 is sent to ECM. | Harness or connectors (APP sensor 1 circuit is open or shorted.) |
| P2123 | Accelerator pedal position sensor 1 circuit high input | An excessively high voltage from the APP sensor 1 is sent to ECM. | Accelerator pedal position sensor (APP sensor 1) |

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 >> Go to EC-477, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage (V) | |
|--|------------------------------------|---------|-------------|--|
| Connector | Terminal | Giodila | voitage (v) | |
| M153 ^{*1} M9 ^{*2} | 6 ^{*1} 5 ^{*2} | Ground | Approx. 5 | |

*1: With ICC

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INFOID:0000000005913955

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*2: Without ICC

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | EC | CM | Continuity | |
|--|------------------------------------|--------------------|-----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| M153 ^{*1} M9 ^{*2} | 5 ^{*1} 4 ^{*2} | M107 | 100 | Existed | |

^{*1:} With ICC

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | EC | CM | Continuity | |
|--|------------|--------------------|----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| M153 ^{*1} M9 ^{*2} | 4*1 3*2 | M107 | 97 | Existed | |

^{*1:} With ICC

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor

^{*2:} Without ICC

^{*2:} Without ICC

[VQ37VHR]

Α >> Repair open circuit, short to ground or short to power in harness or connectors. 8. CHECK APP SENSOR Refer to EC-479, "Component Inspection". EC Is the inspection result normal? YES >> GO TO 10. NO >> GO TO 9. 9. REPLACE ACCELERATOR PEDAL ASSEMBLY Replace accelerator pedal assembly. D Go to EC-479, "Special Repair Requirement". >> INSPECTION END Е 10. CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". F >> INSPECTION END Component Inspection INFOID:0000000005913956 1. CHECK ACCELERATOR PEDAL POSITION SENSOR Turn ignition switch OFF. Н 2. Reconnect all harness connectors disconnected. 3. Turn ignition switch ON. Check the voltage ECM harness connector terminals as per the following. **ECM** Voltage (V) Condition + Connector **Terminal Terminal** Fully released 0.45 - 1.097 (APP sensor 1) 100 Fully depressed 4.2 - 4.8M107 Accelerator pedal Fully released 0.22 - 0.5098 (APP sensor 2) 104 Fully depressed 2.1 - 2.5Is the inspection result normal? YES >> INSPECTION END NO >> GO TO 2. M 2.REPLACE ACCELERATOR PEDAL ASSEMBLY Replace accelerator pedal assembly. Ν Go to EC-479, "Special Repair Requirement". >> INSPECTION END Special Repair Requirement INFOID:0000000005913957 1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING Р Refer to EC-150, "Work Procedure". >> GO TO 2.

Refer to EC-151, "Work Procedure".

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2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-152, "Work Procedure".

>> END

[VQ37VHR]

P2127, P2128 APP SENSOR

DTC Logic INFOID:0000000005913959

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|---|--|
| P2127 | Accelerator pedal position sensor 2 circuit low input | An excessively low voltage from the APP sensor 2 is sent to ECM. | Harness or connectors (APP sensor 2 circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] |
| P2128 | Accelerator pedal position sensor 2 circuit high input | An excessively high voltage from the APP sensor 2 is sent to ECM. | [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] (Battery current sensor circuit is open or shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) (bank 2) • Battery current sensor • EVAP control system 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.

- 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 >> Go to EC-481, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

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INFOID:0000000005913960

Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage (V) |
|--|------------------------------------|---------|-------------|
| Connector | Terminal | Giodila | voltage (v) |
| M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | Ground | Approx. 5 |

*1: With ICC

*2: Without ICC

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity | |
|--|------------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| M153 ^{*1} M9 ^{*2} | 3*1 6*2 | M107 | 103 | Existed | |

*1: With ICC

*2: Without ICC

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| EC | CM | Sensor | | |
|-----------|-------------------------------------|-----------------------------|--|------------------------------------|
| Connector | Terminal | Name | Connector | Terminal |
| F101 | 46 | CKP sensor (POS) | F2 | 1 |
| F102 | 64 | CMP sensor (PHASE) (bank 2) | F18 | 1 |
| F102 64 | Battery current sensor | E21 | | |
| M107 | 103 | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} |
| IVI I U / | EVAP control system pressure sensor | | B73 | 3 |
| | 107 | Refrigerant pressure sensor | E77 | 3 |

*1: With ICC

Is the inspection result normal?

YES >> GO TO 6.

^{*2:} Without ICC

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

NO >> Repair short to ground or short to power in harness or connectors.

6. CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to <u>EC-306, "Component Inspection"</u>.)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- Battery current sensor (Refer to EC-429, "Component Inspection".)
- EVAP control system pressure sensor (Refer to <u>EC-340, "Component Inspection"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 13.

NO >> Replace malfunctioning component.

.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

| APP s | APP sensor | | ECM | |
|--|------------|------------------|-----|------------|
| Connector | Terminal | Connector Termin | | Continuity |
| M153 ^{*1} M9 ^{*2} | 2 | M107 | 104 | Existed |

^{*1:} With ICC

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8 (With ICC).

>> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC). NO

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between APP sensor harness connector and ECM harness connector.

| APP s | ensor | ECM | | Continuity | |
|--|----------|--------------------|----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| M153 ^{*1} M9 ^{*2} | 1 | M107 | 98 | Existed | |

^{*1:} With ICC

Also check harness for short to ground and short to power.

Is the inspection result normal?

>> GO TO 11. YES

NO >> GO TO 10 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

10.DETECT MALFUNCTIONING PART

Check the following.

Harness connectors M150, M151

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^{*2:} Without ICC

^{*2:} Without ICC

- · Harness for open or short between ECM and accelerator pedal position sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK APP SENSOR

Refer to EC-484, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000005913961

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- Check the voltage ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|-----------------------|-----|-------------------|-----------------|-------------|
| Connector | + | - | Condition | | Voltage (V) |
| Connector | Terminal Terminal | | | | |
| | 97 (APP sensor 1) 100 | | Fully released | 0.45 - 1.0 | |
| M107 | 97 (AFF SellSOI I) | 100 | Accelerator pedal | Fully depressed | 4.2 - 4.8 |
| WHO7 | 98 (APP sensor 2) | 104 | Accelerator pedar | Fully released | 0.22 - 0.50 |
| | 96 (AFF Sellsol 2) | 104 | | Fully depressed | 2.1 - 2.5 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- Go to <u>EC-479</u>, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005913962

1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-150, "Work Procedure".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

| P2127, P2128 APP SENSOR | [\/\O27\/HB] | |
|--|--------------|---------|
| < DTC/CIRCUIT DIAGNOSIS > Refer to <u>EC-151</u> , "Work Procedure". | [VQ37VHR] | |
| >> GO TO 3. 3. PERFORM IDLE AIR VOLUME LEARNING | | A EC |
| Refer to EC-152, "Work Procedure". | | _0 |
| >> END | | С |
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P2138 APP SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-378</u>, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P2138 | 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. | Harness or connectors (APP sensor 2 circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] (Battery current sensor circuit is open or shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 2) Crankshaft position sensor (POS) Camshaft position sensor (PHASE) (bank 2) Battery current sensor EVAP control system 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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

- 1. Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Go to EC-486, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005913965

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

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P2138 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between APP sensor harness connector and ground.

| APP : | sensor | Ground | Voltage (V) | |
|--|------------|---------|-------------|--|
| Connector Terminal | | Giodila | voltage (v) | |
| M153 ^{*1} M9 ^{*2} | 6*1 5*2 | Ground | Approx. 5 | |

*1: With ICC

*2: Without ICC

Is the inspection result normal?

>> GO TO 4. YES

NO >> GO TO 3 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground.

| APP | sensor | Ground | Voltage (V) | |
|--|------------------------------------|--------|-------------|--|
| Connector Terminal | | Ground | voitage (v) | |
| M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | Ground | Approx. 5 | |

*1: With ICC

*2: Without ICC

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 5.

5.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Check the continuity between APP sensor harness connector and ECM harness connector.

| APP s | ensor | EC | Continuity | |
|--|------------------------------------|-----------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | M107 | 103 | Existed |

*1: With ICC

*2: Without ICC

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

6. DETECT MALFUNCTIONING PART

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Check the following.

- Harness connectors M105, M151
- Harness for open or short between ECM and accelerator pedal position sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

7.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 | | |
| F101 | 46 | CKP sensor (POS) | F2 | 1 | | |
| F400 04 | | CMP sensor (PHASE) (bank 2) | F18 | | | |
| F102 | 64 | Battery current sensor | E21 | | | |
| 103 | | APP sensor | M153 ^{*1} M9 ^{*2} | 3 ^{*1} 6 ^{*2} | | |
| M107 | 107 | EVAP control system pressure sensor | B73 | 3 | | |
| | 107 | Refrigerant pressure sensor | E77 | 3 | | |

^{*1:} With ICC

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.

- Crankshaft position sensor (POS) (Refer to EC-306, "Component Inspection".)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-311, "Component Inspection".)
- Battery current sensor (Refer to EC-429, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-340, "Component Inspection".)
- Refrigerant pressure sensor (Refer to <u>EC-522, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace malfunctioning component.

9. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

| APP s | ensor | EC | Continuity | |
|--|------------------------------------|-----------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| M153 ^{*1} M9 ^{*2} | 5 ^{*1} 4 ^{*2} | M107 | 100 | Existed |
| IVIS | 2 | | 104 | |

^{*1:} With ICC

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

^{*2:} Without ICC

^{*2:} Without ICC

P2138 APP SENSOR

[VQ37VHR < DTC/CIRCUIT DIAGNOSIS >

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor

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>> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between APP sensor harness connector and ECM harness connector.

| APP s | ensor | ECM | | Continuity |
|-------------------------------------|------------|-----------|----------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| M153 ^{*1} M9 ^{*2} | 4*1 3*2 | M107 | 97 | Existed |
| IVIS | 1 | | 98 | |

*1: With ICC

*2: Without ICC

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12 (With ICC).

NO >> Repair open circuit, short to ground or short to power in harness or connectors (Without ICC).

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M150, M151
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK APP SENSOR

Refer to EC-489, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.

>> GO TO 14. NO

14.replace accelerator pedal assembly

- Replace accelerator pedal assembly.
- Go to EC-490, "Special Repair Requirement".

>> INSPECTION END

15. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- Check the voltage ECM harness connector terminals as per the following.

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| | ECM | | | | |
|-----------|--------------------|----------|---------------------|-----------------|-------------|
| Connector | + | _ | Cond | dition | Voltage (V) |
| Terminal | | Terminal | | | |
| M107 | 97 (APP sensor 1) | 100 | - Accelerator pedal | Fully released | 0.45 - 1.0 |
| | | | | Fully depressed | 4.2 - 4.8 |
| | 98 (APP sensor 2) | 104 | Accelerator pedar | Fully released | 0.22 - 0.50 |
| | 90 (AFF SellSOI 2) | | | Fully depressed | 2.1 - 2.5 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ACCELERATOR PEDAL ASSEMBLY

- 1. Replace accelerator pedal assembly.
- 2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005913967

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1. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-150, "Work Procedure".

>> GO TO 2.

2.perform throttle valve closed position learning

Refer to EC-151, "Work Procedure".

>> GO TO 3.

3.perform idle air volume learning

Refer to EC-152, "Work Procedure".

>> END

[VQ37VHR]

P2A00, P2A03 A/F SENSOR 1

DTC Logic INFOID:0000000005913969

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 | DTC detecting condition | Possible Cause |
|---------|--|--|--|
| P2A00 | Air fuel ratio (A/F) sensor 1 (bank 1) circuit range/performance | The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period. | A/F sensor 1 A/F sensor 1 heater Fuel pressure |
| P2A03 | Air fuel ratio (A/F) sensor 1 (bank 2) circuit range/performance | • The Δ/E signal computed by ECM from the Δ/E | Fuel injector Intake air 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.
- 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

- Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- 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?

YFS >> Go to EC-491, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK GROUND CONNECTION

- Turn ignition switch OFF.
- Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

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NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to EM-36, "Removal and Installation".

>> GO TO 3.

3.CHECK FOR INTAKE AIR LEAK

Start engine and run it at idle.

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P2A00, P2A03 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- 1. Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".
- 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 <u>EC-275, "Diagnosis Procedure"</u> or <u>EC-279, "Diagnosis Procedure"</u>.

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.

Water should not exit.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace harness connector.

6.check a/f sensor 1 power supply circuit

- 1. Turn ignition switch ON.
- 2. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor | Ground | Voltage | |
|-------|------|------------|----------|---------|-----------------|
| ыс | Bank | Connector | Terminal | Glodila | voltage |
| P2A00 | 1 | F3 | 4 | Ground | Battery voltage |
| P2A03 | 2 | F20 | 4 | Ground | Dattery Voltage |

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 45)
- 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

- 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 | | | EC | Continuity | |
|-------|--------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P2A00 | 1 | F3 | 1 | | 57 | |
| PZA00 | ' | 13 | 2 | F102 | 61 | Existed |
| P2A03 | 2 | F20 | 1 | 1 102 | 65 | LXISIEU |
| FZAU3 | 2 | F20 | 2 | | 66 | |

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 |
|--------|----------------|------|----------|---------|-------------|
| DIC | Bank Connector | | Terminal | Giodila | Continuity |
| P2A00 | 1 F3 | | 1 | | |
| FZAUU | ' | 13 | 2 | Ground | Not existed |
| P2A03 | 2 | F20 | 1 | | |
| 1 2A03 | | 1 20 | 2 | | |

| DTC | ECM | | | Ground | Continuity |
|---------|-----------------------|------|----------|---------|-------------|
| | Bank Connector Termin | | Terminal | Giodila | Continuity |
| P2A00 | 1 | | 57 | Ground | |
| FZA00 | ' | F102 | 61 | | Not existed |
| P2A03 2 | 2 | | 65 | | |
| | | | 66 | | |

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-198, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 11.

10.check intermittent incident

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair or replace.

11.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-III?

YES >> GO TO 12.

NO >> GO TO 13.

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P2A00, P2A03 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

12.CONFIRM A/F ADJUSTMENT DATA

(P)With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that "0.000" is displayed on CONSULT-III screen.

Is "0.000" displayed?

YES >> INSPECTION END

NO >> GO TO 13.

13.clear the mixture ratio self-learning value

Clear the mixture ratio self-learning value. Refer to EC-156, "Work Procedure".

Do you have CONSULT-III?

YES >> GO TO 14.

NO >> INSPECTION END

14. CONFIRM A/F ADJUSTMENT DATA

(II) With CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT-III.
- 3. Make sure that "0.000" is displayed on CONSULT-III screen.

>> INSPECTION END

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

ASCD BRAKE SWITCH

Component Function Check

INFOID:0000000005913972

${f 1}$. CHECK ASCD BRAKE SWITCH FUNCTION

(P) With CONSULT-III

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| BRAKE SW1 | Brake pedal | Fully released | ON |

W Without CONSULT-III

- 1. Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | | | |
|------------|----------------------------|----------|-------------|--------------------|-----------------|
| Connector | + | - | Condition | | Voltage (V) |
| Terminal | | Terminal | | | |
| M107 | 126 | 128 | Brake pedal | Slightly depressed | Approx. 0 |
| (ASCD brak | (ASCD brake switch signal) | 120 | Brake pedal | Fully released | Battery voltage |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-495, "Diagnosis Procedure".

INFOID:0000000005913973

Diagnosis Procedure

1. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- Turn ignition switch ON.
- Check the voltage between ASCD brake switch harness connector and ground.

| ASCD bra | ike switch | Ground | Voltage |
|-----------|------------|---------|-----------------|
| Connector | Terminal | Orodria | voltage |
| E109 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3. NO

>> GO TO 2.

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2.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

3.check ascd brake switch input signal circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between ASCD brake switch harness connector and ECM harness connector.

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| ASCD brake switch | | ECM | | Continuity |
|-------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E109 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- · Harness for open or short between ECM and ASCD brake switch
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK ASCD BRAKE SWITCH

Refer to EC-496, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ASCD brake switch.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000005913974

1. CHECK ASCD BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|---------------------|--------------------|-------------|
| 1 and 2 | 1 and 2 Brake pedal | Fully released | Existed |
| i and 2 | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

- Adjust ASCD brake switch installation. Refer to <u>BR-19</u>. "Inspection and Adjustment".
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | втаке редаг | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch.

ASCD INDICATOR

[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

ASCD INDICATOR

Component Function Check

INFOID:0000000005913977

1. CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

| ASCD INDICATOR | CON | CONDITION | |
|---------------------|--|--|--------------|
| CRUISE LAMP | Ignition switch: ON | MAIN switch: Pressed at the 1st time → at the 2nd time | $ON \to OFF$ |
| SET LAMP • Whe twee | MAIN switch: ON | ASCD: Operating | ON |
| | When vehicle speed is be- tween 40 km/h (25 MPH) and 144 km/h (89 MPH) | ASCD: Not operating | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-497, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913978

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-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.

NO >> Repair or replace. EC

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[VQ37VHR]

COOLING FAN

Component Function Check

INFOID:0000000005913980

1. CHECK COOLING FAN FUNCTION

(II) With CONSULT-III

- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT-III

- Perform IPDM E/R auto active test and check cooling fan motors operation, refer to <u>PCS-11, "Diagnosis</u> Description".
- 2. Make sure that cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-498, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913981

1. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module harness connector and ground.

| Cooling fan o | ontrol module | Ground | Voltage | |
|--------------------|---------------|--------|-----------------|--|
| Connector Terminal | | Ground | voltage | |
| E37 | 3 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 7.

2.CHECK COOLING FAN CONTROL MODULE GROUND CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between cooling fan control module harness connector and ground.

| Cooling fan co | ontrol module | Ground | Continuity |
|--------------------|---------------|---------|------------|
| Connector Terminal | | Giodila | Continuity |
| E37 | 1 | Ground | Existed |

Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to power in harness or connectors.

3.CHECK IPDM E/R GROUND CIRCUIT

- 1. Disconnect IPDM E/R harness connectors.
- 2. Check the continuity between IPDM E/R harness connector and ground.

| IPDM | E/R | Ground | Continuity |
|-----------|--------------------|---------|------------|
| Connector | Connector Terminal | | Continuity |
| E5 | 11 | Ground | Existed |
| E6 | 41 | Giodila | LXISIEU |

Also check harness for short to power.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to power in harness or connectors.

4. CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

- Disconnect IPDM E/R harness connector.
- Check the continuity between IPDM E/R harness connector and cooling fan control module harness connector.

| IPDM E/R | | Cooling fan control module | | Continuity |
|-----------|----------|----------------------------|---|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E9 | 97 | E37 | 2 | Existed |

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.

${f 5.}$ CHECK COOLING FAN CONTROL MODULE OUTPUT SIGNAL CIRCUIT

- 1. Reconnect all harness connectors disconnected.
- Disconnect cooling fan control module harness connectors.
- Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module harness connector and ground.

| Cooling fan control module | | Ground | Voltage | |
|----------------------------|----------|--------|-----------------|--|
| Connector | Terminal | Ground | voltage | |
| E301 | 4 | Ground | Battery voltage | |
| E302 | 6 | Ground | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace cooling fan control module.

O.CHECK COOLING FAN MOTORS -1 AND -2

Refer to EC-500, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan motor.

.CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect cooling fan relay. 2.
- Turn ignition switch ON.
- Check the voltage between cooling fan relay harness connector and ground.

| Cooling fan relay | | Ground | Voltage | |
|-------------------|----------|--------|-----------------|--|
| Connector | Terminal | Ground | vollage | |
| F17 | 1 | Ground | Battery voltage | |
| L17 | 3 | Ground | Dattery voltage | |

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

• 10A fuse (No. 42)

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- IPDM E/R harness connector E7
- 50A fusible link (letter O)
- · Harness for open or short between cooling fan relay and fuse
- Harness for open or short between cooling fan relay and battery
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connector.
- 3. Check the continuity between cooling fan relay harness connector and IPDM E/R harness connector.

| Cooling f | Cooling fan relay | | IPDM E/R | |
|-----------|-------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E17 | 2 | E7 | 73 | Existed |

 Check the continuity between cooling fan relay harness connector and cooling fan control module harness connector.

| Cooling fan relay | | Cooling fan control module | | Continuity |
|-------------------|----------|----------------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E17 | 5 | E37 | 3 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK COOLING FAN RELAY

Refer to EC-501, "Component Inspection (Cooling Fan Relay)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace cooling fan relay.

11. CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness connectors.

Component Inspection (Cooling Fan Motor)

INFOID:0000000005913982

1. CHECK COOLING FAN MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connectors.
- 3. Supply cooling fan control module terminals with battery voltage and check operation.

| Cool | ing fan contro | | | |
|---------|----------------|----------|-----|-----------------------|
| Motor | Connector | Terminal | | Operation |
| IVIOLOI | Connector | (+) | (-) | |
| 1 | E301 | 4 | 5 | Cooling fan operates. |
| 2 | E302 | 6 | 7 | Cooling lan operates. |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan motor.

COOLING FAN

< DTC/CIRCUIT DIAGNOSIS >

Component Inspection (Cooling Fan Relay)

[VQ37VHR]

1. CHECK COOLING FAN RELAY

- 1. Turn ignition switch OFF.
- 2. Remove cooling fan relay.
- 3. Check the continuity between cooling fan relay terminals under the following conditions.

| Terminals | Conditions | Continuity |
|-----------|--|-------------|
| 3 and 5 | 12 V direct current supply between terminals 1 and 2 | Existed |
| 5 and 5 | No current supply | Not existed |

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Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan relay.

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[VQ37VHR]

ELECTRICAL LOAD SIGNAL

Description INFOID:000000005913984

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication line.

Component Function Check

INFOID:0000000005913985

1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

- 1. Turn ignition switch ON.
- 2. Connect CONSULT-III and select "DATA MONITOR" mode.
- 3. Select "LOAD SIGNAL" and check indication under the following conditions.

| Monitor item | Condition | | Indication |
|----------------------|-----------------------------|-----|------------|
| LOAD SIGNAL Boor win | Rear window defogger switch | ON | ON |
| LOAD SIGNAL | Rear window defogger switch | OFF | OFF |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Go to EC-502, "Diagnosis Procedure".

2. CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------|-----------------|--------------------|------------|
| LOAD SIGNAL | Lighting switch | ON at 2nd position | ON |
| LOAD SIGNAL | Lighting switch | OFF | OFF |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Go to EC-502, "Diagnosis Procedure".

3.CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

| Monitor item | Condition | | Indication |
|----------------|-----------------------------|-----|------------|
| HEATER FAN SW | Heater fan control switch | | ON |
| TILATER TAN 6W | rieater fair control switch | OFF | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-502, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913986

1. INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to <u>EC-502, "Component Function Check"</u>.

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

Refer to DEF-20, "Work Flow".

| ELECTRICAL LOAD SIGNAL | [VQ37VHR] |
|--|------------|
| < DTC/CIRCUIT DIAGNOSIS > >> INSPECTION END | [VQ3/VIII] |
| 3.CHECK HEADLAMP SYSTEM | А |
| Refer to EXL-62, "Work Flow". | |
| TOTAL OZ, WORLTOW. | EC |
| >> INSPECTION END | |
| 4.CHECK HEATER FAN CONTROL SYSTEM | |
| Refer to HAC-80, "Work Flow". | C |
| NODE OTION END | |
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FUEL INJECTOR

Component Function Check

INFOID:0000000005913988

[VQ37VHR]

1. INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.

NO >> Go to EC-504, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

(P)With CONSULT-III

- Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-III

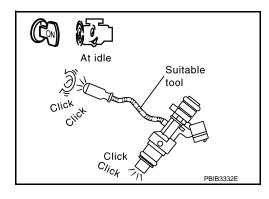
- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-504, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:0000000005913989

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.

| Fuel injector | | Ground | Voltage | | |
|---------------|-----------|----------|---------|-----------------|--|
| Cylinder | Connector | Terminal | Giodila | voltage | |
| 1 | F121 | 1 | Ground | | |
| 2 | F122 | 1 | | Battery voltage | |
| 3 | F123 | 1 | | | |
| 4 | F124 | 1 | Giodila | Battery voltage | |
| 5 | F125 | 1 | | | |
| 6 | F126 | 1 | | | |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness connectors F30, F120
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)

FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

Harness for open or short between fuel injector and fuse

>> Repair open circuit, short to ground or short to power in harness or connectors.

${f 3.}$ CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between fuel injector harness connector and ECM harness connector

| eck the continuity b | etween luci injector ha | iness connector and Low namess com | C C |
|----------------------|-------------------------|------------------------------------|-----|
| | | | |
| Fuel injector | ECM | | |

| Fuel injector | | | ECM | | Continuity |
|---------------|-----------|----------|-----------|----------|------------|
| Cylinder | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F121 | 2 | | 89 | |
| 2 | F122 | 2 | | 85 | |
| 3 | F123 | 2 | F102 | 81 | Existed |
| 4 | F124 | 2 | 1 102 | 90 | LXISIEU |
| 5 | F125 | 2 | | 86 | |
| 6 | F126 | 2 | | 82 | |

Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F30, F120
- Harness for open or short between fuel injector and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK FUEL INJECTOR

Refer to EC-505, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.

>> Replace malfunctioning fuel injector. NO

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

Component Inspection

1. CHECK FUEL INJECTOR

- Turn ignition switch OFF.
- Disconnect fuel injector harness connector.
- Check resistance between fuel injector terminals as follows.

| Terminals | Resistance (Ω) |
|-----------|---|
| 1 and 2 | 11.1 - 14.3 [at 10 - 60°C (60 - 140°F)] |

Is the inspection result normal?

YES >> INSPECTION END

>> Replace malfunctioning fuel injector. NO

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INFOID:0000000005913990

FUEL PUMP

Component Function Check

INFOID:0000000005913992

1. CHECK FUEL PUMP FUNCTION

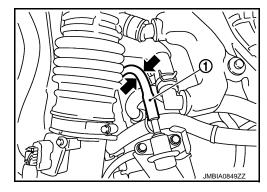
- 1. Turn ignition switch ON.
- Pinch fuel feed hose (1) with two fingers.

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 >> EC-506, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:0000000005913993

1. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

- 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.

| EC | CM | Ground | Voltage | |
|--------------------|----|--------|-----------------|--|
| Connector Terminal | | Ground | voltage | |
| F101 | 22 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

Check the voltage between IPDM E/R harness connector and ground.

| IPDN | /I E/R | Ground | Voltage | |
|--------------------|--------|--------|-----------------|--|
| Connector Terminal | | Ground | voltage | |
| E7 | 77 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 10.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between IPDM E/R and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

- 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.

Check the voltage between "fuel level sensor unit and fuel pump" harness connector and ground.

| Fuel level sensor unit and fuel pump | | Ground | Voltage | |
|--------------------------------------|----------|--------|---|--|
| Connector | Terminal | | | |
| B241 | 1 | Ground | Battery voltage should exist for 1 second after ignition switch is turned ON. | |

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Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 5.

5. CHECK 15A FUSE

- Turn ignition switch OFF.
- Disconnect 15A fuse (No. 41) from IPDM E/R.
- Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace fuse.

6.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

- 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.

| IPDM E/R | | Fuel level and fue | Continuity | |
|-----------|----------|-----------------------|------------|---------|
| Connector | Terminal | Connector | Terminal | |
| E5 | 13 | B241 | 1 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E105, B3
- Harness connectors B51, B230
- IPDM E/R harness connector E5
- Harness for open or short between IPDM E/R and "fuel level sensor unit and fuel pump"

>> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK FUEL PUMP GROUND CIRCUIT

Turn ignition switch OFF.

Check the continuity between "fuel level sensor unit and fuel pump" harness connector and ground.

| Fuel level s and fue | | Ground | Continuity | |
|-------------------------|----------|--------|------------|--|
| Connector | Terminal | | | |
| B241 | B241 3 | | Existed | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to power in harness or connectors.

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FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

9. CHECK FUEL PUMP

Refer to EC-508, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace fuel pump.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.

NO >> Repair or replace harness or connectors.

Component Inspection

INFOID:0000000005913994

[VQ37VHR]

1. CHECK FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump" harness connector.
- 3. Check resistance between "fuel level sensor unit and fuel pump" terminals as follows.

| Terminals | Resistance (Ω) |
|-----------|----------------------------|
| 1 and 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"

ICC BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

ICC BRAKE SWITCH

Component Function Check

INFOID:0000000005913996

1. CHECK ICC BRAKE SWITCH FUNCTION

(P) With CONSULT-III

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-------------|--------------------|-----|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| BRAKE SWI | Brake pedal | Fully released | ON |

Without CONSULT-III

- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|
| Connector | + | - | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M107 126 | | 129 | Brake pedal | Slightly depressed | Approx. 0 |
| WHO | (ICC brake switch signal) | 128 | Brake pedal | Fully released | Battery voltage |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-509, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005913997

1. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ICC brake switch harness connector.
- Turn ignition switch ON.
- Check the voltage between ICC brake switch harness connector and ground.

| ICC brak | e switch | Ground | Voltage | |
|--------------------|----------|---------|-----------------|--|
| Connector Terminal | | Oloulia | Voltage | |
| E114 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10A fuse (No. 3)
- · Harness for open or short between ICC brake switch and fuse

Р

>> Repair open circuit or short to ground in harness or connectors.

${f 3.}$ CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.

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< DTC/CIRCUIT DIAGNOSIS >

Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brake switch | | ECM | | Continuity |
|------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E114 | 2 | M107 | 126 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- · Harness for open or short between ICC brake switch and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK ICC BRAKE SWITCH

Refer to EC-510, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ICC brake switch.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000005913998

1. CHECK ICC BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- Disconnect ICC brake switch harness connector.
- 3. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|--------------|---------------------|--------------------|-------------|
| 1 and 2 | 1 and 2 Brake pedal | Fully released | Existed |
| I allu Z B | brake pedar | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ICC BRAKE SWITCH-II

- 1. Adjust ICC brake switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|------------------|--------------------|-------------|
| 1 and 2 | nd 2 Brake pedal | Fully released | Existed |
| i aliu Z | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch.

IGNITION SIGNAL

Component Function Check

INFOID:0000000005914001

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1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT-III: GO TO 2.

YES-2 >> Without CONSULT-III: GO TO 3.

No >> Go to EC-511, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

(P)With CONSULT-III

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 2. Make sure that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-511, "Diagnosis Procedure".

3.CHECK IGNITION SIGNAL FUNCTION

W Without CONSULT-III

1. Let engine idle.

Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

| | E | CM | | |
|-----------|----------|-----------|----------|--------------------|
| + | | _ | | Voltage signal |
| Connector | Terminal | Connector | Terminal | |
| | 11 | | | |
| | 12 | | | 50mSec/div |
| E404 | 15 | M407 | 400 | |
| F101 | 16 | M107 | 128 | = |
| | 19 | | | |
| | 20 | | | 2V/div JMBIA0035GB |

NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-511, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005914002

1. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

- 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.

| Connector | + | - | Voltage |
|-----------|----------|----------|-----------------|
| Connector | Terminal | Terminal | |
| M107 | 125 | 128 | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

< DTC/CIRCUIT DIAGNOSIS >

NO >> Go to EC-180, "Diagnosis Procedure".

2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- Disconnect condenser harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between condenser harness connector and ground.

| Cond | Condenser | | Voltage |
|-----------|-----------|--------|-----------------|
| Connector | Terminal | Ground | voltage |
| F8 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 3.

3.check ignition coil power supply circuit-iii

- 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.

| | IPDM E/R | | Condenser | | Continuity |
|---|-----------|----------|--------------------|---|------------|
| • | Connector | Terminal | Connector Terminal | | Continuity |
| • | E5 | 5 | F8 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Go to EC-180, "Diagnosis Procedure".

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E20, F40
- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between condenser harness connector and ground.

| Condenser | | Ground | Continuity |
|-----------|----------|--------|------------|
| Connector | Terminal | Ground | Continuity |
| F8 | 2 | Ground | Existed |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit or short to power in harness or connectors.

6.CHECK CONDENSER

Refer to EC-515, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace condenser.

.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

- Reconnect all harness connectors disconnected.
- Disconnect ignition coil harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ignition coil harness connector and ground.

| Ignition coil | | | Ground | Voltage |
|---------------|-----------|--------------------|---------|-----------------|
| Cylinder | Connector | Connector Terminal | | Voltage |
| 1 | F11 | 3 | | |
| 2 | F12 | 3 | | |
| 3 | F13 | 3 | Ground | Battery voltage |
| 4 | F14 | 3 | Giodila | battery voltage |
| 5 | F15 | 3 | | |
| 6 | F16 | 3 | | |

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

- Harness connector F40, E20
- Harness for open or short between ignition coil and harness connector F40

>> Repair or replace harness or connectors.

9.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.

| Ignition coil | | | Ground | Continuity |
|---------------|-----------|----------|---------|------------|
| Cylinder | Connector | Terminal | Ground | Continuity |
| 1 | F11 | 2 | | |
| 2 | F12 | 2 | | |
| 3 | F13 | 2 | Ground | Existed |
| 4 | F14 | 2 | Giodila | LAISIEU |
| 5 | F15 | 2 | | |
| 6 | F16 | 2 | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit or short to power in harness or connectors.

10. Check ignition coil output signal circuit for open and short

- Disconnect ECM harness connector.
- Check the continuity between ignition coil harness connector and ECM harness connector.

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| Ignition coil | | | EC | Continuity | |
|---------------|-----------|----------|-----------|------------|------------|
| Cylinder | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F11 | 1 | | 20 | |
| 2 | F12 | 1 | | 16 | |
| 3 | F13 | 1 | F101 | 12 | Existed |
| 4 | F14 | 1 | FIUI | 11 | EXISTEC |
| 5 | F15 | 1 | | 15 | |
| 6 | F16 | 1 | | 19 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-514, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace malfunctioning ignition coil with power transistor.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000005914003

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.

| Terminals | Resistance (Ω) [at 25°C (77°F)] | |
|-----------|--|--|
| 1 and 2 | Except 0 or ∞ | |
| 1 and 3 | Except 0 | |
| 2 and 3 | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor.

2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

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.

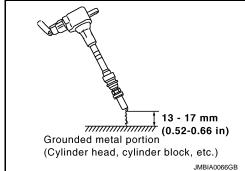
< DTC/CIRCUIT DIAGNOSIS >

Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.

NOTE:

Do not use CONSULT-III 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.
- 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.
- 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 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.

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?

>> INSPECTION END YES

NO >> Replace malfunctioning ignition coil with power transistor.

Component Inspection (Condenser)

1. CHECK CONDENSER

- Turn ignition switch OFF.
- Disconnect condenser harness connector.
- Check resistance between condenser terminals as per the following.

| Terminals | Resistance (MΩ) |
|-----------|--------------------------|
| 1 and 2 | Above 1 [at 25°C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.

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MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

INFOID:0000000005914006

MALFUNCTION INDICATOR LAMP

Component Function Check

1. CHECK MIL FUNCTION

- 1. Turn ignition switch ON.
- 2. Make sure that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-516, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005914007

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-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.

NO >> Repair or replace.

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:0000000005914009

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 >> Go to EC-517, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005914010

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?

>> GO TO 2. Α

В >> GO TO 7.

2.CHECK EVAP CANISTER

- 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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

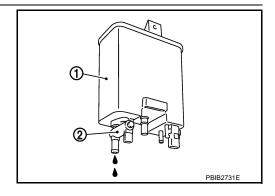
Check if water will drain from EVAP canister (1).

· 2 : EVAP canister vennt control valve

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.

>> 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.

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-519, "Component Inspection".

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[VQ37VHR]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

7.CHECK EVAP CANISTER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 9.

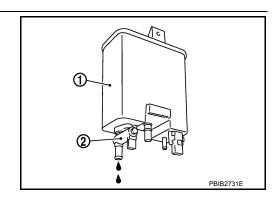
8.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 9. NO >> GO TO 11.



9. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> 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.

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

Refer to EC-519, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

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Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-I

Check one-way valve for clogging.

Is the inspection result normal?

>> GO TO 16. YES

NO >> Repair or replace one-way fuel valve with fuel tank.

16. CHECK ONE-WAY FUEL VALVE-II

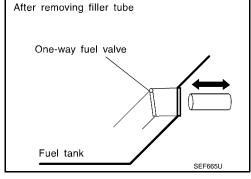
- Make sure that fuel is drained from the tank.
- Remove fuel filler tube and hose.
- 3. Check one-way fuel valve for operation as follows. When a stick is inserted, the valve should open, when removing stick it should close.

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.



Component Inspection

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.CHECK REFUELING EVAP VAPOR CUT VALVE

With CONSULT-III

- Turn ignition switch OFF.
- Remove fuel tank. Refer to FL-10, "Removal and Installation".
- 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 with CONSULT-III.
- 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.

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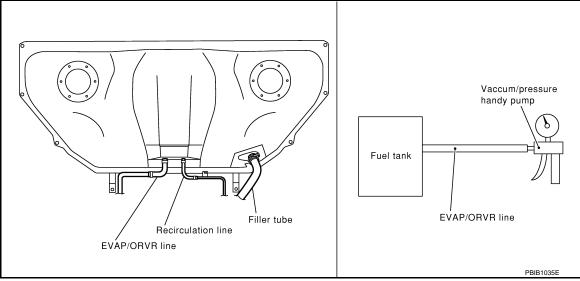
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[VQ37VHR]

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.

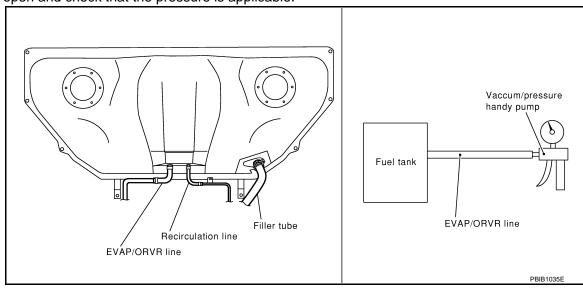
3.CHECK REFUELING EVAP VAPOR CUT VALVE

Without CONSULT-III

- Turn ignition switch OFF.
- Remove fuel tank. Refer to <u>FL-10, "Removal and Installation"</u>.
- 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.



[VQ37VHR] < DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

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REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:0000000005914015

1. CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

- 1. Start engine and warm it up to normal operating temperature.
- Turn A/C switch and blower fan switch ON.
- 3. Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | |
|-----------|---|----------|-------------|
| Connector | + | _ | Voltage (V) |
| Connector | Terminal | Terminal | |
| M107 | 105 (Refrigerant pressure sensor signal) | 112 | 1.0 - 4.0 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-522, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005914016

1. CHECK GROUND CONNECTION

- Turn A/C switch and blower fan switch OFF.
- 2. Turn ignition switch OFF.
- 3. Check ground connection M95. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect refrigerant pressure sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between refrigerant pressure sensor harness connector and ground.

| Refrigerant pr | essure sensor | Ground | Voltage (V) | | | | |
|----------------|---------------|---------|-------------|--|--|--|--|
| Connector | Terminal | Orodria | voltage (v) | | | | |
| E77 | 3 | Ground | Approx. 5 | | | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- · Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VQ37VHR]

| Refrigerant pre | essure sensor | EC | CM | Continuity | |
|---|------------------------------|---------------|--------------|--------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | ī |
| E77 | 1 | M107 | 112 | Existed | |
| | ck harness | | ground a | nd short to | power. |
| s the inspect | | <u>ormal?</u> | | | |
| NO >> 0 | GO TO 6. GO TO 5. | | | | |
| D.DETECT | MALFUNCT | TIONING P | ART | | |
| Check the fol | | | | | |
| Harness co Harness for | | | n FCM ar | nd refrigera | nt pressure sensor |
| 11011100010 | open or or | ion botwoo | ii Loivi ai | ia reingera | n pressure seriou |
| >> F | Repair open | circuit, she | ort to grou | nd or short | to power in harness or connectors. |
| _ | | | _ | | JT SIGNAL CIRCUIT FOR OPEN AND SHORT |
| | | | | | sensor harness connector and ECM harness connec- |
| tor. | | | | . р. ооош. о | |
| | | | | | |
| Refrigerant pre | essure sensor | EC | M | Continuity | |
| Connector | Terminal | Connector | Terminal | | |
| E77 | 2 | M107 | 105 | Existed | |
| | ck harness | | ground a | nd short to | power. |
| s the inspect | | ormal? | | | |
| | GO TO 8. GO TO 7. | | | | |
| 7.DETECT | | TIONING P | ART | | |
| Check the fol | | | | | |
| Harness co | nnectors M | | | | |
| Harness for | r open or sh | ort betwee | en ECM ar | nd refrigera | nt pressure sensor |
| - | . | -1 | | | to account to be an experienced. |
| _ | | | _ | na or snort | to power in harness or connectors. |
| 3.CHECK IN | | | | | |
| Refer to GI-3 | | | <u>nt"</u> . | | |
| s the inspect | | | ooure ee | | |
| | Replace refr Repair or re | | ssure ser | 1501. | |
| | | r | | | |
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Revision: 2010 June **EC-523** 2011 M37/M56

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | | | | | | S١ | /MPT | OM | | | | | | |
|------------|---------------------------------------|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|--|
| | | 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) | Reference page |
| Warranty | y symptom code | AA | AB | AC | AD | AE | AF | AG | АН | AJ | AK | AL | AM | НА | |
| Fuel | Fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | EC-506 |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-161 |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-504 |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-51 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | EC-534 |
| | Incorrect idle speed adjustment | | | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-157 |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | EC-410, EC-417 |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-157 |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-511 |
| Main po | wer supply and ground circuit | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | EC-180 |
| Mass air | r flow sensor circuit | 1 | | | 2 | | | | | | | | | | EC-202, EC-210 |
| Engine o | coolant temperature sensor circuit | | | | | | 3 | | | 3 | | | | | EC-227, EC-232 |
| Air fuel r | ratio (A/F) sensor 1 circuit | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-238, EC-242, EC-245, EC-248, EC-491 |
| Throttle | position sensor circuit | | | | | | 2 | | | 2 | | | | | EC-229, EC-292, EC-406, EC-408, EC-419 |
| Accelera | ator pedal position sensor circuit | | | 3 | 2 | 1 | | | | | | | | | EC-477, EC-481, EC-486 |
| Knock se | ensor circuit | | | 2 | | | | | | | | 3 | | | EC-301 |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

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|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-----------------------|
| | 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) | Reference page |
| Warranty symptom code | AA | AB | AC | AD | AE | AF | AG | АН | AJ | AK | AL | AM | НА | |
| Engine oil temperature sensor | | | 4 | | 1 | | | | | | 3 | | | EC-288, EC-290 |
| Crankshaft position sensor (POS) circuit | 2 | 2 | | | | | | | | | | | | EC-304 |
| Camshaft position sensor (PHASE) circuit | 3 | 2 | | | | | | | | | | | | EC-308 |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | EC-362 |
| Power steering pressure sensor circuit | | 2 | | | | | 3 | 3 | | | | | | EC-371 |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | EC-373, EC-375 |
| Intake valve timing control solenoid valve circuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | EC-208 |
| Manifold absolute pressure (MAP) sensor | | | | | | | | | | | 3 | | | EC-220 |
| VVEL control module | 3 | | 4 | 4 | 3 | | | | | | | | | EC- 469,EC- 470 |
| VVEL actuator motor | 3 | | 4 | 4 | 3 | | | | | | | | | EC-392 |
| VVEL actuator motor relay | 3 | | 4 | 4 | 3 | | | | | | | | | EC-396 |
| VVEL actuator shaft position sensor | 3 | | 4 | 4 | 3 | | | | | | | | | EC-389 |
| PNP signal circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-381 |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | EC-522 |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | EC-502 |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | <u>HAC-80</u> |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | BRC-64 |

^{1 - 6:} The numbers refer to the order of inspection. (continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

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| | | | | | | | S | /MPT | OM | | | | | | |
|-----------------|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|---------------------------------|
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| | | 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) | Reference page |
| Warranty s | symptom code | AA | AB | AC | AD | AE | AF | AG | АН | AJ | AK | AL | AM | НА | |
| Fuel | Fuel tank | 5 | | | | | | | | | | | | | FL-12 |
| | Fuel piping | J | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-48 |
| | Vapor lock | | 5 | | | | | | | | | | | | _ |
| | Valve deposit | | | | | | | | | | | | | | _ |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | _ |
| Air | Air duct | | | | | | | | | | | | | | EM-30 |
| | Air cleaner | | | | | | | | | | | | | | EM-30 |
| | Air leakage from air duct (Mass air flow sensor — electric throttle control actuator) | | 5 | 5 | | 5 | | 5 | 5 | | | 5 | | | EM-30 |
| | Electric throttle control actuator | 5 | | | 5 | | 5 | | | 5 | | | | | EM-31 |
| | Air leakage from intake manifold/ Collector/Gasket | | | | | | | | | | | | | | EM-35 |
| Cranking | Battery | | | | | | | | | | | | | | PG-157 |
| | Generator circuit | 1 | 1 | 1 | | 1 | | 1 | 1 | | | | | 1 | <u>CHG-18,</u> <u>CHG-19</u> |
| | Starter circuit | 3 | | | | | | | | | | 1 | | | STR-22 |
| | Signal plate | 6 | | | | | | | | | | | | | EM-132 |
| | PNP signal circuit | 4 | | | | | | | | | | | | | <u>TM-107</u> |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-119 |
| | Cylinder head gasket | J | 3 | J | 3 | , | | J | 3 | | 4 | J | 3 | | |
| | Cylinder block | | | | | | | | | | | | | | |
| | Piston | | | | | | | | | | | | 4 | | |
| | Piston ring | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | | EM-132 |
| | Connecting rod | | | | - | | | | | | | | | | |
| | Bearing | | | | | | | | | | | | | | |
| Volve | Crankshaft Timing shain | | | | | | | | | | | | | | EM 67 |
| Valve mecha- | Timing chain Camshaft | | | | | | | | | | | | | | EM-106 |
| nism | | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-106 EM-67 |
| | Intake valve timing control Intake valve | 5 | 5 | 5 | 5 | Э | | 3 | 5 | | | 3 | | | <u>⊏IVI-07</u> |
| | Exhaust valve | | | | | | | | | | | | 3 | | EM-119 |
| | | | | | | | | | | | | | | | |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

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|----------------------|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|--------------------------------|
| | | 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) | Reference page |
| Warranty | symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | НА | |
| Exhaust | Exhaust manifold/Tube/Muffler/ Gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-38, EX-4 |
| | Three way catalyst | | | | | | | | | | | | | | <u>LX 4</u> |
| Lubrica- tion | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-48, LU-11, LU- 15 |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | <u>LU-7</u> |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | <u>CO-11</u> , <u>CO-11</u> |
| | Thermostat | | | | | | | | | 5 | | | | | <u>CO-23</u> |
| | Water pump | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | <u>CO-21</u> |
| | Water gallery |] | J | 3 | J | J | | J | J | | 4 | J | | | <u>CO-25</u> |
| | Cooling fan | | | | | | | | | | | | | | <u>CO-18</u> |
| | Coolant level (Low)/Contaminated coolant | | | | | | | | | 5 | | | | | <u>CO-8</u> |
| IVIS (INFII NATS) | NITI Vehicle Immobilizer System — | 1 | 1 | | | | | | | | | | | | <u>SEC-50</u> |

^{1 - 6:} The numbers refer to the order of inspection.

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INFINITI DRIVE MODE SELECTOR

Symptom Table

SYSTEM - DRIVE MODE SELECTOR -

| Malfunction | Chec | k item | Probable malfunctioning part/ Action |
|---|--|--|--|
| | | The central switch of the navigation system operates normally. | Perform self-diagnosis of the engine control system. Refer to EC-102, "DTC Index". |
| ECO pedal reaction force is not | Only ECO pedal reaction force is not generated. [Intelligent pedal (distance control assist) operates normally.] | The central switch of the navigation system malfunctions. | Perform self-diagnosis of the navigation system. Refer to AV-114, "Symptom Table" (BASE AUDIO WITHOUT NAVIGATION) or AV-288. "Symptom Table" (BOSE AUDIO WITH NAVIGATION) |
| generated when in ECO mode. | Intelligent pedal (distance contro generated as well. | Perform self-diagnosis of the ADAS control unit, ICC sensor, and Accelerator pedal actuator. • ADAS C/U: Refer to DAS-40, "DTC Index". • ICC SENSOR: Refer to DAS-111, "DTC Index". • ACCELERATOR PEDAL ACTUATOR:Refer to DAS-114, "DTC Index". | |
| When in ECO mode, settings of ECO pedal reaction force | Intelligent pedal (distance contromalfunction as well. | ol assist) reaction force has a | Perform self-diagnosis of the ADAS control unit, ICC sensor, and Accelerator pedal actuator. • ADAS C/U: Refer to DAS-40, "DTC Index". • ICC SENSOR: Refer to DAS-111, "DTC Index". • ACCELERATOR PEDAL ACTUATOR:Refer to DAS-114, "DTC Index". |
| cannot be changed or vehicle behavior does not agree to the settings. | | The central switch of the navigation system operates normally. | Perform self-diagnosis of the engine control system. Refer to <u>EC-102</u> , "DTC Index". |
| | Intelligent pedal (distance control assist) reaction force is normal. | The central switch of the navigation system malfunctions. | Perform self-diagnosis of the navigation system. Refer to AV-114, "Symptom Table" (BASE AUDIO WITHOUT NAVIGATION) or AV-288, "Symptom Table" (BOSE AUDIO WITH NAVIGATION) |

NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS > [VQ37VHR]

NORMAL OPERATING CONDITION

Description INFOID:0000000005914032

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, <u>EC-44.</u>
"MULTIPORT FUEL INJECTION SYSTEM: System Description".

TORQUE CUT CONTROL (AT HIGH ENGINE OIL TEMPERATURE)

ECM receives engine oil temperature signal from engine oil temperature sensor.

To avoid VVEL performance, ECM performs the engine torque cut control at high engine oil temperature. If engine oil temperature is too high, engine oil viscosity will change. As a result, engine oil pressure is decreased. This control is to control the VVEL operating angle by operating the VVEL actuator sub assembly. If this control is operated, engine performance will decrease, then maximum engine speed is reduced a little, for example.

NOTE:

If the engine oil temperature sensor is deteriorated, its characteristic will change. In this case, the operating temperature for engine torque cut control might be decrease. Perform Component Inspection of the engine oil temperature sensor to check for the deterioration.

Refer to EC-289, "Component Inspection".

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PERIODIC MAINTENANCE

IDLE SPEED

CHECK IDLE SPEED

(P)With CONSULT-III

Check idle speed in "DATA MONITOR" mode of "ENGINE" using CONSULT-III.

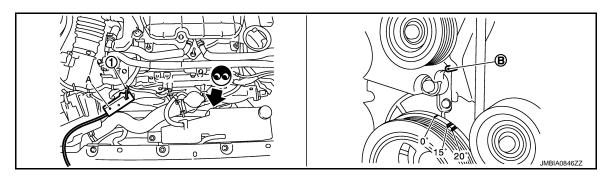
With GST

Check idle speed with Service \$01 of GST.

IGNITION TIMING

CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



- 1. Loop wire
- A. Timing light

- B. Timing indicator
- 2. Check ignition timing.

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EVAP LEAK CHECK

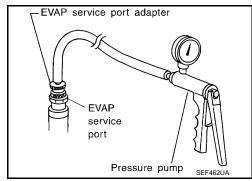
Inspection INFOID:0000000005914042

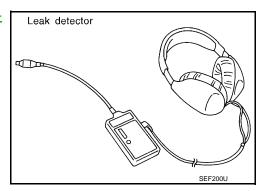
CAUTION:

- 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.

(II) WITH CONSULT-III

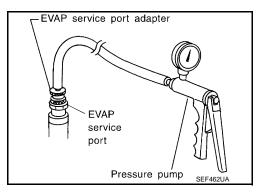
- 1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-III.
- 4. Touch "START". A bar graph (Pressure indicating display) will appear on the screen.
- 5. 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 <u>EC-51</u>, "EVAPO-RATIVE EMISSION SYSTEM: System Diagram".





N WITHOUT CONSULT-III

- 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.
- 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).
- Remove EVAP service port adapter and hose with pressure pump.

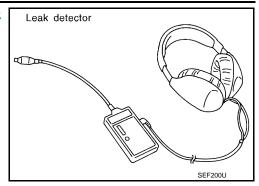


EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

[VQ37VHR]

5. Locate the leak using a leak detector. Refer to <u>EC-51</u>, "EVAPO-RATIVE EMISSION SYSTEM: System Diagram".



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POSITIVE CRANKCASE VENTILATION

< PERIODIC MAINTENANCE >

[VQ37VHR]

POSITIVE CRANKCASE VENTILATION

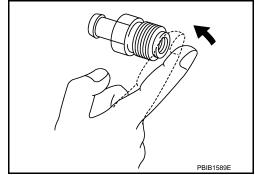
Inspection INFOID:0000000005914013

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.



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REMOVAL AND INSTALLATION

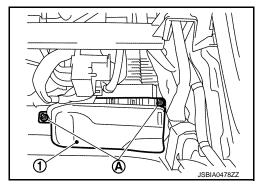
ECM

Removal and Installation

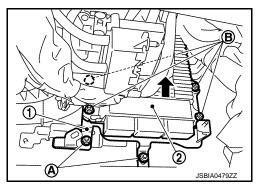
INFOID:00000000006057562

REMOVAL

- 1. Remove the instrument lower cover. Refer to IP-12, "Exploded View".
- 2. Remove the dash side finisher (LH). Refer to INT-38, "DASH SIDE FINISHER: Removal and Installation".
- 3. Remove the ECM cover bolts (A) and remove ECM cover (1).



- 4. Disconnect ECM harness connectors.
- 5. Remove ECM bracket bolt (A)
- 6. Slide the ECM bracket (1) upward and then remove ECM bracket with ECM.
- 7. Remove ECM bracket bolts (B) and separate ECM (2) and ECM bracket.



INSTALLATION

Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing ECM. Refer to EC-147, "Work Procedure".

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Revision: 2010 June **EC-535** 2011 M37/M56

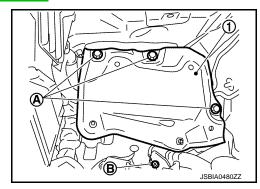
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VVEL CONTROL MODULE

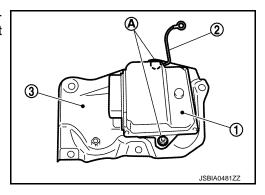
Removal and Installation

REMOVAL

- 1. Remove hoodledge cover (RH) and cowl top cover (RH). Refer to EXT-21, "Exploded View".
- 2. Remove the battery and battery tray. Refer to PG-157, "Exploded View".
- 3. Remove VVEL control module bracket bolts (A).
- 4. Remove the ground harness fix bolt (B).
- 5. Remove VVEL control module bracket (1).



- 6. Disconnect VVEL control module harness connector.
- 7. Remove the fix bolts (A). And then separate VVEL control module (1), ground harness (2) and VVEL control module bracket (3).



INSTALLATION

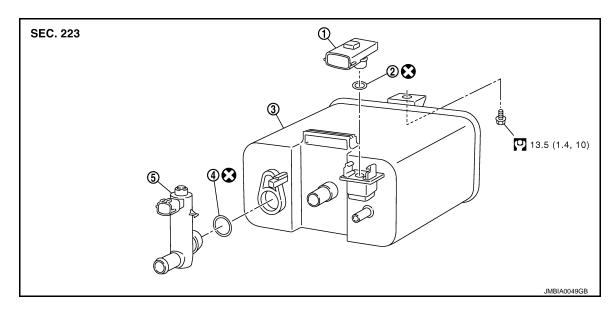
Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing VVEL control module. Refer to <u>EC-148</u>, "Work <u>Procedure"</u>.

EVAP CANISTER

Exploded View INFOID:00000000006057564



- EVAP control system pressure sen- 2.

EVAP canister

O-ring 4.

EVAP canister vent control valve

Refer to GI-3, "Contents" for symbols not described on the above.

Hydraulic Layout

INFOID:00000000006057565

EVAPORATIVE EMISSION LINE DRAWING

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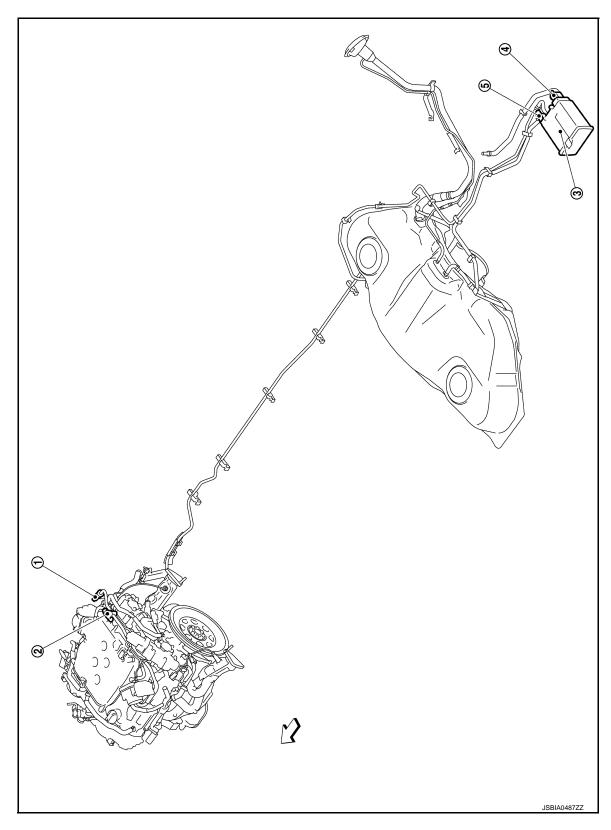
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- 1. EVAP service port
- 4. EVAP canister vent control valve
- EVAP canister purge volume control 3. EVAP canister solenoid valve
- 5. EVAP control system pressure sensor

∵ : Vehicle front

NOTE:

Revision: 2010 June **EC-538** 2011 M37/M56

EVAP CANISTER

< REMOVAL AND INSTALLATION >

[VQ37VHR]

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

Removal and Installation

INFOID:0000000006057566

REMOVAL

- Remove the rear diffuser. Refer to <u>EXT-29</u>, "<u>REAR DIFFUSER</u>: <u>Removal and Installation</u>".
- Disconnect harness connectors (EVAP control system pressure and EVAP canister vent control valve) and EVAP canister hoses.
- 3. Remove EVAP canister fixing bolt.
- 4. Remove EVAP canister.

NOTE:

The EVAP canister vent control valve and EVAP control system pressure sensor can be removed without removing the EVAP canister.

INSTALLATION

Install in the reverse order of removal.

NOTE:

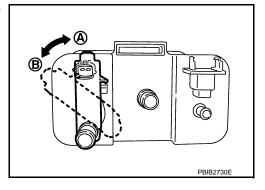
Tighten EVAP canister fixing bolt to the specified torque.

Disassembly and Assembly

INFOID:0000000006057567

DISASSEMBLY

- Disengage the pawl and turn EVAP canister vent control valve counterclockwise.
 - Lock (A)
 - Unlock (B)
- 2. Remove the EVAP canister vent control valve.



ASSEMBLY

Assemble in the reverse order of disassembly.

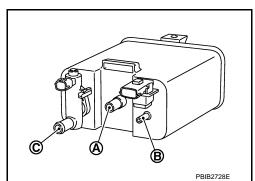
CAUTION:

Always replace O-ring with a new one.

Inspection INFOID:0000000000057568

Check EVAP canister as per the following:

- 1. Block port (B).
- 2. Blow air into port (A) and check that it flows freely out of port (C).
- 3. Release blocked port (B).
- 4. Apply vacuum pressure to port (B) and check that vacuum pressure exists at the ports (A) and (C).
- 5. Block port (A) and (B).
- 6. Apply pressure to port (C) and check that there is no leakage.



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SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VQ37VHR]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 650 ± 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:0000000005914047

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 10 ± 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:0000000005914048

| Condition | Specification (Using CONSULT-III or GST) |
|--------------|--|
| At idle | 5 – 35 % |
| At 2,500 rpm | 5 – 35 % |

Mass Air Flow Sensor

INFOID:0000000005914049

| Supply voltage | Battery voltage (11 – 14 V) |
|--|--|
| Output voltage at idle | 0.7 – 1.2 V* |
| Mass air flow (Using CONSULT-III or GST) | 2.0 – 6.0 g/sec at idle* 7.0 – 20.0 g/sec at 2,500 rpm* |

^{*:} Engine is warmed up to normal operating temperature and running under no load.

< PRECAUTION > [VK56VD]

PRECAUTION

PRECAUTIONS

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

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 "SRS AIR BAG" and "SEAT BELT" 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 that 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 "SRS AIR BAG".
- 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.

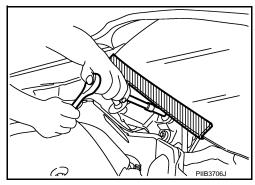
PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

- When working near the Air Bag Diagnosis Sensor Unit or other Air Bag 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 3 minutes before performing any service.

Precaution for Procedure without Cowl Top Cover

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



Precautions For Xenon Headlamp Service

WARNING:

Comply with the following warnings to prevent any serious accident.

- Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.
- Never work with wet hands.
- Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)

Never touch the bulb glass immediately after turning it OFF. It is extremely hot.

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[VK56VD] < PRECAUTION >

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)
- Never perform HID circuit inspection with a tester.
- Never touch the xenon bulb glass with hands. Never put oil and grease on it.
- Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.
- Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).

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

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.

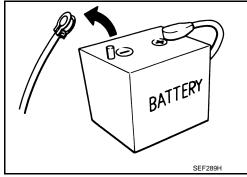
CAUTION:

- 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.)
- · 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 EC-589, "Diagnosis Description".
- 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

Always use a 12 volt battery as power source.

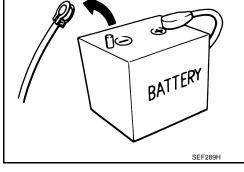
- Never attempt to disconnect battery cables while engine is running.
- Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is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

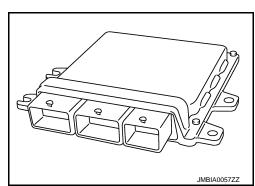


INFOID:0000000005840838

INFOID:0000000005840839

- 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

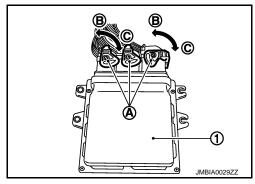




< PRECAUTION > [VK56VD]

• When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.

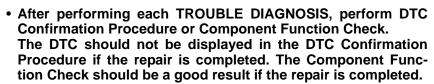
- ECM (1)
- Loosen (C)

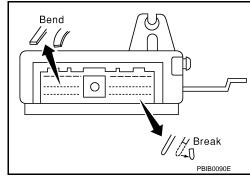


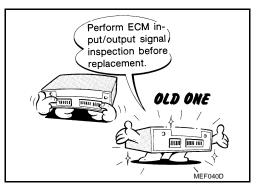
 When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break).
 Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.

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.
- Before replacing ECM, perform ECM Terminals and Reference Value inspection and check that ECM functions properly. Refer to EC-611, "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, crankshaft position sensor.









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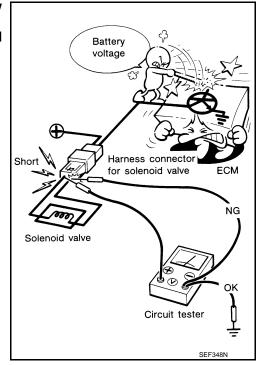
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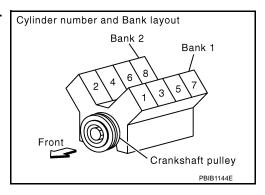
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< PRECAUTION > [VK56VD]

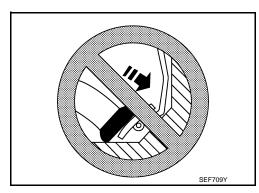
 When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.
 Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



- 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.

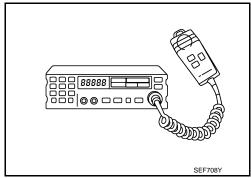


PRECAUTIONS

< PRECAUTION > [VK56VD]

 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 > [VK56VD]

PREPARATION

PREPARATION

Special Service Tools

INFOID:0000000005840840

| Tool number (Kent-Moore No.) Tool name | Description |
|--|-------------------------|
| KV10120000 | Measuring fuel pressure |
| (-) | |
| Fuel tube adapter | |
| | |
| | |
| | |
| | |
| JSBIA0410ZZ | |

Commercial Service Tools

INFOID:0000000005840841

| Tool name (Kent-Moore No.) | | Description |
|---|--|--|
| Leak detector i.e.: (J-41416) | S-NT703 | Locates the EVAP leak |
| EVAP service port adapter i.e.: (J-41413-OBD) | S-N1704 | Applys positive pressure through EVAP service port |
| Fuel filler cap adapter i.e.: (MLR-8382) | S-NT815 | Checks fuel tank vacuum relief valve opening pressure |
| Socket wrench | 19 mm (0.75 in) Note than 32 mm 32 min (1.26 in) | Removes and installs engine coolant temperature sensor |

PREPARATION

< PREPARATION > [VK56VD]

| Tool name (Kent-Moore No.) | | Description |
|---|---------------------------------|---|
| Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12) | a Mating surface shave cylinder | Reconditions the exhaust system threads before installing a new oxygen sensor. Use with antiseize 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 Titania Oxygen Sensor |
| Anti-seize lubricant i.e.: (Permatex TM 133AR or equivalent meeting MIL specifica- tion MIL-A-907) | S-NT779 | Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads. |

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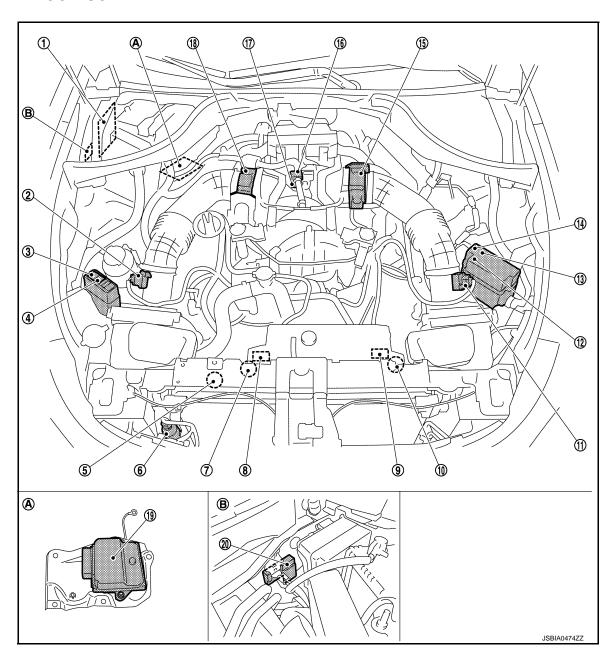
SYSTEM DESCRIPTION

COMPONENT PARTS ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM: Component Parts Location

INFOID:0000000005843737

ENGINE ROOM COMPARTMENT



IPDM E/R
 PCS-5, "IPDM E/R : Component
 Parts Location"

Cooling fan motor 2

4. Injector relay 2

- Mass air flow sensor
 - Power steering pressure sensor ST-79, "2WD: Exploded View" (2WD models) ST-81, "AWD: Exploded View"
 - (AWD models)
- 8. Cooling fan control module 2

- 3. Cooling fan relay 2
- 6. Refrigerant pressure sensor
- 9. Cooling fan control module 1

COMPONENT PARTS

[VK56VD] < SYSTEM DESCRIPTION >

- 10. Cooling fan motor 1
- Mass air flow sensor (with intake air temperature sensor) (bank 1)
- 12. Injector relay 1

- 13. VVEL actuator motor relay
- 14. Cooling fan relay 1

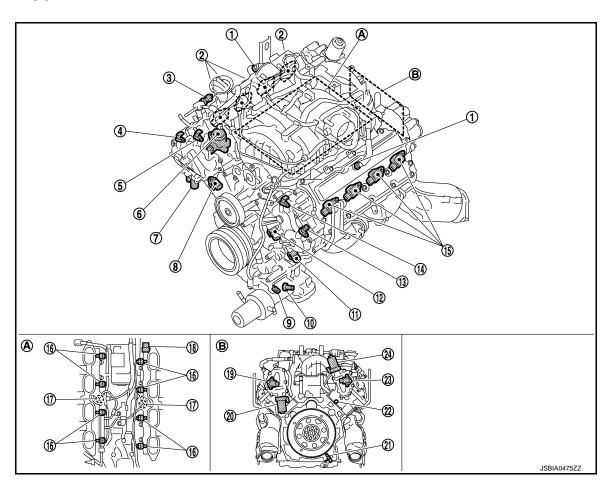
sensor

- 15. Electric throttle control actuator (bank 1)
- 16. EVAP canister purge volume control 17. Manifold absolute pressure (MAP) solenoid valve

- 19. VVEL control module
- 20. Battery current sensor (with battery temperature sensor)
- 18. Electric throttle control actuator (bank 2)

- Under the battery tray (View with upside-down)
- B. Body side in battery case

ENGINE COMPARTMENT



- Positive crankcase ventilation (PCV) 2.
- Exhaust valve timing control position 5. sensor (bank 2)
- 7. Exhaust valve timing control solenoid valve (bank 2)
- 10. Engine oil pressure sensor
- 13. Exhaust valve timing control position sensor (bank 1)
- 16. Fuel injector
- 19. VVEL control shaft position sensor (bank 1)

- Ignition coil (with power transistor) and spark plug (bank 2)
- Camshaft position sensor (bank 2)
- Intake valve timing control solenoid valve (bank 2)
- Exhaust valve timing control sole-11. noid valve (bank 1)
- 14. Camshaft position sensor (bank 1)
- 17. Knock sensor
- 20. VVEL actuator motor (bank 1)

- 3. Low fuel pressure sensor
- 6. High pressure fuel pump
- 9. Engine oil temperature sensor
- 12. Intake valve timing control solenoid valve (bank 1)
- 15. Ignition coil (with power transistor) and spark plug (bank 1)
- 18. Fuel rail pressure sensor
- 21. Crankshaft position sensor

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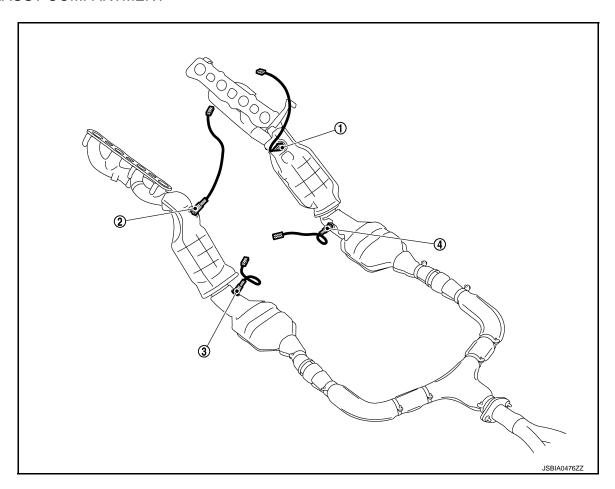
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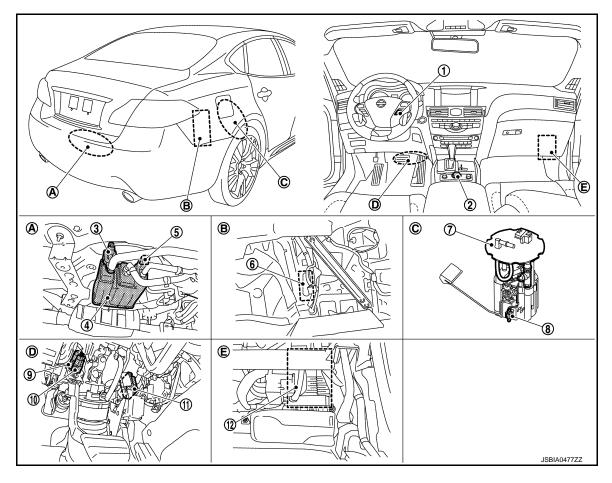
- 22. Engine coolant temperature sensor
- Top view of the engine
 (View with intake manifold is removed)
- 23. VVEL control shaft position sensor (bank 2)
- B. Rear view of the engine
- 24. VVEL actuator motor (bank 2)

EXHAUST COMPARTMENT



- 1. A/F sensor 1 (bank 2)
- 4. Heated oxygen sensor 2 (bank 2)
- 2. A/F sensor 1 (bank 1)
- 3. Heated oxygen sensor 2 (bank 1)

BODY COMPARTMENT



- ASCD steering switch ICC steering switch
- 4. EVAP canister
- 7. Fuel level sensor unit, fuel filter and 8. fuel pump assembly
- 10. ASCD brake switch ICC brake switch

- 2. Drive mode select switch
- 5. EVAP control system pressure sensor
- 8. Fuel tank temperature sensor
- 11. Accelerator pedal position sensor
- 3. EVAP canister vent control valve
- 6. Fuel pump control module (FPCM)
- 9. Stop lamp switch
- 12. ECM

ENGINE CONTROL SYSTEM : Component Description

INFOID:0000000005840868

| Component | Reference |
|-------------------------------------|---|
| ECM | EC-557, "ECM" |
| Malfunction indicator lamp | EC-564, "Malfunction Indicator Lamp (MIL)" |
| Ignition coil with power transistor | EC-563, "Ignition Coil With Power Transistor" |
| Accelerator pedal position sensor | EC-554, "Accelerator Pedal Position Sensor" |
| Mass air flow sensor | EC-564, "Mass Air Flow Sensor (With Intake Air Temperature Sen- |
| Intake air temperature sensor | sor)" |
| Electric throttle control actuator | |
| Throttle control motor | EC-557, "Electric Throttle Control Actuator" |
| Throttle position sensor | |
| Crankshaft position sensor | EC-556, "Crankshaft Position Sensor" |
| Camshaft position sensor | EC-555, "Camshaft Position Sensor" |
| Engine coolant temperature sensor | EC-558, "Engine Coolant Temperature Sensor" |

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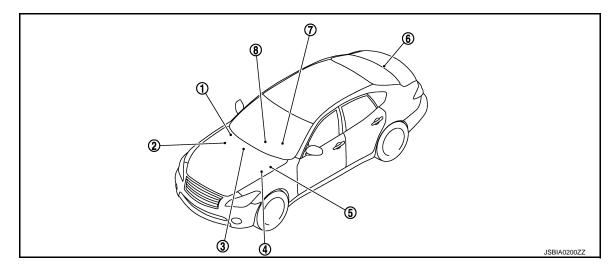
< SYSTEM DESCRIPTION >

| Component | Reference |
|--|--|
| Engine oil pressure sensor | EC-558, "Engine Oil Pressure Sensor" |
| Engine oil temperature sensor | EC-558, "Engine Oil Temperature Sensor" |
| Fuel injector | EC-560, "Fuel Injector" |
| Low pressure fuel pump | EC-564, "Low Pressure Fuel Pump" |
| Low fuel pressure sensor | EC-564, "Low Fuel Pressure Sensor" |
| Fuel pump control module (FPCM) | EC-562, "Fuel Pump Control Module" |
| High pressure fuel pump | EC-561, "High Pressure Fuel Pump" |
| Fuel tank temperature sensor | EC-560, "Fuel Tank Temperature Sensor" |
| Fuel rail pressure sensor | EC-562, "Fuel Rail Pressure Sensor" |
| A/F sensor 1 | EC FEA "Air Fuel Potic (A/F) Concer 1" |
| A/F sensor 1 heater | EC-554, "Air Fuel Ratio (A/F) Sensor 1" |
| Heated oxygen sensor 2 | FO FC4 "Heated Owner Copper 2" |
| Heated oxygen sensor 2 heater | EC-561, "Heated Oxygen Sensor 2" |
| Manifold absolute pressure sensor | EC-564, "Manifold Absolute Pressure Sensor" |
| Knock sensor | EC-563, "Knock Sensor" |
| Power steering pressure sensor | EC-565, "Power Steering Pressure (PSP) Sensor" |
| Cooling fan control module | FO FFC "Cooling For" |
| Cooling fan motor | EC-556, "Cooling Fan" |
| Intake valve timing control solenoid valve | EC-563, "Intake Valve Timing Control Solenoid Valve" |
| Exhaust valve timing control position sensor | EC-560, "Exhaust Valve Timing Control Position Sensor" |
| Exhaust valve timing control solenoid valve | EC-560, "Exhaust Valve Timing Control Solenoid Valve" |
| VVEL control module | EC-566, "VVEL Control Module" |
| VVEL actuator motor relay | EC-566, "VVEL Actuator Motor Relay" |
| VVEL actuator motor | EC-566, "VVEL Actuator Motor" |
| VVEL control shaft position sensor | EC-566, "VVEL Control Shaft Position Sensor" |
| EVAP control system pressure sensor | EC-559, "EVAP Control System Pressure Sensor" |
| EVAP canister vent control valve | EC-559, "EVAP Canister Vent Control Valve" |
| EVAP canister purge volume control solenoid valve | EC-559, "EVAP Canister Purge Volume Control Solenoid Valve" |
| PCV valve | EC-567, "Positive Crankcase Ventilation" |
| Brake booster pressure sensor (Vacuum sensor) | BRC-13, "Vacuum Sensor" |
| Battery current sensor (with battery temperature sensor) | EC-555, "Battery Current Sensor (With Battery Temperature Sensor)" |
| Refrigerant pressure sensor | EC-565, "Refrigerant Pressure Sensor" |
| Stop lamp switch | EC-565, "Stop Lamp Switch" |
| ASCD brake switch | EC-554, "ASCD Brake Switch" |
| ASCD steering switch | EC-554, "ASCD Steering Switch" |
| Information display | EC-563, "Information Display" |
| ICC steering switch | EC-562, "ICC Steering Switch" |
| ICC brake switch | EC-562, "ICC Brake Switch" |

Infiniti Drive Mode Selector

Infiniti Drive Mode Selector: Component Parts Location

INFOID:0000000006134704



- A/C auto amp.
 Refer to MWI-6, "METER SYSTEM:
 Component Parts Location" (WITH FOREST AIR).
 Refer to HAC-10, "AUTOMATIC AIR CONDITIONING SYSTEM (WITHOUT FOREST AIR): Component Parts Location" (WITHOUT FOREST AIR).
- Combination meter
 (Vehicle information display, and

Refer to EC-24, "ENGINE CONTROL

SYSTEM: Component Parts Loca-

ECO drive indicator)8. Drive mode select switch

ECM

tion".

- AV control unit
 Refer to <u>AV-10</u>, "<u>Component Parts</u>
 <u>Location</u>" (BASE AUDIO WITHOUT
 NAVIGATION).
 Refer to <u>AV-144</u>, "<u>Component Parts</u>
 <u>Location</u>" (BOSE AUDIO WITH NAV-
- 6. ADAS control unit DAS-14, "Component Parts Location".

IGATION).

7. TCM

4. Accelerator pedal actuator

TM-8, "A/T CONTROL SYSTEM: Component Parts Location".

Infiniti Drive Mode Selector : Component Description

INFOID:0000000006134705

| Part name | Description | |
|--------------------------|--|--|
| Drive mode select switch | Transmits an ON/OFF state signal of STANDARD, SPORT, ECO, or SNOW mode to the A/C auto amp. | |
| A/C auto amp. | Transmits an input signal (ON/OFF state of each mode) received from the drive mode select switch to the TCM, combination meter, 4WAS main control unit, and ADAS control unit via CAN communication. | |
| AV control unit | Transmits an ECO pedal* reaction force setting signal (Standard/Soft/OFF) to ECM via CAN communication. This signal determines reaction force of the accelerator pedal. | |
| TCM | Transmits a state of a mode received from the A/C auto amp. to ECM. | |
| ECM | Receives a ECO mode signal from TCM and controls throttle angle characteristics and torque. Determines reaction force in accordance with the accelerator pedal operation when in ECO mode and transmits an ECO pedal* reaction force control signal to the ADAS control unit. When receiving the ECO pedal* reaction force setting signal (Standard/Soft/OFF) from the AV control unit, ECM updates ECO pedal* reaction force. Further more, ECM sends back the received signal to the AV control unit for confirmation. Controls the ECO drive indicator when in ECO mode. The ECO drive indicator turns ON or blinks (with ECO pedal*) according to accelerator pedal operation. | |
| Combination meter | Indicates a mode state on the vehicle information display, based on a mode state sig nal received from the A/C auto amp. Turns ON or blinks (with ECO pedal*) the ECO drive indicator according to a request from ECM when in ECO mode. | |

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| Part name | Description |
|----------------------------|---|
| ADAS control unit | Controls accelerator pedal reaction force of the accelerator pedal actuator when in ECO mode, based on an ECO pedal* reaction force control signal received from ECM. |
| Accelerator pedal actuator | Applies reaction force to the accelerator pedal when in ECO mode, based on an accelerator pedal reaction force control signal received from the ADAS control unit. |

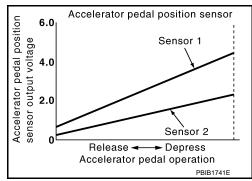
^{*:} ECO pedal control is only for vehicles with intelligent pedal (distance control assist).

Accelerator Pedal Position Sensor

The accelerator pedal position sensor is installed on the accelerator pedal assembly. The sensor detects the accelerator 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 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 engine operations such as fuel cut.



Air Fuel Ratio (A/F) Sensor 1

INFOID:0000000005840995

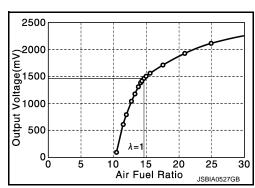
DESCRIPTION

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 760° C (1,400°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.

ASCD Brake Switch

INFOID:0000000005841246

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).

ASCD Steering Switch

INFOID:0000000005841236

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

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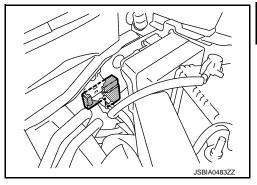
Battery Current Sensor (With Battery Temperature Sensor)

INFOID:0000000005871633

OUTLINE

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator.

Based on sensor signals, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-8, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM: System Description".



CAUTION

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

BATTERY CURRENT SENSOR

The battery current sensor is installed to the battery negative cable. The sensor measures the charging/discharging current of the battery.

BATTERY TEMPERATURE SENSOR

Battery temperature sensor is integrated in battery current sensor.

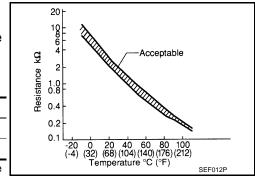
The sensor measures temperature around the battery.

The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

| Temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|-----------------------|--------------|-----------------|
| 25 (77) | 3.333 | 1.9 - 2.1 |
| 90 (194) | 0.969 | 0.222 - 0.258 |

^{*:} These data are reference values and are measured between battery temperature sensor signal terminal and sensor ground.



Camshaft Position Sensor

The camshaft position sensor senses the protrusion of the signal plate installed to the camshaft (INT) front end to identify a particular cylinder. The camshaft position sensor senses the piston position.

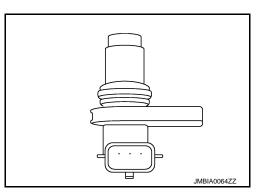
When the crankshaft position sensor system becomes inoperative, the camshaft position sensor provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

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.



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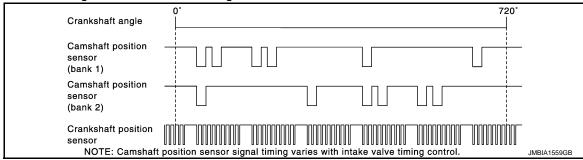
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ECM receives the signals as shown in the figure.



Cooling Fan

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COOLING FAN CONTROL MODULE

Cooling fan control module receives ON/OFF pulse duty signal from IPDM E/R. Corresponding to this ON/OFF pulse duty signal, cooling fan control module sends cooling fan motor operating voltage to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

COOLING FAN MOTOR

Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

Crankshaft Position Sensor

INFOID:0000000005841055

The crankshaft position sensor 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.

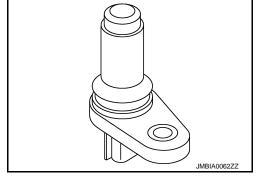
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

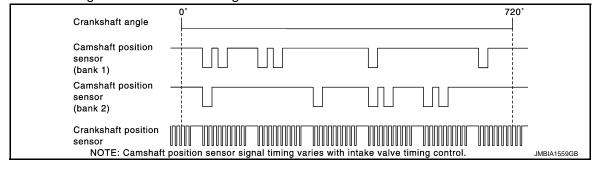
The changing gap causes the magnetic field near the sensor to change.

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.

ECM receives the signals as shown in the figure.



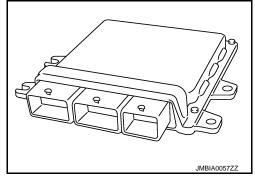


[VK56VD]

ECM INFOID:000000005926809

• ECM (Engine Control Module) controls the engine.

- The ECM consists of a microcomputer and connectors for transmitting/receiving signals and for supplying power. Furthermore, the ECM is equipped with an injector driver unit and actuates the fuel injector at a high voltage (approximately 70 V at the maximum).
- ECM is equipped with ECM temperature sensors. If ECM is overheated, ECM controls output torque to prevent damage to itself.
- 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.

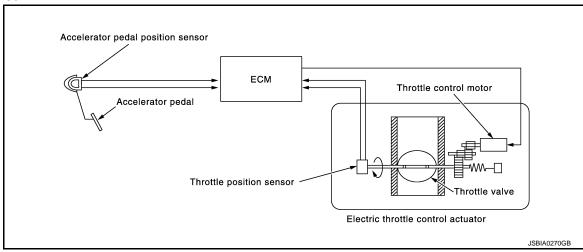


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Electric Throttle Control Actuator

OUTLINE

Electric throttle control actuator consists of throttle body, throttle valve, throttle control motor and throttle position sensor.



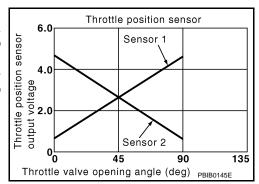
THROTTLE CONTROL MOTOR

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. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

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 potentiometer which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle in response to driving conditions via the throttle control motor.



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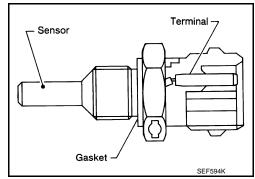
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Engine Coolant Temperature Sensor

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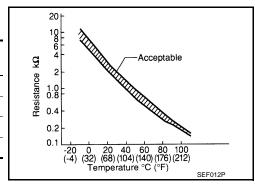
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |

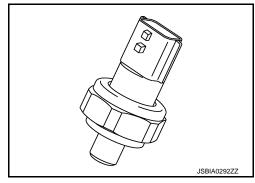
^{*:} These data are reference values and are measured between ECM terminals.



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Engine Oil Pressure Sensor

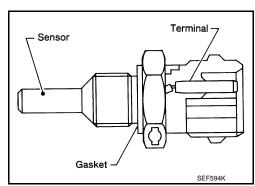
The engine oil pressure (EOP) sensor is detects engine oil pressure and transmits a voltage signal to the ECM.



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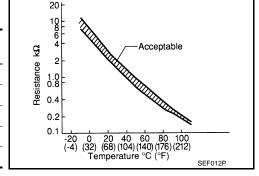
Engine Oil Temperature Sensor

The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil 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>

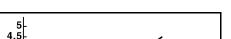
| Engine oil temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|----------------------------------|--------------|-----------------|
| -10 (14) | 4.4 | 7.0 - 11.4 |
| 20 (68) | 3.5 | 2.1 - 2.9 |
| 50 (122) | 2.2 | 0.68 - 1.00 |
| 90 (194) | 0.9 | 0.236 - 0.260 |
| 110 (230) | 0.6 | 0.143 - 0.153 |

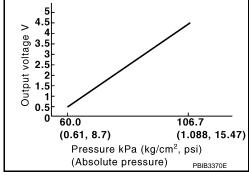


^{*:} These data are reference values and are measured between ECM terminals.

EVAP Control System Pressure Sensor

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





EVAP Canister Vent Control Valve

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.

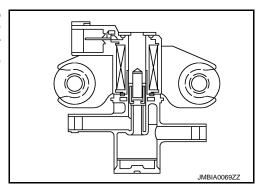
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.

To atmosphere Terminal Spring O-ring Plunger Canister side PBIB1263E

INFOID:0000000005841072

EVAP Canister Purge Volume Control Solenoid Valve

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.



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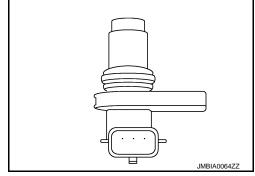
Exhaust Valve Timing Control Position Sensor

Exhaust valve timing control position sensor detects the protrusion of the signal plate installed to the exhaust camshaft front end.

This sensor signal is used for sensing a position of the exhaust camshaft

This sensor uses a Hall IC.

Based on the position of the exhaust camshaft, ECM controls exhaust valve timing control solenoid valve to optimize the shut/open timing of exhaust valve for the driving condition.



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Exhaust Valve Timing Control Solenoid Valve

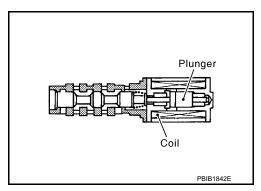
Exhaust valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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

The longer pulse width retards valve angle.

The shorter pulse width advances valve angle.

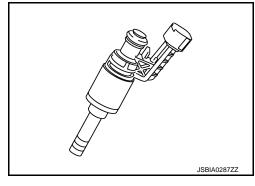
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the exhaust valve angle at the control position.



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Fuel Injector

For the fuel injector, a high pressure fuel injector is used and this enables a high-pressure fuel injection at a high voltage within a short time. The ECM is equipped with an injector driver unit and actuates the fuel injector at a high voltage (approximately 65 V at the maximum).



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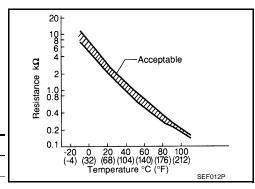
Fuel Tank Temperature Sensor

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>

| Fuel 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:0000000005841008

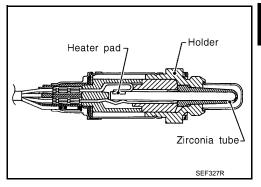
DESCRIPTION

The heated oxygen sensor 2, after three way catalyst (manifold), 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.



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.

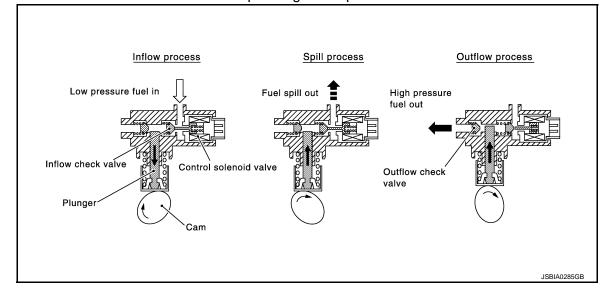
| Engine speed | Heated oxygen sensor 2 heater |
|---|-------------------------------|
| Above 3,600 rpm | OFF |
| Below 3,600 rpm after the following conditions are met. Engine: After warming up Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load | ON |

High Pressure Fuel Pump

INFOID:0000000005926810

The high pressure fuel pump is installed at the front of the engine bank 2 side and activated by the camshaft. ECM controls the high pressure fuel pump control solenoid valve built into the high pressure fuel pump and adjusts the amount of discharge by changing the suction timing of the low pressure fuel.

Operating Description



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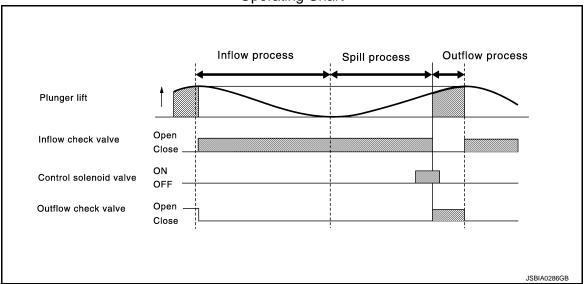
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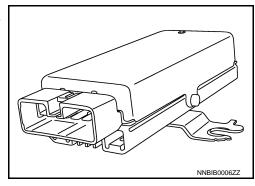
Operating Chart



Fuel Pump Control Module

INFOID:0000000005926812

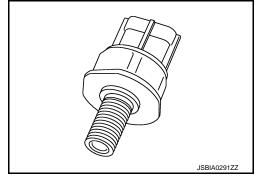
The fuel pump control module (FPCM) controls the discharging volume of the fuel pump by transmitting the FPCM control signals (Low/Mid/High) depending on driving conditions.



Fuel Rail Pressure Sensor

INFOID:00000000005926813

The fuel rail pressure (FRP) sensor is placed to the fuel rail and measures fuel pressure in the fuel rail. The sensor transmits voltage signal to the ECM. As the pressure increases, the voltage rises. The ECM controls the fuel pressure in the fuel rail by operating high pressure fuel pump. The ECM uses the signal from fuel rail pressure sensor as a feedback signal.



ICC Brake Switch

INFOID:0000000005841251

When the brake pedal is depressed, ICC 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).

ICC Steering Switch

INFOID:0000000005841240

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

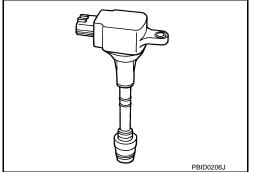
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INFOID:0000000005841329

INFOID:0000000005840947

Ignition Coil With Power Transistor

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.



Information Display

The operation mode of the ASCD is indicated on the information display in the combination meter. When turning ON the MAIN switch of the ASCD steering switch, the CRUISE indicator turns ON, CRUISE is indicated on the information display and the operation mode turns to standby mode. When turning ON the SET/COAST switch while the vehicle is driven at the ASCD setting condition speed range, the SET indicator turns ON and the set speed is indicated on the information display. When the canceling conditions come into effect, CANCEL is indicated on the information display.

Intake Valve Timing Control Solenoid Valve

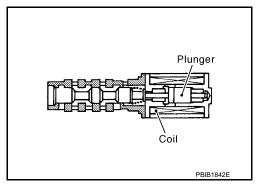
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

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.

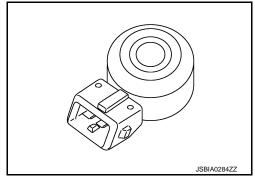
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



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Knock Sensor

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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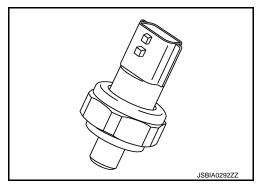
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Low Fuel Pressure Sensor

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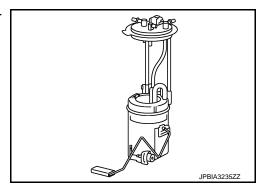
The low fuel pressure sensor is installed to low fuel pressure piping and measures the low fuel pressure. The sensor transmits voltage signal to the ECM. As the pressure increases, the voltage rises.



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Low Pressure Fuel Pump

The low pressure fuel pump is integrated with a fuel pressure regulator and a fuel filter. This pump is build into the fuel tank. ECM controls the low pressure fuel pump via FPCM.



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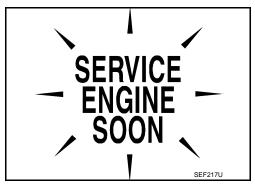
Malfunction Indicator Lamp (MIL)

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-589, "Diagnosis Description".

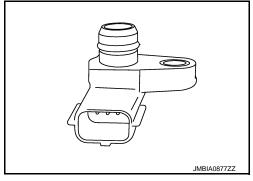


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Manifold Absolute Pressure Sensor

The manifold absolute pressure (MAP) sensor is installed on the intake manifold collector. Detects intake manifold pressure, and transmits a voltage signal to the ECM.

The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.



Mass Air Flow Sensor (With Intake Air Temperature Sensor)

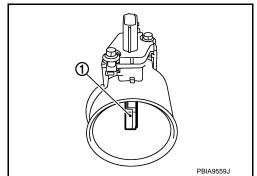
INFOID:0000000005840929

MASS AIR FLOW SENSOR

[VK56VD]

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.



INTAKE AIR TEMPERATURE SENSOR

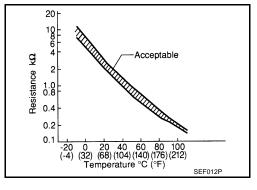
The intake air temperature sensor is built-into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.

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 rise in temperature.

<Reference data>

| Intake air temperature [°C (°F)] | Voltage* (V) | Resistance (kΩ) |
|-------------------------------------|--------------|-----------------|
| 25 (77) | 3.3 | 1.94 - 2.06 |
| 80 (176) | 1.2 | 0.293 - 0.349 |

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



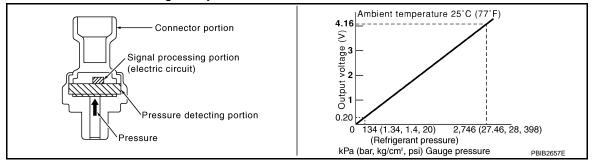
Power Steering Pressure (PSP) Sensor

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

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.



Stop Lamp Switch

Brake 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.

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Revision: 2010 June **EC-565** 2011 M37/M56

< SYSTEM DESCRIPTION >

[VK56VD]

VVEL Actuator Motor

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The VVEL actuator motor rotates the control shaft according to the control signal from the VVEL control module. The VVEL control module judges whether the VVEL actuator motor controls the angle properly by the VVEL control shaft position sensor signal.

VVEL Actuator Motor Relay

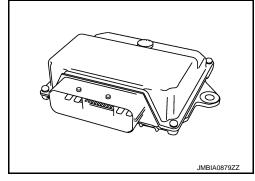
INFOID:0000000005841168

Power supply for the VVEL actuator motor is provided to the VVEL control module via VVEL actuator motor relay. VVEL actuator motor relay is ON/OFF controlled by the VVEL control module. In addition, when the VVEL actuator motor relay cannot be controlled by the VVEL control module for some reason, it ON/OFF controlled by ECM.

VVEL Control Module

INFOID:0000000005841262

The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.



INFOID:0000000005841158

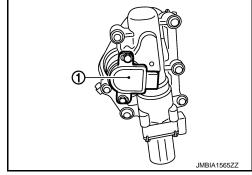
VVEL Control Shaft Position Sensor

VVEL control shaft position sensor (1) is placed on VVEL actuator sub assembly and detects the control shaft position angle.

A magnet is pressed into the arm on the edge of control shaft.

The magnetic field changes as the magnet rotates together with the arm resulting in the output voltage change of the sensor.

VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.

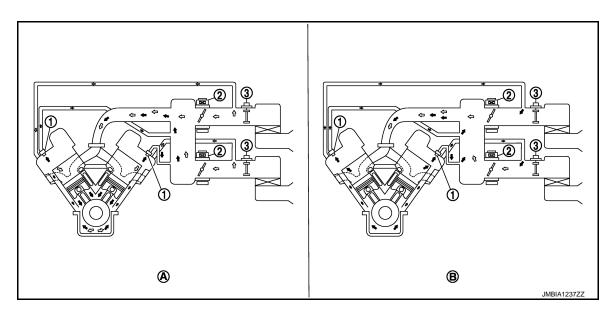


[VK56VD]

STRUCTURE AND OPERATION

Positive Crankcase Ventilation

INFOID:0000000005841339



- PCV valve
- A. Normal condition
- ⟨□: Fresh air
- Blow-by air

- 2. Electric throttle control actuator
- B. Hi-load condition

Mass air flow sensor

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

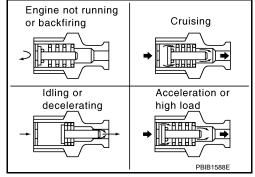
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

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.



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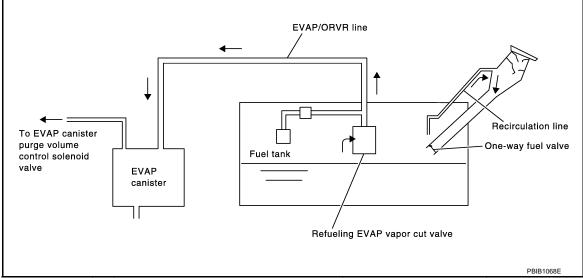
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On Board Refueling Vapor Recovery (ORVR)

INFOID:0000000005841335



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-701, "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.

[VK56VD]

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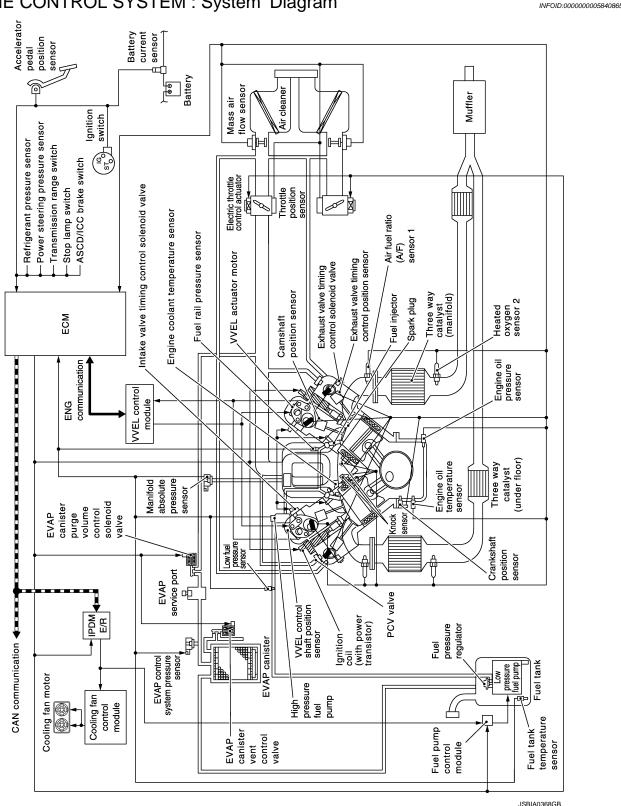
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SYSTEM ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM: System Diagram



ENGINE CONTROL SYSTEM: System Description

INFOID:0000000005840866

ECM performs various controls such as fuel injection control and ignition timing control.

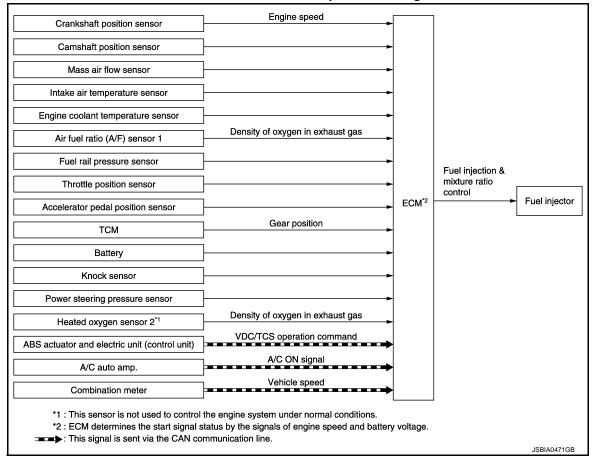
EC-569 Revision: 2010 June 2011 M37/M56

[VK56VD]

DIRECT INJECTION GASOLINE SYSTEM

DIRECT INJECTION GASOLINE SYSTEM: System Diagram

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DIRECT INJECTION GASOLINE SYSTEM: System Description

INFOID:0000000005926821

INPUT/OUTPUT SIGNAL CHART

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| Sensor | Input signal to ECM | ECM function | Actuator | | |
|---|-----------------------------------|--------------------------------|---------------|---|--|
| Crankshaft position sensor | Engine speed*2 | | | | |
| Camshaft position sensor | Camshaft 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 | | | | |
| Fuel rail pressure sensor | Fuel rail pressure | | | | |
| Throttle position sensor | Throttle position | Fuel injection & mixture ratio | Fuel injector | | |
| Accelerator pedal position sensor | Accelerator pedal position | | | | |
| TCM | Park/neutral position | control | | | |
| Battery | Battery voltage*2 | | | | |
| 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 | | | | |
| A/C auto amp. | A/C ON signal Blower ON signal | | | | |
| Combination meter | Vehicle speed | | | | |

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

SYSTEM DESCRIPTION

The adoption of the direct fuel injection method enables more accurate adjustment of fuel injection quantity by injecting atomized high-pressure fuel directly into the cylinder. This method allows high-powered engine, low fuel consumption, and emissions-reduction.

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 and fuel rail pressure) from the crankshaft position sensor, camshaft position sensor, mass air flow sensor and the fuel rail pressure 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

FUEL INJECTION CONTROL

Stratified-charge Combustion

Stratified-charge combustion is a combustion method which enables extremely lean combustion by injecting fuel in the latter half of a compression process, collecting combustible air-fuel around the spark plug, and forming fuel-free airspace around the mixture.

Right after a start with the engine cold, the catalyst warm-up is accelerated by stratified-charge combustion.

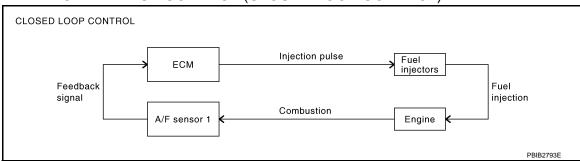
^{*2:} ECM determines the start signal status by the signals of engine speed and battery voltage.

Homogeneous Combustion

Homogeneous combustion is a combustion method that fuel is injected during intake process so that combustion occurs in the entire combustion chamber, as is common with conventional methods.

As for a start except for starts with the engine cold, homogeneous combustion occurs.

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 (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-554, "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.

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

Sequential Direct Injection Gasoline System

[VK56VD]

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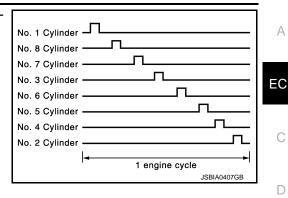
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Fuel is injected into each cylinder during each engine cycle according to the ignition order.



STRATIFIED-CHARGE START CONTROL

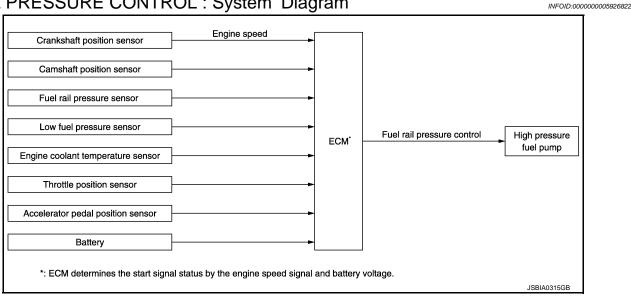
The use of the stratified-charge combustion method enables emissions-reduction when starting the engine with engine coolant temperature between 5°C (41°F) and 40°C (104°F).

FUEL SHUT-OFF

Fuel to each cylinder is shut-off during deceleration, operation of the engine at excessively high speed or operation of the vehicle at excessively high speed.

FUEL PRESSURE CONTROL

FUEL PRESSURE CONTROL: System Diagram

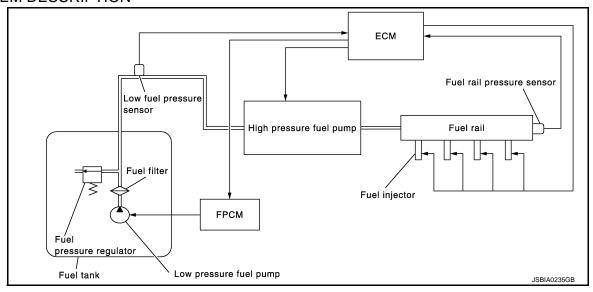


FUEL PRESSURE CONTROL: System Description

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|-----------------------------------|----------------------------|-------------------------|---------------|
| Crankshaft position sensor | Engine speed | | Fuel injector |
| Camshaft position sensor | Camshaft position | | |
| Fuel rail pressure sensor | Fuel rail pressure | | |
| Low fuel pressure sensor | Low fuel pressure | Fuel injection | |
| Engine coolant temperature sensor | Engine coolant temperature | & mixture ratio control | |
| Throttle position sensor | Throttle position | | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage | | |

SYSTEM DESCRIPTION



Low fuel pressure control

The low fuel pressure pump is controlled by the fuel pump control module (FPCM) and pumps fuel according
to a driving condition. The pumped fuel passes through the fuel filter and is sent to the high pressure fuel
pump. FPCM controls the low pressure fuel pump, according to a signal from ECM as shown in the table
below.

| Conditions | Amount of fuel flow | Supplied voltage |
|---|---------------------|--------------------------------|
| After a laps of 1 second after ignition ON | OFF | 0 V |
| For 1 second after ignition ON (engine coolant temperature is 5°C (41°F) or less, or 40°C (104°F) or more) For 1 second after turning ignition switch ON Engine is running under low load and low speed conditions | Low | Approximately 8.5 V |
| For 1 second after ignition ON (engine coolant temperature is 5°C (41°F) or more, or 40°C (104°F) or less) Engine cranking Engine coolant temperature is below 10°C (50°F) Engine is running under high load and high speed conditions | High | Battery voltage (11 – 14 V) |
| Except the above | Mid | Approximately 10 V |

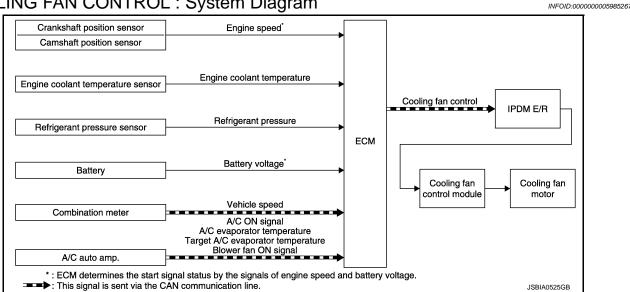
[•] Low fuel pressure is adjusted by the fuel pressure regulator.

High fuel pressure control

The high pressure fuel pump raises the pressure of the fuel sent from the low pressure fuel pump. Actuated by the camshaft, the high pressure fuel pump activates the high pressure fuel pump solenoid based on a signal received from ECM, and adjusts the amount of discharge by changing the timing of closing the inlet check valve to control fuel rail pressure.

COOLING FAN CONTROL

COOLING FAN CONTROL: System Diagram



COOLING FAN CONTROL: System Description

INFOID:0000000005985268

INPUT/OUTPUT SIGNAL CHART

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

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

SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, air conditioner ON signal, refrigerant pressure, target A/C evaporator temperature and A/C evaporator temperature. Cooling fan control signal is sent to IPDM E/R from ECM via the CAN communication line. Then, IPDM E/R sends ON/OFF pulse duty signal to cooling fan control module. Corresponding to this ON/OFF pulse duty signal, cooling fan control module gives cooling fan motor operating voltage to cooling fan motors. Cooling fan speed is controlled by duty cycle of cooling fan motor operating voltage sent from cooling fan control module.

ELECTRIC IGNITION SYSTEM

EC-575 Revision: 2010 June 2011 M37/M56

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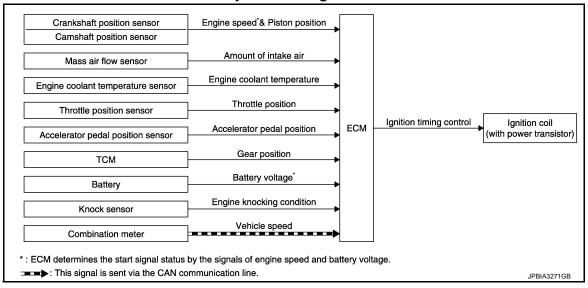
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^{*2:} This signal is sent to ECM via the CAN communication line.

[VK56VD]

ELECTRIC IGNITION SYSTEM : System Diagram

INFOID:0000000005840873



ELECTRIC IGNITION SYSTEM: System Description

INFOID:0000000005840874

INPUT/OUTPUT SIGNAL CHART

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

^{*1:} 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 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.

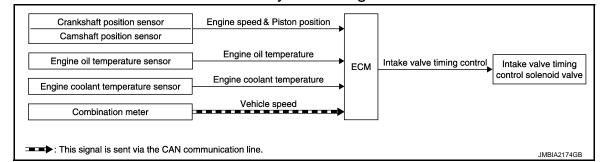
^{*2:} This signal is sent to the ECM via the CAN communication line.

INTAKE VALVE TIMING CONTROL

INTAKE VALVE TIMING CONTROL: System Diagram

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INFOID:0000000005840903



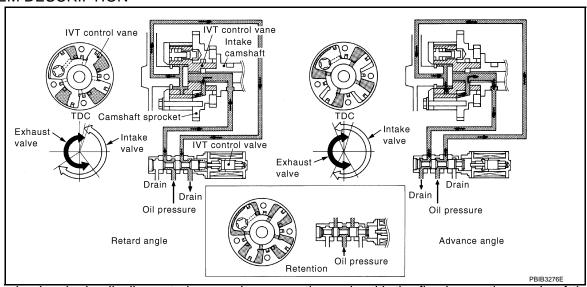
INTAKE VALVE TIMING CONTROL: System Description

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|-----------------------------------|----------------------------------|-----------------------------|--|
| Crankshaft position sensor | Engine aneed and pieter position | | |
| Camshaft position sensor | Engine speed and piston position | Intake valve timing control | Intake valve timing control solenoid valve |
| Engine oil temperature sensor | Engine oil temperature | | |
| 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

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 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.

EXHAUST VALVE TIMING CONTROL

EC-577 Revision: 2010 June 2011 M37/M56

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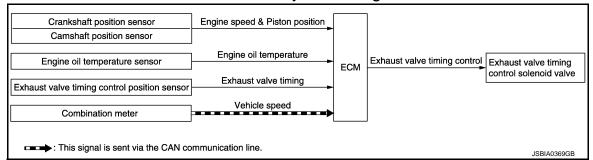
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EXHAUST VALVE TIMING CONTROL: System Diagram

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EXHAUST VALVE TIMING CONTROL: System Description

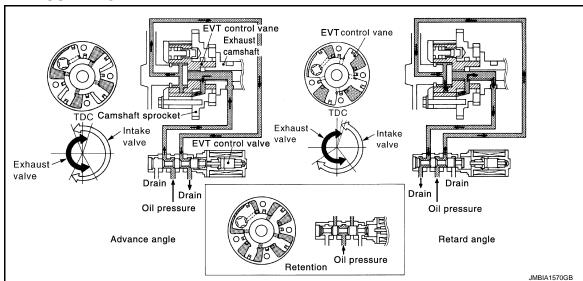
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INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|----------------------------------|------------------------------|---|
| Crankshaft position sensor | Engine speed and piston position | Exhaust valve timing control | Exhaust valve timing control solenoid valve |
| Camshaft position sensor | Engine speed and piston position | | |
| Engine oil temperature sensor | Engine oil temperature | | |
| Exhaust valve timing control position sensor | Exhaust valve timing signal | | |
| 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 exhaust valve.

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

VVEL SYSTEM

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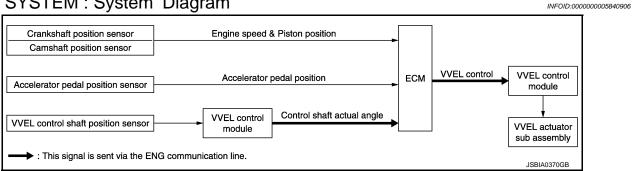
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VVEL SYSTEM: System Diagram



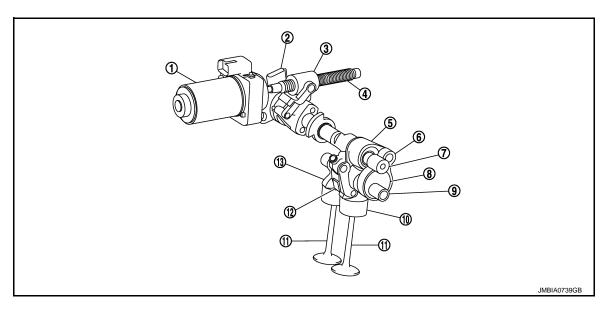
VVEL SYSTEM: System Description

INFOID:0000000005840907

INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|----------------------------------|--------------|----------------------------|
| Camshaft position sensor Crankshaft position sensor | Engine speed and piston position | VVEL control | VVEL control module |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| VVEL control shaft position sensor ↓ VVEL control module | Control shaft actual angle | | VVEL actuator sub assembly |

SYSTEM DESCRIPTION



- VVEL actuator motor
- 4. Ball screw shaft
- Control shaft 7
- 10. Valve lifter
- 13. Output cam

- 2. VVEL control shaft position sensor
- 5. Rocker arm
- 8. Eccentric cam
- 11. Intake valve

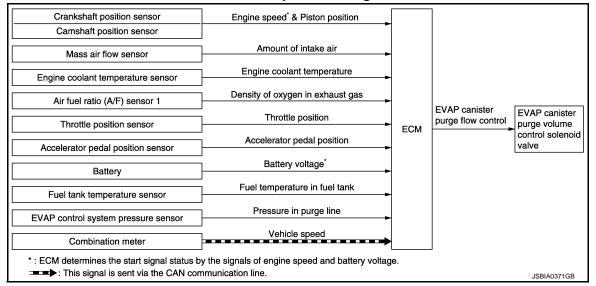
- 3. Ball screw nut
- 6. Link A
- Drive shaft 9.
- 12. Link B

VVEL (Variable Valve Event & Lift) is a system that controls valve event and valve lift continuously. Rotational movement of the drive shaft equipped with eccentric cam is transmitted to output cam via the rocker arm and two kinds of links to depress the intake valve. ECM decides the target valve lift according to the driving condition and sends the command signal to the VVEL control module. The VVEL control module controls the rotation of the control shaft using the VVEL actuator motor and changes the movement of the output cam by shifting the link supporting point. As a result, valve lift changes continuously to improve engine output and response.

EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM: System Diagram

INFOID:0000000005840890



EVAPORATIVE EMISSION SYSTEM: System Description

INFOID:0000000005840891

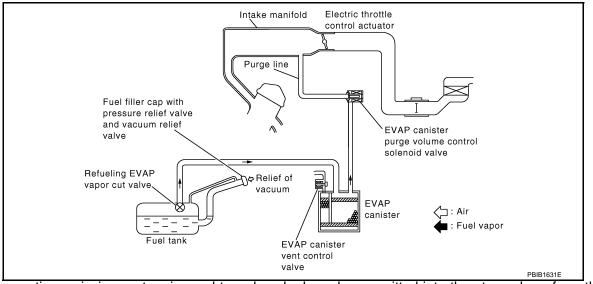
INPUT/OUTPUT SIGNAL CHART

| Sensor | Input signal to ECM | ECM function | Actuator | |
|--|--|--------------------|---|--|
| Crankshaft position sensor Camshaft position sensor | Engine speed*1 | | | |
| Mass air flow sensor | Amount of intake air | | EVAP canister purge volume control solenoid valve | |
| Engine coolant temperature sensor | Engine coolant temperature | | | |
| Battery | Battery voltage*1 | | | |
| Throttle position sensor | Throttle position | EVAP canister | | |
| Accelerator pedal position sensor | Accelerator pedal position | purge flow control | | |
| 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*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.

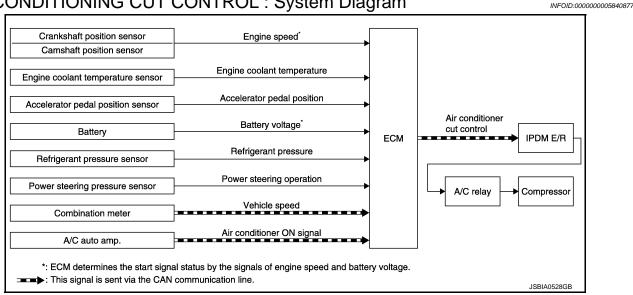
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

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.

AIR CONDITIONING CUT CONTROL

AIR CONDITIONING CUT CONTROL: System Diagram



AIR CONDITIONING CUT CONTROL: System Description

INPUT/OUTPUT SIGNAL CHART

EC-581 Revision: 2010 June 2011 M37/M56

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INFOID:0000000005840878

| Sensor | Input signal to ECM | ECM function | Actuator |
|--|-------------------------------------|--------------------------------------|---------------|
| Crankshaft position sensor Camshaft position sensor | Engine speed*1 | | IPDM E/R ↓ |
| Engine coolant temperature sensor | Engine coolant temperature | Air conditioner cut control A/C rel | |
| Accelerator pedal position sensor | Accelerator pedal position | | |
| Battery | Battery voltage*1 | | |
| Refrigerant pressure sensor | Refrigerant pressure | | |
| Power steering pressure sensor | Power steering operation | | A/C relay |
| A/C auto amp. | A/C ON signal* ² | | Compressor |
| | A/C evaporator temperature*2 | | |
| | Target A/C evaporator temperature*2 | | |
| | Blower ON signal | | |
| Combination meter | Vehicle speed*2 | | |

^{*1:} The 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.

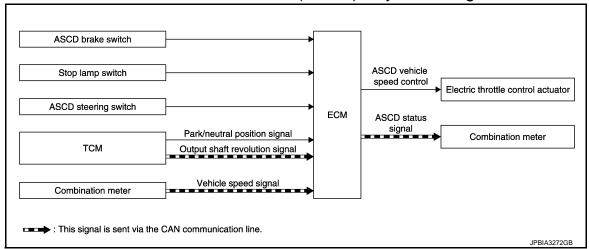
Under the following conditions, the air conditioner is turned off.

- · 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 CONTRÓL DEVICE (ASCD)

AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Diagram

INFOID:0000000005840881



AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description

INFOID:0000000005872367

INPUT/OUTPUT SIGNAL CHART

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

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| Sensor | Input signal to ECM | ECM function | Actuator |
|----------------------|---------------------------------|----------------------------|---|
| ASCD brake switch | Brake pedal operation | | |
| Stop lamp switch | Brake pedal operation | ASCD vehicle speed control | Electric throttle control actua- tor |
| ASCD steering switch | ASCD steering switch operation | | |
| TCM | Park/neutral position signal | | |
| TCIVI | Output shaft revolution signal* | ASCD status signal | Combination meter |
| Combination meter | Vehicle speed* | | |

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

BASIC ASCD SYSTEM

- Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can be set the vehicle speed in the set speed range.
- ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
- Operation status of ASCD is indicated in combination meter.
- If any malfunction occurs in the ASCD system, it automatically deactivates the ASCD control.

Refer to <u>EC-586</u>, "<u>AUTMATIC SPEED CONTROL DEVICE (ASCD)</u>: <u>Switch Name and Function</u>" for ASCD operating instructions.

CAUTION:

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

CAN COMMUNICATION: System Description

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 <u>LAN-35</u>, "CAN COMMUNICATION SYSTEM: CAN Communication Signal Chart", about CAN communication for detail.

Infiniti Drive Mode Selector

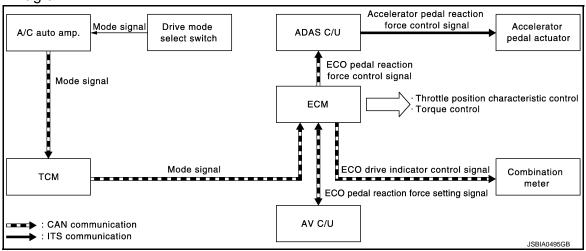
Infiniti Drive Mode Selector: System Description

INFOID:0000000006134706

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INFOID:0000000005840885

System Diagram



NOTE:

- This section provides descriptions only about the control by ECM.
 For overall control, refer to <u>DMS-5</u>. "Infiniti <u>Drive Mode Selector</u>: <u>System Description</u>".
- ECO pedal control is only for vehicles with intelligent pedal (distance control assist).

Infiniti drive mode selector

< SYSTEM DESCRIPTION >

- A/C auto amp. receives an operation state signal of the drive mode select switch and transmits a mode signal (see below) to TCM via CAN communication.
- STANDARD: ON/OFF
- SPORT: ON/OFF
- ECO: ON/OFF
- SNOW: ON/OFF
- TCM transmits a mode state signal to ECM via CAN communication, based on a ECO mode signal received from the A/C auto amp.
- ECM controls throttle angle characteristics and torque appropriate to each mode, based on a ECO mode signal received from TCM via CAN communication.
- The combination meter turns ON or blinks (with ECO pedal) the ECO drive indicator when in ECO mode, based on a ECO drive indicator control signal received from ECM via CAN communication.

ECO pedal control

 The AV control unit transmits an ECO pedal reaction force setting signal (Standard/Soft/OFF) to ECM via CAN communication.

NOTE:

An ECO pedal reaction force setting signal which determines reaction force of the accelerator pedal can be selected on the settings screen of the Multi AV system.

- ECM transmits an ECO pedal reaction force control signal to the ADAS control unit via CAN communication, based on a ECO mode signal received from TCM via CAN communication and an ECO pedal reaction force setting signal received from the AV control unit via CAN communication.
- ECM sends back an ECO pedal reaction force setting signal received from the AV control unit to the AV control unit for confirmation.
- The ADAS control unit controls pedal reaction force of the accelerator pedal actuator via ITS communication, based on an ECO pedal reaction force control signal received from the ADAS control unit.

Control

- With the drive mode selector, a drive mode select switch installed at the top of the center console switches a vehicle drive mode, changes throttle angle characteristics, and controls torque and ECO pedal.
- Vehicle characteristics are controlled in the following modes, on the basis of STANDARD mode ("●" position
 of the drive mode select switch).
- SPORT : Changing throttle angle characteristics allows to use a high engine performance range and increases driving performance.
- ECO: Changing throttle angle characteristics and controlling torque, ECO drive indicator, and ECO pedal enhance fuel economy in actual traffic.
- SNOW: Changing throttle angle characteristics enhances driving performance on roads with a low coefficient of friction.

| Control item | Vehicle drive mode | | | Description | |
|--------------|--------------------|-----|------|--|--|
| Control item | SPORT | ECO | SNOW | - Description | |
| Engine | × | × | × | Changes throttle angle and controls torque ^{*1} and the ECO drive indicator ^{*1} . | |
| ECO pedal*2 | | × | | Controls ECO pedal (Accelerator pedal reaction force control). | |

^{*1:} Torque control and the ECO drive indicator is available only when in ECO mode.

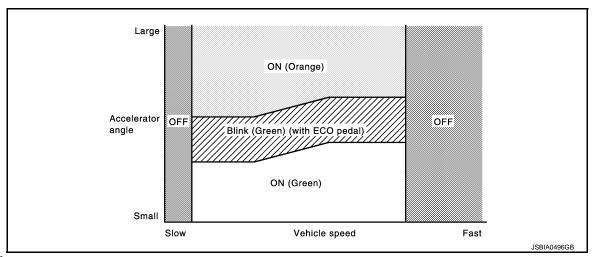
ECO drive indicator control

- ECO drive indicator turns ON or blinks (with ECO pedal) when in ECO mode, according to the operation of the accelerator pedal.
- For vehicles with ECO pedal, the blinking timing of the ECO drive indicator (green) synchronizes to the generation timing of ECO pedal reaction force.

| ECO drive indicator | Driving condition |
|--|----------------------------------|
| ON (Green) | Within the ECO drive range. |
| Blink (Green) (if so equipped ECO pedal) | Likely over the ECO drive range. |

^{*2:} ECO pedal control is only for vehicles with an intelligent pedal (distance control assist).

| ECO drive indicator | Driving condition |
|---------------------|---|
| ON (Orange) | Over the ECO drive range. |
| OFF | Low-speed range [approx. 3 MPH (4.8 km/h) or less] and high-speed range [approx. 90 MPH (144 km/h) or more] |



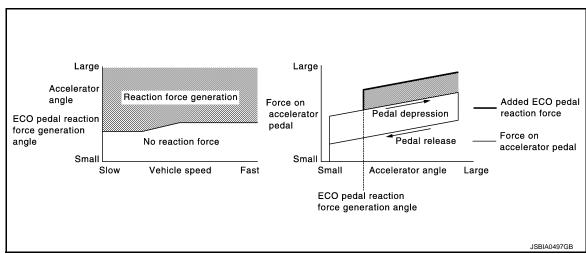
NOTE:

ECO drive indicator turns OFF under the following conditions.

- Intelligent cruise control in operation.
- Selector lever is in R range.

ECO pedal control

- Increasing reaction force of the accelerator pedal supports ECO driving in accordance with the accelerator pedal operation when in ECO mode.
- The level of reaction force to the accelerator pedal can be changed among Standard/Soft/OFF on the navigation screen. ECO pedal reaction force can be turned OFF even when in ECO mode.
- The generation timing of ECO pedal reaction force synchronizes to the blinking timing of the ECO drive indicator (Green).



NOTE:

- When switching from ECO mode to the other mode by operating the drive mode select switch, ECO pedal reaction force is generated in common with ECO mode until the accelerator pedal is released.
- ECO pedal reaction force is not generated under the following conditions.
- Intelligent cruise control is in operation.
- Accelerator pedal is depressed quickly.
- Selector lever is in N or R range.

EC-585 Revision: 2010 June 2011 M37/M56

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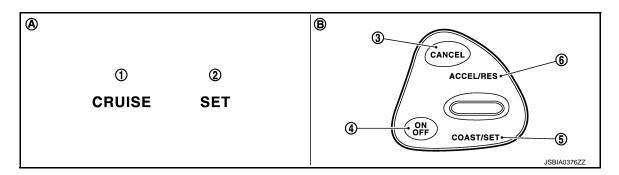
OPERATION

AUTMATIC SPEED CONTROL DEVICE (ASCD)

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

INFOID:0000000005843734

SWITCHES AND INDICATORS



- 1. CRUISE indicator
- 2. SET indicator
- 5. SET/COAST switch
- 3. CANCEL switch
- 6. RESUME/ACCELERATE switch

- A. On the combination meter (Information display)
- B. On the steering wheel

ASCD MAIN switch

SET SPEED RANGE

ASCD system can be set the following vehicle speed.

| Minimum speed (Approx.) | Maximum speed (Approx.) |
|-------------------------|-------------------------|
| 40 km/h (25 MPH) | 143 km/h (88 MPH) |

SWITCH OPERATION

| Item | Function |
|-------------------|---|
| CANCEL switch | Cancels the cruise control driving. |
| RESUME/ACCELERATE | Resumes the set speed. Increases speed incrementally during cruise control driving. |
| SET/COAST | 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 SET/COAST switch or RESUME/ACCELERATE switch.
- Malfunction for some self-diagnoses regarding ASCD control: SET indicator will blink quickly.

OPERATION

< SYSTEM DESCRIPTION >

[VK56VD]

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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HANDLING PRECAUTION

< SYSTEM DESCRIPTION >

[VK56VD]

HANDLING PRECAUTION

Infiniti Drive Mode Selector

INFOID:0000000006134707

ECO DRIVE INDICATOR LAMP CONTROL

- ECO drive indicator turns OFF under the following conditions.
- While driving at low speeds [3 MPH (4.8 km/h) or less] or high speeds [90 MPH (144 km/h) or more].
- Intelligent cruise control is in operation.
- Selector lever is in R range.

ECO PEDAL CONTROL

- When switching from ECO mode to the other mode by operating the drive mode select switch, ECO pedal reaction force is generated in common with ECO mode until the accelerator pedal is released.
- ECO pedal reaction force is not generated under the following conditions.
- Intelligent cruise control is in operation.
- Accelerator pedal is depressed quickly.
- Selector lever is in N or R range.
- ECO pedal reaction force setting is OFF.

NOTF:

ECO pedal control is only for vehicles with an intelligent pedal (distance control assist).

ENGINE OUTPUT CHARACTERISTICS AFTER SWITCHING MODE

- Engine output characteristics after switching mode by operating the drive mode select switch are as follows.
- After switching mode to a mode that engine output increase, engine output characteristics are changed by releasing the accelerator pedal.
- After switching mode to a mode that engine output decreases, engine output characteristics are changed immediately.
- When an accelerator angle is constant, engine output characteristics are as follows.
- SPORT > STANDARD > ECO > SNOW

Output characteristics of each mode

| Control mode | Engine output |
|--------------|---|
| SPORT | Increase |
| STANDARD | Normal |
| ECO | Decrease |
| SNOW | Decrease (More reduction than ECO mode) |

ON BOARD DIAGNOSTIC (OBD) SYSTEM

< SYSTEM DESCRIPTION >

[VK56VD]

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000005984320

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).

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GST (Generic Scan Tool)

INFOID:0000000005984321

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 EC-589, "Diagnosis Description".

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DIAGNOSIS SYSTEM (ECM) DIAGNOSIS DESCRIPTION

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

NFOID:0000000005984379

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.

x: Applicable —: Not applicable

| | | MIL | | | D. | TC | 1st trip DTC | | |
|---|----------|------------|----------|------------|------------|------------|--------------|------------|--|
| Items | 1st trip | | 2nd trip | | 1st trip | 2nd trip | 1st trip | 2nd trip | |
| | Blinking | Illuminate | Blinking | Illuminate | displaying | displaying | displaying | displaying | |
| 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-639, "DTC Index".) | _ | × | _ | _ | × | _ | _ | _ | |
| Except above | _ | _ | _ | × | _ | × | × | _ | |

DIAGNOSIS DESCRIPTION: DTC and Freeze Frame Data

INFOID:0000000005984380

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 <u>EC-639, "DTC Index"</u>. 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-III.

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-683, "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-III or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-III screen.

< SYSTEM DESCRIPTION >

[VK56VD]

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 da | ata | | |

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

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-III 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"

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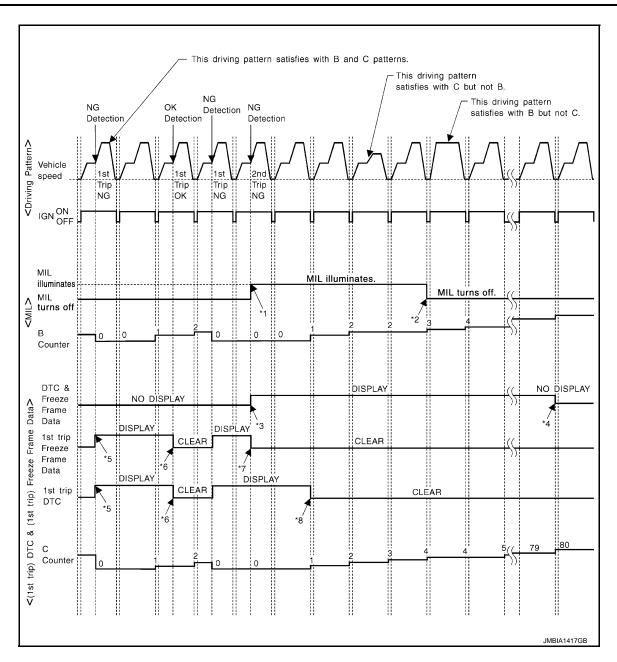
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Revision: 2010 June EC-591 2011 M37/M56



- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *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.)
- *7: When the same malfunction is detected in the 2nd trip, the 1st trip freeze frame data will be cleared.

- *2: MIL will turn OFF after vehicle is driv- *3: When the same malfunction is deen 3 times (pattern B) without any malfunctions.
- *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.
- *8: 1st trip DTC will be cleared when vehicle is driven once (pattern C) without the same malfunction after DTC is stored in ECM.
- tected in two consecutive trips, the DTC and the 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.

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

Driving pattern B means the vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

DIAGNOSIS STSTEM (ECM)

< SYSTEM DESCRIPTION > [VK56VD]

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will turn OFF when the B counter reaches 3. (*2 in "OBD SYSTEM OPERATION CHART")

<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) x (1±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).

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"

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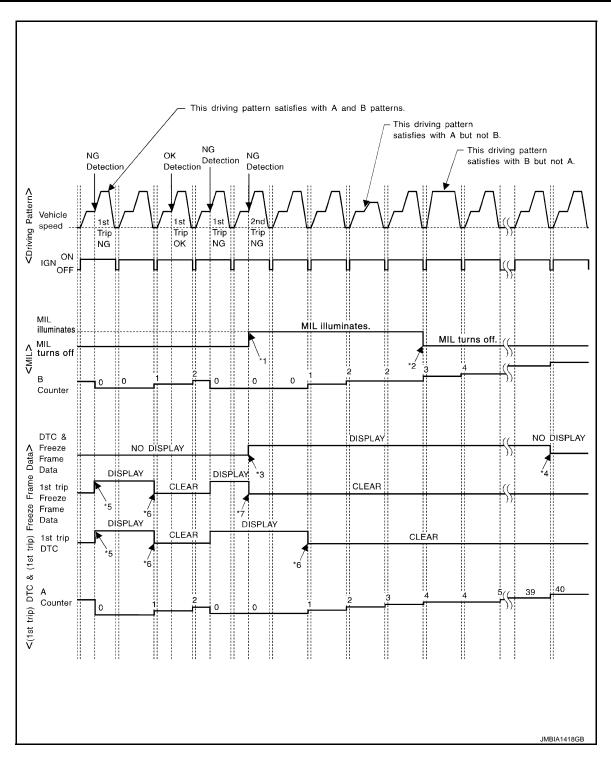
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- *1: When the same malfunction is detected in two consecutive trips, MIL will light up.
- *2: MIL will turn OFF after vehicle is driv- *3: When the same malfunction is deen 3 times (pattern B) without any malfunctions.
 - tected in two consecutive trips, the DTC and the freeze frame data will be stored in ECM.

< SYSTEM DESCRIPTION >

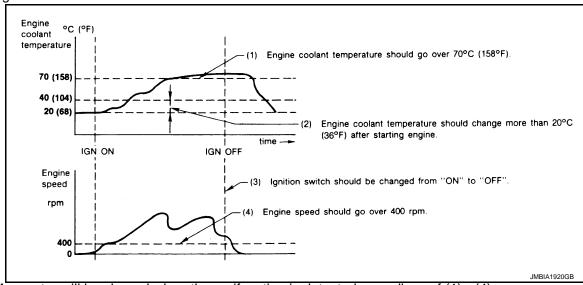
[VK56VD]

- *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.)
- *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: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

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

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

<Driving Pattern A>



• The A counter will be cleared when the malfunction is detected regardless of (1) - (4).

• The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.

The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means operating vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will turn OFF when the B counter reaches 3 (*2 in OBD SYSTEM OPERATION CHART).

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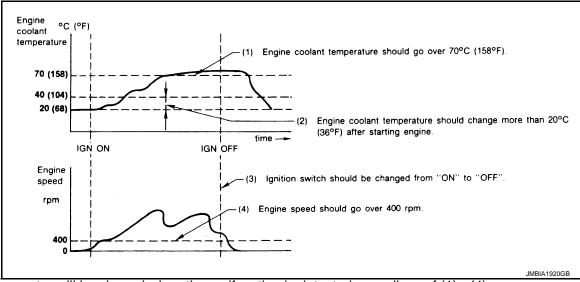
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DIAGNOSIS DESCRIPTION: Driving Pattern

INFOID:0000000005984382

DRIVING PATTERN A



- The A counter will be cleared when the malfunction is detected regardless of (1) (4).
- The A counter will be counted up when (1) (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

DRIVING PATTERN B

Driving pattern B means operating vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will turn OFF when the B counter reaches 3.

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) x (1±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).
- 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.

DIAGNOSIS DESCRIPTION: System Readiness Test (SRT) Code

INFOID:0000000005984383

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 MIL is ON 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") and DTC (No 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.

| | | Example | | | | | | | |
|-------------|-------------|-------------------|--|---------|--------------|---------------------------|--|--|--|
| Self-diagno | osis result | Diagnosis | $\begin{array}{cccccccccccccccccccccccccccccccccccc$ | | | | | | |
| 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 | ОК | _ | _ | | | |
| | | 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.

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. \rightarrow Case 2 above

If one or more SRT related self-diagnoses show NG results in 2 consecutive cycles, the SRT will also indicate "CMPLT". \rightarrow 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".

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".

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^{-:} Self-diagnosis is not carried out.

DIAGNOSIS DESCRIPTION: Malfunction Indicator Lamp (MIL)

INFOID:0000000005984384

SERVICE

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.

 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 <u>EC-1084</u>, "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:0000000005984792

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-694, "Description". |
| Throttle valve closed position learning | ECM can learn the throttle valve closed position. Refer to EC-695, "Description". |
| Idle air volume learning | ECM can learn the idle air volume. Refer to EC-696, "Description". |
| VVEL control shaft position sensor adjustment | The initial position of the VVEL control shaft position sensor can be adjusted. Refer to EC-698 , "Description". |

BLUB 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-1084, "Diagnosis Procedure".

SRT STATUS MODE

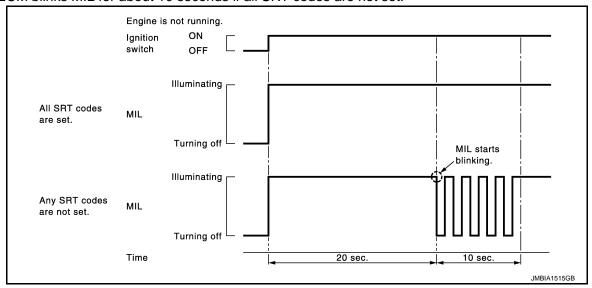
Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to EC-596, "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.

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

- Turn ignition switch ON.
- Check that MIL illuminates. If it remains OFF, check MIL circuit. Refer to EC-1084, "Diagnosis Procedure".
- 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
 - 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.
- Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
- 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.

Fully release the accelerator pedal. ECM has entered to SELF-DIAGNOSTIC RESULTS mode.

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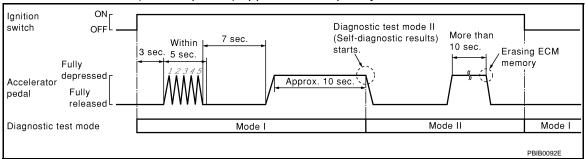
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NOTE:

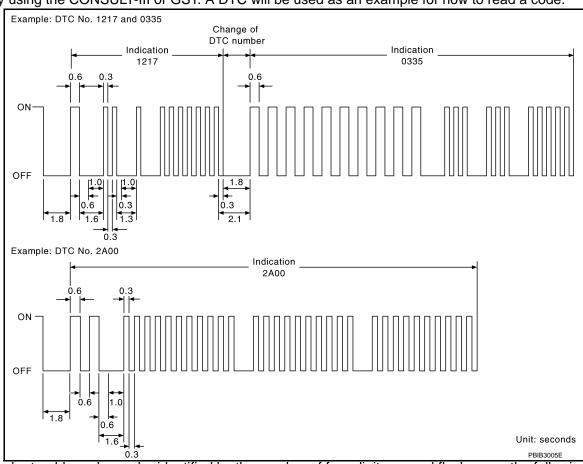
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



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-III 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 | Α | В | С | D | Е | 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.

< SYSTEM DESCRIPTION >

[VK56VD]

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to <u>EC-639</u>, "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.
- 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-III Function

INFOID:0000000005984804

FUNCTION

| Diagnostic test mode | Function |
|------------------------|---|
| Work support | This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-III unit. |
| 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. |
| Active test | Diagnostic Test Mode in which CONSULT-III drives some actuators apart from the ECMs and also shifts some parameters in a specified range. |
| DTC & SRT confirmation | The status of system monitoring tests and the self-diagnosis status/results can be confirmed. |
| Function test | This mode is used to inform customers when the vehicle requires periodic maintenance. |
| ECU identification | ECM part number can be read. |

^{*:} 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

WORK SUPPORT MODE

Work Item

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| WORK ITEM | CONDITION | USAGE |
|-----------------------|--|---|
| IDLE AIR VOL LEARN | The idle air volume that keeps the engine speed 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. Ignition switch ON Engine not running Ambient air 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-III will discontinue it and display appropriate instruction. NOTE: When starting engine, CONSULT-III may display "Battery voltage is low. Charge battery", even when using a charged battery. | When detecting EVAP vapor leak in the EVAP system |
| FUEL PRESSURE RELEASE | 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 | The coefficient of self-learning control mixture ratio returns to the original coefficient. | When clearing mixture ratio self- learning value |
| VIN REGISTRATION | VIN can be registered in ECM. | When registering VIN in ECM |
| VVEL POS SEN ADJ PREP | Use this item only when replacing VVEL actuator sub assembly. Ignition switch ON and engine stopped | When adjusting VVEL control shaft position sensor |
| TARGET IDLE RPM ADJ* | Idle condition | When setting target idle speed |
| TARGET IGN TIM ADJ* | Idle condition | When adjusting target ignition timing |

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-639. "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:

- 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-639, "DTC Index"), skip step 1.
- 1. Erase DTC in TCM. Refer to TM-56, "Diagnosis Description".
- 2. Select "ENGINE" with CONSULT-III.
- 3. Select "SELF-DIAG RESULTS".
- 4. Touch "ERASE". (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

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| Freeze frame data item* | Description | |
|---------------------------------|---|---|
| DIAG TROUBLE CODE [PXXXX] | The engine control component part/control system has a trouble code the is displayed as PXXXX. (Refer to EC-639, "DTC Index".) | Ξ |
| 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] | 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 enleanment) 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 CONDI- TION | 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

Monitored Item

×: Applicable

| Monitored item | Unit | Description | Remarks |
|----------------|----------|--|---|
| ENG SPEED | rpm | Indicates the engine speed computed from the signal of the crankshaft position sensor and camshaft position sensor. | 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 | | | When the engine is stopped, a certain |
| MAS A/F SE-B2 | V | The signal voltage of the mass air flow sensor is displayed. | value is indicated.When engine is running, specification range is indicated in "SPEC". |
| B/FUEL SCHDL | msec | "Base fuel schedule" indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction. | When engine is running, specification range is indicated in "SPEC". |
| A/F ALPHA-B1 | | | When the engine is stopped, a certain |
| A/F ALPHA-B2 | .LPHA-B2 | The mean value of the air-fuel ratio feedback cor- rection factor per cycle is indicated. | 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". |

| Monitored item | Unit | Description | Remarks |
|---------------------------------|-------------|---|--|
| COOLAN TEMP/S | °C or °F | The engine coolant temperature (determined by the signal voltage of the engine coolant tempera- ture sensor) is displayed. | When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The en- gine coolant temperature determined by the ECM is displayed. |
| A/F SEN1 (B1) A/F SEN1 (B2) | V | The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed. | |
| HO2S2 (B1) | | | |
| , , | V | The signal voltage of the heated oxygen sensor 2 is displayed. | |
| HO2S2 (B2) | | | |
| HO2S2 MNTR (B1) HO2S2 MNTR (B2) | RICH/LEAN | 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. | When the engine is stopped, a certain value is indicated. |
| VHCL SPEED SE | km/h or mph | The vehicle speed computed from the vehicle speed signal sent from combination meter is dis- played. | |
| BATTERY VOLT | V | The power supply voltage of ECM is displayed. | |
| ACCEL SEN 1 ACCEL SEN 2 | V | The accelerator pedal position sensor signal voltage is displayed. | ACCEL SEN 2 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal. |
| TP SEN 1-B1 | | The throttle position sensor signal voltage is dis- | TP SEN 2-B1 signal is converted by |
| TP SEN 2-B1 | V | played. | ECM internally. Thus, they differs from ECM terminal voltage signal. |
| FUEL T/TMP SE | °C or °F | The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed. | |
| EVAP SYS PRES | V | The signal voltage of EVAP control system pressure sensor is displayed. | |
| FUEL LEVEL SE | V | The signal voltage of the fuel level sensor is displayed. | |
| START SIGNAL | ON/OFF | Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage. | After starting the engine, [OFF] is displayed regardless of the starter signal. |
| CLSD THL POS | ON/OFF | Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal. | |
| AIR COND SIG | ON/OFF | Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal. | |
| PW/ST SIGNAL | ON/OFF | [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 | 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 | Indicates [ON/OFF] condition from ignition switch signal. | |
| HEATER FAN SW | ON/OFF | Indicates [ON/OFF] condition from the heater blower ON signal. | |
| BRAKE SW | ON/OFF | Indicates [ON/OFF] condition from the stop lamp switch signal. | |

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|-----------------|-------------|--|--|
| INJ PULSE-B1 | msec | Indicates the actual fuel injection pulse width compensated by ECM according to the input sig- | When the engine is stopped, a certain computed value is indicated. |
| INJ PULSE-B2 | PTDC | nals. • Indicates the ignition timing computed by ECM | When the engine is stopped, a certain |
| IGN TIMING | BTDC | according to the input signals. | value is indicated. |
| COMBUSTION | _ | These items are displayed but are not applicable to this model. | |
| CAL/LD VALUE | % | "Calculated load value" indicates the value of the current air flow divided by peak air flow. | |
| MASS AIRFLOW | g/s | Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor. | |
| PURG VOL C/V | % | 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. | |
| EXH/V TIM B1 | 000 | a ladicates [OCA] of our good complet valued on all | |
| EXH/V TIM B2 | °CA | Indicates [°CA] of exhaust camshaft retard angle. | |
| INT/V SOL (B1) | | The control value of the intake valve timing con- trol solenoid valve (determined by ECM accord- | |
| INT/V SOL (B2) | % | ing to the input signals) is indicated.The advance angle becomes larger as the value increases. | |
| AIR COND RLY | ON/OFF | The air conditioner relay control condition (determined by ECM according to the input signals) is indicated. | |
| VENT CONT/V | ON/OFF | 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 | Indicates the throttle control motor relay control condition determined by the ECM according to the input signals. | |
| A/F S1 HTR (B1) | | Air fuel ratio (A/F) sensor 1 heater control value | |
| A/F S1 HTR (B2) | % | computed by ECM according to the input signals. The current flow to the heater becomes larger as the value increases. | |
| HO2S2 HTR (B1) | | Indicates [ON/OFF] condition of heated oxygen | |
| HO2S2 HTR (B2) | ON/OFF | sensor 2 heater determined by ECM according to the input signals. | |
| ALT DUTY SIG | ON/OFF | The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive. | |
| I/P PULLY SPD | rpm | Indicates the engine speed computed from the in- put speed sensor signal. | |
| VEHICLE SPEED | km/h or mph | The vehicle speed computed from the vehicle speed signal sent from TCM is displayed. | |

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|----------------|-------------|--|---------|
| IDL A/V LEARN | YET/CMPLT | 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 | Distance traveled while MIL is activated. | |
| ENG OIL TEMP | °C or °F | The engine oil temperature (determined by the signal voltage of the engine oil temperature sen- sor) is displayed. | |
| VHCL SPEED SE | km/h or mph | The vehicle speed computed from the vehicle speed signal sent from unified meter and combi- nation meter is displayed. | |
| SET VHCL SPD | km/h or mph | The preset vehicle speed is displayed. | |
| MAIN SW | ON/OFF | Indicates [ON/OFF] condition from MAIN switch signal. | |
| CANCEL SW | ON/OFF | Indicates [ON/OFF] condition from CANCEL switch signal. | |
| RESUME/ACC SW | ON/OFF | Indicates [ON/OFF] condition from RESUME/AC- CELERATE switch signal. | |
| SET SW | ON/OFF | Indicates [ON/OFF] condition from SET/COAST switch signal. | |
| BRAKE SW1 | ON/OFF | Indicates [ON/OFF] condition from ASCD brake switch signal. | |
| BRAKE SW2 | ON/OFF | Indicates [ON/OFF] condition of stop lamp switch signal. | |
| DIST SW | ON/OFF | Indicates [ON/OFF] condition from DISTANCE switch signal. | |
| VHCL SPD CUT | NON/CUT | 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 | 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 | Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM. | |
| AT OD CANCEL | ON/OFF | Indicates [ON/OFF] condition of A/T O/D cancel request signal. | |
| CRUISE LAMP | ON/OFF | Indicates [ON/OFF] condition of CRUISE indicator determined by the ECM according to the input signals. | |
| SET LAMP | ON/OFF | Indicates [ON/OFF] condition of SET indicator determined by the ECM according to the input signals. | |
| EXH V/T LEARN | YET/CMPLT | Display the condition of Exhaust Valve Timing Control Learning YET: Exhaust Valve Timing Control Learning has not been performed yet. CMPLT: Exhaust Valve Timing Control Learning has already been performed successfully. | |

< SYSTEM DESCRIPTION >

| Monitored item | Unit | Description | Remarks |
|-------------------------------|-----------|---|--|
| FAN DUTY | % | Indicates a command value for cooling fan. The value is calculated by ECM based on input signals. | |
| AC EVA TEMP | °C or °F | Indicates A/C evaporator temperature sent from "A/C auto amp.". | |
| AC EVA TARGET | °C or °F | Indicates target A/C evaporator temperature sent from "A/C auto amp.". | |
| ALT DUTY | % | Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal. | |
| BAT CUR SEN | mV | The signal voltage of battery current sensor is displayed. | |
| A/F ADJ-B1 | | Indicates the correction of a factor stored in ECM. | |
| A/F ADJ-B2 | _ | The factor is calculated from the difference be- tween the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 sig- nal. | |
| TP SEN 1-B2 | ., | The throttle position sensor signal voltage is dis- | TP SEN 2-B2 signal is converted by |
| TP SEN 2-B2 | V | played. | ECM internally. Thus, they differs from ECM terminal voltage signal. |
| P/N POSI SW | ON/OFF | Indicates [ON/OFF] condition from the park/neutral position (PNP) signal. | |
| INT/A TEMP SE | °C or °F | The intake air temperature (determined by the signal voltage of the intake air temperature sen- sor) is indicated. | |
| AC PRESS SEN | V | The signal voltage from the refrigerant pressure sensor is displayed. | |
| FUEL PRESS SEN | MPa | Indicates the fuel rail pressure computed by ECM according to the input signals | |
| PRESS REG | % | Displays control duty of the high pressure fuel pump solenoid valve. | |
| FUEL INJB1 | msec | ECM-calculated injection pulse width of the fuel injector on the Bank 1 side. | |
| FUEL INJB2 | msec | ECM-calculated injection pulse width of the fuel injector on the Bank 2 side. | |
| INT/V TIM (B1) INT/V TIM (B2) | °CA | Indicates [°CA] of intake camshaft advance angle. | |
| MAP SENSOR | V | The signal voltage from the manifold absolute pressure (MAP) sensor is displayed. | |
| EVAP LEAK DIAG | YET/CMPLT | 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 | Indicates the ready condition of EVAP leak diagnosis. ON: Diagnosis has been ready condition. OFF: Diagnosis has not been ready condition. | |
| VVEL LEARN | YET/DONE | Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been performed successfully. | |

< SYSTEM DESCRIPTION >

[VK56VD]

| Monitored item | Unit | Description | Remarks |
|-------------------------|--------------------|---|---------|
| VVEL SEN LEARN- B1 | V | Indicates the VVEL learning value. | |
| VVEL SEN LEARN- B2 | v | madatod the VVEE loaning value. | |
| VVEL POSITION SEN-B1 | V | The VVEL control shaft position sensor signal | |
| VVEL POSITION SEN-B2 | V | voltage is displayed. | |
| VVEL TIM-B1 | deg | Indicates [deg] of VVEL control shaft angle. | |
| VVEL TIM-B2 | ueg | • indicates [deg] of VVEL control shall angle. | |
| FPCM | HI/MID/LOW/ OFF | The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signals) is indicated. | |
| BAT TEMP SEN | V | The signal voltage from the battery temperature sensor is displayed. | |
| THRTL STK CNT B1 | | Not used. | |
| THRTL STK CNT B2 | _ | Not used. | |
| HO2 S2 DIAG2(B2) | CMP/INCMP | These items are displayed but are not applicable | |
| HO2 S2 DIAG2(B1) | CMP/INCMP | to this model. | |
| FUEL INJ TIMG | deg | Indicates the fuel injection timing computed by ECM according to the input signals. | |
| H/P FUEL PUMP DEG | deg | Displays ECM-calculated fuel discharge position of the high pressure fuel pump. | |
| FUEL PRES SEN V | mV | The signal voltage of FRP sensor is displayed. | |
| L/FUEL PRES SEN | MPa | Displays a pressure value calculated from a low fuel pressure sensor voltage. | |
| L/FUEL PRES SEN V | mV | The signal voltage of low fuel pressure sensor is displayed. | |
| EOP SENSOR | mV | The signal voltage of EOP sensor is displayed. | |
| ECM TEMP 1 | °C or °F | Displays a temperature calculated from a signal of ECM temperature sensor 1. | |
| ECM TEMP 2 | °C or °F | Displays a temperature calculated from a signal of ECM temperature sensor 2. | |
| FUEL PUMP DUTY | % | The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signals) is indicated. | |

NOTE:

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

ACTIVE TEST MODE

Test Item

| TEST ITEM | CONDITION | JUDGMENT | CHECK ITEM (REMEDY) |
|---------------------|---|---|--|
| VENT CON- TROL/V | Ignition switch: ON (Engine stopped) Turn solenoid valve ON and OFF with the CONSULT-III and listen to operating sound. | Solenoid valve makes an operating sound. | Harness and connectors Solenoid valve |
| ENG COOLANT TEMP | Engine: Return to the original non-standard condition Change the engine coolant temperature using CONSULT-III. | If malfunctioning symptom disappears, see CHECK ITEM. | Harness and connectors Engine coolant temperature sensor Fuel injector |

< SYSTEM DESCRIPTION >

[VK56VD]

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| TEST ITEM | CONDITION | JUDGMENT | CHECK ITEM (REMEDY) |
|-------------------------|---|--|--|
| FUEL INJEC- TION | Engine: Return to the original non-standard condition Change the amount of fuel injection using CONSULT-III. | If malfunctioning symptom disappears, see CHECK ITEM. | Harness and connectors Fuel injector Air fuel ratio (A/F) sensor 1 E |
| FUEL/T TEMP SEN | Change the fuel tank temperature | using CONSULT-III. | |
| PURG VOL CONT/V | Engine: After warming up, run engine at 1,500 rpm. Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III. | Engine speed changes according to the opening percent. | Harness and connectors Solenoid valve |
| FAN DUTY CON- TROL* | Ignition switch: ON Change duty ratio using CON- SULT-III. | Cooling fan speed changes. | Harness and connectors Cooling fan motor Cooling fan relay Cooling fan control module IPDM E/R |
| ALTERNATOR DUTY | Engine: Idle Change duty ratio using CON- SULT-III. | Battery voltage changes. | Harness and connectors IPDM E/R Alternator |
| EXH V/T ASSIGN ANGLE | Engine: Return to the original non-standard condition Change exhaust valve timing using CONSULT-III. | If malfunctioning symptom disappears, see CHECK ITEM. | Harness and connectors Exhaust valve timing control magnet retarder |
| POWER BAL- ANCE | Engine: After warming up, idle the engine. A/C switch OFF Selector lever: P or N Cut off each injector signal one at a time using CONSULT-III. | Engine runs rough or stops. | Harness and connectors Compression Fuel injector Power transistor Spark plug Ignition coil |
| INT V/T ASSIGN ANGLE | Engine: Return to the original non-standard condition Change intake valve timing using CONSULT-III. | If malfunctioning symptom disappears, see CHECK ITEM. | Harness and connectors Intake valve timing control solenoid valve |
| IGNITION TIM- ING | Engine: Return to the original non-standard condition Timing light: Set Retard the ignition timing using CONSULT-III. | If malfunctioning symptom disappears, see CHECK ITEM. | Perform Idle Air Volume Learning. |
| FPCM | Engine: Return to the original trouble condition Select "LOW", "MID" and "HI" with CONSULT-III. | Fuel pump speed changes or stops. | Harness and connectors Fuel pump control module (FPCM) |

^{*:} Leaving cooling fan OFF with CONSULT-III while engine is running may cause the engine to overheat.

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For items whose SRT codes are set, "CMPLT" is displayed on the CONSULT-III screen; for items whose SRT codes are not set, "INCMP" is displayed.

SRT WORK SUPPORT Mode

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

DTC WORK SUPPORT Mode

| Test mode | Test item | Corresponding DTC No. | Reference page |
|--------------------|---------------------------|-----------------------|---------------------|
| | HO2S2 (B1) P1146 | P0138 | EC-807, "DTC Logic" |
| | HO2S2 (B1) P1147 | P0137 | EC-801, "DTC Logic" |
| HO2S2 | HO2S2 (B1) P0139 | P0139 | EC-815, "DTC Logic" |
| ПО232 | HO2S2 (B2) P1166 | P0158 | EC-807, "DTC Logic" |
| | HO2S2 (B2) P1167 | P0157 | EC-801, "DTC Logic" |
| | HO2S2 (B2) P0159 | P0159 | EC-815, "DTC Logic" |
| | A/F SEN1 (B1) P1278/P1279 | P0133 | EC-796, "DTC Logic" |
| A/F SEN1 | A/F SEN1 (B1) P1276 | P0130 | EC-786, "DTC Logic" |
| AVF SEINT | A/F SEN1 (B2) P1288/P1289 | P0153 | EC-796, "DTC Logic" |
| | A/F SEN1 (B2) P1286 | P0150 | EC-786, "DTC Logic" |
| | EVP V/S LEAK P0456/P1456* | P0456 | EC-905, "DTC Logic" |
| EVAPORATIVE SYSTEM | PURG VOL CN/V P1444 | P0443 | EC-876, "DTC Logic" |
| | PURG FLOW P0441 | P0441 | EC-871, "DTC Logic" |

^{*:} DTC P1456 does not apply to Y51 models but appears in DTC Work Support Mode screens.

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

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VALUES ON THE DIAGNOSIS TOOL

NOTE:

- · Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
- * Specification data may not be directly related to their components signals/values/operations. i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show
- the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIM-ING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

| Monitor Item | | Values/Status | |
|-----------------|--|--|--------------------------------------|
| ENG SPEED | Run engine and compare CONSI | Almost the same speed as the tachometer indication | |
| MAS A/F SE-B1 | See EC-709, "Description". | | |
| MAS A/F SE-B2 | See EC-709, "Description". | | |
| B/FUEL SCHDL | See EC-709, "Description". | | |
| A/F ALPHA-B1 | See EC-709, "Description". | | |
| A/F ALPHA-B2 | See EC-709, "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 1.5 V |
| A/F SEN1 (B2) | Engine: After warming up | Maintaining engine speed at 2,000 rpm | Fluctuates around 1.5 V |
| HO2S2 (B1) | Revving engine from idle up to 3 tions are met. Engine: After warming up After keeping engine speed betwat idle for 1 minute under no load | 0 - 0.3 V ←→ Approx. 0.6 - 1.0 V | |
| HO2S2 (B2) | 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) | Revving engine from idle up to 3 tions are met. Engine: After warming up After keeping engine speed betwat idle for 1 minute under no load | $LEAN \longleftrightarrow RICH$ | |
| HO2S2 MNTR (B2) | Revving engine from idle up to 3 tions are met. Engine: After warming up After keeping engine speed betwat idle for 1 minute under no load | $LEAN \longleftrightarrow RICH$ | |
| VHCL SPEED SE | Turn drive wheels and compare C dication. | Almost the same speed as speedometer indication | |
| BATTERY VOLT | Ignition switch: ON (Engine stopped) | | 11 - 14 V |
| A00EL 0EN 4 | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.0 V |
| ACCEL SEN 1 | (Engine stopped) | Accelerator pedal: Fully depressed | 4.4 - 4.8 V |
| | Ignition switch: ON | Accelerator pedal: Fully released | 0.45 - 1.0 V |
| ACCEL SEN 2*1 | (Engine stopped) | Accelerator pedal: Fully depressed | 4.3 - 4.8 V |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | (| Condition | Values/Status |
|---------------------------|---|--|---|
| TP SEN 1-B1 | Ignition switch: ON (Engine stopped) | Accelerator pedal: Fully released | More than 0.36 V |
| | Selector lever: D position | Accelerator pedal: Fully depressed | Less than 4.75 V |
| 1 | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 2-B1* ¹ | (Engine stopped)Selector lever: D position | 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 \rightarrow START \rightarrow | ON | $OFF \to ON \to OFF$ |
| CLSD THL POS | Ignition switch: ON | Accelerator pedal: Fully released | ON |
| CLSD THE FOS | (Engine stopped) | Accelerator pedal: Slightly depressed | OFF |
| | Engine: After warming up, idle | Air conditioner switch: OFF | OFF |
| AIR COND SIG | the engine | Air conditioner switch: ON (Compressor operates.) | ON |
| DW/OT OLONIAL | Engine: After warming up, idle | Steering wheel: Not being turned | OFF |
| PW/ST SIGNAL | the engine | Steering wheel: Being turned | ON |
| LOAD SIGNAL | Ignition switch: ON | Rear window defogger switch: ON and/or Lighting switch: 2nd position | ON |
| LOAD SIGNAL | | Rear window defogger switch and lighting switch: OFF | OFF |
| IGNITION SW | • Ignition switch: $ON \rightarrow OFF \rightarrow O$ | N | $ON \to OFF \to ON$ |
| HEATER FAN SW | Engine: After warming up, idle | Blower fan switch: ON | ON |
| TIE/TIEIT TAIV OV | the engine | Blower fan switch: OFF | OFF |
| BRAKE SW | Ignition switch: ON | Brake pedal: Fully released | OFF |
| | ig.mio.r omio.r or | Brake pedal: Slightly depressed | ON |
| | Engine: After warming up Selector lever: P or N position | Idle | 2.0 - 3.0 msec |
| INJ PULSE-B1 | A/C switch: OFF No load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | Idle | 2.0 - 3.0 msec |
| INJ PULSE-B2 | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | 1.9 - 2.9 msec |
| | Engine: After warming up | Idle | 1 - 4°BTDC |
| IGN TIMING | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | 25 - 45°BTDC |
| COMBUSTION | _ | | These items are displayed but are not applicable to this model. |
| | Engine: After warming up | Idle | 5 - 35% |
| | | | · · · |
| CAL/LD VALUE | Selector lever: P or N position A/C switch: OFF No load | 2,500 rpm | 5 - 35% |
| CAL/LD VALUE | Selector lever: P or N positionA/C switch: OFF | 2,500 rpm Idle | 5 - 35% 2.0 - 6.0 g/s |

| Monitor Item | | Condition | Values/Status | | |
|-----------------|--|---|---|--|--|
| PURG VOL C/V | Engine: After warming up Selector lever: P or N position A/C switch: OFF | Idle (Accelerator pedal: Not depressed even slightly, after engine starting.) | 0% | | |
| | No load | 2,000 rpm | 5% | | |
| | Engine: After warming up | Idle | –5° - 5°CA | | |
| EXH/V TIM B1 | Selector lever: P or N positionA/C switch: OFFNo load | Around 2,500 rpm while the engine speed is rising | Approx. 0 - 30°CA | | |
| | Engine: After warming up | Idle | −5 - 5°CA | | |
| EXH/V TIM B2 | Selector lever: P or N positionA/C switch: OFFNo load | Around 2,500 rpm while the engine speed is rising | Approx. 0 - 30°CA | | |
| | Engine: After warming up | Idle | 0 - 2% | | |
| NT/V SOL (B1) | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% | | |
| | Engine: After warming up | Idle | 0 - 2% | | |
| INT/V SOL (B2) | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 0 - 50% | | |
| | Engine: After warming up, idle | A/C switch: OFF | OFF | | |
| AIR COND RLY | the engine | A/C switch: ON (Compressor operates) | ON | | |
| VENT CONT/V | Ignition switch: ON | OFF | | | |
| THRTL RELAY | Ignition switch: ON | ON | | | |
| A/F S1 HTR (B1) | Engine: After warming up, idle th (More than 140 seconds after state) | 4 - 100% | | | |
| A/F S1 HTR (B2) | Engine: After warming up, idle the (More than 140 seconds after state) | 4 - 100% | | | |
| HO2S2 HTR (B1) | - Engine: After warming up | after the following conditions are met. een 3,500 and 4,000 rpm for 1 minute and at | ON | | |
| | Engine speed: Above 3,600 rpm | OFF | | | |
| | | after the following conditions are met. | | | |
| HO2S2 HTR (B2) | Engine: After warming up Keeping the engine speed between idle for 1 minute under no load | een 3,500 and 4,000 rpm for 1 minute and at | ON | | |
| | Engine speed: Above 3,600 rpm | Engine speed: Above 3,600 rpm | | | |
| ALT DUTY SIC | Power generation voltage variable | le control: Operating | ON | | |
| ALT DUTY SIG | Power generation voltage variable | le control: Not operating | OFF | | |
| /P PULLY SPD | Vehicle speed: More than 20 km | /h (12 MPH) | Almost the same speed as the tachometer indication | | |
| VEHICLE SPEED | Turn drive wheels and compare 0 dication. | CONSULT-III value with the speedometer in- | Almost the same speed as the speedometer indication | | |
| IDL A/V LEARN | Engine: Running | Idle air volume learning has not been performed yet. | YET | | |
| | g | Idle air volume learning has already been performed successfully. | CMPLT | | |
| TRVL AFTER MIL | Ignition switch: ON | Vehicle has traveled after MIL has illuminated. | 0 - 65,535 km (0 - 40,723 miles) | | |
| ENG OIL TEMP | Engine: After warming up | | More than 70°C (158°F) | | |
| VHCL SPEED SE | Turn drive wheels and compare 0 dication. | CONSULT-III value with the speedometer in- | Almost the same speed as the speedometer indication | | |

| < ECU DIAGNOSI | S INFORMATION > | ECM | [VK56VD] |
|-------------------------|--|---|--|
| Monitor Item | | Condition | Values/Status |
| SET VHCL SPD | Engine: Running | ASCD: Operating | The preset vehicle speed is displayed |
| NAAINI OVA | - Inviting a suitale ON | MAIN switch: Pressed | ON |
| MAIN SW | Ignition switch: ON | MAIN switch: Released | OFF |
| CANCEL CW | a Ignition quitable ON | CANCEL switch: Pressed | ON |
| CANCEL SW | Ignition switch: ON | CANCEL switch: Released | OFF |
| RESUME/ACC SW | Ignition switch: ON | RESUME/ACCELERATE switch: Pressed | ON |
| | - ignition switch. Oiv | RESUME/ACCELERATE switch: Released | OFF |
| SET SW | Ignition switch: ON | SET/COAST switch: Pressed | ON |
| SET SW | • Ignition switch. ON | SET/COAST switch: Released | OFF |
| BRAKE SW1 | | Brake pedal: Fully released | ON |
| (ASCD/ICC brake switch) | Ignition switch: ON | Brake pedal: Slightly depressed | OFF |
| BRAKE SW2 | | Brake pedal: Fully released | OFF |
| (Stop lamp switch) | Ignition switch: ON | Brake pedal: Slightly depressed | ON |
| DIOT OW | | DISTANCE switch: Pressed | ON |
| DIST SW | Ignition switch: ON | DISTANCE switch: Released | OFF |
| 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 \rightarrow at the 2nd time | $ON \to OFF$ |
| | MAIN switch: ON | ASCD: Operating | ON |
| SET LAMP | When vehicle speed is between 40 km/h (25 MPH) and 144 km/ h (89 MPH) The speed is between 40 km/h (25 MPH) | ASCD: Not operating | OFF |
| EXH V/T LEARN | • Engine: Punning | Exhaust Valve Timing Control Learning has not been performed yet. | YET |
| EXH V/I LEARN | Engine: Running | Exhaust Valve Timing Control Learning has not been performed yet. | CMPLT |
| FAN DUTY | Engine: Running | | 0 - 100% |
| AC EVA TEMP | Engine: Running | | Indicates A/C evaporator temperature sent from"A/C auto amp.". |
| AC EVA TARGET | Engine: Running | | Indicates target A/C evaporator temperature sent from "A/C auto amp.". |
| ALT DUTY | Engine: Idle | | 0 - 80% |
| | Engine speed: Idle | | |
| BAT CUR SEN | Battery: Fully charged*² Selector lever: P or N position A/C switch: OFF No load | Battery: Fully charged*² Selector lever: P or N position A/C switch: OFF | |
| A/F ADJ-B1 | Engine: Running | | -0.330 - 0.330 |
| A/F ADJ-B2 | Engine: Running | | -0.330 - 0.330 |
| | Ignition switch: ON | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 1-B2 | (Engine stopped)Selector lever: D position | Accelerator pedal: Fully depressed | Less than 4.75 V |

| Monitor Item | | Condition | Values/Status |
|---------------------------|---|--|---|
| 1 | Ignition switch: ON (Family a standard) | Accelerator pedal: Fully released | More than 0.36 V |
| TP SEN 2-B2* ¹ | (Engine stopped) • Selector lever: D position | Accelerator pedal: Fully depressed | Less than 4.75 V |
| P/N POSI SW | a Ignition quitable ON | Selector lever: P or N | ON |
| P/IN POSI 3W | Ignition switch: ON | Selector lever: Except above position | 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 |
| | Engine: After warming up | Idle | Approx. 2.74 MPa |
| FUEL PRES SEN | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 3.0 MPa |
| | Engine: After warming up | Idle | Approx. 82.5% |
| PRESS REG | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 90.0% |
| | Engine: After warming up | Idle | Approx. 1.4 msec |
| FUEL INJ B1 | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 1.0 msec |
| | Engine: After warming up | Idle | Approx. 1.4 msec |
| FUEL INJ B2 | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 1.0 msec |
| | Engine: After warming up | Idle | −5 - 5°CA |
| INT/V TIM (B1) | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 0 - 30°CA |
| | Engine: After warming up | Idle | −5 - 5°CA |
| INT/V TIM (B2) | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 0 - 30°CA |
| VVEL LEARN | Ignition switch: OFF → ON (After warming up) | VVEL learning has not been performed yet. | YET |
| VVELLEARN | | VVEL learning has already been performed successfully. | DONE |
| | Engine: After warming up | Idle | Approx. 1.0 V |
| MAP SENSOR | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 1.35 V |
| 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. |
| VVEL SEN LEARN-B1 | VVEL learning has already been | performed successfully | Approx. 0.30 - 0.80 V |
| VVEL SEN LEARN-B2 | VVEL learning has already been | performed successfully | Approx. 0.30 - 0.80 V |
| VVEL POSITION SEN- | Engine: After warming up Selector lever: P or N position | Idle When revving engine up to 2,000 rpm | Approx. 0.25 - 1.50 V |
| B1 | A/C switch: OFF No load | quickly | Approx. 0.25 - 4.75 V |
| VVEL POSITION SEN- | Engine: After warming upSelector lever: P or N position | Idle | Approx. 0.25 - 1.50 V |
| B2 | Air conditioner switch: OFF No load | When revving engine up to 2,000 rpm quickly | Approx. 0.25 - 4.75 V |

< ECU DIAGNOSIS INFORMATION >

| Monitor Item | | Condition | Values/Status |
|--------------------|---|--|---|
| | Engine: After warming up | Idle | Approx. 0 - 23 deg |
| VVEL TIM-B1 | Selector lever: P or N positionA/C switch: OFFNo load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| | Engine: After warming up | Idle | Approx. 0 - 23 deg |
| VVEL TIM-B2 | Selector lever: P or N positionA/C switch: OFFNo load | When revving engine up to 2,000 rpm quickly | Approx. 0 - 90 deg |
| | | Engine: Cranking | HI |
| FPCM | Engine: After warming up Selector lever: P or N position | Revving engine from idle to 4,000 rpm quickly | MID |
| | A/C switch: OFF No load | Engine: Idle Engine coolant temperature: More than 10°C (50°F) | LOW |
| BAT TEMP SEN | Engine: After warming upSelector lever: P or N positionA/C switch: OFFNo load | Idle | Indicates the temperature around the battery. |
| THRTL STK CNT B1 | Not used. | | _ |
| THRTL STK CNT B2 | Not used. | _ | |
| HO2 S2 DIAG2(B2) | DTC P0139 self-diagnosis (slow | response) is incomplete. | IMCMP |
| 1102 02 51/(02(52) | DTC P0139 self-diagnosis (slow | CMPLT | |
| HO2 S2 DIAG2(B1) | DTC P0139 self-diagnosis (slow | response) is incomplete. | IMCMP |
| | DTC P0139 self-diagnosis (slow | response) is complete. | CMPLT |
| | Engine: After warming upSelector lever: P or N position | Idle | Approx. 16 deg |
| FUEL INJ TIMG | A/C switch: OFF No load | 2,000 rpm | Approx. –170 deg |
| | Engine: After warming up | Idle | Approx. 211.0 deg |
| H/P FUEL PUMP DEG | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 206.0 deg |
| | Engine: After warming up | Idle | Approx. 980 – 1,200 mV |
| FUEL PRES SEN V | Selector lever: P or N positionA/C switch: OFFNo load | Revving engine from idle to 4,000 rpm quickly | Approx. 1,100 – 2,900 mV |
| | Engine: After warming up | Idle | Approx. 0.45 MPa |
| L/FUEL PRES SEN | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 0.45 MPa |
| | Engine: After warming up | Idle | Approx. 3250 mV |
| L/FUEL PRES SEN V | Selector lever: P or N positionA/C switch: OFFNo load | 3,000 rpm | Approx. 3100 mV |
| | Engine: After warming up | Idle | Approx. 1450 mV |
| EOP SENSOR | Selector lever: P or N positionA/C switch: OFFNo load | 2,000 rpm | Approx. 2850 mV |
| ECM TEMP 1 | Engine: After warming up Selector lever: P or N position A/C switch: OFF No load | Idle | Indicates the temperature o ECM internal circuit 1. |

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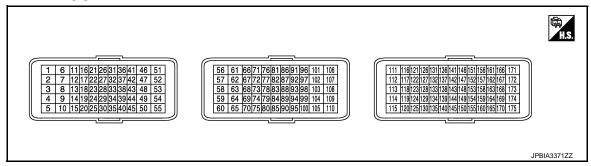
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| Monitor Item | Condition | | Values/Status |
|----------------|--|--------------------|--|
| ECM TEMP 2 | Engine: After warming up Selector lever: P or N position A/C switch: OFF No load | Idle | Indicates the temperature of ECM internal circuit 2. |
| FUEL PUMP DUTY | Engine: After warming up Shift lever: P or N Air conditioner switch: OFF No load | Engine speed: Idle | 30 - 40% |

^{*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.

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT-III.

| | nal No. color) | Description | | Condition | Value |
|----------|-------------------|--------------------------|------------------|--|--|
| + | _ | Signal name | Input/ Output | | (Approx.) |
| 1 (Y) | 175 | Fuel injector No. 8 (HI) | Output | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V) 100mSec/div 20V/div JPBIA3345ZZ |
| 2 (L) | (B) | Fuel injector No. 5 (HI) | | | BATTERY VOLTAGE N (11 - 14 V)★ |
| | | | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 100mSec/div |
| | | | | | 20V/div JPBIA3347ZZ |

^{*2:} Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

| | nal No. color) | Description | | Condition | Value |
|-----------------------|-------------------|--|------------------|---|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 3 (Y) 175 4 (B) | | Fuel injector No. 3 (LO) Fuel injector No. 2 (LO) | Input | [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 2V/div JPBIA3355ZZ |
| | (B) | | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) 50mSec/div 2V/div JPBIA3356ZZ |
| 5 (B) | _ | ECM ground | _ | _ | _ |
| 6 (BR) | 175 | | Output | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V)★ 100mSec/div 20V/div JPBIA3345ZZ |
| 7 (B/W) | (B) | | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) 100mSec/div 20V/div JPBIA3347ZZ |

| | nal No. color) | Description | | - Condition | Value |
|-------------------------|--------------------------|--|---|--|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 8 (BR) 175 | Fuel injector No. 8 (LO) | Input | [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 2V/div JPBIA3356ZZ | |
| 9 (B/W) | 9 (B) Fu | Fuel injector No. 5 (LO) | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div 2V/div JPBIA3356ZZ |
| 10 (GR) | _ | ECM ground | _ | _ | _ |
| 11 (LG) | 175 (B) | PNP switch | Input | [Ignition switch: ON] Selector lever: P or N position [Ignition switch: ON] Selector lever: Except above position | BATTERY VOLTAGE (11 - 14 V) |
| 12 (O) 13 (L) | 175 | Ignition signal No. 1 Ignition signal No. 2 | locut | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.2 V★ 50mSec/div 2V/div JPBIA3356ZZ |
| 14 (B) (G) 15 (R) | | Ignition signal No. 3 Ignition signal No. 4 | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 0.1 - 0.4 V★ 50mSec/div 2V/div JPBIA3356ZZ |

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| | nal No. color) | Description | | Condition | Value | |
|-------------------------|-------------------|--|------------------|--|--|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) | |
| 17 (LG) 18 (V) | (LG) 18 | Ignition signal No. 5 Ignition signal No. 6 | Input - | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 0.2 V★ 50mSec/div 2V/div JPBIA3355ZZ | |
| 19 (L) 20 (G) | (B) | Ignition signal No. 7 Ignition signal No. 8 | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 0.1 - 0.4 V★ 50mSec/div 2V/div JPBIA3356ZZ | |
| 21 (R) | 25 (P) | Intake air temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with intake air temperature. | |
| 22 (GR)*1 | 25 (P) | Mass air flow sensor (bank 1) | Input | [Engine is running]Warm-up conditionIdle speed[Engine is running] | 0.95 - 1.35 V | |
| (B)*2 | | | | Warm-up condition Engine speed: 2,500 rpm | 1.3 - 1.7 V | |
| 23 | 45 | | land | [Engine is running]Warm-up conditionIdle speed | 2.4 - 3.6 V 50mSec/div 2V/div JPBIA3357ZZ | |
| (B) | (V) | Low fuel pressure sensor | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 2.4 - 3.6 V 50mSec/div 2V/div JPBIA3358ZZ | |
| 24 (B)*1 | 30 | Mass air flow sensor (bank 2) | Input | [Engine is running]Warm-up conditionIdle speed | 0.95 - 1.35 V | |
| (BR)*2 | (O) | iviass air now sensor (bank 2) | | [Engine is running]Warm-up conditionEngine speed: 2,500 rpm | 1.3 - 1.7 V | |
| 25 (P) | _ | Sensor ground [Mass air flow sensor (bank 1)/ Intake air temperature sensor] | _ | _ | _ | |
| 27 (G) | 45 (V) | Sensor power supply (Power steering pressure sensor/ Low fuel pressure sensor) | _ | [Ignition switch: ON] | 5 V | |

| | nal No. color) | Description | | Condition | Value | |
|-----------------|-------------------------|--|---|---|--|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) | |
| 28 (W) | 40 (B) | Sensor power supply (Fuel rail pressure sensor/Engine oil pressure sensor) | _ | [Ignition switch: ON] | 5 V | |
| 29 (W) | 35 (—) | Knock sensor (bank 1) | Input | [Engine is running] • Idle speed | 2.5 V*3 | |
| 30 (O) | _ | Sensor ground [Mass air flow sensor (bank 2)] | _ | _ | _ | |
| 31 | 31 40 Fuel rail process | | [Engine is running]Warm-up conditionIdle speed | 0.98 - 1.2 V | | |
| (G) | (B) | Fuel rail pressure sensor | Input | [Engine is running]Warm-up conditionRevving engine from idle to 4,000 rpm quickly | 1.1 - 2.9 V | |
| 32 (Y) | 40 (B) | Engine coolant temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine coolant temperature. | |
| 33 (GR) | 35 (—) | Knock sensor (bank 2) | Input | [Engine is running] • Idle speed | 2.5 V*3 | |
| 35 (—) | _ | Sensor ground (Knock sensor) | _ | | | |
| 39 | | Input | [Engine is running] • Steering wheel: Being turned | 0.5 - 4.5 V | | |
| (LG) | | mpac | [Engine is running]Steering wheel: Not being turned | 0.4 - 0.8 V | | |
| 40 (B) | _ | Sensor ground (Fuel rail pressure sensor/Engine oil pressure sensor/Engine coolant temperature sensor/Engine oil temperature sensor) | | _ | _ | |
| 41 | 40 | Engine oil pressure sensor | Input | [Engine is running]Warm-up conditionIdle speed | 1.3 V★ 5mSec/div 2V/div JPBIA3359ZZ | |
| (G) (B) Linguis | | • • • • | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 2.7 V★ 5mSec/div 2V/div JPBIA3360ZZ | | |
| 42 (L) | 40 (B) | Engine oil temperature sensor | Input | [Engine is running] | 0 - 4.8 V Output voltage varies with engine oil temperature. | |
| 45 (V) | _ | Sensor ground (Power steering pressure sen- sor/ Low fuel pressure sensor) | _ | _ | _ | |

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| | nal No. color) | Description | | Condition | Value |
|------------|-------------------|--|------------------|---|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 46 (LG) | 175 (B) | Fuel injector driver power supply | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 47 (BR) | 175 (B) | Heated oxygen sensor 2 heater (bank 1) | Input | [Engine is running] 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 | 10 V★ 50mSec/div 5V/div JMBIA0037GB |
| | | | | [Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm | BATTERY VOLTAGE (11 - 14 V) |
| 48 (Y) | 175 (B) | A/F sensor 1 heater (bank 1) | Input | [Engine is running]Warm-up conditionIdle speed (More than 140 seconds after starting engine) | 2.9 - 8.8 V★ 5mSec/div 5V/div JPBIA3361ZZ |
| | | | | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) |
| 49 (GR) | 175 (B) | Intake valve timing control solenoid valve (bank 2) | Output | [Engine is running] • Warm-up condition • Engine speed: 2,000rpm | 7 - 12 V★ 5V/div JMBIA0038GB |
| | | | | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) |
| 50 (V) | 175 (B) | Exhaust valve timing control solenoid valve (bank 2) | Output | [Engine is running]Warm-up conditionAround 2,500 rpm while the engine speed is rising | 7 - 12 V★ 5V/div JMBIA0034GB |
| 51 (W) | 175 (B) | Fuel injector driver power supply | Output | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) |

| | nal No. color) | Description | | Condition | Value | А |
|------------|-------------------|--|------------------|---|--|-----|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) | |
| 52 (G) | 175 (B) | Heated oxygen sensor 2 heater (bank 2) | Output | [Engine is running] 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 | 10 V★ 50mSec/div 5V/div JMBIA0037GB | C |
| | | | | [Ignition switch: ON]Engine: Stopped[Engine is running]Engine speed: Above 3,600 rpm | BATTERY VOLTAGE (11 - 14 V) | Е |
| | | | | | 2.9 - 8.8 V★ 5mSec/div | F |
| 53 (P) | 175 (B) | A/F sensor 1 heater (bank 2) | Output | [Engine is running] Warm-up condition Idle speed (More than 140 seconds after starting engine) | 5V/div JPBIA3361ZZ | G |
| | | | | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) | - H |
| | | | | | 7 - 12 V★ | |
| 54 (SB) | 175 (B) | Intake valve timing control so- lenoid valve (bank 1) | Output | [Engine is running]Warm-up conditionEngine speed: 2,000rpm | | J |
| | | | | | 5V/div JMBIA0038GB | K |
| | | | | [Engine is running]Warm-up conditionIdle speed | BATTERY VOLTAGE (11 - 14 V) | L |
| | | | | | 7 - 12 V★ | |
| 55 (R) | 175 (B) | Exhaust valve timing control solenoid valve (bank 1) | Output | [Engine is running]Warm-up conditionAround 2,500 rpm while the engine speed is rising | 5V/div JMBIA0034GB | M |

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| | nal No. color) | Description | | Condition | Value |
|-------------|-------------------|---|------------------|---|---|
| + | - | Signal name | Input/ Output | Condition | (Approx.) |
| 57 | 175 | Throttle control motor (bank 1) | Output | [Ignition switch: ON] • Engine: Stopped • Selector lever: D • Accelerator pedal: Fully depressed | 0 - 14 V★ 500μSec/div 5V/div JMBIA0031GB |
| (L) | (B) | (Open) | Output | [Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released | 0 - 14 V★ 500μSec/div 5V/div JMBIA0032GB |
| 58 (G) | 175 (B) | Throttle control motor (bank 2) (Close) | Output | [Ignition switch: ON] Engine: Stopped Selector lever: D position Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500μSec/div 5V/div JMBIA0031GB |
| 60 (B/W) | _ | Shield | _ | _ | _ |
| 62 | 175 | Throttle control motor (bank 2) | Output | [Ignition switch: ON] • Engine: Stopped • Selector lever: D • Accelerator pedal: Fully depressed | 0 - 14 V★ 500μSec/div 5V/div JMBIA0031GB |
| (R) | (B) | (Open) | Output | [Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released | 0 - 14 V★ 500μSec/div 5V/div JMBIA0032GB |
| 63 (P) | 175 (B) | Throttle control motor (bank 1) (Close) | Output | [Ignition switch: ON] Engine: Stopped Selector lever: D position Accelerator pedal: In the middle of releasing operation | 0 - 14 V★ 500µSec/div 5V/div JMBIA0031GB |

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| | nal No. color) | Description | | Condition | Value |
|-------------|-------------------|---|------------------|---|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 64 | 175 | EVAP canister purge volume | Output | [Engine is running]Idle speedAccelerator pedal: Not depressed even slightly, after engine starting | BATTERY VOLTAGE (11 - 14 V) 50mSec/div 10V/div JMBIA0039GB |
| | (B) | control solenoid valve | Output | [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 |
| 67 (R) | 175 (B) | Manifold absolute pressure sensor | Input | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition Engine speed: 2,000 rpm | 1.2 V 1.5 V |
| 68 (L) | _ | Sensor ground [Camshaft position sensor (bank 1)/Exhaust valve timing control position sensor (bank 1)] | _ | _ | _ |
| 69 (O/L) | _ | Sensor ground [Throttle position sensor (bank 2)] | _ | _ | _ |
| 70 (G) | _ | Sensor ground (Manifold absolute pressure sensor) | _ | _ | _ |
| 71 (O) | 97 (G) | Throttle position sensor 1 (bank 2) | Input | [Ignition switch: ON] Engine: Stopped Selector lever: D position Accelerator pedal: Fully released [Ignition switch: ON] Engine: Stopped Selector lever: D position Accelerator pedal: Fully depressed | More than 0.36 V Less than 4.75 V |

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| | nal No. color) | Description | | 0 - 150 - | Value |
|-------------|-------------------|---|------------------|--|---|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 73 | 99 | Camshaft position sensor | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0045GB |
| (B) | (R) | (bank 2) | mput - | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0046GB |
| 74 (L/W) | 175 (B) | A/F sensor 1 (bank 2) | Input | [Ignition switch: ON] | 2.5 V |
| 75 (R) | 68 (L) | Exhaust valve timing control position sensor (bank 1) | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 4.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0043GB |
| | | | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 20mSec/div |
| 76 (B) | 86 (L) | Sensor power supply (Crankshaft position sensor) | _ | [Ignition switch: ON] | 5 V |
| 77 (B) | 68 (L) | Sensor power supply [Camshaft position sensor (bank 1)] | _ | [Ignition switch: ON] | 5 V |
| 78 (L/R) | 175 (B) | A/F sensor 1 (bank 2) | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 2.2 - 2.8V Output voltage varies with air fuel ratio. |
| 79 (B) | 97 (G) | Throttle position sensor 2 (bank 1) | Input | [Ignition switch: ON] Engine: Stopped Selector lever: D position Accelerator pedal: Fully released | Less than 4.75 V |
| | | | | [Ignition switch: ON]Engine: StoppedSelector lever: D positionAccelerator pedal: Fully depressed | More than 0.36 V |
| 80 (L) | 175 (B) | Sensor power supply [A/F sensor 1 (bank 2)] | | [Ignition switch: ON] | 3.0 V |

| | nal No. color) | Description | | Condition | Value |
|----------------------|---------------------------------------|---|---|---|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 81 (W) | 97 (G) | Sensor power supply [Throttle position sensor (bank 1)] | _ | [Ignition switch: ON] | 5 V |
| 82 (W) | 69 (O/L) | Sensor power supply [Throttle position sensor (bank 2)] | _ | [Ignition switch: ON] | 5 V |
| 83 (L) | 175 (B) | Sensor power supply [Camshaft position sensor (bank 2)] | _ | [Ignition switch: ON] | 5 V |
| 85 (W) | 175 (B) | Sensor power supply (Manifold absolute pressure sensor) | _ | [Ignition switch: ON] | 5 V |
| | | | | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 4.0 - 5.0 V★ 1mSec/div 2V/div JMBIA0041GB |
| (L) | 86 (L) 98 (Crankshaft position sensor | Crankshaft position sensor | Input - | [Engine is running] • Engine speed: 2,000 rpm | 4.0 - 5.0 V★ 1mSec/div 2V/div JMBIA0042GB |
| 87 (BR) | 100 (P) | Heated oxygen sensor 2 (bank 2) | Input | [Engine is running] 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 |
| 88 L/W) | 175 (B) | A/F sensor 1 (bank 1) | Input | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 2.2 - 2.8 V Output voltage varies with air fuel ratio. |
| 89 | 69 | Throttle position sensor 2 | Input | [Ignition switch: ON]Engine: StoppedSelector lever: D positionAccelerator pedal: Fully released | Less than 4.75 V |
| (W/L) (O/L) (bank 2) | (bank 2) | mput | [Ignition switch: ON]Engine: StoppedSelector lever: D positionAccelerator pedal: Fully depressed | More than 0.36 V | |
| 90 (L/R) | 175 (B) | Sensor power supply [A/F sensor 1 (bank 1)] | _ | [Ignition switch: ON] | 3.0 V |

| | nal No. color) | Description | | Condition | Value |
|-----------|--|---|---|---|---|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 91 | 175 | Throttle position sensor 1 | Input | [Ignition switch: ON]Engine: StoppedSelector lever: D positionAccelerator pedal: Fully released | More than 0.36 V |
| (R) | (B) | (bank 1) | | [Ignition switch: ON]Engine: StoppedSelector lever: D positionAccelerator pedal: Fully depressed | Less than 4.75 V |
| 93 (B) | 99 Exhaust valve timing control (R) position sensor (bank 2) | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0045GB | |
| | | position concest (bank 2) | input | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0046GB |
| 94 (L) | 175 (B) | A/F sensor 1 (bank 1) | Input | [Ignition switch: ON] | 2.0 V |
| 95 | 68 | Camshaft position sensor | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0045GB |
| (R) | (L) | (bank 1) | mput | [Engine is running] • Engine speed: 2,000 rpm | 3.0 - 5.0 V★ 20mSec/div 2V/div JMBIA0046GB |
| 96 (Y) | 100 (P) | Heated oxygen sensor 2 (bank 1) | Input | [Engine is running] 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 |
| 97 (G) | _ | Sensor ground [Throttle position sensor (bank 1)] | _ | _ | _ |

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|---------------------|--------------------------|---|---|---|---|
| Termir (Wire | | Description | | - Condition | Value |
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 98 (R) | _ | Sensor ground (Crankshaft position sensor) | _ | _ | _ |
| 99 (R) | _ | Sensor ground [Camshaft position sensor (bank 2)/Exhaust valve timing control position sensor (bank 2)] | _ | _ | _ |
| 100 (P) | _ | Sensor ground (Heated oxygen sensor 2) | _ | _ | _ |
| 101 (Y) 102 | 175 (B) | Fuel injector No. 1 (HI) Fuel injector No. 6 (HI) | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V) * 100mSec/div 20V/div JPBIA3345ZZ |
| | (5) | Fuel Injector No. 6 (HI) | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) ★ 100mSec/div 20V/div JPBIA3347ZZ |
| 103 3/W) 175 Fue | Fuel injector No. 7 (LO) | 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 2V/div JPBIA3355ZZ | |
| 104 (BR) | (B) | Fuel injector No. 4 (LO) | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) * 50mSec/div 2V/div JPBIA3356ZZ |

| | nal No. color) | Description | | Condition | Value | |
|--------------|-------------------|--|------------------|--|---|--|
| + | - | Signal name | Input/ Output | Condition | (Approx.) | |
| 105 | 175 | High pressure fuel pump (HI) | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V) 20mSec/div 10V/div JPBIA3340ZZ | |
| (W) | (B) | Tilgit pressure ruel pump (Fil) | mput | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) 20mSec/div 10V/div JPBIA3341ZZ | |
| 106 (L) | 175 (B) | Fuel injector No. 7 (HI) Fuel injector No. 4 (HI) | Output | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V) 100mSec/div 20V/div JPBIA3345ZZ | |
| 107 (Y) | | | | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) 100mSec/div 20V/div JPBIA3347ZZ | |
| 108 (BR) | 175 (B) | Fuel injector No. 1 (LO) Fuel injector No. 6 (LO) | 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 2V/div JPBIA3355ZZ | |
| 109 (B/W) | | | Output | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V)★ 50mSec/div 2V/div JPBIA3356ZZ | |

| + | | Description | | Condition | Value | |
|-------------|--|--|------------------|---|---|--|
| | _ | Signal name | Input/ Output | Condition | (Approx.) | |
| 110 | 175 | | | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V) 20mSec/div 5V/div JPBIA3342ZZ | |
| (B) | (B) | High pressure fuel pump (LO) | Input | [Engine is running] • Warm-up condition • Engine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V)★ 20mSec/div | |
| | | | | Engine speed. 2,000 ipin | 5V/div JPBIA3343ZZ | |
| 111 (W) | 175 (B) | Fuel injector driver power supply | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 112 (W) | 175 (B) | Fuel injector driver power supply | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 114 (B) | _ | ECM ground (Fuel injector) | _ | _ | _ | |
| 115 (B) | _ | ECM ground (Fuel injector) | _ | _ | _ | |
| 120 (G) | 175 (B) | EVAP canister vent control valve | Output | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | |
| 122 (V) | 175 (B) | VVEL actuator motor relay abort signal (VVEL control module) | Input | [Ignition switch: ON] | 0 V | |
| 123 (BG) | 175 (B) | Throttle control motor relay | Output | [Ignition switch: ON \rightarrow OFF] | 0 - 1.0 V ↓ BATTERY VOLTAGE (11 - 14 V) ↓ 0 V | |
| | | | | [Ignition switch: ON] | 0 - 1.0 V | |
| 125 (P) | 175 (B) | Fuel pump control module (FPCM) | Output | [When cranking engine] [Engine is running] • Warm-up condition | 0 - 0.5 V 0 - 4.0 V★ 5mSec/div 2V/div JPBIA3344ZZ | |
| 126 (Y) | 129 (BR) ^{*1} (B) ^{*2} | Accelerator pedal position sensor 2 | Input | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released [Ignition switch: ON] | 0.22 - 0.5 V | |

< ECU DIAGNOSIS INFORMATION >

| | nal No. color) | Description | | Condition | Value |
|------------------------|--|---|------------------|---|--------------|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| | | | | [Ignition switch: ON] • ASCD steering switch: OFF | 4 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| 128 (SB) | 130 (Y) | ASCD steering switch | Input | [Ignition switch: ON] • CANCEL switch: Pressed | 1 V |
| (32) | (., | | | [Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed | 3 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 2 V |
| | | | | [Ignition switch: ON] • ICC steering switch: OFF | 4.2 V |
| | | | | [Ignition switch: ON] • MAIN switch: Pressed | 0 V |
| | | | | [Ignition switch: ON] • CANCEL switch: Pressed | 1.9 V |
| 128 (SB) | 175 (B) | ICC steering switch | Input | [Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed | 3.7 V |
| | | | | [Ignition switch: ON] • SET/COAST switch: Pressed | 3.2 V |
| | | | | [Ignition switch: ON] • DISTANCE switch: Pressed | 2.6 V |
| | | | | [Ignition switch: ON] • DYNAMIC DRIVE ASSISTANCE switch: Pressed | 1.0 V |
| 129 (BR)*1 (B)*2 | _ | Sensor ground (Accelerator pedal position sensor 2) | _ | _ | _ |
| 130 (Y) | _ | Sensor ground (ASCD steering switch) | _ | _ | _ |
| 131 (L) | 129 (BR) ^{*1} (B) ^{*2} | Sensor power supply (Accelerator pedal position sensor 2) | _ | [Ignition switch: ON] | 5 V |
| 133 (BG) | 150 (V) | Sensor power supply [Refrigerant pressure sensor/ Battery current sensor/EVAP control system pressure sensor] | _ | [Ignition switch: ON] | 5 V |
| 134 (P) | 175 (B) | Fuel temperature sensor | Input | [Engine is running] • Warm-up condition | 2.8 V |
| 136 | 140 | Accelerator pedal position | Input | [Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released | 0.45 - 1.0 V |
| (R) | (W) | sensor 1 | mput | [Ignition switch: ON] | 4.4 - 4.8 V |
| 137 (G) | 140 (W) | Sensor power supply (Accelerator pedal position sensor 1) | _ | [Ignition switch: ON] | 5 V |

| | nal No. color) | Description | | Condition | Value |
|-------------|-------------------|---|------------------|---|--------------------------------|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 138 (P) | 175 (B) | Battery current sensor | Input | [Engine is running] Battery: Fully charged*⁴ Idle speed | 2.6 - 3.5 V |
| 139 (BG) | 175 (B) | Battery temperature sensor | Input | [Engine is running]Battery temperature: 25°CIdle speed | 3.3 V |
| 140 (W) | _ | Sensor ground (Accelerator pedal position sensor 1) | _ | _ | _ |
| 4.44 | 475 | | | [Ignition switch: OFF] | 0 V |
| 141 (G) | 175 (B) | Ignition switch | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| | | | | [When cranking engine] | 0 V |
| 142 (GR) | 175 (B) | Fuel pump control module (FPCM) check | Input | [Engine is running]Warm-up conditionIdle speed | 9 V |
| 143 (P) | 175 (B) | Fuel tank pressure sensor | Input | [Engine is running]Warm-up condition | 4 V |
| 144 (LG) | 150 (V) | Refrigerant pressure sensor | Input | [Engine is running] Warm-up condition Both A/C switch and blower fan motor switch: ON (Compressor operates) | 1.0 - 4.0 V |
| 146 (L) | _ | CAN communication line | _ | _ | _ |
| 147 | 175 | ASCD/ICC brake switch | Input | [Ignition switch: ON] • Brake pedal: Slightly depressed | 0 V |
| (BR) | (B) | ACCEPTICE Brake SWILCH | | [Ignition switch: ON] • Brake pedal: Fully released | BATTERY VOLTAGE (11 - 14 V) |
| 150 (Y) | _ | Sensor ground [Refrigerant pressure sensor/ Battery current sensor/EVAP control system pressure sensor] | _ | _ | _ |
| 151 (P) | | CAN communication line | _ | _ | _ |
| 156 (W) | 175 (B) | Power supply for ECM (Back-up) | Input | [Ignition switch: OFF] | BATTERY VOLTAGE (11 - 14 V) |
| 158 | 175 | Stan Jama quitab | lot | [Ignition switch: OFF] • Brake pedal: Fully released | 0 V |
| (P) | (B) | Stop lamp switch | Input | [Ignition switch: OFF] • Brake pedal: Slightly depressed | BATTERY VOLTAGE (11 - 14 V) |
| 161 (Y) | _ | ENG communication line | _ | | |
| 163 (W) | 175 (B) | ECM relay (Self shut-off) | Output | [Engine is running][Ignition switch: OFF]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) |

| | nal No. color) | Description | | Condition | Value |
|-------------|-------------------|-------------------------------------|------------------|---|---|
| + | _ | Signal name | Input/ Output | | (Approx.) |
| 166 (BG) | _ | ENG communication line | _ | _ | _ |
| | 175 | Engine speed signal output | Input | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | 0 - 7.0 V★ 10mSec/div 2V/div JPBIA3352ZZ |
| | (B) | Engine speed signal output | mput | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 0 - 7.0 V★ 10mSec/div 2V/div JPBIA3354ZZ |
| 171 (SB) | 175 (B) | Power supply for ECM | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 172 (SB) | 175 (B) | Power supply for ECM | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 173 (R) | 175 (B) | Throttle control motor power supply | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) |
| 174 (B) | _ | ECM ground | _ | _ | _ |
| 175 (B) | _ | ECM ground | _ | _ | _ |

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

Fail-safe

NON DTC RELATED ITEM

| Detected items | Engine operating condition in fail-safe mode | Remarks | Reference page |
|------------------------------------|--|---|---|
| Malfunction indicator lamp circuit | Engine speed will not rise more than 2,500 rpm due to the fuel cut | When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction. | EC-1084. "Diagno- sis Proce- dure" |

DTC RELATED ITEM

^{*1:} With ICC.

^{*2:} Without ICC.

^{*3:} This may vary depending on internal resistance of the tester.

^{*4:} Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

| DTC No. | Detected items | Engine operating condition in fail-safe mode | | | | |
|--|--|--|---|--|--|--|
| U0113 U1003 U1024 | Can communication circuit | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut. | | | | |
| 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. | | | | |
| P0014 P0024 | Exhaust valve timing control | | The signal is not energized to the exhaust valve timing control magnet retarder and the magnet retarder control does not function. | | | |
| P0087 | FRP control system | Engine torque is limited.VVEL value is maintained at a fixed angle. | | | | |
| P0088 | - | Engine speed is limited. | | | | |
| P008A | Low fuel pressure control system | Engine torque is limited. | | | | |
| P0090 | FRP control system | Engine torque is limited.VVEL value is maintained at a fix | ed angle. | | | |
| P0102 P0103 P010C P010D | Mass air flow sensor circuit | Engine speed will not rise more than 2,400 rpm due to the fuel cut. | | | | |
| | Engine coolant tempera- ture sensor circuit | | determined by ECM based on the following condition. colant temperature decided by ECM. | | | |
| | | Condition | Engine coolant temperature decided (CONSULT-III display) | | | |
| P0117 | | Just as ignition switch is turned ON or START | 40°C (104°F) | | | |
| P0118 | | 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 fan operates while engine is running | e coolant temperature sensor is activated, the cooling g. | | | |
| P0122 P0123 P0222 | Throttle position sensor | order for the idle position to be with The ECM regulates the opening spe | le control actuator in regulating the throttle opening in in +10 degrees. eed of the throttle valve to be slower than the normal | | | |
| P0223 P0227 P0228 P1239 P2132 P2133 P2135 | | condition. Therefore, the acceleration will be p | poor. | | | |
| P0190 | FRP sensor | Engine speed is limited.High pressure fuel pump is activated. | ated at maximum discharge pressure. | | | |
| P0196 P0197 P0198 | Engine oil temperature sensor | Exhaust valve timing control does n | ot function. | | | |
| P0201 P0202 P0203 P0204 P0205 P0206 P0207 P0208 | Injector | Engine torque is limited. Fuel injection shut-off of malfunct Mixture ratio feedback control do Idle engine speed is increased. | | | | |
| P0500 | Vehicle speed sensor | The cooling fan operates (Highest) | while engine is graphed | | | |

| DTC No. | Detected items | Engine operating condition in fail-safe mode |
|-------------------------|------------------------------------|---|
| P0524 | Engine oil pressure | The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function. Engine speed will not rise more than 2,400 rpm due to the fuel cut. |
| P0605 | ECM | (When ECM calculation function is malfunctioning:) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ECM deactivates ASCD operation. |
| P0607 | ECM | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle Engine speed will not rise more than 3,500 rpm due to the fuel cut. |
| P062B | ECM | Type1 Engine torque is limited. Idle engine speed is increased. Fuel injector power supply shut-off. High fuel pressure limitation. |
| 1 0025 | | Type2 Engine torque is limited. Fuel injection shut-off of malfunction cylinder. Mixture ratio feedback control does not function. Idle engine speed is increased. |
| 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. |
| P1087 P1088 | VVEL control function | VVEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut. |
| P1089 P1092 | VVEL control shaft position sensor | VVEL value is maintained at a fixed angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut |
| P1608 | VVEL control shaft position sensor | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle Engine speed will not rise more than 3,500 rpm due to the fuel cut. |
| P1090 | VVEL actuator motor | VVEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut. |
| P1093 | | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle Engine speed will not rise more than 3,500 rpm due to the fuel cut. |
| P1091 | VVEL actuator motor relay | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle Engine speed will not rise more than 3,500 rpm due to the fuel cut. |
| P1197 | Out of gas | Engine torque is limited.VVEL value is maintained at a fixed angle. |
| P1233 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. |
| P1236 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. |
| | Electric throttle control actuator | (When electric throttle control actuator does not function properly due to the return sprin 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. |
| P1238 P2119 | | (When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator because of 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 the N or P position, and engine speed will not exceed 1,000 rpr or more. |
| P1290 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. |
| P1606 | VVEL control module | VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle Engine speed will not rise more than 3,500 rpm due to the fuel cut. |

ECM

< ECU DIAGNOSIS INFORMATION >

[VK56VD]

| DTC No. | Detected items | Engine operating condition in fail-safe mode | | | | |
|---|-----------------------------------|--|--|--|--|--|
| | Brake switch | ECM controls the electric throttle cosmall range. Therefore, acceleration will be poo | ontrol actuator by regulating the throttle opening to a r. | | | |
| P1805 | | Vehicle condition | Driving condition | | | |
| | | When engine is idling | Normal | | | |
| | | When accelerating | Poor acceleration | | | |
| P2122 P2123 P2127 P2128 P2138 | Accelerator pedal position sensor | The ECM controls the electric throttle control actuator in regulating the throttle opening 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 norm condition. Therefore, the acceleration will be poor. | | | | |
| P2539 | Low fuel pressure sensor | Engine torque is limited. | | | | |

DTC Inspection Priority Chart

INFOID:0000000005841351

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

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| Priority | Detected items (DTC) |
|---------------|--|
| Priority 1 | U0101 CAN communication line U0103 CAN communication line U1001 CAN communication line U1004 VVEL CAN communication line U1024 VVEL CAN communication line P006A P0101 P0102 P0103 P010B P010C P010D Mass air flow sensor P010A Manifold absolute pressure sensor P0112 P0113 P0127 Intake air temperature sensor P0116 P0117 P0118 P0125 Engine coolant temperature sensor P0112 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throttle position sensor P0128 Thermostat function P0128 Thermostat function P0181 P0182 P0183 Fuel tank temperature sensor P0198 P0197 P0198 Engine oil temperature sensor P0197 P0198 Engine oil temperature sensor P0327 P0328 P0332 P0333 Knock sensor P0335 Crankshaft position sensor P0340 P0345 Camshaft position sensor P0460 P0461 P0462 P0463 Fuel level sensor P0500 Vehicle speed sensor P0500 Vehicle speed sensor P0500 EOP sensor P0605 P0607 P0611 P062B ECM P0605 P0607 P0611 P062B ECM P0605 P0607 P0611 P062B ECM P0705 P0850 Transmission range switch P1089 P1092 P1608 VVEL control shaft position sensor P1197 Out of gas* P1220 Fuel pump control module (FPCM) P1423 P1424 Cold start control P1556 P1557 Battery temperature sensor |
| | P1606 P1607 VVEL control module P1610 - P1615 NATS P1806 Brake booster pressure sensor P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor P2539 P2541 P2542 Low fuel pressure sensor |

| Priority | Detected items (DTC) | • |
|----------|---|---|
| 2 | P0031 P0032 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 | |
| | P0078 P0084 Exhaust valve timing control solenoid valve | E |
| | P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 P2A00 P2A03 Air fuel ratio (A/F) sensor 1 | |
| | P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 | |
| | P0190 - P0193 FRP sensor | |
| | 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 | |
| | P0603 ECM power supply | |
| | • P0710 P0717 P0720 P0729 P0730 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 | |
| | P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches | |
| | P1078 P1084 Exhaust valve timing control position sensor | |
| | • P1087 P1088 VVEL system | |
| | P1090 P1093 VVEL actuator motor | |
| | P1091 VVEL actuator motor relay | |
| | P1217 Engine over temperature (OVERHEAT) | |
| | P1233 P2101 Electric throttle control function | |
| | P1236 P2118 Throttle control motor | |
| | P1805 Brake switch | |
| | P2100 P2103 Throttle control motor relay | |
| | P2101 Electric throttle control function | |
| 3 | P0011 P0021 Intake valve timing control | - |
| | P0014 P0024 Exhaust valve timing control | |
| | P0087, P0088, P0090 FRP control system | |
| | P008A Low fuel pressure control system | |
| | P008B Low fuel pressure control system | |
| | P0106 Manifold absolute pressure sensor | |
| | P0171 P0172 P0174 P0175 Fuel injection system function | |
| | P0201 - P0208 Injector | |
| | • P0300 - P0308 Misfire | |
| | P0420 P0430 Three way catalyst function | |
| | P0456 EVAP control system (VERY SMALL LEAK) | |
| | P0506 P0507 Idle speed control system | |
| | P050E Cold start control | |
| | P0524 Engine oil pressure | |
| | P100A P100B VVEL system | |
| | P1148 P1168 Closed loop control | |
| | P1211 TCS control unit | |
| | P1212 TCS communication line | |
| | P1238 P2119 Electric throttle control actuator | |
| | P1564 ASCD steering switch / ICC steering switch | |
| | P1568 ICC command value | |
| | P1572 ASCD brake switch / ICC brake switch | |
| | P1574 ASCD vehicle speed sensor / ICC vehicle speed sensor | |
| | | |

*: If "P1197" is displayed with other DTC in priority 1, perform trouble diagnosis for "P1197" first.

DTC Index

×:Applicable —: Not applicable

INFOID:0000000005841352

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| DTC*1 | | Itomo | | | | Reference |
|----------------------------------|-------|----------------------------|----------|------|-----|-----------|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | SRT code | Trip | MIL | page |
| U0101 | 0101 | LOST COMM (TCM) | _ | 1 | × | EC-720 |
| U0113 | 0113 | CAN COMM CIRCUIT | _ | 1 | × | EC-721 |

| DTC | ; * 1 | Items | | | | Reference |
|----------------------------------|--------------------|--|----------|-------------------------------------|------------------------|-----------|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | SRT code | Trip | MIL | page |
| U1001 | 1001* ⁴ | CAN COMM CIRCUIT | _ | 2 (with ASCD) 1 (with ICC) | _ | EC-723 |
| U1003 | 1003 | CAN COMM CIRCUIT | _ | 2 | _ | EC-721 |
| U1024 | 1024 | VVEL CAN COMM CIRCUIT | _ | 1 | × | EC-724 |
| P0000 | 0000 | NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED. | _ | _ | Blinking* ⁷ | _ |
| P0011 | 0011 | INT/V TIM CONT-B1 | X | 2 | × | EC-732 |
| P0014 | 0014 | EXH/V TIM CONT-B1 | _ | 2 | × | EC-736 |
| P0021 | 0021 | INT/V TIM CONT-B2 | × | 2 | × | EC-732 |
| P0024 | 0024 | EXH/V TIM CONT-B2 | _ | 2 | × | EC-736 |
| P0031 | 0031 | A/F SEN1 HTR (B1) | _ | 2 | × | EC-740 |
| P0032 | 0032 | A/F SEN1 HTR (B1) | _ | 2 | × | EC-740 |
| P0037 | 0037 | HO2S2 HTR (B1) | _ | 2 | × | EC-743 |
| P0038 | 0038 | HO2S2 HTR (B1) | _ | 2 | × | EC-743 |
| P0051 | 0051 | A/F SEN1 HTR (B2) | _ | 2 | × | EC-740 |
| P0052 | 0052 | A/F SEN1 HTR (B2) | _ | 2 | × | EC-740 |
| P0057 | 0057 | HO2S2 HTR (B2) | _ | 2 | × | EC-743 |
| P0058 | 0058 | HO2S2 HTR (B2) | _ | 2 | × | EC-743 |
| P006A | 006A | MAP-MAF CORELTION-B1 | _ | 2 | × | EC-726 |
| P0075 | 0075 | INT/V TIM V/CIR-B1 | _ | 2 | × | EC-746 |
| P0078 | 0078 | EX V/T ACT/CIRC-B1 | | 2 | × | EC-749 |
| P0081 | 0081 | INT/V TIM V/CIR-B2 | _ | 2 | × | EC-746 |
| P0084 | 0084 | EX V/T ACT/CIRC-B2 | _ | 2 | × | EC-749 |
| P0087 | 0087 | LOW FUEL PRES | _ | 2 | × | EC-755 |
| P0088 | 0088 | HIGH FUEL PRES | _ | 2 | × | EC-755 |
| P008A | 008A | LOW FUEL PRES SYS | _ | 2 | × | EC-752 |
| P008B | 008B | LOW FUEL PRES SYS | _ | 2 | × | EC-754 |
| P0090 | 0090 | FUEL PUMP | _ | 2 | × | EC-75 |
| P0101 | 0101 | MAF SEN/CIRCUIT-B1 | _ | 2 | × | EC-726 |
| P0102 | 0102 | MAF SEN/CIRCUIT-B1 | | 1 | × | EC-758 |
| P0103 | 0103 | MAF SEN/CIRCUIT-B1 | | 1 | × | EC-758 |
| P0106 | 0106 | ABSL PRES SEN/CIRC | _ | 2 | × | EC-764 |
| P010A | 010A | ABSL PRES SEN/CIRC | _ | 2 | × | EC-768 |
| P010B | 010B | MAF SEN/CIRCUIT-B2 | _ | 2 | × | EC-726 |
| P010C | 010C | MAF SEN/CIRCUIT-B2 | _ | 1 | × | EC-758 |
| P010D | 010D | MAF SEN/CIRCUIT-B2 | | 1 | × | EC-758 |
| P0112 | 0112 | IAT SEN/CIRCUIT-B1 | _ | 2 | × | EC-77 |
| P0113 | 0112 | IAT SEN/CIRCUIT-B1 | | 2 | × | EC-77 |
| P0116 | 0116 | ECT SEN/CIRC | | 2 | × × | EC-773 |
| P0117 | 0117 | ECT SEN/CIRC | | 1 | × × | EC-775 |
| 1 0117 | 0117 | LOT OLIVOINO | | 1 | ^ | <u> </u> |

| DTC | · _* 1 | ORIVIATION > | | | | | - |
|-------------|------------------|----------------------------------|-------------|------|-----|----------------|-----|
| CONSULT-III | | ltems (CONSULT-III screen terms) | SRT code | Trip | MIL | Reference page | /- |
| GST*2 | ECM*3 | (CONCOLI III COI COII (CIIIIC) | | | | pago | |
| P0122 | 0122 | TP SEN 2/CIRC-B1 | _ | 1 | × | EC-777 | E |
| P0123 | 0123 | TP SEN 2/CIRC-B1 | _ | 1 | × | EC-777 | |
| P0125 | 0125 | ECT SENSOR | _ | 2 | × | EC-780 | - |
| P0127 | 0127 | IAT SENSOR-B1 | _ | 2 | × | EC-782 | (|
| P0128 | 0128 | THERMSTAT FNCTN | _ | 2 | × | EC-784 | - |
| P0130 | 0130 | A/F SENSOR1 (B1) | × | 2 | × | EC-786 | |
| P0131 | 0131 | A/F SENSOR1 (B1) | _ | 2 | × | EC-790 | - ' |
| P0132 | 0132 | A/F SENSOR1 (B1) | _ | 2 | × | EC-793 | = |
| P0133 | 0133 | A/F SENSOR1 (B1) | × | 2 | × | EC-796 | - |
| P0137 | 0137 | HO2S2 (B1) | × | 2 | × | EC-801 | - |
| P0138 | 0138 | HO2S2 (B1) | × | 2 | × | EC-807 | - |
| P0139 | 0139 | HO2S2 (B1) | × | 2 | × | EC-815 | - |
| P0150 | 0150 | A/F SENSOR1 (B2) | × | 2 | × | EC-786 | = |
| P0151 | 0151 | A/F SENSOR1 (B2) | _ | 2 | × | EC-790 | - (|
| P0152 | 0152 | A/F SENSOR1 (B2) | _ | 2 | × | EC-793 | = |
| P0153 | 0153 | A/F SENSOR1 (B2) | × | 2 | × | EC-796 | = |
| P0157 | 0157 | HO2S2 (B2) | × | 2 | × | EC-801 | = |
| P0158 | 0158 | HO2S2 (B2) | × | 2 | × | EC-807 | - |
| P0159 | 0159 | HO2S2 (B2) | × | 2 | × | EC-815 | = |
| P0171 | 0171 | FUEL SYS-LEAN-B1 | _ | 2 | × | EC-821 | - |
| P0172 | 0172 | FUEL SYS-RICH-B1 | _ | 2 | × | EC-825 | - |
| P0174 | 0174 | FUEL SYS-LEAN-B2 | _ | 2 | × | EC-821 | - |
| P0175 | 0175 | FUEL SYS-RICH-B2 | _ | 2 | × | EC-825 | - |
| P0181 | 0181 | FTT SENSOR | _ | 2 | × | EC-829 | - |
| P0182 | 0182 | FTT SEN/CIRCUIT | _ | 2 | × | EC-832 | - |
| P0183 | 0183 | FTT SEN/CIRCUIT | | 2 | × | EC-832 | - |
| P0190 | 0190 | FUEL PRES SEN/CIRC | _ | 1 | × | EC-834 | - |
| P0191 | 0191 | FRP SENSOR A | _ | 2 | × | EC-834 | - |
| P0192 | 0192 | FRP SEN/CIRC | _ | 2 | × | EC-834 | - |
| P0193 | 0193 | FRP SEN/CIRC | _ | 2 | × | EC-834 | _ |
| P0196 | 0196 | EOT SENSOR | _ | 2 | × | EC-841 | - |
| P0197 | 0197 | EOT SEN/CIRC | _ | 2 | × | EC-843 | - |
| P0198 | 0198 | EOT SEN/CIRC | _ | 2 | × | EC-843 | = |
| P0201 | 0201 | INJECTOR CIRC-CYL1 | _ | 2 | × | EC-845 | = |
| P0202 | 0202 | INJECTOR CIRC-CYL2 | _ | 2 | × | EC-845 | - (|
| P0203 | 0203 | INJECTOR CIRC-CYL3 | _ | 2 | × | EC-845 | = |
| P0204 | 0204 | INJECTOR CIRC-CYL4 | _ | 2 | × | EC-845 | - |
| P0205 | 0205 | INJECTOR CIRC-CYL5 | _ | 2 | × | EC-845 | - ' |
| P0206 | 0206 | INJECTOR CIRC-CYL6 | _ | 2 | × | EC-845 | = |
| P0207 | 0207 | INJECTOR CIRC-CYL7 | _ | 2 | × | EC-845 | = |
| P0208 | 0208 | INJECTOR CIRC-CYL8 | _ | 2 | × | EC-845 | - |
| P0222 | 0222 | TP SEN 1/CIRC-B1 | | 1 | × | EC-846 | - |

| DTC | ·*1 | Items | | | | Reference |
|----------------------------------|-------|----------------------------|-----------------|--------|-----|-----------|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | SRT code | Trip | MIL | page |
| P0223 | 0223 | TP SEN 1/CIRC-B1 | _ | 1 | × | EC-846 |
| P0227 | 0227 | TP SEN 2/CIRC-B2 | | 1 | × | EC-777 |
| P0228 | 0228 | TP SEN 2/CIRC-B2 | _ | 1 | × | EC-777 |
| P0300 | 0300 | MULTI CYL MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0301 | 0301 | CYL 1 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0302 | 0302 | CYL 2 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0303 | 0303 | CYL 3 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0304 | 0304 | CYL 4 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0305 | 0305 | CYL 5 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0306 | 0306 | CYL 6 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0307 | 0307 | CYL 7 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0308 | 0308 | CYL 8 MISFIRE | _ | 1 or 2 | × | EC-849 |
| P0327 | 0327 | KNOCK SEN/CIRC-B1 | _ | 2 | × | EC-855 |
| P0328 | 0328 | KNOCK SEN/CIRC-B1 | | 2 | × | EC-855 |
| P0332 | 0332 | KNOCK SEN/CIRC-B2 | _ | 2 | × | EC-85 |
| P0333 | 0333 | KNOCK SEN/CIRC-B2 | | 2 | × | EC-855 |
| P0335 | 0335 | CKP SEN/CIRCUIT | _ | 2 | × | EC-857 |
| P0340 | 0340 | CMP SEN/CIRC-B1 | | 2 | × | EC-86 |
| P0345 | 0345 | CMP SEN/CIRC-B2 | | 2 | × | EC-86 |
| P0420 | 0420 | TW CATALYST SYS-B1 | × | 2 | × | EC-866 |
| P0430 | 0430 | TW CATALYST SYS-B2 | × | 2 | × | EC-866 |
| P0441 | 0441 | EVAP PURG FLOW/MON | × | 2 | × | EC-87 |
| P0443 | 0443 | PURG VOLUME CONT/V | | 2 | × | EC-876 |
| P0444 | 0444 | PURG VOLUME CONT/V | | 2 | × | EC-88 |
| P0445 | 0445 | PURG VOLUME CONT/V | _ | 2 | × | EC-88 |
| P0447 | 0447 | VENT CONTROL VALVE | | 2 | × | EC-884 |
| P0448 | 0448 | VENT CONTROL VALVE | _ | 2 | × | EC-888 |
| P0451 | 0451 | EVAP SYS PRES SEN | _ | 2 | × | EC-892 |
| P0452 | 0452 | EVAP SYS PRES SEN | | 2 | × | EC-89 |
| P0453 | 0453 | EVAP SYS PRES SEN | _ | 2 | × | EC-900 |
| P0456 | 0456 | EVAP VERY SML LEAK | ×* ⁶ | 2 | × | EC-905 |
| P0460 | 0460 | FUEL LEV SEN SLOSH | _ | 2 | × | EC-911 |
| P0461 | 0461 | FUEL LEVEL SENSOR | _ | 2 | × | EC-912 |
| P0462 | 0462 | FUEL LEVL SEN/CIRC | _ | 2 | × | EC-914 |
| P0463 | 0463 | FUEL LEVL SEN/CIRC | _ | 2 | × | EC-914 |
| P0500 | 0500 | VEHICLE SPEED SEN A*5 | _ | 2 | × | EC-915 |
| P0506 | 0506 | ISC SYSTEM | _ | 2 | × | EC-917 |
| P0507 | 0507 | ISC SYSTEM | _ | 2 | × | EC-919 |
| P050E | 050E | COLD START CONTROL | _ | 2 | × | EC-92 |
| P0520 | 0520 | EOP SENSOR/SWITCH | _ | 1 | _ | EC-923 |
| P0524 | 0524 | ENGINE OIL PRESSURE | _ | 2 | × | EC-926 |
| P0550 | 0550 | PW ST P SEN/CIRC | _ | 2 | _ | EC-929 |

| DTC | ;* ¹ | Items | | | | Reference |
|----------------------------------|-------------------|----------------------------|----------|--------|--------|---------------|
| CONSULT-III GST* ² | ECM ^{⋆3} | (CONSULT-III screen terms) | SRT code | Trip | MIL | page |
| P0603 | 0603 | ECM BACK UP/CIRCUIT | _ | 2 | × | EC-932 |
| P0605 | 0605 | ECM | _ | 1 or 2 | × or — | EC-934 |
| P0607 | 0607 | ECM | _ | 1 | × | EC-936 |
| P0611 | 0611 | FIC MODULE | _ | 2 | × | EC-937 |
| P062B | 062B | ECM | _ | 2 | × | EC-938 |
| P0643 | 0643 | SENSOR POWER/CIRC | _ | 1 | × | EC-939 |
| P0705 | 0705 | T/M RANGE SENSOR A | _ | 2 | × | <u>TM-107</u> |
| P0710 | 0710 | FLUID TEMP SENSOR A*8 | _ | 2 | × | TM-108 |
| P0717 | 0717 | INPUT SPEED SENSOR A | _ | 2 | × | <u>TM-110</u> |
| P0720 | 0720 | OUTPUT SPEED SENSOR*5 | _ | 2 | × | <u>TM-111</u> |
| P0729 | 0729 | 6GR INCORRECT RATIO*8 | _ | 2 | × | TM-115 |
| P0730 | 0730 | INCORRECT GR RATIO | | 2 | × | TM-117 |
| P0731 | 0731 | 1GR INCORRECT RATIO*8 | | 2 | × | TM-119 |
| | | | | 2 | | |
| P0732 | 0732 | 2GR INCORRECT RATIO*8 | _ | | × | <u>TM-121</u> |
| P0733 | 0733 | 3GR INCORRECT RATIO*8 | _ | 2 | × | <u>TM-123</u> |
| P0734 | 0734 | 4GR INCORRECT RATIO*8 | _ | 2 | × | <u>TM-125</u> |
| P0735 | 0735 | 5GR INCORRECT RATIO*8 | _ | 2 | × | <u>TM-127</u> |
| P0740 | 0740 | TORQUE CONVERTER | _ | 2 | × | TM-129 |
| P0744 | 0744 | TORQUE CONVERTER | _ | 2 | × | TM-130 |
| P0745 | 0745 | PC SOLENOID A | _ | 2 | × | TM-132 |
| P0750 | 0750 | SHIFT SOLENOID A | _ | 2 | × | <u>TM-133</u> |
| P0775 | 0775 | PC SOLENOID B | _ | 2 | × | TM-134 |
| P0780 | 0780 | SHIFT | _ | 1 | × | <u>TM-135</u> |
| P0795 | 0795 | PC SOLENOID C | _ | 2 | × | <u>TM-137</u> |
| P0850 | 0850 | P-N POS SW/CIRCUIT | _ | 2 | × | EC-941 |
| P100A | 100A | VVEL SYSTEM-B1 | | 2 | × | EC-944 |
| P100B | 100B | VVEL SYSTEM-B2 | _ | 2 | × | EC-944 |
| P1078 | 1078 | EXH TIM SEN/CIRC-B1 | 1 | 2 | × | EC-948 |
| P1084 | 1084 | EXH TIM SEN/CIRC-B2 | 1 | 2 | × | EC-948 |
| P1087 | 1087 | VVEL SYSTEM-B1 | 1 | 1 | × | EC-951 |
| P1088 | 1088 | VVEL SYSTEM-B2 | _ | 1 | × | EC-951 |
| P1089 | 1089 | VVEL POS SEN/CIRC-B1 | | 1 | × | EC-952 |
| P1090 | 1090 | VVEL ACTR MOT-B1 | _ | 1 | × | <u>EC-955</u> |
| P1091 | 1091 | VVEL ACTR MOT PWR | _ | 1 or 2 | × | <u>EC-958</u> |
| P1092 | 1092 | VVEL POS SEN/CIRC-B2 | _ | 1 | × | <u>EC-952</u> |
| P1093 | 1093 | VVEL ACTR MOT-B2 | _ | 1 | × | EC-955 |
| P1148 | 1148 | CLOSED LOOP-B1 | _ | 1 | × | EC-961 |
| P1168 | 1168 | CLOSED LOOP-B2 | _ | 1 | × | EC-961 |
| P1197 | 1197 | FUEL RUN OUT | _ | 2 | _ | EC-843 |
| P1211 | 1211 | TCS C/U FUNCTN | | 2 | _ | EC-964 |
| P1212 | 1212 | TCS/CIRC | _ | 2 | _ | EC-965 |

| DTC | ;*1 | Items | | | | Reference |
|----------------------------------|-------|----------------------------|----------|--------|--------|--|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | SRT code | Trip | MIL | page |
| P1217 | 1217 | ENG OVER TEMP | _ | 1 | × | EC-966 |
| P1220 | 1220 | FPCM | _ | 1 | _ | EC-969 |
| P1225 | 1225 | CTP LEARNING-B1 | _ | 2 | _ | EC-972 |
| P1226 | 1226 | CTP LEARNING-B1 | _ | 2 | _ | EC-973 |
| P1233 | 1233 | ETC FNCTN/CIRC-B2 | _ | 1 | × | EC-974 |
| P1234 | 1234 | CTP LEARNING-B2 | _ | 2 | _ | EC-972 |
| P1235 | 1235 | CTP LEARNING-B2 | _ | 2 | _ | EC-973 |
| P1236 | 1236 | ETC MOT-B2 | _ | 1 | × | EC-978 |
| P1238 | 1238 | ETC ACTR-B2 | _ | 1 | × | EC-980 |
| P1239 | 1239 | TP SENSOR-B2 | _ | 1 | × | EC-982 |
| P1423 | 1423 | COLD START CONTROL | _ | 2 | × | EC-985 |
| P1424 | 1424 | COLD START CONTROL | _ | 2 | × | EC-985 |
| P1550 | 1550 | BAT CURRENT SENSOR | _ | 2 | _ | EC-987 |
| P1551 | 1551 | BAT CURRENT SENSOR | _ | 2 | _ | EC-990 |
| P1552 | 1552 | BAT CURRENT SENSOR | _ | 2 | _ | EC-990 |
| P1553 | 1553 | BAT CURRENT SENSOR | _ | 2 | _ | EC-994 |
| P1554 | 1554 | BAT CURRENT SENSOR | _ | 2 | _ | EC-998 |
| P1556 | 1556 | BAT TMP SEN/CIRC | _ | 2 | _ | EC-1002 |
| P1557 | 1557 | BAT TMP SEN/CIRC | _ | 2 | _ | EC-1002 |
| P1564 | 1564 | ASCD SW | _ | 1 | _ | EC-1005 (with ASC EC-1008 (with ICC |
| P1568 | 1568 | ICC COMMAND VALUE | _ | 1 | _ | EC-101 |
| P1572 | 1572 | ASCD BRAKE SW | _ | 1 | _ | EC-1012 (with ASC EC-1012 (with ICC |
| P1574 | 1574 | ASCD VHL SPD SEN | _ | 1 | _ | EC-1023 (with ASC EC-1023 (with ICC |
| P1606 | 1606 | VVEL CONTROL MODULE | _ | 1 or 2 | × or — | EC-102 |
| P1607 | 1607 | VVEL CONTROL MODULE | _ | 1 | × | EC-1028 |
| P1608 | 1608 | VVEL SENSOR POWER/CIRC | _ | 1 | × | EC-1029 |
| P1610 | 1610 | LOCK MODE | _ | 2 | _ | SEC-55 |
| P1611 | 1611 | ID DISCORD IMMU-ECM | | 2 | | SEC-56 |
| P1612 | 1612 | CHAIN OF ECM-IMMU | _ | 2 | _ | SEC-58 |
| P1614 | 1614 | CHAIN OF IMMU-KEY | _ | 2 | _ | SEC-59 |
| P1715 | 1715 | IN PULY SPEED | _ | 2 | _ | EC-103 |
| P1730 | 1730 | INTERLOCK | _ | 2 | × | TM-142 |
| P1734 | 1734 | 7GR INCORRECT RATIO*8 | _ | 2 | × | TM-144 |
| P1805 | 1805 | BRAKE SW/CIRCUIT | _ | 2 | _ | EC-103 |
| P1806 | 1806 | BRAKE VACUUM SEN | _ | 2 | × | BRC-11 |
| P2100 | 2100 | ETC MOT PWR-B1 | _ | 1 | × | EC-103 |

| DT | ·C*1 | - Items | | | | Reference |
|----------------------------------|-------|----------------------------|----------|------|-----|-----------|
| CONSULT-III GST* ² | ECM*3 | (CONSULT-III screen terms) | SRT code | Trip | MIL | page |
| P2101 | 2101 | ETC FNCTN/CIRC-B1 | _ | 1 | × | EC-974 |
| P2103 | 2103 | ETC MOT PWR | _ | 1 | × | EC-1035 |
| P2118 | 2118 | ETC MOT-B1 | _ | 1 | × | EC-978 |
| P2119 | 2119 | ETC ACTR-B1 | _ | 1 | × | EC-980 |
| P2122 | 2122 | APP SEN 1/CIRC | _ | 1 | × | EC-1037 |
| P2123 | 2123 | APP SEN 1/CIRC | _ | 1 | × | EC-1037 |
| P2127 | 2127 | APP SEN 2/CIRC | _ | 1 | × | EC-1040 |
| P2128 | 2128 | APP SEN 2/CIRC | _ | 1 | × | EC-1040 |
| P2132 | 2132 | TP SEN 1/CIRC-B2 | _ | 1 | × | EC-846 |
| P2133 | 2133 | TP SEN 1/CIRC-B2 | _ | 1 | × | EC-846 |
| P2135 | 2135 | TP SENSOR-B1 | _ | 1 | × | EC-982 |
| P2138 | 2138 | APP SENSOR | _ | 1 | × | EC-1044 |
| P2539 | 2539 | LOW FUEL PRES SEN | _ | 2 | × | EC-1049 |
| P2541 | 2541 | LOW FUEL PRES SEN | _ | 2 | × | EC-1049 |
| P2542 | 2542 | LOW FUEL PRES SEN | _ | 2 | × | EC-1049 |
| P2713 | 2713 | PC SOLENOID D | _ | 2 | × | TM-152 |
| P2722 | 2722 | PC SOLENOID E | _ | 2 | × | TM-153 |
| P2731 | 2731 | PC SOLENOID F | _ | 2 | × | TM-154 |
| P2807 | 2807 | PC SOLENOID G | _ | 2 | × | TM-155 |
| P2A00 | 2A00 | A/F SENSOR1 (B1) | _ | 2 | × | EC-1053 |
| P2A03 | 2A03 | A/F SENSOR1 (B2) | _ | 2 | × | EC-1053 |

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

Test Value and Test Limit

Revision: 2010 June

The following is the information specified in Service \$06 of 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)

> **EC-645** 2011 M37/M56

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INFOID:0000000005926830

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^{*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:} The troubleshooting for this DTC needs CONSULT-III.

^{*5:} When the fail safe operations for both self-diagnoses occur, the MIL illuminates.

^{*6:} SRT code will not be set if the self-diagnostic result is NG.

^{*7:} When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to "How to Display SRT Status".

^{*8:} When erasing this DTC, always use CONSULT-III or GST.

| Item | OBD- MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|------|-------------|--|-------|---|---------------------------|--|
| | | | | TID | Unit and Scaling ID | Description |
| | 01H | Air fuel ratio (A/F) sensor 1 (Bank 1) | P0131 | 83H | 0BH | Minimum sensor output voltage for te cycle |
| | | | P0131 | 84H | 0BH | Maximum sensor output voltage for te |
| | | | P0130 | 85H | 0BH | Minimum sensor output voltage for te cycle |
| | | | P0130 | 86H | 0BH | Maximum sensor output voltage for te |
| | | | P0133 | 87H | 04H | Response rate: Response ratio (Lean Rich) |
| | | | P0133 | 88H | 04H | Response rate: Response ratio (Rich Lean) |
| | | | P2A00 | 89H | 84H | The amount of shift in air fuel ratio |
| HO2S | | | P2A00 | 8AH | 84H | The amount of shift in air fuel ratio |
| | | | P0130 | 8BH | 0BH | Difference in sensor output voltage |
| | | | P0133 | 8CH | 83H | Response gain at the limited frequer |
| | 02H | Heated oxygen sensor 2 (Bank 1) | P0138 | 07H | 0CH | Minimum sensor output voltage for te |
| | | | P0137 | 08H | 0CH | Maximum sensor output voltage for te |
| | | | P0138 | 80H | 0CH | Sensor output voltage |
| | | | P0139 | 81H | 0CH | Difference in sensor output voltage |
| | 03H | Heated oxygen sensor 3 (Bank 1) | P0143 | 07H | 0CH | Minimum sensor output voltage for to cycle |
| | | | P0144 | 08H | 0CH | Maximum sensor output voltage for to cycle |
| | | | P0146 | 80H | 0CH | Sensor output voltage |
| | | | P0145 | 81H | 0CH | Difference in sensor output voltage |

| | OBD- | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | | |
|---------------|------|--|-------|---|--------------------------|--|--|
| Item | MID | | | TID | Unitand Scaling ID | Description | |
| | | 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 | |
| | 05H | | P0153 | 87H | 04H | Response rate: Response ratio (Lean Rich) | |
| | | | P0153 | 88H | 04H | Response rate: Response ratio (Rich t Lean) | |
| | | | P2A03 | 89H | 84H | The amount of shift in air fuel ratio | |
| | | | P2A03 | 8AH | 84H | The amount of shift in air fuel ratio | |
| HO2S | | | P0150 | 8BH | 0BH | Difference in sensor output voltage | |
| | | | P0153 | 8CH | 83H | Response gain at the limited frequency | |
| | | Heated oxygen sensor 2 (Bank 2) | P0158 | 07H | 0CH | Minimum sensor output voltage for test cycle | |
| | 06H | | P0157 | 08H | 0CH | Maximum sensor output voltage for test cycle | |
| | | | P0158 | 80H | 0CH | Sensor output voltage | |
| | | | P0159 | 81H | 0CH | Difference in sensor output voltage | |
| | | Heated oxygen sensor 3 (Bank2) | P0163 | 07H | 0CH | Minimum sensor output voltage for test cycle | |
| | 07H | | P0164 | 08H | 0CH | Maximum sensor output voltage for test cycle | |
| | | | P0166 | 80H | 0CH | Sensor output voltage | |
| | | | P0165 | 81H | 0CH | Difference in sensor output voltage | |
| CATA- LYST | 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 | |
| | | Three way catalyst function (Bank2) | P0430 | 80H | 01H | O2 storage index | |
| | 22H | | P0430 | 82H | 01H | Switching time lag engine exhaust index value | |
| | 22П | | P2424 | 83H | 0CH | Difference in 3rd O2 sensor output voltage | |
| | | | P2424 | 84H | 84H | O2 storage index in HC trap catalyst | |

| Item | OBD- MID | Self-diagnostic test item | DTC | Test value and Test limit (GST display) | | Description |
|--------------------------|-------------|---|-------------------------------------|--|-----|--|
| | | | | | | |
| | | | | | 31H | EGR function |
| | P0400 | 81H | 96H | Low Flow Faults: EGR temp change rate (long term) | | |
| EGR SYSTEM | 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 | | |
| | 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) |
| VVT | | | P0014 | 83H | 9DH | VTC exhaust function diagnosis (VTC drive failure diagnosis) |
| SYSTEM | 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) |
| | 39H | EVAP control system leak (Cap Off) | P0455 | 80H | 0CH | Difference in pressure sensor output voltage before and after pull down |
| | 3ВН | EVAP control system leak (Small leak) | P0442 | 80H | 05H | Leak area index (for more than 0.04 inch) |
| EVAP SYSTEM | 3СН | EVAP control system leak (Very small leak) | P0456 | 80H | 05H | Leak area index (for more than 0.02 inch) |
| OTOTEM | | | P0456 | 81H | FDH | Maximum internal pressure of EVAP system during monitoring |
| | 3DH | Purge flow system | P0441 | 83H | 0CH | Difference in pressure sensor output voltage before and after vent control valve close |
| | 41H | A/F sensor 1 heater (Bank 1) | Low Input:P0031 High Input:P0032 | 81H | 0BH | Converted value of Heater electric current to voltage |
| O2 SEN- SOR HEATER | 42H | Heated oxygen sensor 2 heater (Bank 1) | Low Input:P0037 High Input:P0038 | 80H | 0CH | Converted value of Heater electric current to voltage |
| | 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 |
| | 46H | Heated oxygen sensor 2 heater (Bank 2) | Low Input:P0057 High Input:P0058 | 80H | 0CH | Converted value of Heater electric current to voltage |
| | 47H | Heated oxygen sensor 3 heater (Bank 2) | P0063 | 80H | 0CH | Converted value of Heater electric current to voltage |

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| Item OBD- MID | | Solf diagnostic test item | DTC | li | e and Test mit display) | Description |
|-------------------------|-----|--------------------------------|------------------------------|------------|-------------------------------|---|
| | | Self-diagnostic test item | ыс | TID | Unitand Scaling ID | Description |
| | | | P0411 | 80H | 01H | Secondary Air Injection System Incor- rect Flow Detected |
| | | | Bank1: P0491 Bank2: P0492 | I ATH LOTH | | Secondary Air Injection System Insufficient Flow |
| | | | P2445 | 82H | 01H | Secondary Air Injection System Pump Stuck Off |
| SEC- OND- ARY AIR | 71H | Secondary Air system | P2448 | 83H | 01H | Secondary Air Injection System High Airflow |
| 7.11.17.11.1 | | | 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 |
| | 81H | Fuel injection system function | P0171 or P0172 | 80H | 2FH | Long term fuel trim |
| FUEL | οιП | (Bank 1) | P0171 or P0172 | 81H | 24H | The number of lambda control clamped |
| SYSTEM | 82H | Fuel injection system function | P0174 or P0175 | 80H | 2FH | Long term fuel trim |
| | 02Π | (Bank 2) | P0174 or P0175 | 81H | 24H | The number of lambda control clamped |

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|---------|-------------|----------------------------|-------|----------------|--|---|
| Item | OBD- MID | Self-diagnostic test item | DTC | (GST | Unit and Scaling ID | Description |
| | | | 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 Misfir | Misfiring counter at 1000 revolution of the sixth cylinder | |
| | | | P0307 | 86H | 24H | Misfiring counter at 1000 revolution of the seventh cylinder |
| | | Multiple Cylinder Misfires | P0308 | 87H | 24H | Misfiring counter at 1000 revolution o the eighth cylinder |
| | | | P0300 | 88H | 24H | Misfiring counter at 1000 revolution o the multiple cylinders |
| MISFIRE | A1H | | P0301 | 89H | 24H | Misfiring counter at 200 revolution of the first cylinder |
| MISFIRE | AIII | | 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 o 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 |

[VK56VD]

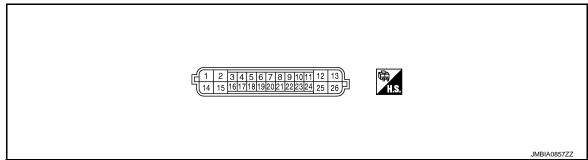
| | OBD- | 0.16.15 | DTO | li | e and Test mit display) | D |
|---------|------|---------------------------|-------|-----|-------------------------------|--|
| Item | MID | Self-diagnostic test item | DTC | TID | Unitand Scaling ID | Description |
| | A2H | No. 1 Cylinder Misfire | P0301 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | , | P0301 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | АЗН | No. 2 Cylinder Misfire | P0302 | овн | 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 | овн | 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 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | , | P0304 | 0CH | 24H | Misfire counts for last/current driving cycles |
| IISFIRE | A6H | No. 5 Cylinder Misfire | P0305 | овн | 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 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driv- ing cycles |
| | | | P0306 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | A8H | No. 7 Cylinder Misfire | P0307 | овн | 24H | EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles |
| | | | P0307 | 0CH | 24H | Misfire counts for last/current driving cycles |
| | А9Н | No. 8 Cylinder Misfire | P0308 | овн | 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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VVEL CONTROL MODULE

Reference Value

TERMINAL LAYOUT



PHYSICAL VALUES

NOTE:

- VVEL control module is located under the battery. Temporarily remove the battery to check voltage of the terminals.
- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT-III.

| Termi | nal No. | Description | | | Value | | |
|----------|-------------|---|------------------|---|---|--|--|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) | | |
| 1 (W) | 14 (B/R) | VVEL actuator motor power supply (bank 2) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14V) | | |
| 2 | 14 | VVEL actuator motor | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ | | |
| (L/B) | (B/R) | (High lift) (bank 2) | Cupat | [Engine is running]Warm-up conditionWhen revving engine up to 2,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ | | |
| 3 | 6 | VVEL control shaft position | | [Engine is running]Warm-up conditionIdle speed | 0.25 - 1.40 V | | |
| (Y) | (B) | sensor 1 (bank 1) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 3,000 rpm quickly | 0.25 - 4.75 V | | |
| 4 (W) | _ | Sensor ground [VVEL control shaft position sensor 1 (bank 2)] | _ | _ | _ | | |

VVEL CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[VK56VD]

| Termi | nal No. | Description | | | Value | Δ. |
|-------------|-------------|---|------------------|---|---|----|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) | А |
| 5 | 4 | VVEL control shaft position | | [Engine is running]Warm-up conditionIdle speed | 0.25 - 1.40 V | EC |
| (L) | (W) | sensor 1 (bank 2) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 3,000 rpm quickly | 0.25 - 4.75 V | С |
| 6 (B) | l | Sensor ground [VVEL control shaft position sensor 1 (bank 1)] | l | _ | _ | D |
| 7 (W) | 6 (B) | Sensor power supply [VVEL control shaft position sensor 1 (bank 1)] | I | [Ignition switch: ON] | 5 V | Е |
| 8 (R) | 14 (B/R) | Power supply for VVEL control module | _ | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | F |
| 9 (W) | 4 (W) | Sensor power supply [VVEL position sensor 1 (bank 2)] | _ | [Ignition switch: ON] | 5 V | G |
| 11 (GR) | _ | ENG communication line | Input/ Output | _ | _ | |
| 12 (L/B) | 14 (B/R) | VVEL actuator motor | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ | H |
| (L/B) | (B/K) | (High lift) (bank 1) | | [Engine is running]Warm-up conditionWhen revving engine up to 3,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ | K |
| 13 (W) | 14 (B/R) | VVEL actuator motor power supply (bank 1) | Input | [Ignition switch: ON] | BATTERY VOLTAGE (11 - 14 V) | M |
| 14 (B/R) | _ | VVEL control module ground | _ | _ | _ | N |

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< ECU DIAGNOSIS INFORMATION >

| Termi | inal No. | Description | | | Value |
|-----------|-------------|---|------------------|---|---|
| + | - | Signal name | Input/ Output | Condition | Value (Approx.) |
| 15 | 14 | VVEL actuator motor | | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ |
| (L/W) | (B/R) | (Low lift) (bank 2) | Output | [Engine is running]Warm-up conditionWhen revving engine up to 3,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ |
| 46 | 10 | VV/El control chaft position | | [Engine is running] • Warm-up condition • Idle speed | 3.50 - 4.75 V |
| 16 (G) | 19 (L) | VVEL control shaft position sensor 2 (bank 1) | Input | [Engine is running]Warm-up conditionWhen revving engine up to 3,000 rpm quickly | 0.25 - 4.75 V |
| 17 (Y) | _ | Sensor ground [VVEL control shaft position sensor 2 (bank 2)] | _ | _ | _ |
| 18 (R) | 17 (L) | VVEL control shaft position sensor 2 (bank 2) | Input | [Engine is running] Warm-up condition Idle speed [Engine is running] Warm-up condition When revving engine up to 3,000 | 3.50 - 4.75 V 0.25 - 4.75 V |
| | | | | rpm quickly | |
| 19 (L) | _ | Sensor ground [VVEL control shaft position sensor 2 (bank 1)] | _ | _ | _ |
| 20 (R) | 19 (L) | Sensor power supply [VVEL control shaft position sensor 2 (bank 1)] | _ | [Ignition switch: ON] | 5 V |
| 21 (V) | 14 (B/R) | VVEL actuator motor relay abort signal [ECM] | Input | [Engine is running] • Warm-up condition • Idle speed | 0 V |
| 22 (G) | 17 (Y) | Sensor power supply [VVEL control shaft position sensor 2 (bank 2)] | _ | [Ignition switch: ON] | 5 V |
| 23 (Y) | 14 (B/R) | VVEL control motor relay | Output | [Ignition switch: OFF] | BATTERY VOLTAGE (11 - 14 V) 0 - 1.0 V |
| 24 (L) | _ | ENG communication line | Input/ Output | [Ignition switch: ON] | — |

VVEL CONTROL MODULE

< ECU DIAGNOSIS INFORMATION >

[VK56VD]

| Termi | inal No. | Description | | | Value |
|-------|----------|---------------------|------------------|---|---|
| + | _ | Signal name | Input/ Output | Condition | (Approx.) |
| 25 | 14 | VVEL control motor | Output | [Engine is running]Warm-up conditionIdle speed | 0 - 14 V★ 100μSec/div 5V/div JMBIA0854ZZ |
| (L/W) | (B/R) | (Low lift) (bank 1) | Сара | [Engine is running]Warm-up conditionWhen revving engine up to 3,000 rpm quickly | 0 - 14 V★ 100μSec/div 5V/div JMBIA0855ZZ |

 $[\]bigstar$: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

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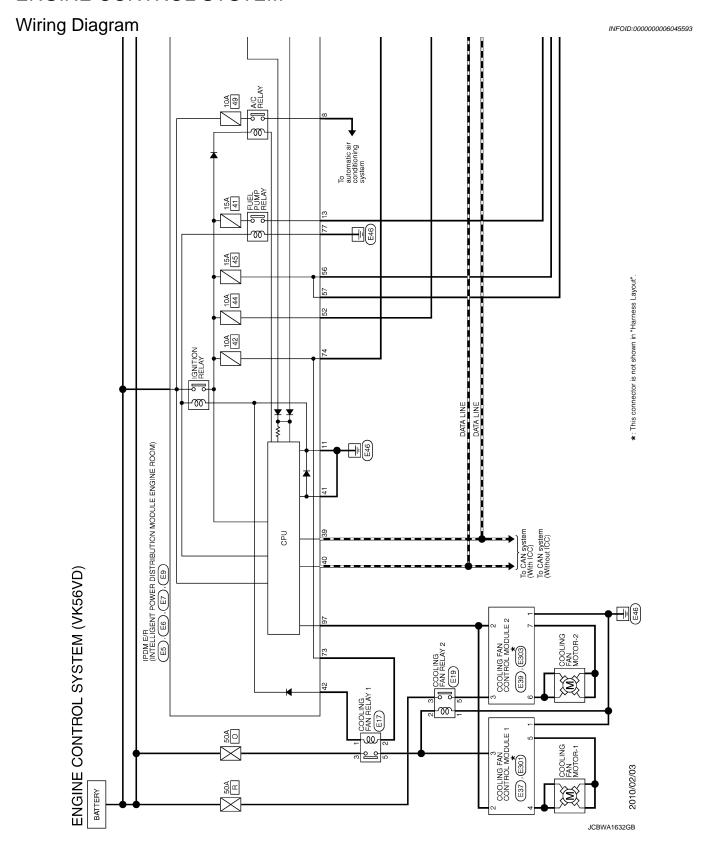
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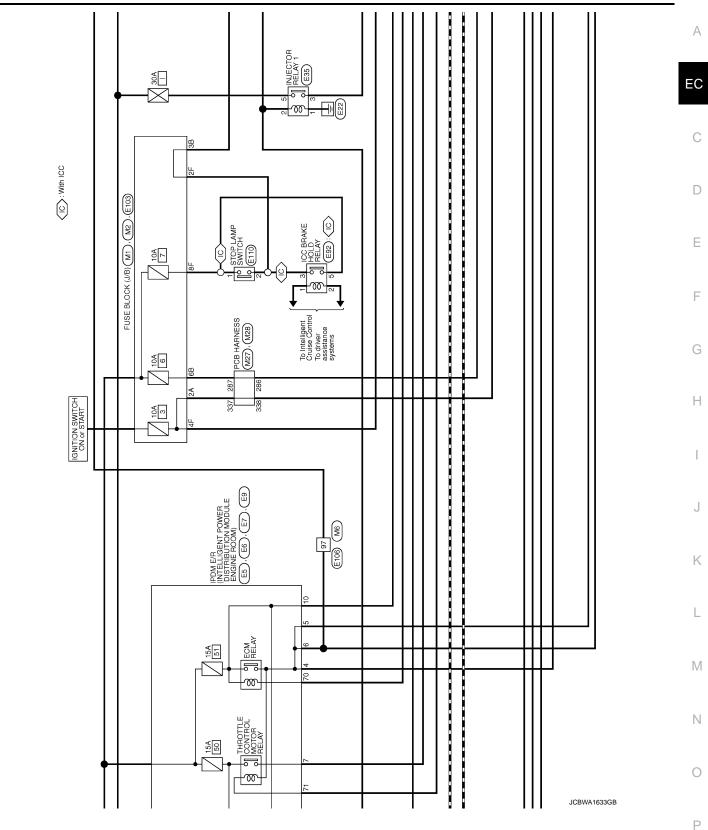
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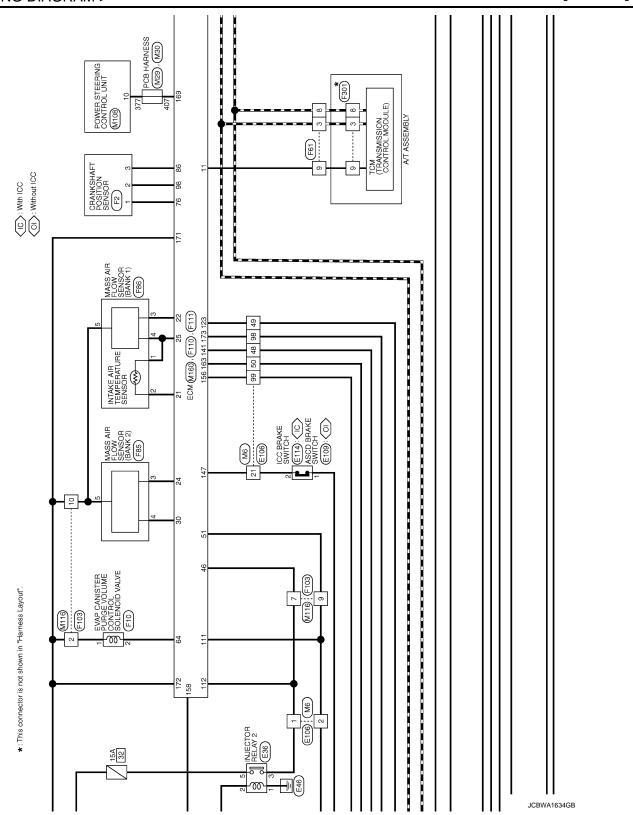
< WIRING DIAGRAM > [VK56VD]

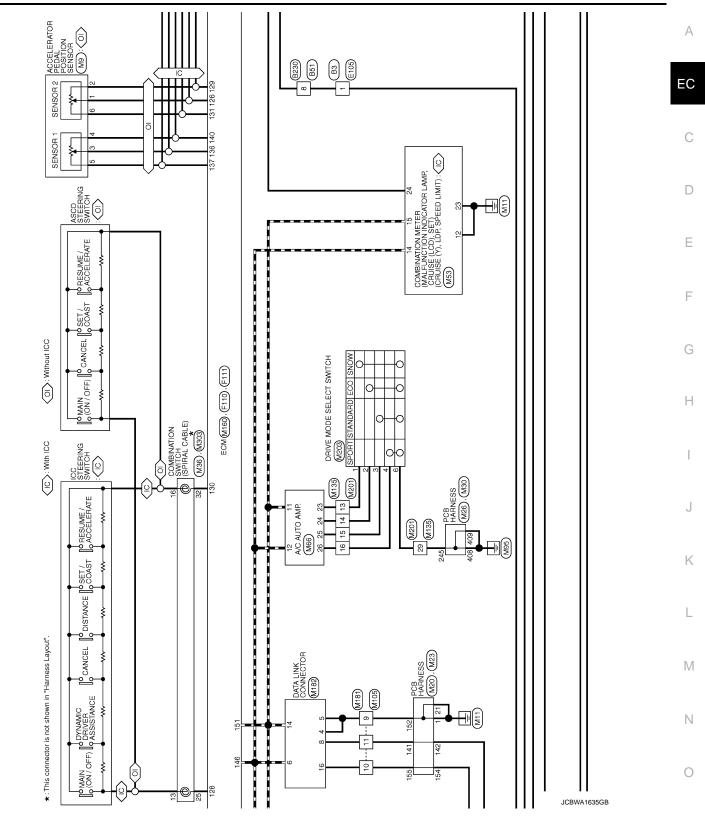
WIRING DIAGRAM

ENGINE CONTROL SYSTEM

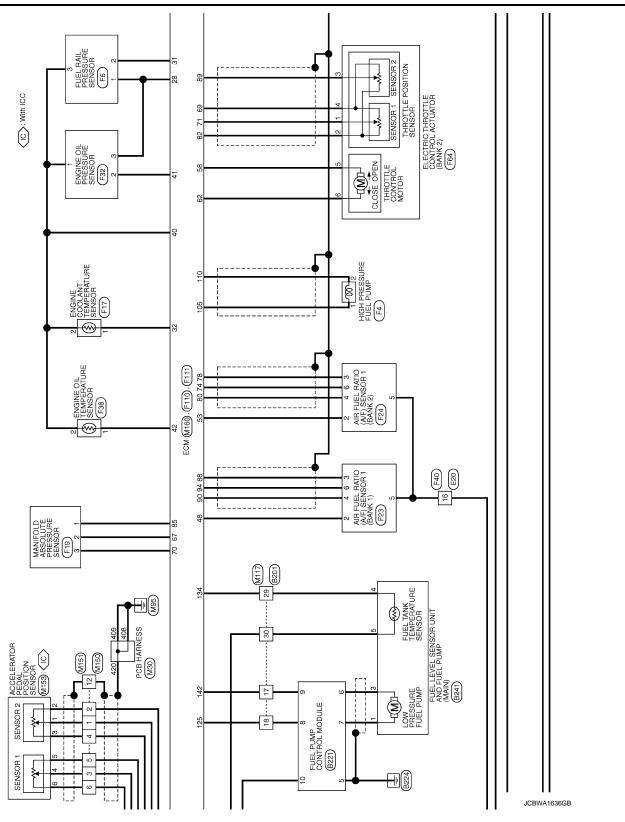


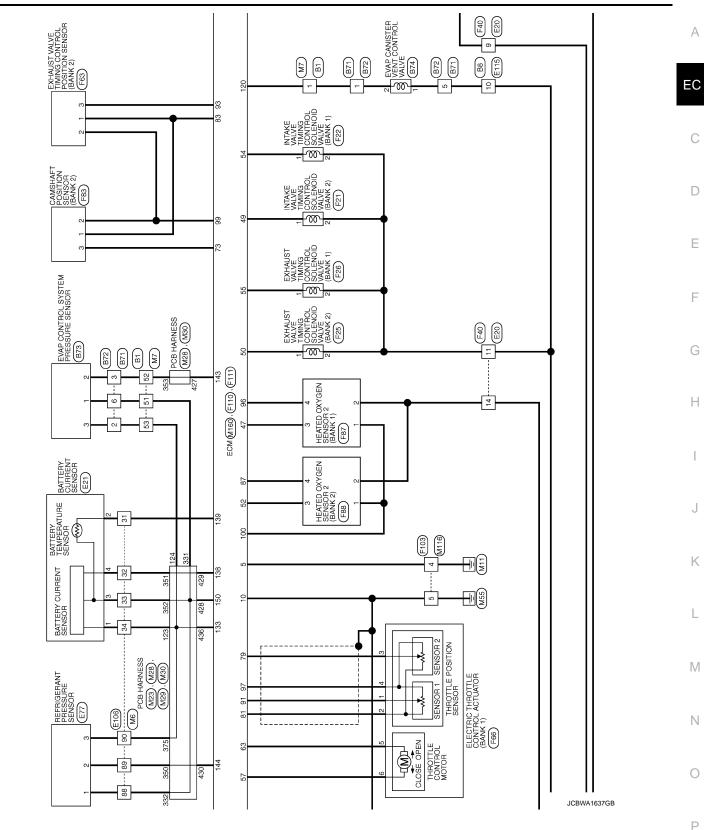


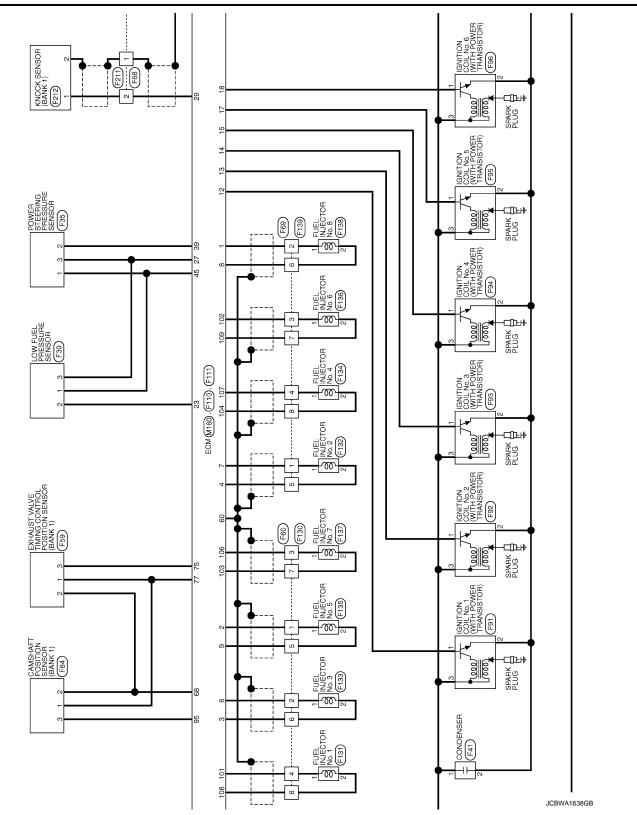


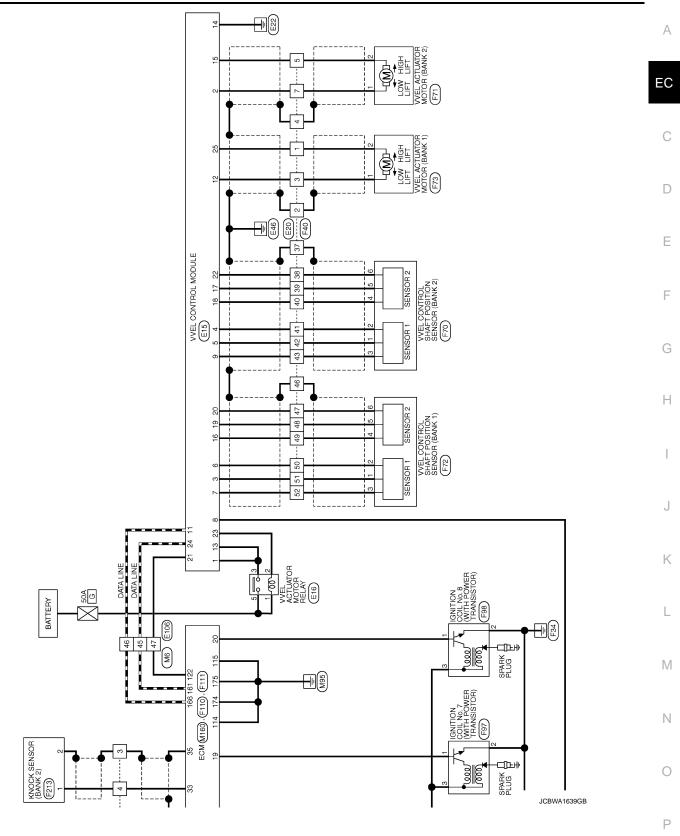


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| Connector No. | ENGINE CONTROL SYSTEM (VK56VD) Connector No. B1 | Ш | SB | | Connector No. B3 | Terminal Color Signal Name [Specification] |
|---------------|--|-------|----------------|---------------------------------|--|--|
| | Connector Name WIRE TO WIRE | 40 | SHIELD GR/V | O | Connector Name WIRE TO WIRE | |
| | Connector Type TH80FW-CS16-TM4 | 42 | N/L | 1 | Connector Type M02FW-LC | |
| | | 45 | > 0 | 1 1 | 医 | Connector No. B71 |
| | | 84 | ≻ E | | HS. | Connector Name WIRE TO WIRE |
| | * 0 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 | .50 E | £ 5 | | <u></u> | Connector Type RS06FB-PR |
| | 0 0 | 51 | > | - | | 1 |
| | | 52 | 97 | - | | B |
| | | 23 | G | 1 | L | HS SH |
| | Color Of Wire | 29 | <u>ا</u> | 1 | Terminal Color Signal Name [Specification] | (321) |
| - 1 | | 28 | 5 9 | | t | 654 |
| | M | 29 | > | 1 | 2 L |) |
| ı l | TO | 09 | Μ | - | | |
| ıl | | 19 | В | - | | Terminal Color Simal Name [Specification] |
| ıl | - ^ | 62 | FIG | | Connector No. B8 | |
| - 1 | GR - | 63 | BB | 4 | Connector Name WIRE TO WIRE | - C |
| - 1 | > <u>-</u> | 63 | > < | - [Without ICC and 4WAS system] | т | 2 6 |
| 1 | | 8 99 | 9 8 | | 2000 | 2 × |
| 1 | GR - [With Climate controlled seat] | 67 | > | 1 | 修 | : > |
| | | 89 | PT | - | 25 | |
| ıl | - [Wi | 69 | GR | 1 | 5 4 | |
| - 1 | GR – [With heated seat] | 70 | œ | r | 12 11 10 9 8 7 6 | Connector No. B72 |
| - 1 | | 72 | - ' | - | | Connector Name WIRE TO WIRE |
| | r (| ? | 1 | | | Т |
| | | 75 | | | Terminal Color | Connector Type KSUbMB |
| | 1 | 92 | . > | 1 | _ | Œ |
| | 1 | 11 | ۳ | 1 | t | |
| ıl | M | 78 | W | - | - × 2 | |
| | | 79 | 5 | - | - M 01 | |
| . 1 | B | 81 | LG | 1 | \dashv | |
| - 1 | - PT | 85 | H 5 | - | 12 SB – | |
| - 1 | > | 3 | 3 | | | ŀ |
| -1 | > C | 8 8 | > ≥ | | Connector No. 1851 | Terminal Color Signal Name [Specification] No. of Wire |
| 1 | - E | 98 | 2 | 1 | Γ | t |
| 1 | - SS | 87 | : 0 | 1 | Connector Name WIRE TO WIRE | 2 G |
| 1 | ┞ | 88 | æ | 1 | Connector Type M08MB-LC | ۵ |
| - | L/O - [Without Pre-crash seat belt system] | 16 | SB | - | 4 | - w |
| | L | 92 | 9 | - | 修 | - ^ 9 |
| - | W/L - [Without Pre-crash seat belt system] | 96 | Υ | - | H.S. | |
| - | SHIELD - | 97 | 0 | - | 1 2 3 4 | |
| | 7 | 86 | SB | - | 1 | |
| | ı | 66 | PCG | 1 | \ 0 | |
| - 1 | | | | | | |
| | - | | | | | |
| | - 5 | | | | | |

JCBWA1640GB

ENGINE CONTROL SYSTEM

[VK56VD] < WIRING DIAGRAM >

| | Α |
|--|----|
| Signal Name [Specification] PRELIEVEL ENGINE LEVEL ENGINE AND FUEL ENGINE AND FUEL ENGINE AND FUEL PAGE AND FUEL | EC |
| 1 | С |
| Connector No. Connector No. Connector No. Connector No. Connector No. Connector Type Sample Sam | D |
| Seat] Seat] | Е |
| - With Climate controlled seat] | F |
| Note | G |
| 10 10 10 10 10 10 10 10 | Н |
| | 1 |
| | J |
| 17 GR | К |
| | L |
| ENGINE CONTROL SYSTEM (VK56VD) Connector Name Connector Name | М |
| CONTROL SYS BY3 EGGEGY-RS Fire Signal Name [Signal Na | N |
| Terminal Color Name Connector Name Connector Type 3 PV 2 PV 3 PV 3 PV 1 WWre 1 WWre 2 PV 3 PV 3 PV 4 PV 4 PV 4 PV 6 PV 6 PV 6 PV 6 PV 7 PV 7 PV 8 PV 9 | 0 |
| JCBWA1641G | В |

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| - ; | Y AVGGZ | - 24 L CANL - 25 L/W MOTOR2-B1 | | Connector No. E16 Connector Name VVEL ACTUATOR MOTOR RELAY | VVEL CONTROL MODULE Connector Type 24347 9F900 | RHISEB-AJZ8-LH | SI. | 5 6 7 8 9 10 11 | 18 19 20 21 22 23 24 25 | Terminal Color Signal Name [Specification] | Signal Name [Specification] 1 B - | 1 m | MOTORI-B2 5 B - | VEL/S1-B1 [With VK engine] VEL/S1-B1 [With VQ engine] | AGND1 Connector No. E17 | VEL/S1-B2 [With VK engine] Connector Name COOLING FAN RELAY 1 | VEL/31-BZ [Wtth VV engine] AGND3 Connector Type [24347_9F900 | AVCC3 [With VK engine] | AVCC3 [With VQ engine] | | AVCC1 [With VQ engine] | MOTOR-B 1 | | P-GND Terminal Color Signal Name [Specification] of Wire | (engine] | 2 G | AGND2 [With VK engine] 3 L – – AGND2 [With VC engine] 5 R – – | | VEL/S2-B2 [With VQ engine] | ACAIDA Ingila VIX angina | AGIND+ [WITH VK BIIRING] | AGND4 [With VQ engine] | ACAING TIVEL OF ACROSSING ACAING THE ACAING |
|--------|---------|-----------------------------------|---------------|--|--|-------------------------------|-----|---------------------------------------|-------------------------|--|-----------------------------------|-----|-----------------|---|-------------------------|---|--|------------------------|------------------------|-----|------------------------|-----------|---|--|------------------|---|---|---|----------------------------|--------------------------|--------------------------|------------------------|---|
| - 1 | o d | 94 LG 96 R | 97 V 102 O | - | Connector Name VVEL C | Connector Type RH18FE | 匮 | 2 3 4 | 14 15 16 17 | | Terminal Color No. of Wire | Ħ | 2 L/B | » B ≺ | 4 W | - T | M 89 | M 2 | × 8 | 9 B | + | 12 GR | Н | 14 B/R | t | Н | 77 Y | + | Н | 1 01 | 9 | Н | ₩ |
| | 1 1 1 | 1 1 | 1 1 | | E/ IPDIA E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) | CS12-M4 | | 6870717273 7475787738 81 82 | <u> </u> | | Signal Name [Specification] | 1 | - | 1 1 | 1 | 1 | 1 1 | 1 | 1 1 | - | 1 | | ı | | | PDM E/R UNTELLIGENT POWER DISTRIBUTION MODULE | | | | V | ; | 05 04 03 | 7 96 95 94 93 92 91 |
| ŀ | ₩ | 43 SB 44 GR | 45 G 46 BR | | Connector No. E/ FOUNDER OF ENGINE RC | Connector Type TH20FW-CS12-M4 | 唇 | S S S S S S S S S | | | Terminal Color Sign | Н | + | 52 G | Н | + | 20 OCK | Н | 70 LG | Н | 74 R | /5 Y | Н | | Connector No. E9 | و | | 1 | 修 | II. | | 08 07 | 98 97 |

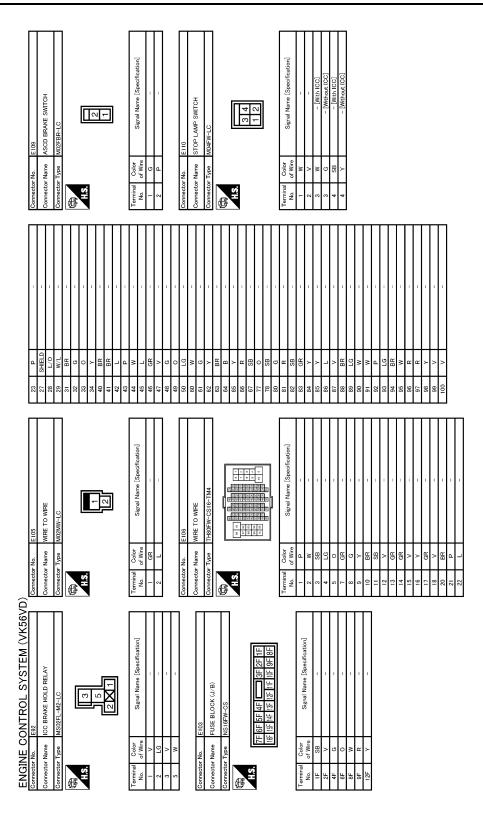
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ENGINE CONTROL SYSTEM

[VK56VD] < WIRING DIAGRAM >

| | | Α |
|--|-------------|---|
| Signal Name [Specification] | E | С |
| Signal N Signal N Signal N Signal N Signal N Signal N | | С |
| Terminal Color 1 | | D |
| aution] | | Е |
| E36 Signal Name [Specification] Signal Name [Specification] E36 MSD7L-M2-LC MSD7L-M2-LC MSD7L-M2-LC E37 COOLING FAU CONTROL MODULE 1 SJZDIFGV-SNZZ COLING FAU CONTROL MODULE 1 SJZDIFGV-SNZZ | | F |
| | | G |
| Connector No. Connector Name Conne | | Н |
| CURRENT SENSOR | | l |
| | | J |
| BR BR BR BR BR BR BR BR | | K |
| | | L |
| Columeter Name | 1 | M |
| COUNTROL SYS | | N |
| Connector Name Color Name | | 0 |
| | JCBWA1643GB | |
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JCBWA1644GB

ENGINE CONTROL SYSTEM

[VK56VD] < WIRING DIAGRAM >

| 1 L | A EC |
|--|-----------|
| lon) | Е |
| F4 HIGH PRESSURE FUEL PUMP Signal Name [Specification] F6 F10 Signal Name [Specification] Signal Name [Specification] | F |
| Name | G |
| Connector Connec | Н |
| Signal Name [Specification] | J |
| Terminal Color S | К |
| | L |
| Convector Name Conv | М |
| CONTROL SY | N |
| | OWA1645GB |
| JCB | P |

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| | 1 O - [With VQ engine] 2 LG - [With VK engine] 2 V - [With VQ engine] | | Connector No. F38 Connector Name ENGINE OIL TEMPERATURE SENSOR Connector Type E02FGY-RS | HS HS | Sign - [Wit | 2 B./W - [With VQ engine] Connector No. F39 Connector Name LOW FUEL PRESSURE SENSOR | Connector Type RH03FB | Terminal Color Signal Name [Specification] Of Wire Signal Name [Specification] | |
|--------------------------------|--|---------------------------|---|---|---|---|--|--|---|
| | Connector No. F26 Connector Name (2) EXAMIST VALVE THINNG CONTROL SOLENOID VALVE (BANK) | Connector Type E02FG-RS | | Terminal Color Signal Name [Specification] No of Wire T R - | Connector No. F32 Connector Name ENGINE OIL PRESSURE SENSOR Connector Type RH03FB | | Color Signal Name [Specification] Color No. Color No. Color Co | Connector No. F35 Connector Name POWER STEERING PRESSURE SENSOR Connector Type RKGGFB | Terminal Color Signal Nane [Specification] No. of Wire Signal Nane [Specification] |
| (D) | 4 L/R 5 0 6 6 L | Connector No. F24 | Connector Name AIR FUEL RATIO (A/F) SENSOR I (BANK 2) Connector Type AFZ06FB | H.S. (456) | Terminal Color Signal Name [Specification] No. of Wire Signal Name [Specification] 2 P - - | | Connector type EUZ-U-HS H.S. (1.2) | Terminal Color Signal Name [Specification] No. of Wire 1 | |
| ENGINE CONTROL SYSTEM (VK56VD) | Connector Name F21 Connector Name Intrac VALVE TRAINS CONTROL SOLENDD VALVE (BANK 2) | Connector Type E02FG-RS | | Terminal Color Signal Name [Specification] | Connector No. F22 Connector Name Intrac valve transc confrol solehod valve (sakk) Connector Type E02FG-RS | | Terminal Color Signal Name [Specification] No. of Wire SB - 2 G | Connector No. F23 Connector Name AR PLEL RATIO (A/F) SENSOR I (BANK I) Connector Type AFZO6FB AFZ 206FB | Terminal Color Signal Name [Specification] No. of Wire S. Y - - |

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| ENG | INE | ENGINE CONTROL SYSTEM (VK56VI | Q | | | | | | | |
|---------------|----------------|---------------------------------|---------------|----------------|---------------------|--|----------------|---|---|--|
| Connector No. | tor No. | F40 | 38 | \sim | – [Wit | - [With VK engine] | Connector No. | F59 | Connector No. F61 | |
| Connect | Connector Name | le WIRE TO WIRE | 39 | ۵. | - [Wit | - [With VQ engine] - [With VK engine] | Connector Name | EXHAUST VALVE TIMING CONTROL POSITION SENSOR (BANK 1) | Connector Name A/T ASSEMBLY | |
| Connect | Connector Type | B SAA36FB-RS8-SHZ8 | 9 | ~ | - [Wit | - [With VQ engine] | Connector Type | RH03FB | Connector Type RK10FG-DGY | |
| ą | Ļ | 1 | 4 | J/0 | – [Wit | - [With VK engine] | ą | | | |
| 事 | | 12 11 10 9 | 14 | Α | - [Wit | - [With VQ engine] | (Hely) | | C. CANON | |
| ES. | _ | 16 15 14 13 3 | 45 | 0 9 | - [Win | - [With VK engine] | Ε, S. | R | Wis. | |
| | | 25 24 23 27 27 20 18 18 17 4 | 42 | 5 s | - [With | - [With VQ engine] | | | 5 4 3 2 1 | |
| | | 9 | 43 | <u> </u> | - [Wit | - [With VQ engine] | | (1213) | - | |
| | | 52 51 50 49 48 47 48 48 48 47 | 94 | SHELD | | 70110010 | | | , | |
| | | | 47 | 7 | - [Wit | [With VK engine] | | | | |
| Terminal | al Color | lor Signal Nama [Spanification] | 47 | W | - [Wit | - [With VQ engine] | Terminal Color | Sirnal Nama Chaniffontion | Terminal Color Simpl Name [Specification] | |
| No. | of Wir. | | 48 | \mathcal{N} | - [Wit | [With VK engine] | No. of Wire | | | |
| - | W/J | M | 48 | BR | – [Wit | - [With VQ engine] | - - | - | Υ - | |
| 2 | SHIELD | | 49 | W/L | – [Wit | [With VK engine] | 2 L | 1 | 2 R | |
| က | L/B | B | 49 | 0/L | - [Wit | - [With VQ engine] | 8 | - | 3 L = | |
| 4 | SHIELD | - OTI | 20 | J/0 | - [Wit | - [With VK engine] | | | 4 V | |
| 9 | M/7 | | 20 | M/L | - [Wit | - [With VQ engine] | | | - B | |
| 9 | ď | - [With VK engine] | 51 | 0 | - [Wit | - [With VK engine] | Connector No. | F60 | - 5 9 | |
| 9 | М | / [With VQ engine] | 51 | SB | - [Wit | h VQ engine] | Oscal Mosso | E TO MARK | 88 L | |
| 7 | L/B | | 25 | × | - [Wit | - [With VK engine] | Connector Name | WINE TO WINE | L 8 | |
| 6 | Μ | - | 52 | 0 | - [Wit | - [With VQ engine] | Connector Type | RS08FB-PR | | |
| 10 | 5 | - | | | | | ģ | | H | |
| 11 | 5 | | | | | | 唐 | | | |
| Ξ | ď | t [With VQ engine] | Connector No. | tor No. | F41 | | H.S. | | | |
| 12 | W | | Connec | Connector Name | CONDENSER | | | 13 21 | Connector No. F63 | |
| 13 | ۵ | 1 | | | | | | ۱ (| Connector Name EXHAUST VALVE TIMING CONTROL POSITION SENSOR | |
| 14 | > | 1 | Connector | tor Type | M02FW-GY-LC | | | ٥ / | | |
| 15 | œ | | ą | | | | | | Connector Type RH03FB | |
| 16 | 0 | | 事 | | | | | | d | |
| 91 | ≻ | | H.S. | , | | | Terminal Color | Signal Name [Specification] | MATA | |
| 19 | Μ | | | | <u> </u> | | No. of Wire | | £5. | |
| 19 | - | - [With VQ engine] | | | ֧֚֭֚֭֚֚֚֭֓֞ ֖֖֓֞ | | - | 1 | / | |
| 50 | ≯ | - | | | 7 | | 2 BR | 1 | ((1 2 3)) | |
| 21 | g | | | | | | 3 | 1 | | |
| 22 | × | | | ŀ | | | + | 1 | | |
| 23 | 4 | - | Terminal | | Signal Nar | Signal Name [Specification] | 9 B/W | - | ŀ | |
| 24 | > | | Š Š | ot Wire | | | 9 | - | la L | |
| 52 | <u>ا</u> د | | - | > | | | + | | No. of Wire | |
| 58 | <u>د</u> : | | 2 | a | | _ | 8 BR | - | | |
| 6.7 S | ≥ 0 | | | | | | | | + | |
| 8 8 | ο ≱ | | | | | | | | 2 | |
| 5 | × - | | | | | | | | | |
| 32 | 2 8 | | | | | | | | | |
| 35 | £ ; | - [With VQ engine] | | | | | | | | |
| 25 | ۵ - | 1 | | | | | | | | |
| 8 | 1 | [with vereigne] | | | | | | | | |
| 8 2 | | 1 | | | | | | | | |
| 3/ | SHEL | | | | | | | | | |
| 88 | 7 | | | | | | | | | |
| 38 | G | - [With VQ engine] | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| | | | | | | | | | | |
| CR | | | | | | | | | | |

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| | No. of Wire Signal Name [Specification] | 2 0/L - | 3 W | | Connector Name VVEL ACTUATOR MOTOR (BANK I) Connector Type X02FB | Œ | | | Terminal Color | No. of Wire Signal Name [Specification] | 2 L/W - | | Connector type KHUSI-B | H.S. | |) | | No. of Wire Signal Name [Specification] | + | מ | |
|--------------------------------|---|-----------------------|------|---|--|---|--------|---------------------|-----------------------------|--|-----------------------|---|--|--|----|---|-------------------|---|-----------------------|---|----------|
| Canadata No 1770 | | Connector Type RH06FB | H8 | (1 <u>2</u> 3456 | Terminal Color Signal Name [Specification] | 2 O/L - | W/L | Н | Connector No. F71 | Connector Name VVEL ACTUATOR MOTOR (BANK 2) | Connector Type X02FB | #SI | | Terminal Color Signal Name [Specification] | ++ | 1 | Connector No. F72 | e e | Connector Type RH06FB | 唇 | (123456) |
| Connector No Irea | _ ₽ | Connector Type RS04MB | H.S. | (1) (1) (1) (1) (1) (1) (1) (1) (1) (1) | Terminal Color Signal Name [Specification] No. of Wire | 1 SHIELD - 2 SHIELD - 3 SHIELD - | 4 GR - | Connector No. F69 | Connector Name WIRE TO WIRE | Connector Type RS08FB-PR | 香 | 8 7 6 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | Terminal Color Signal Name [Specification] No. of Wire Signal Name [Specification] | $^{+}$ | > | Н | 6 BR - | 8 BR = - | | | |
| ENGINE CONTROL SYSTEM (VK56VD) | e e | Connector Type HS06FB | HS. | (1213141516) | Terminal Color Signal Name [Specification] | 1 0 | 0/L | Н | Connector No. F66 | Connector Name ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 1) | Connector Type HS06FB | HS. (123456) | | Terminal Color Signal Name [Specification] No. of Wire | Ħ | Н | Q Q | Н | | | |

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ENGINE CONTROL SYSTEM

[VK56VD] < WIRING DIAGRAM >

| | А |
|---|----------|
| F94 F94 F94 Cowtron colt, No. 4 (with Provins Travelsistron) Signal Name [Specification] Signal Name [Specification] | EC |
| F94 F94 F95 F94 F95 | С |
| 1 0 0 0 0 0 0 0 0 0 | D |
| ation] | Е |
| F91 F92 Signal Name [Specification] Signal Name [Specification] Signal Name [Specification] F93 F93 F93 F93 F94 Signal Name [Specification] F95 F95 F97 F98 F98 F98 F98 F98 F98 F98 | F |
| F91 P02 P03 | G |
| Connector No. Connector Name Connector Name | Н |
| R 2 (BANK 1) R 2 (BANK 2) R 2 (GANK 2) | I |
| FE) HEATED OXYGEN SENSOR 2 (BANK 1) Signal Name [Specification] Signal Name [Specification] Signal Name [Specification] | J |
| Name | К |
| | L |
| Terminal Color Signal Name [Specification] Somector Name HH03FB Terminal Color Name Specification] Terminal Color Signal Name [Specification] Terminal Color Name Signal Name [Specification] Terminal Color Signal Name [Specification] | M |
| CAMSHAFT POSITION SENSOR (BANK 1) RHG3FB Signal Name [Specification] | N |
| Connector Name CAMSHA Connector Name CAMSTA CONNECTOR NAME CA | 0 |
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| | |

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| ENGINE CONTROL SYSTEM (VK56VD) | | | | | | | | | |
|--|---------------|----------------|--|---------------|----------------|---|----|----|--|
| Connector No. F96 | 1 | 5 | - | Connector No. | tor No. | F110 | 45 | В | ENGINE OIL TEMPERATURE SENSOR [WITHOUT ICC] |
| Connector Name (Calification Coll No. 8 (MITL DOMED TRANSPORTOR) | 2 | В | 1 | 00000 | Connector Mamo | NO | 45 | > | SENSOR GROUND |
| | 3 | W | - | | | | 46 | LG | FUEL INJECTOR DRIVER POWER SUPPLY |
| Connector Type E03FGY-RS | | | | Connec | Connector Type | MAB35FB-MEB20-LH-Z | 47 | BR | HEATED OXYGEN SENSOR 2 HEATER (BANK 1) |
| 4 | | | | 4 | | | 48 | ٨ | A/F SENSOR 1 HEATER (BANK 1) |
| 修 | Connector No. | or No. | F103 | 唐 | | | 49 | GR | INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) |
| S . | | | LOWN OF LOWN | E | | 1 6 11 21 31 41 46 51 | 20 | > | EXHAUST VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) |
| | Connect | or Name | WINE TO WINE | | | 2 7 12 17 22 27 33 47 52 | 21 | > | FUEL INJECTOR DRIVER POWER SUPPLY |
| ((1 2 3)) | Connect | Connector Type | TK36FW-NS10 | | | 3 8 13 16 23 23 23 23 48 53 44 53 44 5 54 45 54 54 54 54 54 54 54 54 54 5 | 25 | ŋ | HEATED OXYGEN SENSOR 2 HEATER (BANK 2) |
| | ą | | | | | 5 10 15 20 25 30 35 40 45 50 55 | 23 | Ь | A/F SENSOR 1 HEATER (BANK 2) |
| | B | | | | | | 24 | SB | INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1) |
| Į. | H.S. | | | | ı | | 22 | œ | EXHAUST VALVE TIMING CONTROL SOLENOID VALVE (BANK 1) |
| Terminal Color Signal Name [Specification] | | 38 37 38 36 5 | 88 37 38 58 34 53 52 51 53 50 19 19 17 16 15 14 19 12 17 1 | Terminal | al Color | Signal Name [Specification] | | | |
| Ť | | | | 2 - | > | (II) 6 -N GOTOSI NI ISILIS | | | |
| > a | | | | - - | - - | FUEL INJECTOR NO. 8 (FI) | | | |
| ł | | | | 4 65 | ۷ > | FILE IN FOTOB No. 3 (LO) | | | |
| | Tormino | - Color | | • | - | CITE IN IECTOD No. 9 (LO) | | | |
| | Ş | | Signal Name [Specification] | t G | | ECM GROUND | | | |
| Connector No. F97 | 6 | <u> </u> - | 1 | 9 | 22 | FIJEL IN JECTOR No. 3 (HI) | | | |
| т | 9 | g | 1 | 7 | B/W | FUEL INJECTOR No. 2 (HI) | | | |
| Connector Name KINITION COLE No. / (MITH POWER TRANSISTOR) | 4 | | - [With VK engine] | ω | 띪 | FUEL INJECTOR No. 8 (LO) | | | |
| Connector Type E03FGY-RS | 4 | œ | - [With VQ engine] | 6 | B/W | FUEL INJECTOR No. 5 (LO) | | | |
| 4 | 9 | GR | - [With VK engine] | 10 | GR | ECM GROUND | | | |
| | 2 | a | - [With VQ engine] | Ξ | 57 | TRANSMISSION RANGE SWITCH | | | |
| SH | 7 | 97 | ι | 12 | 0 | IGNITION SIGNAL No. 1 | | | |
| | 8 | > | 1 | 13 | _ | IGNITION SIGNAL No. 2 | | | |
| ((1 2 3)) | 6 | Μ | - [With VK engine] | 14 | ŋ | IGNITION SIGNAL No. 3 | | | |
| | 6 | SB | - [With VQ engine] | 15 | æ | IGNITION SIGNAL No. 4 | | | |
| | 10 | BR | - [With VK engine] | 17 | PΠ | IGNITION SIGNAL No. 5 | | | |
| | 10 | ۸ | - [With VQ engine] | 18 | ٨ | IGNITION SIGNAL No. 6 | | | |
| Terminal Color Signal Nama [Specification] | 11 | 7 | 1 | 19 | ٦ | IGNITION SIGNAL No. 7 | | | |
| | 12 | Ь | 1 | 20 | 9 | IGNITION SIGNAL No. 8 | | | |
| I | 13 | ۸ | - | 21 | ď | INTAKE AIR TEMPERATURE SENSOR (BANK 1) | | | |
| 2 B – | 14 | SB | - | 22 | GR | MASS AIR FLOW SENSOR (BANK1) [WITH ICC] | | | |
| 3 W = | 15 | В | - | 22 | В | MASS AIR FLOW SENSOR (BANK1) [WITHOUT ICC] | | | |
| | 16 | W | 1 | 23 | В | LOW FUEL PRESSURE SENSOR | | | |
| | 1.7 | GR | - | 24 | В | MASS AIR FLOW SENSOR (BANK2) [WITH ICC] | | | |
| Connector No. F98 | 18 | ΓC | 1 | 24 | GR | MASS AIR FLOW SENSOR (BANK2) [WITHOUT ICC] | | | |
| Connector Name (Control Coll No. 8 (MITH POWER TRANSISTOR) | 21 | ΓG | 1 | 25 | ۵ | SENSOR GROUND | | | |
| | 22 | В | 1 | 27 | 5 | SENSOR POWER SUPPLY | | | |
| Connector Type E03FGY-RS | 23 | g | 1 | 28 | × | SENSOR POWER SUPPLY | | | |
| á | 24 | BR | 1 | 59 | W | KNOCK SENSOR (BANK 1) | | | |
| (HAT) | 25 | 0 | 1 | 30 | 0 | SENSOR GROUND | | | |
| S | | | | 31 | ŋ | FUEL RAIL PRESSURE SENSOR | | | |
| | | | | 32 | >- | ENGINE COOLANT TEMPERATURE SENSOR | | | |
| ((123)) | | | | 33 | æ | KNOCK SENSOR (BANK 2) | | | |
| | | | | 32 | SHIELD | SENSOR GROUND | | | |
| | | | | 39 | Pl | POWER STEERING PRESSURE SENSOR | | | |
| | | | | 40 | В | SENSOR GROUND | | | |
| Terminal Color Signal Name [Specification] | | | | 4 | σ. | ENGINE OIL PRESSURE SENSOR | | | |
| of Wire | | | | 45 | _ | ENGINE OIL TEMPERATURE SENSOR [WITH ICC] | | | |

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[VK56VD]

| Connector No. F135 Connector Name FUEL INJECTOR No. 5 Connector Type HS02FGY HS3 | Terminal Color Signal Name [Specification] 1 P | Terminal Color Signal Name [Specification] Color No. Color No. Color Color | Terminal Color No. Signal Nane [Specification] 1 G 1 C 2 Y - - - |
|--|---|--|--|
| Connector No. F132 Connector Name FUEL INJECTOR No. 2 Connector Type HS02FGY HS0 | Color Signal Name [Specification] | Color Signal Name [Specification] 1 ER - | Terminal Color Signal Name [Specification] 1 GR - 2 SB - - |
| 102 L 103 B/W 104 BR 105 W 106 L 108 BY 109 B/W 110 B | octor Na octor Ty | 5 0 | Terminal Color Signal Name [Specification] |
| ENGINE CONTROL SYSTEM (VK56VD) Connector Name ECM Connector Type MABSSFBR-MEBZO-LH-Z ALS. | Color Colo | | 97 G SENSOR GROUND 98 R SENSOR GROUND 100 P SENSOR GROUND 1100 Y FUEL INJECTOR No. 1 (H) |

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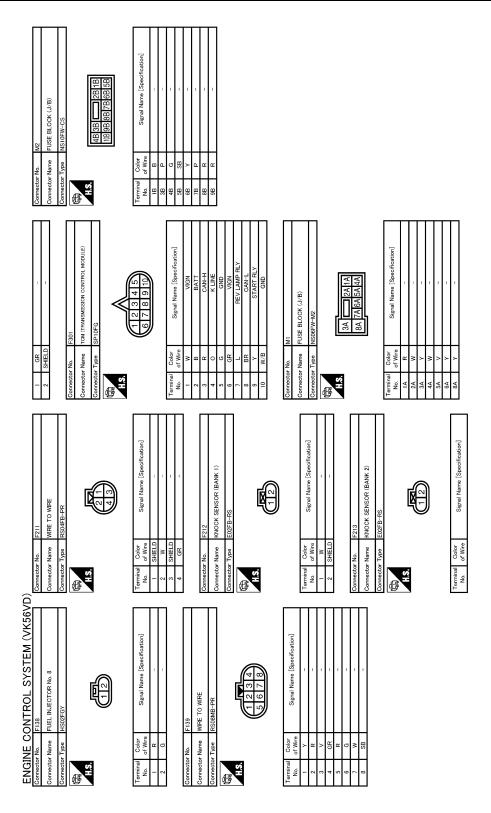
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ENGINE CONTROL SYSTEM

< WIRING DIAGRAM > [VK56VD]

| | ENGII | ENGINE CONTROL SYSTEM (VK56VD) | - 1 | | | | | | | | |
|----|----------------|--|---------------|----------------|--|-----|----------|--------------------------------|-------------|----------------|-----------------------------------|
| _ | Sonnector | r No. M6 | 20 | × | | ا و | > | - | 8 | # : | - |
| J | Connector Name | r Name WIRE TO WIRE | 90 | æ, | 1 | _ (| σ ; | ' | 65 | ≥ (| - |
| ľ | Connector Time | Time Tubohaw_CS16_TM4 | 89 | <u> </u> | | 0 0 | - 0 | | 8 6 | <u> </u> | |
| اك | O III I COO | and a | 70 | 3 8 | | p 5 | 2 2 | | 6 8 | } ! | |
| _ | o∏: | | 8 | <u>د</u> | | 2 7 | · ; | Parent Contract of Contract | 90 | 3 8 | |
| | Į | 20 49 69 89 | # 0 | 1 | | = | - | Dware controlled sead | 9 6 | 9 > | |
| | | 1 0 1100 0140 0100 0100 | 8 9 | 2 0 | | 2 | , . | - Date Olimete controlled cost | 2,2 | - | |
| | | 70 20 30 30 30 30 30 30 30 30 30 30 30 30 30 | 29 | - | | 4 5 | . 8 | - Division bearing | 73 | ٥ | |
| | | 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 3 5 | اً ا | | 2 5 | 5 8 | - [with reaced seat] | 2 5 | - | |
| | | | 2 | , | | 2 | 5 | | 1 | , | |
| | | | 2 8 | , (| | ţ | 5 8 | | 2 6 | ١ | |
| Ľ | | | 8 8 | 5. | | 2 9 | 2 | | 9 5 | ; | |
| | erminal N- | Signal Name [Specification] | 0 8 | 1 | | 2 5 | > ? | 5000 0000 | ì | - | ' |
| _ | | | 82 | n | 1 | - ! | 200 | - [with ICC] | 8/ | 20 : | |
| | 1 | | 82 | BG | - | - | m | - [Without ICC] | 79 | \$ | - |
| | 2 | | 84 | SB | 1 | 18 | _ | 1 | 81 | LG | 1 |
| | က | | 82 | > | • | 19 | ≥ | • | 82 | æ | 1 |
| _ | 4 | | 98 | | - | 20 | ۳ | - | 83 | BG | 1 |
| _ | ď | | 87 | > | 1 | 2 | ۵ | | 84 | <u> </u> | |
| _ | , | | 0 | . > | | 66 | - | | 90 | 3 | |
| _ | | | 8 | .[| | 77 | 2 | | 8 | : . | |
| | | | 88 | 5 | - | 8 | \$ | - | 8 | 9 | - |
| | 6 | | 90 | BG | _ | 24 | > | - | 87 | ď | _ |
| | 10 | | 91 | Α | 1 | 25 | G | 1 | 88 | 5 | 1 |
| _ | 11 | | 92 | BG | - | 26 | BR | 1 | 91 | М | 1 |
| _ | 2 | | 63 | c | | 7.6 | 97 | | 65 | ٣ | |
| | : | | 3 | , | | i e | 2 | | 9 | 3 | |
| _ | 2 ; | | 100 | -[| | 07 | - | | 96 | 2 | |
| | 4 | | 66 | ۸ | 1 | 67 | 4 | I | 6 | 50 | 1 |
| | 2 | | 96 | 2 | 1 | 30 | SHELD | - | 86 | <u>-</u> | - |
| | 91 | | 97 | SB | | 32 | _ | _ | 66 | ΓC | _ |
| | 17 | | 86 | œ | 1 | 33 | α. | 1 | | | |
| | 18 | _ ^ | 66 | M | 1 | 34 | 7 | - | | | |
| _ | 20 | | 100 | - | 1 | 35 | ۵ | | Connec | Connector No. | 6M |
| _ | 5 | | | , | | 38 | . 6 | | | | |
| _ | 1 8 | | | | | 8 5 | 3 8 | | Connec | Connector Name | ACCELERATOR PEDAL POSITION SENSOR |
| _ | T | | | | | ò : | 8 | | ļ | | |
| _ | ┪ | | Connector No. | tor No. | M7 | 40 | SHELD | - | Connec | Connector Type | RH06FB |
| | 27 | SHIELD - | Connect | Connector Name | WIDE TO WIDE | 41 | SB | - | ą | • | |
| _ | 28 | | | | | 42 | > | - | 事 | | |
| | 29 | | Connect | nector Type | TH80MW-CS16-TM4 | 45 | м | - | \ \ \ | | |
| _ | 31 | | [| | | 47 | 7 | 1 | | | <u> </u> |
| _ | 32 | - | 厚 | | | 48 | 97 | | | | 1 0 0 1 6 6 |
| _ | 33 | | Ę | | 20 40 E0 | 40 | 8 | | | | oΙ |
| | 3 | | 4 | | 20 20 20 20 20 20 20 20 20 20 20 20 20 2 | 2 | <u> </u> | | | | |
| _ | 45 | | | | 2 S | 90 | > | 1 | | | |
| | 40 | | | | | 21 | > | - | | | |
| _ | 41 | | | | | 52 | ۵ | 1 | Terminal | nal Color | |
| _ | 42 | | | | | 53 | BG | | Š | | olgnai Name [opecification] |
| _ | ş | | | | | 3 | 3 8 | | ŀ | | |
| _ | 43 | | | | | 86 | Se | 1 | | - | |
| | 44 | | Termina | | [O | 22 | ۵ | | 2 | ω | |
| | 45 | - × | N | of Wire | | 28 | 97 | 1 | 8 | ď | 1 |
| | ş | | - | | | 9 | > | | _ | ¥ | |
| _ | , | | - | ; | | 8 | - { | | , | : | |
| | 47 | | 2 | \ | | 09 | g | | S | ŋ | |
| | 48 | - J | 4 | BR | 1 | 61 | 80 | 1 | 9 | _ | 1 |
| _ | 49 | | 5 | ۵ | | 62 | <u> </u> | | | | |
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| 3W | | | | | | | | | | | |
| VΑ | | | | | | | | | | | |
| Α1 | | | | | | | | | | | |
| 16 | | | | | | | | | | | |
| 65 | | | | | | | | | | | |
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| В | | | | | | | | | | | |
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Revision: 2010 June **EC-677** 2011 M37/M56

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| ENGINE CONTROL SYSTEM (VK56VD) | SYSTEM (VK56VI | _ا | | | | - 1 | | | |
|---|--|----------|----------------|---|----------|----------------|---|-----------------|--|
| Connector No. M20 | | | BG BC | | 249 | _ | | 4 | B |
| Connector Name PCB HARNESS | | 124 | H | | 250 | SHIELD | | \dashv | - ^ |
| | | 128 | 4 | | 253 | _ | - [With Climate controlled seat] | + | |
| Connector Type TH40FB-NH | | 130 | 4 | | 253 | 4 | - [With heated seat] | 4 | |
| á | | 131 | SB | - 6 | 254 | Λ. | - [With Climate controlled seat] | | |
| 曲 | | 132 | 5 LG | 5 | 254 | В | - [With heated seat] | Ц | - · |
| H.S. | ſ | 133 | 4 | 1 | 255 | ┪ | 1 | 320 | M |
| | | 135 | 9 9 | - | 256 | Н | - | | |
| 20 19 18 17 16 15 14 13 12 11 10 | 9 8 7 6 5 4 3 2 1 | 137 | ٧ / | _ | 257 | ည | - | | |
| m 100 | 20 20 21 20 20 21 20 22 21 | 138 |] | - | 258 | 2 | - | Connector No. | M28 |
| | | 139 | 9 Б | - | 259 | 7 | - | Occupation Nome | SSENGER AND ST |
| | | 140 | | | 260 | BG | 1 | Confidence Ivan | |
| Terminal Color Signal No. | Simpl Name [Specification] | 141 | W | - h | 261 | Ь | - | Connector Type | Se TH40FW-NH |
| of Wire | dame Lobechicagori | 142 | Н | | 269 | GR | - | q | |
| - B | 1 | 144 | <u>۵</u> | - | 270 | \dashv | 1 | 手 | |
| \dashv | 1 | 145 | 4 | | 271 | 4 | 1 | H.S. | |
| 12 R | I | 146 | 4 | | 272 | 4 | 1 | | |
| 14 L | 1 | 147 | 7 B | | 273 | 4 | - | 3 5 5 | 317 336 335 334 335 335 335 367 368 366 364 364 363 360 |
| 4 | 1 | 148 | 4 | | 274 | <u>~</u> | 1 | | |
| | - | 149 | | | 275 | <u>-</u> | _ | | |
| + | 1 | 150 | ٥ | | 276 | <u>в</u> | - | | |
| 20 R | 1 | 151 | _ | - | 277 | 5 | 1 | la l | Color Simal Nama [Snacification] |
| | 1 | 152 | | | 278 | | | | of Wire |
| 22 R | - | 153 | W W | | 279 | SB | - [Wir | 321 | - ^ |
| 23 L | - | 154 | W . | - h | 279 | 2 | - [With heated seat] | | ۰ ۸ |
| 24 L | 1 | 155 | | | 280 | > | I | 324 | |
| | - | 157 | | | | | | 325 | 7 |
| 30 SHIELD | 1 | 158 | <u>د</u> | - | | | | 326 | 7 |
| 31 V | 1 | 159 | 4 | 1 | Conne | Connector No. | M27 | 4 | |
| 33 ^ | 1 | | | | Conne | Connector Name | PCB HARNESS | _ | |
| 4 | 1 | | | | | | Т | + | - B |
| 36 P | 1 | Conne | Connector No. | M26 | Conne | Connector Type | TH40FB-NH | 4 | |
| 38 L | 1 | Conne | Connector Name | PCB HARNESS | ą | | | 4 | |
| 40 Y | I | | | ╗ | 事 | | | 4 | - B |
| | | Conne | Connector Type | e TH40FW-NH | H.S. | vi. | | 337 | |
| ſ | | ąĮ. | • | | | 200 000 000 | | 4 | |
| Connector No. M23 | | 事 | | | | 300 319 31 | 8 377 318 315 314 313 312 311 310 333 333 337 338 337 348 333 337 | + | _ |
| Connector Name PCB HARNESS | | Š | ń | | | | | + | na > |
| Connector Type TH40FW-NH | | | 280 288 | 1 858 557 556 555 554 255 552 551 559 548 348 347 346 545 344 343 342 841 | | | | ╀ | |
| | | | 280 279 | 278 277 278 275 274 275 272 271 271 288 388 287 386 286 284 283 282 281 | Townsino | - | | 242 | 1 0 |
| 49 | | | | | No. | of Wire | Signal Name [Specification] | ╀ | - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 |
| S | ı | | | | 282 | + | 1 | ╀ | - ^ |
| | | Terminal | inal Color | lor Simul Name Consideration | 283 | H | - | H | DT |
| 140 139 138 137 136 136 134 133 132 132 132 133 133 133 133 13 133 13 | 1 125 128 128 128 128 124 128 129 121 1 125 128 128 128 124 128 129 121 | No. | of Wire | | 284 | Н | 1 | Н | |
| to the less tool tool tool tool tool tool tool | | 241 | _ | - | 286 | W | 1 | Н | |
| | | 243 | ж Ж | - ~ | 287 | | 1 | | |
| | | 244 | 4 | | 288 | 4 | I | 358 | |
| Color | Signal Name [Specification] | 245 | 9 | | 290 | 4 | ı | 4 | M |
| of Wire | | 246 | + | 4 | 292 | 4 | 1 | 360 | - 5 |
| 121 R | | 247 | , LG | G - [With Climate controlled seat] | 293 | 4 | - | | |
| V 221 | - | 747 | 4 | | 4R7 | 9 | - | | |

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[VK56VD]

| < VVIRING DIAGRAM > | < WIRI | IG DIAGRAM > | |
|---------------------|--------|--------------|--|
|---------------------|--------|--------------|--|

| M66 A/C AUTO AMP. TH20FW-TE6 Signal Name [Specification] BATTERY POWER SUPPLY BLOWER MOTOR F.B SIGNAL GROUND GROUND GROUND DRIVE MODE SELECT SW (STANDARD) DRIVE MODE SELECT SW (SPORT) | EC |
|--|--------|
| Connector Name | C D |
| COMBINATION METER THAUGHANTHON METER THAUGHANN SIGNAI Name [Specification] BATTERY POWER SUPPLY CHOLE SPEED SIGNAL (2-PULSE) VEHICLE SPEED SIGNAL (2-PULSE) NEHOLE SPEED SIGNAL (3-PULSE) NEHOLE SPEED SIGNAL (3-PULSE) NEHOLE SPEED SIGNAL (3-PULSE) NEHICLE SPEED SIGNAL (3-PULSE) NEHICLE SPEED SIGNAL (3-PULSE) NEHICLE SPEED SIGNAL (3-PULSE) NEHICLE SPEED SIGNAL (3-PULSE) ALTERNATION CONTROL SIGNAL GROUND FUEL LEVEL SENDED SIGNAL PADDLE SHITTER SHITT UP SIGNAL MANUAL MODE SHITTER SHITTER MANUAL MODE SHITTER MAN | E |
| Connector No. M53 | G |
| Signal Name [Specification] M86 COMBINITION SWITCH (SPINAL CABLE) TROBEGY-IV TROBEGY-IV Signal Name [Specification] | I J |
| Terminal Color No. 1 No. | K |
| ENGINE CONTROL SYSTEM (VK56VD) Connector Non- Signal Manne Signal Name Specification No. of Wire No. of Wire Signal Name Specification Signal Name Specification Signal Name Specification Signal Name Specification Signal Name Sig | M |
| ENGINE CONTROL Connector Name P.CB HARNESS Connector Name P.CB HARNESS Connector Name P.CB HARNESS Connector Name P.CB HARNESS San | N O |

| | | 18 LG | - 8 | - 57 G | W - 58 R | | T _C | Connactor No M117 C C C C | N | J > | Connector Type TH80FW-CS16-TM4 68 SB - | 69 | 70 | 1. S S S S S S S S S S | 20 C C C C C C C C C C C C C C C C C C C | 1 62 2 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 | 88 | H | (all Color Simple Name [Specification] 82 | Ognar Name Copecinication | × × × × × × × × × × × × × × × × × × × | מאַ | 000 | 60 88 | - × - × - × - × - × - × - × - × - × - × | | 23 R - 91 Y | BG – 93 W – [Wit | LG - 93 G - [With h | 20 W - W 94 V | 28 V = 97 | 29 P - 98 BR - | - B | Н | 32 Y = - | έs | + | + | _ | SB | 46 L - [With Climate controlled seat] | BG | G – [Wr | 47 GR - [With heated seat] | | |
|--------------------------------|-------------|---------------------------------|--------------------------|--------|----------|----------|---------------------------------|---|---|-----|--|---------------------------|----------|--|--|--|----|---|---|---------------------------|---------------------------------------|----------------|-----|----------|---|---|--|------------------|---------------------|---------------|-------------------------------------|----------------|-----|---|-----------------------|-----|---|----|---|-----------------------|---------------------------------------|----|---------|----------------------------|----|--|
| Mino | Ι | ame POWER STEERING CONTROL UNIT | ype TH12FW-NH | 1 | | <u>_</u> | 3 2 | ç | ╗ | | Color Color | | a | G IGN | | VEHICL | | | | o. M116 | ame WIRE TO WIRE | TECOCAMA NO. O | 7 | | | | 6 7 8 9 10 212223242528273829 39404424344546 | | | - | of Wire Signal Name [Specification] | SB | | | SB – [With VQ engine] | . В | | | | SB – [With VQ engine] | SB - | | d | - ^ | | |
| (VK56VD) | Connector N | Connector Name | Connector Type | 4 | 医 | H.S. | 2 1 | 22 21 | | | Terminal | No. | | n (r | , , | | 10 | | | Connector No. | Connector Name | Tatoonago Tan | | ₽ | - | | 10 | | | | | 2 | 8 | 4 | 4 | S. | 7 | ω. | 6 | o | 01 | 11 | 12 | 13 | 14 | |
| ENGINE CONTROL SYSTEM (VK56VD) | MIUS | WIRE TO WIRE | Connector Type TH40FW-NH | | | | 15 14 13 12 11 10 9 8 7 6 5 4 3 | 40 39 38 37 36 35 34 33 32 31 30 29 28 27 26 25 24 23 | | | [miles Since O] among leaving | Olgrai Ivanie Lopecincaut | 1 | 1 1 | 1 | 1 | 1 | _ | - | 1 | 1 | 1 1 | | | ı | 1 | 1 | 1 | 1 | 1 | | 1 | 1 | 1 | _ | 1 | 1 | | | | | | | | | |

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[VK56VD]

< WIRING DIAGRAM >

| 129 B SENSOR GROUND [WITHOUT ICG] 130 V SENSOR POWER SUPPLY 131 E SENSOR POWER SUPPLY 132 E C SENSOR POWER SUPPLY 133 P ACCELERATOR PEGAL POSITION SENSOR 136 B ACCELERATOR PEGAL POSITION SENSOR 137 G SENSOR POWER SUPPLY 138 B ACCELERATOR PEGAL POSITION SENSOR 140 W SENSOR POWER SUPPLY 141 G C SENSOR POWER SUPPLY 142 GR PLEL TANK PEGSUNE SENSOR 143 P FCHE TANK PINTON SWITCH 141 G C C C C 152 C C C C 154 P FCHE TANK PINTON ILNE 145 F C C C C 150 W C C C C 151 F C C C C 152 S C C C C 154 F C C C C 155 W C C C C 156 W C C C C 157 C C C C C 158 W C C C C 159 W C C C C 150 W C C C C 150 W C C C C 151 C C C C C 152 C C C C C 153 C C C C C 154 D C C C C 155 C C C C C 156 W C C C C 157 C C C C C 158 C C C C C 159 W C C C C 150 C C C C C C C 150 C C C C C C C 150 C C C C C C C C 150 C C C C C C C C 150 C C C C C C C C C 150 C C C C C C C C C | |
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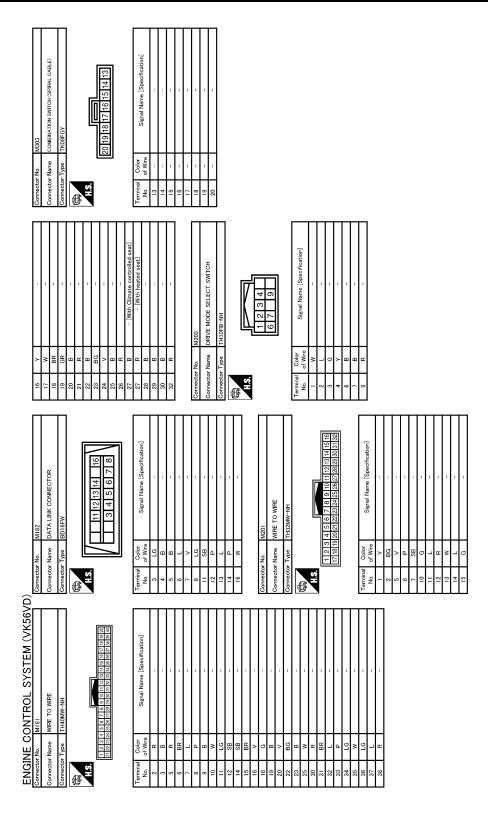
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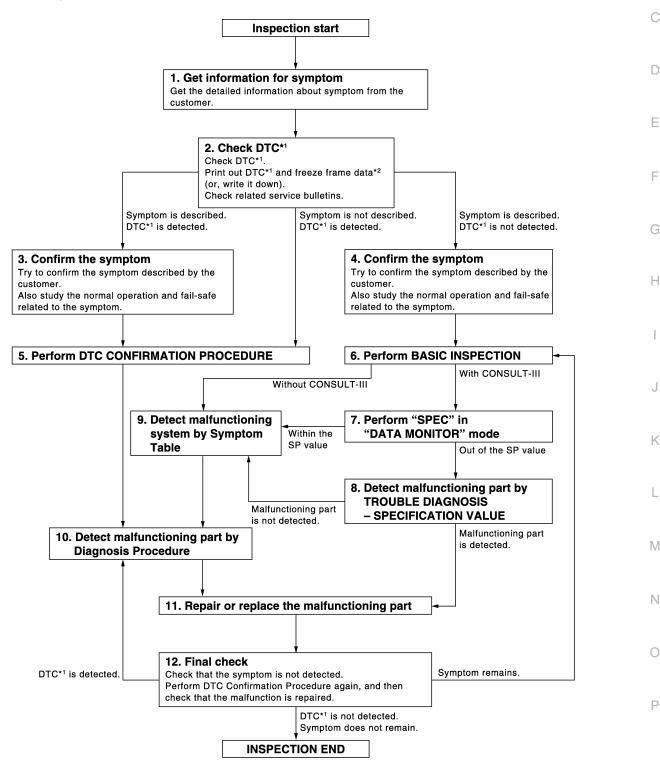
[VK56VD] < BASIC INSPECTION >

BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow INFOID:0000000005840842 EC

OVERALL SEQUENCE



^{*1:} Include 1st trip DTC.

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^{*2:} Include 1st trip freeze frame data.

< BASIC INSPECTION > [VK56VD]

1.GET INFORMATION FOR SYMPTOM

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-685, "Diagnostic Work Sheet".)

>> GO TO 2.

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-III or GST.)
- Erase DTC.
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Matrix Chart is useful. Refer to EC-1091, "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 <u>EC-1097, "Description"</u> and <u>EC-634, "Fail-safe"</u>.

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 Refer to <u>EC-1091</u>, "Symptom <u>Table"</u> and <u>EC-634</u>, "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 check that DTC is detected again.

If two or more DTCs are detected, refer to <u>EC-637, "DTC Inspection Priority Chart"</u> 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.

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

Is DTC detected?

YES >> GO TO 10.

NO >> Check according to GI-38, "Intermittent Incident".

6. PERFORM BASIC INSPECTION

Perform EC-687, "Work Procedure".

Will CONSULT-III be used?

DIAGNOSIS AND REPAIR WORKFLOW

[VK56VD] < BASIC INSPECTION > YES >> GO TO 7. NO >> GO TO 9. Α 7.PERFORM SPEC IN DATA MONITOR MODE With CONSULT-III EC Check 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 "SPEC" in "DATA MONITOR" mode with CONSULT-III. Refer to EC-709, "Component Function Check". Is the measurement value within the SP value? YES >> GO TO 9. NO >> GO TO 8. D $oldsymbol{8}$.DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE Detect malfunctioning part according to EC-710, "Diagnosis Procedure". Is a malfunctioning part detected? Е YES >> GO TO 11. NO >> GO TO 9. F $\mathbf{9}.$ DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE Detect malfunctioning system according to EC-1091, "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 Н Inspect according to Diagnosis Procedure of the system. 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-41, "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 CON-SULT-III. Refer to EC-611, "Reference Value". K 11. REPAIR OR REPLACE THE MALFUNCTIONING PART Repair or replace the malfunctioning part. 2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replace-Check DTC. If DTC is displayed, erase it. M >> GO TO 12. 12. FINAL CHECK Ν When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then check that the malfunction have been completely repaired. When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and check that the symptom is not detected. Is DTC detected and does symptom remain? YES-1 >> DTC is detected: GO TO 10. Р YES-2 >> Symptom remains: GO TO 6. >> Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM NO (Transmission Control Module). If the completion of SRT is needed, drive vehicle under the specific driving pattern. Refer to EC-704, "Description". Diagnostic Work Sheet INFOID:0000000005840843

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DESCRIPTION

DIAGNOSIS AND REPAIR WORKFLOW

< BASIC INSPECTION > [VK56VD]

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

WORKSHEET SAMPLE

| Customer name MR/MS | | Model & Year | VIN | |
|---------------------|----------------|---|--|--|
| Engine # | | Trans. | Mileage | |
| Incident Date | | Manuf. Date | In Service Date | |
| Fuel and fuel | filler cap | ☐ Vehicle ran out of fuel causing misfire☐ Fuel filler cap was left off or incorrectly | screwed on. | |
| | ☐ Startability | ☐ Impossible to start ☐ No combust ☐ Partial combustion affected by th ☐ Partial combustion NOT affected ☐ Possible but hard to start ☐ Other | nrottle position I by throttle position | |
| Symptoms | ☐ Idling | ☐ No fast idle ☐ Unstable ☐ H☐ Others [| ligh idle ☐ Low idle | |
| | ☐ Driveability | ☐ Stumble ☐ Surge ☐ Knock☐ Intake backfire ☐ Exhaust backfi☐ Others [| Intake backfire | |
| | ☐ Engine stall | ☐ At the time of start ☐ While idling ☐ While accelerating ☐ While dece ☐ Just after stopping ☐ While loadi | lerating | |
| Incident occur | rrence | ☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime | | |
| Frequency | | ☐ All the time ☐ Under certain conditions ☐ Sometimes | | |
| Weather cond | litions | ☐ Not affected | | |
| | Weather | ☐ Fine ☐ Raining ☐ Snowing | ☐ Others [] | |
| | Temperature | ☐ Hot ☐ Warm ☐ Cool ☐ |] Cold ☐ Humid °F | |
| | | ☐ Cold ☐ During warm-up ☐ / | After warm-up | |
| Engine conditions | | Engine speed0 2,000 | 4,000 6,000 8,000 rpm | |
| Road conditions | | ☐ In town ☐ In suburbs ☐ Hig | hway | |
| Driving conditions | | Not affected At starting | O . | |
| | | 0 10 20 | 30 40 50 60 MPH | |
| Malfunction in | idicator lamp | ☐ Turned on ☐ Not turned on | | |

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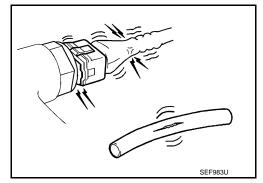
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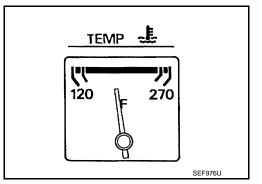
BASIC INSPECTION

Work Procedure

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.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
- 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.

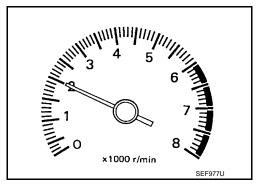




- 5. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.
- 6. Check that no DTC is displayed with CONSULT-III or GST.

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 approximately 2,000 rpm for approximately 2 minutes under no load.

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BASIC INSPECTION

< BASIC INSPECTION > [VK56VD]

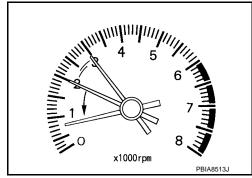
2. Rev engine between 2,000 and 3,000 rpm 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.

Check idle speed.

For procedure, refer to <u>EC-1098</u>, "Inspection". For specification, refer to <u>EC-1109</u>, "Idle Speed".

Is the inspection result normal?

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



4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

- 1. Stop engine.
- 2. Perform EC-694, "Work Procedure".

>> GO TO 5.

5.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-695, "Work Procedure".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-696, "Work Procedure".

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

- 1. Start engine and warm it up to normal operating temperature.
- 2. Check idle speed.

For procedure, refer to EC-1098, "Inspection".

For specification, refer to EC-1109, "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 and circuit. Refer to EC-861, "DTC Logic".
- Check crankshaft position sensor and circuit. Refer to EC-857, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 9.

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

9. 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 SEC-53, "ECM: Work Procedure".

>> GO TO 4.

10. CHECK IGNITION TIMING

- 1. Run engine at idle.
- Check ignition timing with a timing light. For procedure, refer to <u>EC-1099</u>. "Inspection".

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BASIC INSPECTION

[VK56VD] < BASIC INSPECTION > For specification, refer to EC-1109, "Ignition Timing". Α Is the inspection result normal? YES >> GO TO 19. NO >> GO TO 11. EC 11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING Stop engine. Perform EC-694, "Work Procedure". >> GO TO 12. 12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING D Perform EC-695, "Work Procedure". Е >> GO TO 13. 13. PERFORM IDLE AIR VOLUME LEARNING Perform EC-696, "Work Procedure". 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 Start engine and warm it up to normal operating temperature. Check idle speed. For procedure, refer to EC-1098, "Inspection". For specification, refer to EC-1109, "Idle Speed". Is the inspection result normal? YES >> GO TO 15. NO >> GO TO 17. 15. CHECK IGNITION TIMING AGAIN Run engine at idle. Check ignition timing with a timing light. For procedure, refer to EC-1099, "Inspection". For specification, refer to EC-1109, "Ignition Timing". Is the inspection result normal? YES >> GO TO 19. NO >> GO TO 16. 16.CHECK TIMING CHAIN INSTALLATION M Check timing chain installation. Refer to EM-243, "Inspection". Is the inspection result normal? N 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 and circuit. Refer to <u>EC-861</u>, "<u>DTC Logic"</u>. Check crankshaft position sensor and circuit. Refer to <u>EC-857</u>, "DTC Logic". Р Is the inspection result normal? YES >> GO TO 18. NO >> Repair or replace malfunctioning part. Then GO TO 4. 18.check ecm function Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident,

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although this is rare.)

BASIC INSPECTION

< BASIC INSPECTION > [VK56VD]

2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to .

>> GO TO 4.

19.INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, perform <u>EC-691</u>. "Work <u>Procedure"</u>.

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING ECM

[VK56VD] < BASIC INSPECTION > ADDITIONAL SERVICE WHEN REPLACING ECM Α Description INFOID:0000000005840845 When replacing ECM, the following procedure must be performed. EC Work Procedure INFOID:0000000005840846 1.perform initialization of IVIS (NATS) SYSTEM and REGISTRATION OF ALL IVIS (NATS) IGNI-TION KEY IDS Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-D 53, "ECM: Work Procedure". >> GO TO 2. Е 2.PERFORM VIN REGISTRATION Perform VIN registration. Refer to EC-693, "Work Procedure". F >> GO TO 3. 3.perform accelerator pedal released position learning Perform accelerator pedal released position learning. Refer to EC-694, "Work Procedure". >> GO TO 4. Н f 4.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING Perform throttle valve closed position learning. Refer to EC-695, "Work Procedure". >> GO TO 5. 5. PERFORM IDLE AIR VOLUME LEARNING Perform idle air volume learning. Refer to EC-696, "Work Procedure". K >> WORK END L M Ν Р

ADDITIONAL SERVICE WHEN REPLACING VVEL CONTROL MODULE

< BASIC INSPECTION > [VK56VD]

ADDITIONAL SERVICE WHEN REPLACING VVEL CONTROL MODULE

Description INFOID:0000000005840847

When replacing VVEL control module, the following procedure must be performed.

Work Procedure

1. PERFORM IDLE AIR VOLUME LEARNING

Perform idle air volume learning. Refer to EC-696, "Work Procedure".

>> WORK END

VIN REGISTRATION

[VK56VD] < BASIC INSPECTION > VIN REGISTRATION Α Description INFOID:0000000005840853 VIN Registration is an operation to register VIN in ECM. It must be performed each time ECM is replaced. EC Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M). Work Procedure INFOID:0000000005840854 1. CHECK VIN D Check the VIN of the vehicle and note it. Refer to GI-20, "Information About Identification or Model Code". >> GO TO 2. Е 2. PERFORM VIN REGISTRATION (II) With CONSULT-III Turn ignition switch ON with engine stopped. F Select "VIN REGISTRATION" in "WORK SUPPORT" mode. Follow the instructions on the CONSULT-III display. >> END Н K L

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ACCELERATOR PEDAL RELEASED POSITION LEARNING

< BASIC INSPECTION > [VK56VD]

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description INFOID:0000000005840855

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.

Work Procedure

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 > [VK56VD]

THROTTLE VALVE CLOSED POSITION LEARNING

Description INFOID:0000000005840857

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.

EC

INFOID:0000000005840858

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Work Procedure

1.START

- 1. Check that accelerator pedal is fully released.
- 2. Turn ignition switch ON.
- 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

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< BASIC INSPECTION > [VK56VD]

IDLE AIR VOLUME LEARNING

Description INFOID:000000005840859

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.

Work Procedure

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: 70 105°C (158 221°F)
- Selector lever position: 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 illuminate.

- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT-III: Drive vehicle until "ATF TEMP 2" in "DATA MONITOR" mode of "A/T" system indicates less than 0.9 V.
- Without CONSULT-III: Drive vehicle for 10 minutes.

Will CONSULT-III be used?

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

2.PERFORM IDLE AIR VOLUME LEARNING

(P) With CONSULT-III

- 1. Perform Accelerator Pedal Released Position Learning. Refer to EC-694, "Work Procedure".
- 2. Perform Throttle Valve Closed Position Learning. EC-695, "Work Procedure".
- 3. Start engine and warm it up to normal operating temperature.
- Select "IDLE AIR VOL LEARN" in "WORK SUPPORT" mode.
- 5. Touch "START" and wait 20 seconds.

Is "CMPLT" displayed on CONSULT-III screen?

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

${f 3.}$ PERFORM IDLE AIR VOLUME LEARNING

Nithout CONSULT-III

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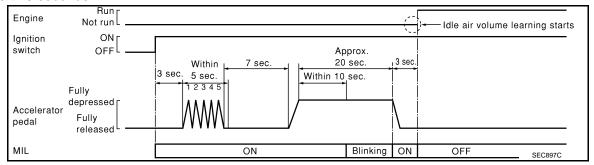
- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- Perform Accelerator Pedal Released Position Learning. Refer to <u>EC-694</u>, "Work Procedure".
- 2. Perform Throttle Valve Closed Position Learning. EC-695, "Work Procedure".
- 3. Start engine and warm it up to normal operating temperature.
- 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.
- Repeat the following procedure quickly 5 times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
- Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and turns ON.
- 8. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.

IDLE AIR VOLUME LEARNING

< BASIC INSPECTION > [VK56VD]

9. Start engine and let it idle.

10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up engine two or three times and check that idle speed and ignition timing are within the specifications. For procedure, refer to EC-1109, "Idle Speed" and EC-1109, "Ignition Timing".

For specifications, refer to EC-1109. "Idle Speed" and EC-1109. "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.

O.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 <u>EC-709</u>, "<u>Description</u>". 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

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VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

< BASIC INSPECTION > [VK56VD]

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Description INFOID:000000005840861

VVEL control shaft position sensor adjustment is an operation to adjust the initial position of the VVEL control shaft position sensor.

It must be performed each time VVEL actuator sub assembly is replaced.

CAUTION:

- It must be performed only on the replaced bank side.
- It must not be performed except when VVEL actuator sub assembly is replaced. If by any chance the
 adjustment is performed, replace VVEL actuator sub assembly.

Work Procedure

1.START

Will CONSULT-III be used?

Will CONSULT-III be used?

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

2.perform vvel control shaft position sensor adjustment

(II) With CONSULT-III

- 1. Turn ignition switch ON.
- Select "VVEL POS SEN ADJ PREP" in "WORK SUPPORT" mode with CONSULT-III.
- Touch "Start" and wait a few seconds.
- 4. Check that "CMPLT" is displayed on CONSULT-III screen.
- Select "VVEL POSITION SEN-B1" or "VVEL POSITION SEN-B2" in "DATA MONITOR" mode with CON-SULT-III.
- 6. Loosen the VVEL control shaft position sensor mounting bolts (1).
- 7. Turn the VVEL control shaft position sensor (2) clockwise and counterclockwise while monitoring the output voltage of "VVEL POSITION SEN-B1" or "VVEL POSITION SEN-B2" and adjust the output voltage to be within the standard value.

Voltage: $500 \pm 48 \text{ mV}$

8. Tighten the VVEL control shaft position sensor mounting bolts.

O. 7.0 N•m (0.71 kg-m, 62 in-lb)

Reconfirm that the output voltage of "VVEL POSITION SEN-B1" or "VVEL POSITION SEN-B2" is within the standard value.

Voltage: $500 \pm 48 \text{ mV}$

NOTE:

If it varies from the standard value after the mounting bolts are tightened, perform steps 6 to 8 again.

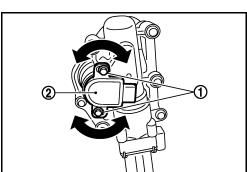
- 10. Turn ignition switch OFF and wait at least 10 seconds.
- 11. Start engine and warm it up to normal operating temperature.
- 12. Turn ignition switch OFF and wait at least 10 seconds.
- 13. Perform idle air volume learning. Refer to EC-696, "Work Procedure".

>> INSPECTION END

3.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

₩ Without CONSULT-III

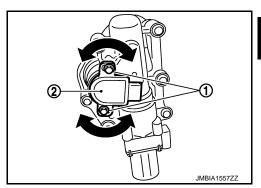
- 1. Disconnect VVEL control shaft position sensor harness connector.
- Remove VVEL actuator motor relay.
- 3. Turn ignition switch ON, wait at least 5 seconds and then turn it OFF.



VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

< BASIC INSPECTION > [VK56VD]

- 4. Reconnect all harness connectors disconnected.
- Install VVEL actuator motor relay.
- 6. Turn ignition switch ON and wait at least 5 seconds.
- Loosen the VVEL control shaft position sensor mounting bolts (1).
- 8. Turn the VVEL control shaft position sensor (2) clockwise and counterclockwise while monitoring the output voltage between the VVEL control module terminals with a tester and adjust the output voltage to be within the standard value.



| Bank | Connector | + | _ | Voltage |
|-------|-----------|----------|----------|---------------|
| Dalik | | Terminal | Terminal | |
| 1 | E15 | 3 | 6 | 500 ± 48 mV |
| 2 | E 13 | 5 | 4 | 300 ± 46 IIIV |

9. Tighten the VVEL control shaft position sensor mounting bolts.

7.0 N•m (0.71 kg-m, 62 in-lb)

10. Reconfirm that the output voltage of VVEL control shaft position sensor is within the standard value.

| Bank | Connector | + | _ | Voltage |
|------|-----------|----------|----------|---------------|
| | | Terminal | Terminal | |
| 1 | E15 | 3 | 6 | 500 ± 48 mV |
| 2 | E15 | 5 | 4 | 300 ± 48 IIIV |

NOTE:

If it varies from the standard value after the mounting bolts are tightened, perform steps 7 to 9 again.

- 11. Turn ignition switch OFF and wait at least 10 seconds.
- 12. Start engine and warm it up to normal operating temperature.
- 13. Turn ignition switch OFF and wait at least 10 seconds.
- 14. Perform Idle Air Volume Learning. Refer to EC-696, "Work Procedure".

>> INSPECTION END

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MIXTURE RATIO SELF-LEARNING VALUE CLEAR

< BASIC INSPECTION > [VK56VD]

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description INFOID:0000000005840863

This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instructions in "Diagnosis Procedure".

Work Procedure

1.START

- (P) With CONSULT-III
- 1. Start engine and warm it up to normal operating temperature.
- 2. Select "SELF-LEARNING CONT" in "WORK SUPPORT" mode with CONSULT-III.
- 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.
- Disconnect mass air flow sensor (bank 1) harness connector.
- 4. Restart engine and let it idle for at least 5 seconds.
- 5. Stop engine and reconnect mass air flow sensor (bank 1) harness connector.
- 6. Select Service \$03 with GST. Check DTC P0102 is detected.
- 7. Select Service \$04 with GST to erase the DTC P0102.

>> END

FUEL PRESSURE

Work Procedure INFOID:0000000005926837

FUEL PRESSURE RELEASE

(P) WITH CONSULT-III

- 1. Turn ignition switch ON.
- Perform "FUEL PRESSURE RELEASE" in "WORK SUPPORT" mode with CONSULT-III.
- Start engine.
- 4. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.

M WITHOUT CONSULT-III

1. Remove fuel pump fuse in IPDM E/R.

NOTE:

- For the fuse number, refer to EC-656, "Wiring Diagram".
- For the fuse arrangement, refer to PG-133, "Fuse, Connector and Terminal Arrangement".
- Start engine.
- 3. After engine stalls, crank it two or three times to release all fuel pressure.
- Turn ignition switch OFF.
- Reinstall fuel pump fuse after servicing fuel system.

LOW FUEL PRESSURE CHECK

CAUTION:

- Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.
- The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.
- Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains seal ability with O-rings inside.
- Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.

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. Release fuel pressure to zero.
- 2. Prepare fuel hose for fuel pressure check (B) and fuel tube adapter [SST (KV10120000)] (D), then connect fuel pressure gauge (A).

C

To quick connector

To fuel tube (engine side)

: Hose clamp

CAUTION:

- Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).
- To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.
- · Do not use the fuel hose for checking fuel pressure with damage or cracks on it.
- Use Pressure Gauge to check fuel pressure.
- Disconnect fuel feed hose from fuel tube. Refer to EM-193, "Exploded View". **CAUTION:**

Do not twist or kink fuel hose because it is plastic hose.

PBIB2982E

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- 4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
 - 5 : No.2 spool

CAUTION:

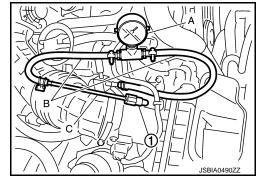
- Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
- Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).
- Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.
- Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).
- When reconnecting fuel line, always use new clamps.
- Use a torque driver to tighten clamps.
- Install hose clamp to the position within 1 2 mm (0.04 0.08 in).

Tightening torque : 1 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

- Make sure that clamp screw does not contact adjacent parts.
- 5. Connect fuel tube adapter (C) to quick connector (1).

A : Fuel pressure gauge

B : Fuel hose for fuel pressure check



(5)

1 - 2 mm

(0.04 - 0.08 in)

PBIB2983E

- 6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
- Reinstall the part removed at Step 3.

NOTE:

Install the part to allow smooth engine starts.

- 8. Turn ignition switch ON and check for fuel leakage.
- Start engine and check for fuel leakage.
- 10. Read the indication of fuel pressure gauge.

CAUTION:

- Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.
- During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.

At idling : Approximately 450 kPa (4.5 bar, 4.6 kg/cm², 65 psi)

HIGH FUEL PRESSURE CHECK

NOTE:

Since the fuel pressure gauge kit cannot be connected, follow the method shown below to check high fuel pressure.

- (P) WITH CONSULT-III
- 1. Start engine.
- Check "FUEL PRES SEN V" in "DATA MONITOR" mode with CONSULT-III.

FUEL PRESSURE

[VK56VD] < BASIC INSPECTION >

| Monitor Item | Condition | Values/Status |
|--------------------|---|------------------|
| FUEL PRES SEN V | Idle | 980 – 1,200 mV |
| I OLL FIXES SEIV V | Revving engine from idle to 4,000 rpm quickly | 1,100 – 2,900 mV |

WITHOUT CONSULT-IIIStart engine.

- Start engine.
- Check the voltage between ECM harness connector and ground.

| ECM | | | | | | |
|-----------|----------|-----------|-----------|---|---------------|--|
| + - | | _ | Condition | Voltage | | |
| Connector | Terminal | Connector | Terminal | | | |
| | | | | [Engine is running]Warm-up conditionIdle speed | Apporx. 1.2 V | |
| F110 | 31 | F110 | 40 | [Engine is running]Warm-up conditionRevving engine from idle to 4,000 rpm quickly | Apporx. 3 V | |

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< BASIC INSPECTION > [VK56VD]

HOW TO SET SRT CODE

Description INFOID:000000005984268

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

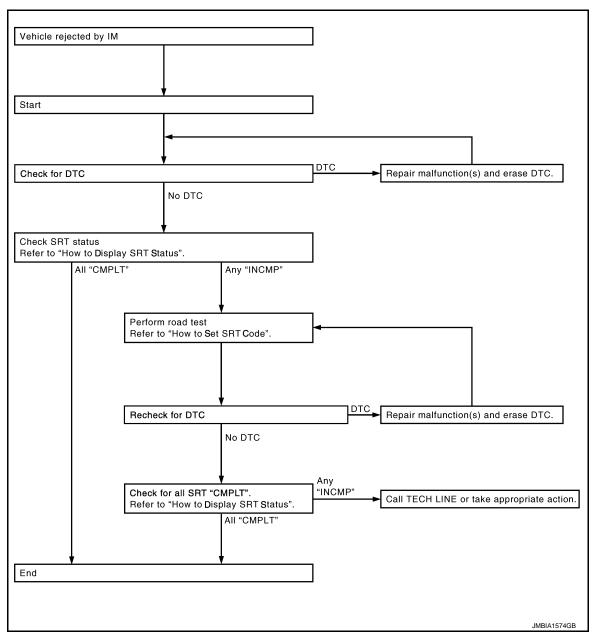
The table below shows required self-diagnostic items to set the SRT to "CMPLT".

| SRT item*1 (CONSULT-III 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 | P0130, P0133, P0150, P0153 |
| | Heated oxygen sensor 2 | P0137, P0157 |
| | Heated oxygen sensor 2 | P0138, P0158 |
| | Heated oxygen sensor 2 | P0139, P0159 |
| EGR/VVT SYSTEM | Intake value timing control function | P0011, P0021 |

^{*1:} Though displayed on the CONSULT-III screen, "HO2S HTR" is not SRT item.

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 on the next page.



SRT Set Driving Pattern

CAUTION:

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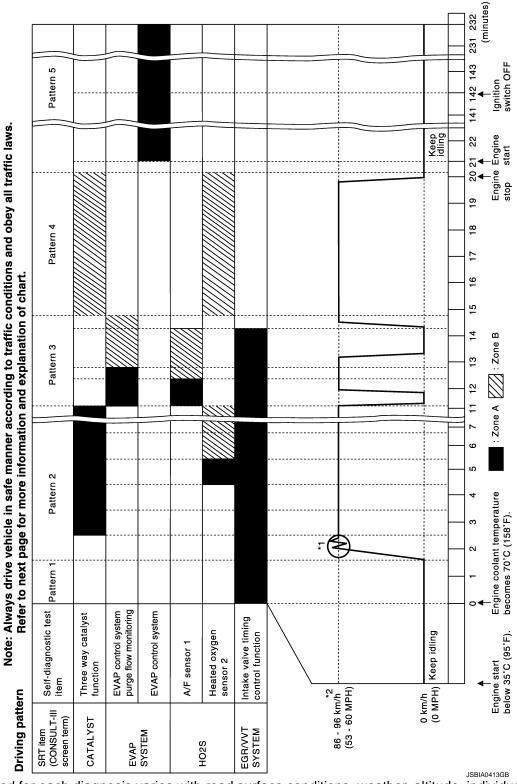
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Always drive the vehicle in safe manner according to traffic conditions and obey all traffic laws.



 The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.

Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.

Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

- *: Normal conditions refer to the following:
- Sea level

HOW TO SET SRT CODE

| < BASIC INSPECTION > [VK56] | /D] |
|--|-----------|
| Flat road Ambient air temperature: 20 - 30°C (68 - 86°F) Diagnosis is performed as quickly as possible under normal conditions. Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed. | A gno- |
| Work Procedure | |
| 1. CHECK DTC | С |
| Check DTC. | |
| <u>Is any DTC detected?</u> YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-639, "DTC Index"</u> . NO >> GO TO 2. | D |
| 2.CHECK SRT STATUS | E |
| ©WITH CONSULT-III Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT-III. ®WITHOUT CONSULT-III | F |
| Perform "SRT status" mode with <u>EC-598</u> , "On <u>Board Diagnosis Function"</u> . | |
| Select Service \$01 with GST (Generic Scan Tool). Is SRT code(s) set? | G |
| YES >> END NO-1 >> With CONSULT-III: GO TO 3. NO-2 >> Without CONSULT-III: GO TO 4. | Н |
| 3.DTC CONFIRMATION PROCEDURE | |
| Select "SRT WORK SUPPORT" in "DTC & SRT CONFIRMATION" mode with CONSULT-III. For SRT(s) that is not set, perform the corresponding "DTC CONFIRMATION PROCEDURE" accordin the "Performance Priority" in the "SRT ITEM" table. Refer to EC-704, "Description". Check DTC. | _ |
| Is any DTC detected? | J |
| YES >> Repair malfunction(s) and erase DTC. Refer to <u>EC-639, "DTC_Index"</u> . NO >> GO TO 10. | I/ |
| 4.PERFORM ROAD TEST | K |
| Check the "Performance Priority" in the "SRT ITEM" table. Refer to <u>EC-704</u>, "<u>Description</u>". Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to <u>EC-705</u>, "<u>SRT Set Eing Pattern</u>". | Driv- |
| In order to set all SRTs, the SRT set driving pattern must be performed at least once. | |
| >> GO TO 5. | M |
| 5. PATTERN 1 | N |
| 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). | |
| Start the engine. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F) | 0 |
| NOTE: | Г. |
| 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 1.4 V | Р |
| • Fuel tank temperature: Less than 4.1 V Refer to EC-611 "Reference Value" | |

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>> GO TO 6.

< BASIC INSPECTION > [VK56VD]

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.
- Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

NOTE:

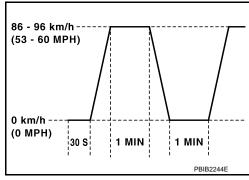
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> 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

- 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 9.

9. PATTERN 5

Cool down the engine so that the engine coolant temperature lowers between 15 - 35°C (59 - 95°F).
 CAUTION:

Never turn the ignition switch ON while cooling down the engine.

• Engine coolant temperature at engine start is between 15 – 35°C (59 – 95°F) and has lowered 45°C (113°F) or more since the latest engine stop.

>> GO TO 10.

10. CHECK SRT STATUS

(P)WITH CONSULT-III

Select "SRT STATUS" in "DTC & SRT CONFIRMATION" mode with CONSULT-III.

WITHOUT CONSULT-III

Perform "SRT status" mode with EC-598, "On Board Diagnosis Function".

WITH GST

Select Service \$01 with GST (Generic Scan Tool).

Is SRT(s) set?

YES >> END

NO >> Call TECH LINE or take appropriate action.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description INFOID:0000000005926888

The specification (SP) value indicates the tolerance of the value that is displayed in "SPEC" in "DATA MONI-TOR" mode of CONSULT-III 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 items:

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

Component Function Check

INFOID:0000000005926889

1.PRECONDITIONING

Check 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 (0.983 1.043 bar, 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 2" (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch and lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle

(P) WITH CONSULT-III

· Gear position: Neutral (or parking)

>> GO TO 2.

2.PERFORM SPEC IN DATA MONITOR MODE

NOTE:

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

- Perform basic inspection. Refer to EC-687, "Work Procedure".
- Select "B/FUEL SCHDL", "A/F ALPHA-B1", "A/F ALPHA-B2", "MAS A/F SE-B1" and "MAS A/F SE-B2" in "SPEC" of "DATA MONITOR" mode with CONSULT-III.
- Check that monitor items are within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END

>> Proceed to EC-710, "Diagnosis Procedure". NO

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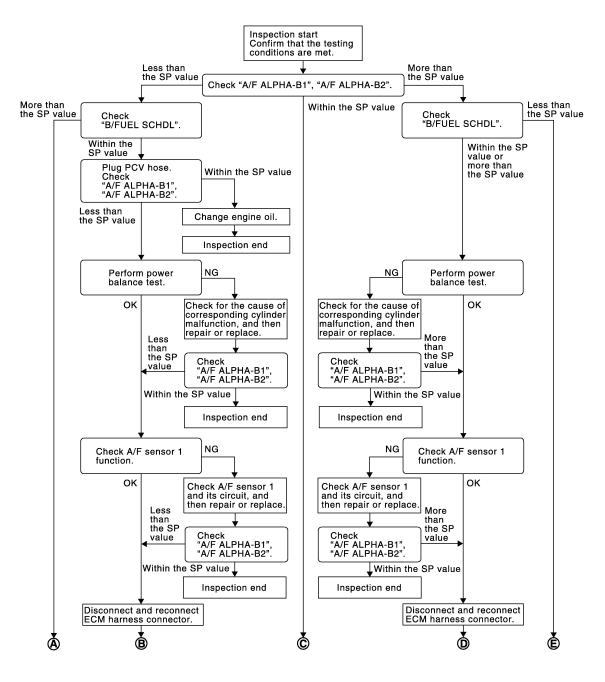
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[VK56VD]

Diagnosis Procedure

INFOID:0000000005926890

OVERALL SEQUENCE



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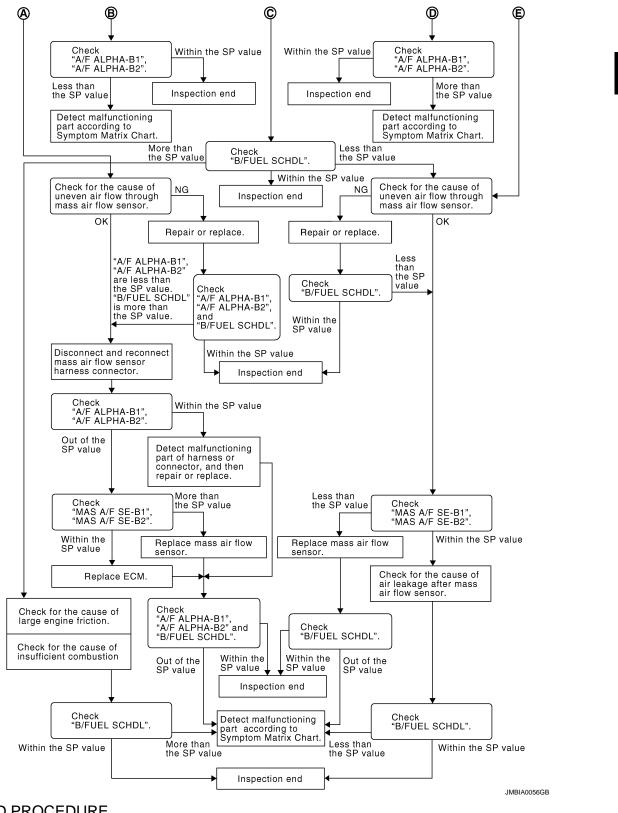
[VK56VD]

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DETAILED PROCEDURE

1.CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2"

(II) WITH CONSULT-III

- Start engine.
- Check that the testing conditions are met. Refer to <u>EC-709</u>, "Component Function Check".
- 3. Select "A/F ALPHA-B1" and "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NOTE:

Check "A/F ALPHA-B1" and "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 14.

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 16.

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 22.

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.
- Select "A/F ALPHA-B1" and "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.
- 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. PERFORM POWER BALANCE TEST

- 1. Perform "POWER BALANCE" in "ACTIVE TEST" mode.
- Check that each cylinder produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following below.

- Ignition coil and its circuit (Refer to <u>EC-1075</u>, "Component Function Check".)
- Fuel injector and its circuit (Refer to <u>EC-1067</u>, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to <u>EM-172, "Inspection"</u>.)

Is the inspection result normal?

| < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
|--|---------------|
| YES >> Replace fuel injector. Refer to <u>EM-197</u> . "Removal and Installation". And then GO TO NO >> Repair or replace malfunctioning part and then GO TO 8. |) 8. A |
| 8.CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2" | |
| Start engine. Select "A/F ALPHA-B1" and "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and che indication is within the SP value. | eck that each |
| Is the measurement value within the SP value? | |
| YES >> INSPECTION END NO >> GO TO 9. | С |
| 9.CHECK A/F SENSOR 1 FUNCTION | D |
| Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1. • For DTC P0130, P0150, refer to EC-786 , "DTC Logic". • For DTC P0131, P0151, refer to EC-790 , "DTC Logic". • For DTC P0132, P0152, refer to EC-793 , "DTC Logic". | E |
| • For DTC P0133, P0153, refer to <u>EC-796, "DTC Logic"</u> . | |
| • For DTC P2A00, P2A03, refer to EC-1053, "DTC Logic". Are any DTCs detected? | F |
| YES >> GO TO 10. NO >> GO TO 12. | |
| 10.check a/f sensor 1 circuit | G |
| Perform Diagnosis Procedure according to corresponding DTC. | |
| 00 T0 44 | Н |
| >> GO TO 11. 11.CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2" | |
| 1. Start engine. | |
| Select "A/F ALPHA-B1" and "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and che indication is within the SP value. | |
| Is the measurement value within the SP value? | J |
| YES >> INSPECTION END NO >> GO TO 12. | |
| 12. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR | K |
| 1. Stop the engine. | |
| 2. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then | reconnect it. |
| >> GO TO 13. | |
| 13.CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2" | M |
| Start engine. Select "A/F ALPHA-B1" and "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and che indication is within the SP value. | eck that each |
| Is the measurement value within the SP value? | |
| YES >> INSPECTION END NO >> Detect malfunctioning part according to <u>EC-1091</u> , "Symptom Table". | 0 |
| 14. 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 15. NO-2 >> Less than the SP value: GO TO 22. | |
| 15. DETECT MALFUNCTIONING PART | |

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- 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.
- 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 27.

16. 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 18.

NO >> Repair or replace malfunctioning part, and then GO TO 17.

$17.\mathsf{CHECK}$ "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" and "A/F ALPHA-B2" are less than the SP value: GO TO 18.

$18. \mathsf{DISCONNECT}$ and reconnect mass air flow sensor harness connector

- 1. Stop the engine.
- Disconnect mass air flow sensor harness connector. Check pin terminal and connector for damage and then reconnect it again.

>> GO TO 19.

19. CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2"

- 1. Start engine.
- Select "A/F ALPHA-B1" and "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-758, "DTC <a href="Logic". Then GO TO 26.

NO >> GO TO 20.

20.CHECK "MAS A/F SE-B1" AND "MAS A/F SE-B2"

Select "MAS A/F SE-B1" and "MAS A/F SE-B2" 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 21.

NO >> More than the SP value: Replace malfunctioning mass air flow sensor. Refer to <u>EM-184</u>, <u>"Removal and Installation"</u>. And then GO TO 26.

21.REPLACE ECM

Replace ECM. Refer to EC-1103, "Removal and Installation"

TROUBLE DIAGNOSIS - SPECIFICATION VALUE [VK56VD] < DTC/CIRCUIT DIAGNOSIS > >> GO TO 26. 22.check intake system Α Check for the cause of uneven air flow through mass air flow sensor. Refer to the following. Crushed air ducts EC 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 24. NO >> Repair or replace malfunctioning part, and then GO TO 23. 23. CHECK "B/FUEL SCHDL" Select "B/FUEL SCHDL" in "SPEC" of "DATA MONITOR" mode, and check that the indication is within the SP value. Е Is the measurement value within the SP value? YES >> INSPECTION END NO >> Less than the SP value: GO TO 24. F 24 . CHECK "MAS A/F SE-B1" AND "MAS A/F SE-B2" Select "MAS A/F SE-B1" and "MAS A/F SE-B2" 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 25. NO >> Less than the SP value: Replace malfunctioning mass air flow sensor. Refer to EM-184, "Removal and Installation". And then GO TO 27. 25. 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 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 K 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. L

>> GO TO 27.

26.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 >> Detect malfunctioning part according to EC-1091, "Symptom Table".

27.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.

Is the measurement value within the SP value?

YES >> INSPECTION END

>> Detect malfunctioning part according to EC-1091, "Symptom Table". NO

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INFOID:0000000005840916

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

1. CHECK FUSE

Check that the following fuse is not fusing.

| Location | Fuse No. | Capacity |
|--------------|----------|----------|
| IPDM E/R | #51 | 15A |
| II DIVI L/IX | #42 | 10A |

Is the fuse fusing?

YES >> Replace the fuse after repairing the applicable circuit.

NO >> GO TO 2.

2. CHECK GROUND CONNECTION

1. Check ground connection M11, M95 and M95. Refer to PG-143, "Main Harness".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace ground connection.

3. CHECK ECM GROUND CIRCUIT

- 1. Disconnect ECM harness connector.
- 2. Check the continuity between ECM harness connector and ground.

| E | СМ | Ground | Continuity | |
|-----------|--------------------|--------|------------|--|
| Connector | Connector Terminal | | Continuity | |
| F110 | 5 | | | |
| FIIO | 10 | | Existed | |
| | 114 | Ground | | |
| M160 | 115 | | | |
| WITOU | 174 | | | |
| | 175 | | | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit in harness or connectors.

4. CHECK ECM POWER SUPPLY (MAIN)-1

- 1. Reconnect ECM harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between ECM harness connector and ground.

| | Valtaria | | | |
|-----------|----------|----------------------|-----|---------------|
| | - | Voltage (Approx.) | | |
| Connector | Terminal | Connector | | |
| M160 | 171 | M160 | 175 | Battery volt- |
| IVITOU | 172 | IVITOU | 175 | age |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. CHECK ECM POWER SUPPLY (MAIN) CIRCUIT

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector and IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

| E | CM | IPDN | M E/R | Continuity | |
|-----------|----------|-----------------------------|-------|----------------------|--|
| Connector | Terminal | Terminal Connector Terminal | | Continuity | |
| M160 | 171 | E5 | 6 | Evieted | |
| IVITOO | 172 | LU | 0 | - Continuity Existed | |

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

NO >> Repair harness or connectors.

6.CHECK ECM POWER SUPPLY (MAIN)-2

- Turn ignition switch OFF and wait at least 10 seconds.
- Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | No. It account | |
|-----------|----------|-----------|----------|--|----------------------|--|
| + | | _ | | Condition | Voltage (Approx.) | |
| Connector | Terminal | Connector | Terminal | | | |
| | 171 | | | After turning ignition | | |
| M160 | 172 | M160 | 175 | switch OFF, battery volt- age will exist for a few seconds | Drop to 0 V. | |

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 7.

.CHECK ECM RELAY CONTROL SIGNAL

Check the voltage between ECM harness connector terminals as per the following.

| | E | СМ | | Valtage | |
|-----------|----------|-----------|--------------------|--|----------------------|
| + | | - | | Condition | Voltage (Approx.) |
| Connector | Terminal | Connector | Terminal | | |
| | | | Ignition switch ON | 0 V | |
| M160 | 163 | M160 | 175 | Turn ignition switch OFF and wait at least 10 seconds. | Battery voltage |

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> GO TO 8.

8. CHECK ECM RELAY CONTROL CIRCUIT

- Disconnect ECM harness connector.
- Disconnect IPDM E/R harness connector.
- Check the continuity between ECM harness connector and IPDM E/R harness connector.

| E | СМ | IPDN | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M160 | 163 | E7 | 70 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

NO >> Repair harness or connectors.

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POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

9. CHECK IGNITION SWITCH SIGNAL

- 1. Reconnect ECM harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals.

| | E | CM | | Maltana | |
|-----------|----------|----------------|-----------|----------------------|-----------------|
| + - | | _ | Condition | Voltage (Approx.) | |
| Connector | Terminal | Connector | Terminal | | (11 / |
| M160 | 1/11 | 141 M160 175 – | | Ignition switch OFF | 0 V |
| IVITOO | 141 | | | Ignition switch ON | Battery voltage |

Is the inspection result normal?

YES >> GO TO 11. NO >> GO TO 10.

10. CHECK IGNITION SWITCH SIGNAL CIRCUIT

- 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.

| E | CM | IPDN | Continuity | |
|--------------------|-----|-----------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| M160 | 141 | E7 | 52 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

NO >> Repair harness or connectors.

11. CHECK ECM POWER SUPPLY (BACK-UP)

- 1. Reconnect ECM harness connector.
- 2. Turn ignition switch OFF.
- 3. Check the voltage between ECM harness connector terminals.

| | \ | | | |
|-----------|----------|-----------|----------|----------------------|
| | + | _ | | Voltage (Approx.) |
| Connector | Terminal | Connector | Terminal | () 1 - / |
| M160 | 156 | M160 | 175 | Battery voltage |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 12.

12.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.

| E | CM | IPDN | Continuity | |
|-----------|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M160 | 156 | E5 | 10 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

POWER SUPPLY AND GROUND CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> Repair harness or connectors.

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U0101 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

U0101 CAN COMM CIRCUIT

DTC Logic

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. | CAN communication line betrween 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-720, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840919

Perform the trouble diagnosis for CAN communication system. Refer to <u>LAN-25</u>, "Trouble <u>Diagnosis Flow Chart"</u>.

U0113, U1003 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

U0113, U1003 CAN COMM CIRCUIT

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC U0113 or U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-936, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| U0113 | CAN COMM CIRCUIT (Lost communication with VVEL | When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with VVEL control module for 2 seconds or more. | Harness or connectors (VVEL CAN communication line is open or shorted) |
| U1003 | control module) | When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) with VVEL control module for 2 seconds or more. | ECM VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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. Turn ignition switch ON and wait at least 3 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-721, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK VVEL CAN COMMUNICATION CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Disconnect VVEL control module harness connector.
- 4. Check the continuity between ECM harness connector and VVEL control module harness connector.

| E | СМ | VVEL control module | | Continuity | |
|-----------|--------------------|---------------------|----------|------------|--|
| Connector | Connector Terminal | | Terminal | Continuity | |
| M160 | 161 | E15 | 24 | Existed | |
| 101100 | 166 | LIJ | 11 | LXISIEU | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

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- Harness for open or short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

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>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace.

4. REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-1104, "Removal and Installation".

>> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Select "SELF DIAGNOSTIC RESULT" mode with CONSULT-III.
- 4. Touch "ERASE".
- 5. Perform DTC Confirmation Procedure. See <u>EC-721</u>, "<u>DTC Logic</u>".
- **WITH GST**
- 1. Reconnect all harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Select Service \$04 with GST.
- 4. Perform DTC Confirmation Procedure.

See EC-721, "DTC Logic".

Is the DTC U0113 or U1003 displayed again?

YES >> GO TO 6.

NO >> INSPECTION END

6.REPLACE ECM

Replace ECM. Refer to EC-1103, "Removal and Installation".

>> INSPECTION END

U1001 CAN COMM CIRCUIT

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

U1001 CAN COMM CIRCUIT

DTC Logic INFOID:0000000005840924

DTC DETECTION LOGIC

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|---|---|--|
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| 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. | Harness or connectors (CAN communication line is open or shorted) |

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DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 3 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-723, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840925

Perform the trouble diagnosis for CAN communication system. Refer to LAN-25, "Trouble Diagnosis Flow Chart".

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U1024 CAN COMM CIRCUIT

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to <u>EC-936</u>, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| U1024 | VVEL CAN COMM CIRCUIT (VVEL CAN communication) | When VVEL control module cannot transmitting or receiving CAN communication signal with ECM for 2 seconds or more. When detecting error during the initial diagnosis of CAN controller of VVEL control module. | (CAN communication line is open or shorted) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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. Turn ignition switch ON and wait at least 3 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-724, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840928

1. CHECK VVEL CAN COMMUNICATION CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Disconnect VVEL control module harness connector.
- 4. Check the continuity between ECM harness connector and VVEL control module harness connector.

| E | СМ | VVEL control module | | Continuity | |
|-----------|--------------------|---------------------|----------|-------------|--|
| Connector | Connector Terminal | | Terminal | Outilitally | |
| M160 | 161 | E15 | 24 | Existed | |
| IVITOO | 166 | LIO | 11 | Existed | |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- · Harness for open or short between ECM and VVEL control module
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

U1024 CAN COMM CIRCUIT

| U1024 CAN COMM CIRCUIT | |
|--|----------|
| < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
| 3.CHECK INTERMITTENT INCIDENT | Δ |
| Refer to GI-38, "Intermittent Incident". | |
| Is the inspection result normal? | |
| YES >> GO TO 4. NO >> Repair or replace. | EC |
| 4.REPLACE VVEL CONTROL MODULE | |
| Replace VVEL control module. Refer to EC-1104, "Removal and Installation". | C |
| | |
| >> GO TO 5. | D |
| 5.PERFORM DTC CONFIRMATION PROCEDURE | |
| WITH CONSULT-III Reconnect all harness connectors disconnected. | Е |
| 2. Turn ignition switch ON. | |
| Select "SELF DIAGNOSTIC RESULT" mode with CONSULT-III. Touch "ERASE". | F |
| 5. Perform DTC Confirmation Procedure. | Г |
| See <u>EC-724, "DTC Logic"</u> . | |
| 1. Reconnect all harness connectors disconnected. | G |
| Turn ignition switch ON. Select Service \$04 with GST. | |
| 4. Perform DTC Confirmation Procedure. | Н |
| See <u>EC-724. "DTC Logic"</u> . <u>Is the DTC U1024 displayed again?</u> | |
| YES >> GO TO 6. | 1 |
| NO >> INSPECTION END | |
| 6.REPLACE ECM | J |
| Replace ECM. Refer to EC-1103, "Removal and Installation". | |
| >> INSPECTION END | K |
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P006A, P0101, P010B MAF SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P006A, P0101 or P010B 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 |
|---------|--|--|--|
| P006A | MAP-MAF CORELTION-B1 (Manifold pressure - mass air flow correlation) | A difference exceeding the specified value develops between a value transmitted from the manifold absolute pressure sensor to ECM and an estimated intake pressure of intake manifold calculated by ECM, based on a mass sir flow sensor signal. | Harness or connectors (The sensor circuit is open or shorted.) Mass air flow sensor Manifold absolute pressure sensor EVAP control system pressure sensor Intake air leaks Intake air temperature sensor |
| P0101 | MAF SEN/CIRCUIT-B1 (Mass air flow sensor (bank 1) circuit range/performance) | A difference exceeding the specified value develops between a signal transmitted from the mass air flow | Mass air flow sensor (bank 1) |
| P010B | MAF SEN/CIRCUIT-B2 (Mass air flow sensor (bank 2) circuit range/performance) | sensor (bank 1) to ECM and a signal transmitted from the mass air flow sensor (bank 2) to ECM. | Mass air flow sensor (bank 2) |

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.

If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch ON) instead of running engine at idle speed.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Accelerate the vehicle from 0 km/h (0 MPH) to 88 km/h (55 MPH) under the following conditions:

CAUTION:

Always drive at a safe speed.

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses

| ACCEL SEN 1 | 1.4 – 2.0 V |
|----------------|-------------|
| Selector lever | D position |

4. Check 1st trip DTC.

WITHOUT CONSULT-III

- Start engine and warm it up to normal operating temperature.
- 2. With selector lever in D position, accelerate the vehicle from 0 km/h (0 MPH) to 88 km/h (55 MPH) under the following conditions:

NOTE:

P006A, P0101, P010B MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Accelerate with the accelerator pedal kept constant.

• The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

| Accelerator peda | I position sensor 1 | Ground | Voltage (V) | |
|--------------------|---------------------|--------|-------------|--|
| Connector Terminal | | Ground | voltage (v) | |
| M9 (Whthout ICC) | 3 | Ground | 1.4 – 2.0 | |
| M153 (With ICC) | 4 | Ground | 1.4 – 2.0 | |

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CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-727, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:0000000005840931

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 SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between mass air flow sensor harness connector and ground.

| DTC | ľ | Mass air flow sensor | | | Voltage | |
|--------------|------|----------------------|----------|---------|-----------------|--|
| ыс | Bank | Connector | Terminal | Ground | voltage | |
| P006A, P0101 | 1 | F86 | 5 | Ground | Battery voltage | |
| P006A, P010B | 2 | F85 | 5 | Giodila | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- 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
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

f 4 .CHECK MASS AIR FLOW SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between mass air flow sensor harness connector and ECM harness connector.

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| DTC | N | Mass air flow sensor | | ECM | | Continuity |
|--------------|------|----------------------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P006A, P0101 | 1 | F86 | 4 | F110 | 25 | Existed |
| P006A, P010B | 2 | F85 | 4 | 1 110 | 30 | LAISIEU |

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.

${f 5.}$ CHECK MASS AIR FLOW SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between mass air flow sensor harness connector and ECM harness connector.

| DTC | Mass air flow sensor | | ECM | | Continuity | |
|--------------|----------------------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P006A, P0101 | 1 | F86 | 3 | F110 | 22 | Existed |
| P006A, P010B | 2 | F85 | 3 | FIIU | 24 | EXISTEC |

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 MANIFOLD ABSOLUTE PRESSURE SENSOR

Check manifold absolute pressure sensor. Refer to EC-766, "Component Inspection (MAP Sensor)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace manifold absolute pressure sensor. Refer to EM-190, "Exploded View".

7.CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to <u>EC-783</u>, "Component Inspection (Intake Air Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to <u>EM-184, "Removal</u> and Installation".

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES-1 (Only DTC P006A is detected)>>GO TO 9.

YES-2 (DTC P006A and P0101 are detected)>>GO TO 10.

YES-3 (DTC P006A and P010B are detected)>>GO TO 11.

NO >> Replace EVAP control system pressure sensor. Refer to EC-1108, "Removal and Installation"

9. CHECK MASS AIR FLOW SENSOR

Refer to EC-729, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace mass air flow sensor (bank 1) and (bank 2).

10. CHECK MASS AIR FLOW SENSOR (BANK 1)

Check mass air flow sensor (bank 1). Refer to EC-729, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 12.

P006A, P0101, P010B MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> Replace mass air flow sensor (bank 1). Refer to EM-184, "Removal and Installation".

11. CHECK MASS AIR FLOW SENSOR (BANK 2)

Check mass air flow sensor (bank 2). Refer to EC-729, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace mass air flow sensor (bank 2). Refer to EM-184, "Removal and Installation".

12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAF Sensor)

INFOID:0000000005840932

1.CHECK MASS AIR FLOW SENSOR-I

WITH CONSULT-III

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Start engine and warm it up to normal operating temperature.
- 4. Connect CONSULT-III and select "DATA MONITOR" mode.
- Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|-----------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

WITHOUT CONSULT-III

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | |
|---------------------------------------|----------|---|--|-----------------------------|
| Connector | + | _ | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| 22 [MAF sensor (bank 1) signal] | 25 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 | |
| | | 25 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |
| FIIU | F110 | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| 24 [MAF sensor (bank 2) signal] | 20 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 | |
| | • , | , | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 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

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NO >> GO TO 2.

$2. \mathsf{CHECK}$ 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-II

(P)WITH CONSULT-III

- 1. Repair or replace malfunctioning part.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Connect CONSULT-III and select "DATA MONITOR" mode.
- 4. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|-----------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

NWITHOUT CONSULT-III

- Repair or replace malfunctioning part.
- Start engine and warm it up to normal operating temperature.
- 3. Check the voltage between ECM harness connector terminals under the following conditions.

| | ECM | | | | |
|-----------|------------------------------|----------|--|-----------------------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 22 [MAF sensor (bank 1) | 25 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 | |
| IMAF | signal] | 23 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| F110 | | | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* | |
| FIIU | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 | |
| | 24 [MAF concer (book 2) | 30 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 | |
| | [MAF sensor (bank 2) signal] | 50 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 | |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 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 MASS AIR FLOW SENSOR-III

(P)WITH CONSULT-III

1. Turn ignition switch OFF.

P006A, P0101, P010B MAF SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- 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-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|-----------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

WITHOUT CONSULT-III

- 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 under the following conditions.

| | ECM | | | |
|---------------------------------------|----------------------------|---|--|-----------------------------|
| + | | _ | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 22 [MAE concer (book 1) | 25 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| [MAF sensor (bank signal] | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |
| F110 | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| 24 [MAF sensor (bank 2) signal] | 20 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 | |
| | | 30 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | Idle t | Idle to about 4,000 rpm | 0.95 - 1.35 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 malfunctioning mass air flow sensor. Refer to <u>EM-184, "Removal and Installation".</u>

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DTC Logic

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 <u>EC-746</u>, "<u>DTC Logic"</u>.

| DTC No. | Trouble diagnosis (Trouble diagnosis con- tent) | Detecting condition | Possible cause |
|---------|--|--|--|
| P0011 | INT/V TIM CONT-B1 [Intake valve timing control performance (bank 1)] | | Crankshaft position sensor Camshaft position sensor Intake valve timing control solenoid valve |
| P0021 | INT/V TIM CONT-B2 [Intake valve timing control performance (bank 2)] | There is a gap between angle of target and phase-control angle degree. | 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 |

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 at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE-I

(P) WITH CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 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 | Less than 2,000 rpm (A constant rotation is maintained.) |
|----------------|--|
| COOLAN TEMP/S | More than 70°C (158°F) |
| Selector lever | P or N position |

- 4. Let engine idle for 25 seconds.
- Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-733, "Diagnosis Procedure"

NO >> GO TO 3.

3.perform dtc confirmation procedure-ii $\,$

(P) WITH CONSULT-III

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- Maintain the following conditions for at least 20 consecutive seconds.

| ENG SPEED | 1,500 - 3,175 rpm (A constant rotation is maintained.) |
|---------------|--|
| COOLAN TEMP/S | More than 70°C (158°F) |

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Selector lever | 1st or 2nd position |
|-------------------------|--|
| Driving location uphill | Oriving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) |

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CAUTION:

Always drive at a safe speed.

- Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-733, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840934

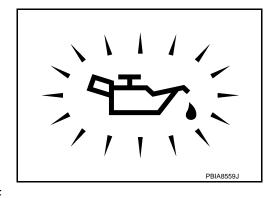
1. CHECK OIL PRESSURE WARNING LAMP

- Start engine.
- 2. Check that oil pressure warning lamp is not illuminated.

Is oil pressure warning lamp illuminated?

YES >> Refer to <u>LU-23, "Inspection"</u>.

NO >> GO TO 2.



2.check intake valve timing control solenoid valve

Refer to EC-734, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-230, "Exploded View".

3. CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.

NO

>> Replace crankshaft position sensor. Refer to <u>EM-203, "2WD : Exploded View"</u> (2WD) or <u>EM-206, "AWD : Exploded View"</u> (AWD).

4. CHECK CAMSHAFT POSITION SENSOR

Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning camshaft position sensor. Refer to EM-230, "Exploded View".

5. CHECK CAMSHAFT (INTAKE)

Check the following.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

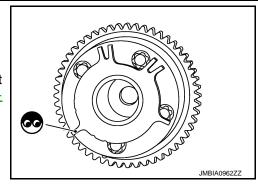
- Accumulation of debris on the signal plate of camshaft front end
- · Chipping signal plate of camshaft front end

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-246, "Disassembly and Assembly".



6. 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-243, "Inspection".

NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to EM-254, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000005840935

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

- 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.

| Terminals | Resistance |
|-------------------|---|
| 1 and 2 | 7.0 - 7.7 Ω [at 20°C (68°F)] |
| 1 or 2 and ground | $\stackrel{\scriptstyle \infty}{} \Omega$ (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-230, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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:

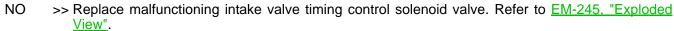
Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

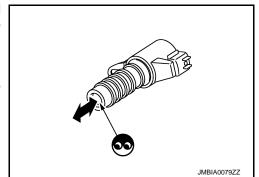
NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END





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[VK56VD]

P0014, P0024 EVT CONTROL

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P0014 or P0024 is displayed with DTC P0078, P0084 first perform trouble diagnosis for DTC P0078, P0084. Refer to <u>EC-749</u>, "<u>DTC Logic"</u>.
- If DTC P0014 or P0024 is displayed with DTC P1078, P1084 first perform trouble diagnosis for DTC P1078, P1084. Refer to <u>EC-948</u>, "<u>DTC Logic"</u>.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | Detecting condition | Possible cause | |
|---------|---|--|--|--|
| P0014 | EXH/V TIM CONT-B1 [Exhaust valve timing control performance (bank 1)] | | Crankshaft position sensor Camshaft position sensor Exhaust valve timing control position sensor | |
| P0024 | EXH/V TIM CONT-B2 [Exhaust valve timing control performance (bank 2)] | There is a gap between angle of target and phase-control angle degree. | Exhaust valve timing 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 exhaust valve timing control | |

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 at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

(P) WITH CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 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 | Less than 2,000 rpm (A constant rotation is maintained.) | |
|----------------|--|--|
| COOLAN TEMP/S | More than 70°C (158°F) | |
| Selector lever | P or N position | |

- Let engine idle for 10 seconds.
- Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-737, "Diagnosis Procedure"

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

(P) WITH CONSULT-III

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- Maintain the following conditions for at least 20 consecutive seconds.

| ENG SPEED | 1,500 - 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 uphill | Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.) |

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CAUTION:

Always drive at a safe speed.

- Check 1st trip DTC.
- WITH GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-737, "Diagnosis Procedure"

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005840937

1. CHECK OIL PRESSURE WARNING LAMP

- Start engine.
- 2. Check that oil pressure warning lamp is not illuminated.

Is oil pressure warning lamp illuminated?

>> Refer to <u>LU-23</u>, "Inspection". YES

NO >> GO TO 2.



2.check exhaust valve timing control solenoid valve

Refer to EC-738. "Component Inspection (Echaust Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace malfunctioning exhaust valve timing control solenoid valve. Refer to EM-230. "Exploded View".

3.check exhaust valve timing control position sensor

Refer to EC-950, "Component Inspection (Exhaust Valve Timing Control Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace malfunctioning exhaust valve timing control position sensor.

f 4.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 5.

>> Replace crankshaft position sensor. Refer to EM-203, "2WD : Exploded View" (2WD) or EM-206, NO "AWD : Exploded View" (AWD)

5. CHECK CAMSHAFT POSITION SENSOR

Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".

Is the inspection result normal?

>> GO TO 6. YES

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P0014, P0024 EVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

>> Replace malfunctioning camshaft position sensor. Refer to EM-230, "Exploded View". NO

6.CHECK CAMSHAFT (EXH)

Check the following.

- · Accumulation of debris to the signal plate of camshaft front end
- · Chipping signal plate of camshaft front end

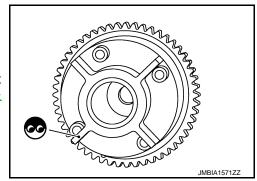
Is the inspection result normal?

YES

NO

>> GO TO 7.

>> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-246, "Disassembly and Assembly".



7.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?

>> Check timing chain installation. Refer to EM-243, "Inspection".

NO >> GO TO 8.

8. CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (EXT) Oil Groove". Refer to EM-254, "Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Clean lubrication line.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Echaust Valve Timing Control Solenoid Valve)

1. CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-I

- Turn ignition switch OFF.
- Disconnect exhaust valve timing control solenoid valve harness connector. 2.
- Check resistance between exhaust valve timing control solenoid valve terminals as per the following.

| Terminals | Resistance | | |
|-------------------|--|--|--|
| 1 and 2 | 7.0 - 7.7 Ω [at 20°C (68°F)] | | |
| 1 or 2 and ground | $\stackrel{\scriptstyle \infty \; \Omega}{\text{(Continuity should not exist)}}$ | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning exhaust valve timing control solenoid valve.

2.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove exhaust valve timing control solenoid valve.

P0014, P0024 EVT CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Provide 12 V DC between exhaust valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check 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 exhaust valve timing control solenoid valve.

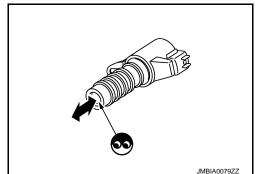
NOTE:

Always replace O-ring when exhaust valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning exhaust valve timing control solenoid valve.



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[VK56VD]

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0031 | A/F SEN1 HTR (B1) [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.) | 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) [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.) | Harness or connectors (The A/F sensor 1 heater circuit is shorted.) A/F sensor 1 heater |
| P0051 | A/F SEN1 HTR (B2) [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.) | 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) [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.) | Harness or connectors (The A/F sensor 1 heater circuit is shorted.) A/F sensor 1 heater |

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 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-740, "Diagnosis Procedure".

NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840941

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor 1 | | | Voltage | |
|--------------|------|--------------|----------|---------|-----------------|--|
| ыс | Bank | Connector | Terminal | Ground | vollage | |
| P0031, P0032 | 1 | F23 | 4 | Ground | Battery voltage | |
| P0051, P0052 | 2 | F24 | 4 | Giodila | Dattery Voltage | |

Is the inspection result normal?

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

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER [VK56VD] < DTC/CIRCUIT DIAGNOSIS > 2.DETECT MALFUNCTIONING PART Check the following. 15 A fuse (No. 45) Harness for open or short between A/F sensor 1 and fuse EC Loose or poor connection for each connector and harness >> Repair or replace harness or connectors. 3.CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Turn ignition switch OFF. 2. Disconnect ECM harness connector. D Check the continuity between A/F sensor 1 harness connector and ECM harness connector. Е A/F sensor 1 **ECM** DTC Continuity Bank Connector Terminal Connector **Terminal** P0031, P0032 1 F23 2 48 F110 Existed 2 P0051, P0052 F24 2 53 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

Refer to EC-741, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

${f 5}$. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-222, "Exploded View".

- 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

6.CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (A/F Sensor 1 Heater)

1. CHECK AIR FUEL RATIO (A/F) SENSOR 1

- Turn ignition switch OFF.
- 2. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
- Check resistance between A/F sensor 1 terminals as per the following.

| Terminal | Resistance | |
|----------|--------------------------------|--|
| 2 and 5 | 1.98 - 2.66 Ω [at 25°C (77°F)] | |

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INFOID:0000000005840942

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Terminal | Resistance |
|---------------|-------------------------------|
| 2 and 3, 4, 6 | ∞ Ω |
| 5 and 3, 4, 6 | (Continuity should not exist) |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE A/F SENSOR 1

Replace malfunctioning 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

P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0037, P0038, P0057, P0058 HO2S2 HEATER

DTC Logic INFOID:0000000005840944

DTC DETECTION LOGIC

| Е | |
|---|--|

| 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.) | 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 cir- cuit 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.) | 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 cir- cuit 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.) | 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 cir- cuit 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.) | Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) Heated oxygen sensor 2 heater |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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 11 V or more at idle.

>> GO TO 2.

2.perform dtc confirmation procedure

- Start engine and warm it up to the normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- 3. Turn ignition switch ON.
- 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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-743, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840945

1. CHECK HEATED OXYGEN SENSOR 2 (HO2S2) POWER SUPPLY CIRCUIT

- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- Turn ignition switch ON.
- Check the voltage between HO2S2 harness connector and ground.

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| DTC | HO2S2 | | | Ground | Voltage | |
|--------------|-------|-----------|----------|---------|-----------------|--|
| ыс | Bank | Connector | Terminal | Giodila | vollage | |
| P0037, P0038 | 1 | F87 | 2 | Ground | Battery voltage | |
| P0057, P0058 | 2 | F88 | 2 | Giodila | Battery voltage | |

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

- 15 A fuse (No. 45)
- Harness for open or short between heated oxygen sensor 2 and fuse
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

3.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 | HO2S2 | | ECM | | Continuity | |
|--------------|-------|-----------|----------|-----------|------------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0037, P0038 | 1 | F87 | 3 | F110 | 47 | Existed |
| P0057, P0058 | 2 | F88 | 3 | 1 110 | 52 | LAISIEU |

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 HEATER

Refer to EC-745, "Component Inspection (HO2 Sensor 2 Heater)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EX-7</u>, "VK56VD: 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

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0037, P0038, P0057, P0058 HO2S2 HEATER

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Component Inspection (HO2 Sensor 2 Heater)

INFOID:0000000005840946

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1. CHECK HEATED OXYGEN SENSOR 2 HEATER

- 1. Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- 3. Check resistance between HO2S2 terminals as follows.

| Terminal | Resistance |
|------------|-------------------------------|
| 2 and 3 | 3.4 - 4.4 Ω [at 25°C (77°F)] |
| 2 and 1, 4 | ∞ Ω |
| 3 and 1, 4 | (Continuity should not exist) |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

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P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0075, P0081 IVT CONTROL SOLENOID VALVE

DTC Logic

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 | Harness or connectors (Intake valve timing control solenoid | |
| P0081 | INT/V TIM V/CIR-B2 [Intake valve timing control solenoid valve (bank 2) circuit] | through intake valve timing control solenoid valve. | valve circuit is open or shorted.) • Intake valve timing control solenoid 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.
- 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 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-746, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840949

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 IVT control solenoid valve harness connector and ground.

| DTC | IVT control solenoid valve | | | Ground | Voltage | |
|-------|----------------------------|-----------|----------|---------|-----------------|--|
| DIC | Bank | Connector | Terminal | Giodila | voltage | |
| P0075 | 1 | F22 | 2 | Ground | Battery voltage | |
| P0081 | 2 | F21 | 2 | Giodila | Battery Voltage | |

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between IVT control solenoid valve and IPDM E/R
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

${f 3.}$ CHECK IVT 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 IVT control solenoid valve harness connector and ECM harness connector.

| DTC | IVT | control solen | oid valve | ECM | | Continuity | |
|-------|------|---------------|-----------|-----------|----------|------------|--|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0075 | 1 | F22 | 1 | F110 | 54 | Existed | |
| P0081 | 2 | F21 | 1 | F110 | 49 | LXISIEU | |

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 IVT CONTROL SOLENOID VALVE

Refer to EC-747, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning IVT control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000006115614

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.

| Terminals | Resistance |
|-------------------|--|
| 1 and 2 | 7.0 - 7.7 Ω [at 20°C (68°F)] |
| 1 or 2 and ground | $\stackrel{\sim}{\sim} \Omega$ (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-230, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

- Remove intake valve timing control solenoid valve.
- 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.

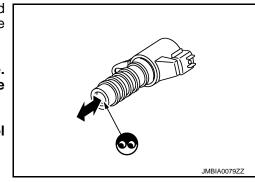
CAUTION:

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?



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P0075, P0081 IVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-245, "Exploded View".

P0078, P0084 EVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0078, P0084 EVT CONTROL SOLENOID VALVE

DTC Logic INFOID:0000000005840952

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P0078 | EX V/T ACT/CIRC-B1 [Exhaust valve timing control solenoid valve (bank 1) circuit] | An improper voltage is sent to the ECM through exhaust valve timing control | Harness or connectors (Exhaust valve timing control solenoid valve circuit is open or shorted.) |
| P0084 | EX V/T ACT/CIRC-B2 [Exhaust valve timing control sole- noid valve (bank 2) circuit] | solenoid valve. | Exhaust valve timing control solenoid valve |

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 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-749, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005840953

1. CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect exhaust valve timing (EVT) control solenoid valve harness connector.
- Turn ignition switch ON.
- Check the voltage between EVT control solenoid valve harness connector and ground.

| DTC | EVT control solenoid valve | | | Ground | Voltage | |
|-------|----------------------------|-----------|----------|---------|-----------------|--|
| DIC | Bank | Connector | Terminal | Ground | voltage | |
| P0078 | 1 | F26 | 2 | Ground | Battery voltage | |
| P0084 | 2 | F25 | 2 | Giodila | battery voltage | |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVT control solenoid valve and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

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P0078, P0084 EVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

${f 3.}$ CHECK EVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVT control solenoid valve harness connector and ECM harness connector.

| DTC | EVT | control solen | oid valve | ECM | | Continuity |
|-------|------|---------------|-----------|-----------|----------|------------|
| DIO | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0078 | 1 | F26 | 1 | F110 | 55 | Existed |
| P0084 | 2 | F25 | 1 | FIIU | 50 | 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 EVT CONTROL SOLENOID VALVE

Refer to EC-738, "Component Inspection (Echaust Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning EVT control solenoid valve. Refer to EM-230, "Exploded View".

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Echaust Valve Timing Control Solenoid Valve)

INFOID:0000000006115615

1. CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-I

- 1. Turn ignition switch OFF.
- 2. Disconnect exhaust valve timing control solenoid valve harness connector.
- 3. Check resistance between exhaust valve timing control solenoid valve terminals as per the following.

| Terminals | Resistance |
|-------------------|--|
| 1 and 2 | 7.0 - 7.7 Ω [at 20°C (68°F)] |
| 1 or 2 and ground | $\stackrel{\scriptstyle \sim \; \Omega}{\text{(Continuity should not exist)}}$ |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning exhaust valve timing control solenoid valve.

2.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-II

- 1. Remove exhaust valve timing control solenoid valve.
- Provide 12 V DC between exhaust valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

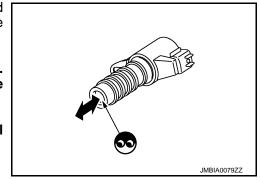
CAUTION:

Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in exhaust valve timing control solenoid valve.

NOTE:

Always replace O-ring when exhaust valve timing control solenoid valve is removed.

Is the inspection result normal?



P0078, P0084 EVT CONTROL SOLENOID VALVE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

YES >> INSPECTION END

NO >> Replace malfunctioning exhaust valve timing control solenoid valve.

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P008A LOW FUEL PRESSURE CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P008A LOW FUEL PRESSURE CONTROL SYSTEM

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P008A is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197. Refer to EC-962, "DTC Logic".

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---------------------------|---|---|
| P008A | Low fuel pressure too low | A condition of low fuel pressure 0.23 MPa (2.3 bar, 2.346 kg/cm², 33.35 psi) or less continues for 5 seconds or more after warming up the engine. | Harness or connectors (The low pressure fuel pump circuit is open or shorted.) Low pressure fuel pump Fuel pressure regulator Low pressure fuel system Out of gas |

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 at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Check that the fuel tank is 1/8 full of fuel.
- 2. Start the engine and warm it up to the normal operating temperature.

NOTE:

When replacing ECM, warm up the engine until "COOLAN TEMP/S" on "DATA MONITOR" of CONSULT-III reaches at least 70°C (158°F).

- 3. Let the engine at idle for 60 seconds.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-752</u>, "<u>Diagnosis Procedure</u>".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005926895

1. PERFORM LOW PRESSURE FUEL PUMP COMPONENT FUNCTION CHECK

Refer to EC-1081, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform low pressure fuel pump diagnosis. Refer to <u>EC-1081</u>, "Diagnosis Procedure".

2.CHECK FUEL LEAKAGE

- Start the engine.
- 2. Visually check that the low fuel pressure system has no fuel leakage.

Is inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK LOW PRESSURE FUEL PIPING AND HOSE

1. Turn ignition switch OFF.

P008A LOW FUEL PRESSURE CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

2. Check that the low pressure fuel piping and hose have no breakage, bend, and crush. Refer to <u>FL-4.</u> "Inspection".

Is inspection result normal?

- YES >> Replace fuel level sensor unit and fuel pump (main) (fuel pressure regulator malfunction). Refer to FL-6, "Removal and Installation".
- NO >> Repair or replace error-detected parts.

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P008B LOW FUEL PRESSURE CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P008B LOW FUEL PRESSURE CONTROL SYSTEM

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|----------------------------|---|--|
| P008B | Low fuel pressure too high | A condition of low fuel pressure 0.67 MPa (6.7 bar, 6.834 kg/cm², 97.15 psi) or more continues for 5 seconds or more after warming up the engine. | Harness or connectors (The low pressure fuel pump circuit is open or shorted.) Fuel pressure regulator |

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 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start the engine and keep the engine speed at idle for 60 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-754, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:00000000006008698

1. CHECK FUEL PUMP CONTROL MODULE (FPCM) SIGNAL

Refer to EC-971, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace FPCM. Refer to EC-1105, "Removal and Installation".

2. CHECK FUEL PUMP CONTROL CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect FPCM harness connector and fuel level sensor unit and fuel pump (main) harness connector.
- 3. Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump (main) harness connector.

| FPCM | | Fuel level sensor unit | Continuity | |
|-----------|----------|------------------------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| B221 | 6 | B241 | 3 | Existed |
| D22 I | 7 | 5241 | 1 | LAISIEU |

4. Also check harness for short to ground and short to power.

Is inspection result normal?

YES >> Replace fuel level sensor unit and fuel pump (main) (fuel pressure regulator malfunction). Refer to FL-6, "Removal and Installation".

NO >> Repair or replace error-detected parts.

[VK56VD]

P0087, P0088, P0090 FRP CONTROL SYSTEM

DTC Logic INFOID:0000000005926898

DTC DETECTION LOGIC

 If DTC P0087 or P0090 is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197.

• DTC P0087 or P0090 may be displayed when running out of gas.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|--|--|---|--|
| P0087 | High fuel pressure too low | Fuel rail pressure does not reach 1.3 MPa (13 bar, 13.3 kg/cm², 188.5 psi) at engine cold start [water temperature 5°C (41°F) –40C° (104°F)]. Fuel rail pressure remains at 3.5 MPa (35 bar, 35.7 kg/cm², 507.5 psi) or less for 1 second or more during engine idle condition after cold start [water temperature 5°C (41°F) –40C° (104°F)]. The following condition continues for 5 seconds or more after engine start (regardless of water temperature): Target fuel pressure – Actual fuel pressure ≥ 2.7 MPa (27 bar, 27.5 kg/cm², 392 psi) | Harness or connectors (The fuel pump circuit is open or shorted) Fuel system | |
| P0088 | high fuel pressure too high | Fuel rail pressure remains at more than 16.5 MPa (165 bar, 168.3 kg/cm², 2392.5 psi) for 1 second or more during engine idle condition after cold start [water temperature 5°C (41°F) – 40C° (104°F)]. The following condition continues for 5 seconds or more after engine start (regardless of water temperature):Actual fuel pressure – Target fuel pressure ≥ 2.7 MPa (27 bar, 27.5 kg/cm², 392 psi) | | |
| P0090 | High pressure fuel pump per- formance | Fuel rail pressure remains at 1.5 MPa (15 bar, 15.3 kg/ cm², 217.5 psi) or less for 3 seconds or more during engine rev. Fuel rail pressure remains at 18.5MPa (185 bar, 188.7 kg/cm², 2682.5 psi) or more for 0.3 seconds or more during engine rev. | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON. 2.
- 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 at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

EC-755 Revision: 2010 June 2011 M37/M56

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P0087, P0088, P0090 FRP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- 1. Check that the fuel tank is 1/8 full of fuel.
- Warm up the engine to the normal operating temperature and keep the engine speed at idle for 10 seconds.

NOTE:

Warm up the engine until "COOLAN TEMP/S" on "DATA MONITOR" of CONSULT-III reaches at least 70°C (158°F).

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-756</u>, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform dtc confirmation procedure-ii

- 1. Cool the engine until the engine coolant temperature reaches 60°C (140°F) or less.
- 2. Start the engine and wait at least 40 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-756, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005926899

1. CHECK LOW FUEL PRESSURE

(P)WITH CONSULT-III

- 1. Start the engine.
- 2. Check "L/FUEL PRES SEN V" in "DATA MONITOR" of "ECM" with CONSULT-III.

| Data monitor item | Condition | Value (Approx.) |
|---------------------|-----------------------------------|--------------------|
| L/FUEL PRES SEN V | Engine speed: idle | 3.000 –3.300 mV |
| LI OLL FILLS SLIN V | Engine speed: 3,000 rpm (no load) | |

WITHOUT CONSULT-III

- 1. Start the engine.
- Check low fuel pressure sensor signal voltage.

| + | | _ | | |
|--------------------------|----------|--------|-----------------------------------|--------------------|
| Low fuel pressure sensor | | | Condition | Value (Approx.) |
| Connector | Terminal | | | (11 -) |
| F39 | 2 | Ground | Engine speed: idle | 3.0 –3.3 V |
| | | | Engine speed: 3,000 rpm (no load) | |

Is inspection result normal?

YES >> GO TO 2.

NO >> Check low fuel pressure system. Refer to <u>EC-1081</u>, "<u>Diagnosis Procedure</u>".

2.PERFORM THE HIGH PRESSURE FUEL PUMP COMPONENT INSPECTION

Perform the high pressure fuel pump component inspection. Refer to <u>EC-757, "Component Inspection"</u>.

Is inspection result normal?

YES >> GO TO 3.

NO >> Replace the fuel pump.

3. CHECK FUEL LEAKAGE

- 1. Start the engine.
- Visually check that the fuel pump, fuel rail, and fuel piping have no fuel leakage.

Is inspection result normal?

P0087, P0088, P0090 FRP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

YES >> Check that the fuel system has no breakage, bend, and crush.

NO >> Repair or Replace the error-detected parts.

Component Inspection

INFOID:0000000005926900

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1. CHECK HIGH PRESSURE FUEL PUMP-I

- 1. Turn ignition switch OFF.
- 2. Disconnect high pressure fuel pump harness connector.
- 3. Check the resistance between high pressure fuel pump terminals as follows.

| + | _ | | | |
|-------------------------|-------|---------------------------------------|--|------------|
| High pressure fuel pump | | Condition | | Resistance |
| Terr | minal | | | |
| 1 | 2 | Temperature °C (°F) 20 – 30 (68 - 86) | | 9 - 11 Ω |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace high pressure fuel pump.

2.CHECK HIGH PRESSURE FUEL PUMP-II

(P)WITH CONSULT-III

- Reconnect high pressure fuel pump harness connector.
- Start the engine.
- Check "FUEL PRES SEN" in "DATA MONITOR" of "ECM" with CONSULT-III.

| Data monitor item | Condition | Voltage (Approx.) |
|-------------------|---|----------------------|
| FUEL PRES SEN V | Engine speed: idle | 980 – 1,200 mV |
| TOLLT NES SEN V | Engine speed: Revving engine from idle to 4,000 rpm quickly | 1,100 – 2,900 mV |

WITHOUT CONSULT-III

- 1. Start the engine.
- Check fuel rail pressure sensor signal voltage.

| | + | | | | |
|---------------------------|----------|--------|---|--------------------|--|
| Fuel rail pressure sensor | | _ | Condition | Value (Approx.) | |
| Connector | Terminal | | | (| |
| F6 | 2 | Ground | Engine speed: idle | 0.98 – 1.2 V | |
| 10 | 2 Ground | | Engine speed: Revving engine from idle to 4,000 rpm quickly | 1.1 – 2.9 V | |

YES >> INSPECTION END

NO >> Replace high pressure fuel pump.

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P0102, P0103, P010C, P010D MAF SENSOR

DTC Logic

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 (bank 1) circuit low input] | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The mass air flow sensor (bank 1) circuit is open or shorted.) Intake air leaks Mass air flow sensor |
| P0103 | MAF SEN/CIRCUIT-B1 [Mass air flow sensor (bank 1) circuit high input] | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The mass air flow sensor (bank 1) circuit is open or shorted.) Mass air flow sensor |
| P010C | MAF SEN/CIRCUIT-B2 [Mass air flow sensor (bank 2) circuit low input] | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The mass air flow sensor (bank 2) circuit is open or shorted.) Intake air leaks Mass air flow sensor |
| P010D | MAF SEN/CIRCUIT-B2 [Mass air flow sensor (bank 2) circuit high input] | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The mass air flow sensor (bank 2) 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.
- Turn ignition switch OFF and wait at least 10 seconds.

Which DTC is detected?

P0102, P010C>>GO TO 2.

P0103, P010D>>GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102 AND P010C

- Start engine and wait at least 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-759, "Diagnosis Procedure".

NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-I

- 1. Turn ignition switch ON and wait at least 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-759, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103 AND P010D-II

- Start engine and wait at least 5 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-759, "Diagnosis Procedure".

< DTC/CIRCUIT DIAGNOSIS >

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840957

[VK56VD]

1.INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

P0102, P010C>>GO TO 2.

P0103, P010D>>GO TO 3.

${f 2.}$ 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.

${f 3.}$ CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

- Disconnect mass air flow (MAF) sensor harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between MAF sensor harness connector and ground.

| DTC | MAF sensor | | | Ground | Voltage |
|--------------|------------|-----------|----------|---------|-----------------|
| ы | Bank | Connector | Terminal | Ground | voltage |
| P0102, P0103 | 1 | F86 | 5 | Ground | Battery voltage |
| P010C, P010D | 2 | F85 | 5 | Giodila | Battery voltage |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

f 4.DETECT MALFUNCTIONING PART

Check the following.

- 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
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.check maf sensor ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between MAF sensor harness connector and ECM harness connector.

| DTC | MAF sensor | | EC | Continuity | | |
|--------------|------------|-----------|----------|------------|----------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0102, P0103 | 1 | F86 | 4 | F110 | 25 | Existed |
| P010C, P010D | 2 | F85 | 4 | 1110 | 30 | LXISIEU |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

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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

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

| DTC | MAF sensor | | ECM | | Continuity | |
|--------------|------------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0102, P0103 | 1 | F86 | 3 | F110 | 22 | Existed |
| P010C, P010D | 2 | F85 | 3 | 1110 | 24 | LXISIEU |

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 ground or short to power in harness or connectors.

7.CHECK MASS AIR FLOW SENSOR

Refer to EC-760, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace malfunctioning mass air flow sensor. Refer to EM-184, "Exploded View".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAF Sensor)

INFOID:0000000006115616

1. CHECK MASS AIR FLOW SENSOR-I

(I) WITH CONSULT-III

- 1. Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Start engine and warm it up to normal operating temperature.
- 4. Connect CONSULT-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|--------------------------------|--|-----------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 MAS A/F SE-B2 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

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- 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 under the following conditions.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| • | ECM | | | |
|-----------|---------------------------------------|----------|--|-----------------------------|
| Connector | + | _ | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 22 [MAF sensor (bank 1) signal] | 25 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | | 25 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| F110 | | | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |
| FIIU | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | [MAF sensor (bank 2) signal] | 30 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 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 2.

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

- 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-II

(II) WITH CONSULT-III

- 1. Repair or replace malfunctioning part.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Connect CONSULT-III and select "DATA MONITOR" mode.
- 4. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|-----------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

®WITHOUT CONSULT-III

- 1. Repair or replace malfunctioning part.
- 2. Start engine and warm it up to normal operating temperature.
- Check the voltage between ECM harness connector terminals under the following conditions.

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| | ECM | | | |
|-----------|----------------------------|--|--|-----------------------------|
| Connector | + - | | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 22 [MAF sensor (bank 1) | 25 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | signal] | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| F110 | | | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |
| FIIU | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | 24 | 24 AF sensor (bank 2) 30 signal] | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | . , | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 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 MASS AIR FLOW SENSOR-III

(II) WITH CONSULT-III

- 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-III and select "DATA MONITOR" mode.
- 5. Select "MAS A/F SE-B1" and "MAS A/F SE-B2", and check the indication.

| Monitor item | Condition | Indication (V) |
|---------------|--|-----------------------------|
| | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| MAS A/F SE-B1 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| MAS A/F SE-B2 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4* |

^{*:} Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

WITHOUT CONSULT-III

- 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 under the following conditions.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| | ECM | | | |
|-----------|--|----------|--|-----------------------------|
| • | + | - | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| F110 | 22 [MAF sensor (bank 1) signal] | 25 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | | | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 to Approx. 2.4' |
| | 24 [MAF sensor (bank 2) 30 signal] | | Ignition switch ON (Engine stopped.) | Approx. 0.4 |
| | | 20 | Idle (Engine is warmed-up to normal operating temperature.) | 0.95 - 1.35 |
| | | 30 | 2,500 rpm (Engine is warmed-up to normal operating temperature.) | 1.3 - 1.7 |
| | | | Idle to about 4,000 rpm | 0.95 - 1.35 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 malfunctioning mass air flow sensor. Refer to <u>EM-184, "Removal and Installation"</u>.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0106 MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0106 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 |
|---------|---|--|--|
| P0106 | ABSL PRES SEN/CIRC [Manifold absolute pressure (MAP) circuit range/performance] | A difference exceeding the specified value develops between a value transmitted from the manifold absolute pressure (MAP) sensor to ECM and an estimated intake pressure of intake manifold calculated by ECM. | Harness or connectors (The manifold absolute pressure (MAP) sensor circuit is open or shorted.) manifold absolute pressure (MAP) sensor Intake air 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.

If engine will not start or stops soon, wait at least 10 seconds with engine stopped (Ignition switch ON) instead of running engine at idle speed.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

- 1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Accelerate the vehicle from 0 to 88 km/h (0 to 55 MPH) under the following conditions:

CAUTION:

Always drive at a safe speed.

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

| ACCEL SEN 1 | 1.4 – 2.0 V |
|----------------|-------------|
| Selector lever | D position |

4. Check 1st trip DTC.

WITHOUT CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 2. Drive the vehicle under the following conditions.
- With selector lever in D position, accelerate the vehicle from 0 to 88 km/h (0 to 55 MPH) under the following conditions:

CĂUTION:

Always drive at a safe speed.

NOTE:

- Accelerate with the accelerator pedal kept constant.
- The acceleration at engine speed 2,000 and 3,000 rpm allows easy diagnoses.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Accelerator peda | l position sensor 1 | Ground | Voltage (V) |
|--------------------|---------------------|----------------|-------------|
| Connector Terminal | | Ground | Voltage (V) |
| M9 (Without ICC) | 2 | Ground | 1.4 – 2.0 |
| M153 (With ICC) | 3 | Ground 1.4 – 2 | 1.4 – 2.0 |

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4. Check 1st trip DTC.

Is 1st trip DTC detected?

>> Proceed to EC-765, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

INFOID:000000000584096

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 >> Repair or replace malfunctioning part.

2.check manifold absolute pressure (map) sensor power supply circuit for open AND SHORT

- Disconnect manifold absolute pressure (MAP) sensor harness connector. 1.
- 2. Turn ignition switch ON.
- Check the voltage between manifold absolute pressure (MAP) sensor harness connector and ground.

| Manifold absolute pr | essure (MAP) sensor | — Ground Vo | Voltage (V) |
|----------------------|---------------------|-------------|-------------|
| Connector | Terminal | | voitage (v) |
| F19 | 1 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 3.

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.check manifold absolute pressure (map) sensor ground circuit for open and SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between manifold absolute pressure (MAP) sensor harness connector and ECM harness connector.

| Manifold absolute pr | essure (MAP) sensor | ECM | | Continuity |
|----------------------|---------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F19 | 3 | F111 | 70 | Existed |

Also check harness for short to ground and 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 MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between manifold absolute pressure (MAP) sensor harness connector and ECM harness connector.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Manifold absolute pressure (MAP) sensor | | E(| Continuity | |
|---|----------|-----------|------------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F19 | 2 | F111 | 67 | Existed |

2. Also check harness for short to ground and 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.

CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Refer to EC-766, "Component Inspection (MAP Sensor)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace manifold absolute pressure (MAP) sensor. Refer to EM-190, "Exploded View".

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAP Sensor)

INFOID:0000000005840962

1.CHECK MAP SENSOR-I

- 1. Turn ignition switch OFF.
- 2. Start engine and warm it up to normal operating temperature.
- 3. Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
- 4. Check the voltage between ECM harness connector terminals as follows.

| ECM | | | | | |
|-----------|----------|-----------|----------|--|--|
| | + | | _ | | |
| Connector | Terminal | Connector | Terminal | | |
| F111 | 67 | F111 | 70 | | |

NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.
- 5. Measure the atmospheric pressure.

NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

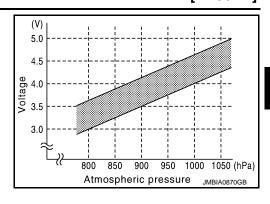
| Altitude (m) | Compensated pressure (hPa) |
|--------------|----------------------------|
| 0 | 0 |
| 200 | -24 |
| 400 | -47 |
| 600 | -70 |
| 800 | -92 |
| 1000 | -114 |
| 1500 | -168 |
| 2000 | -218 |

^{6.} Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

< DTC/CIRCUIT DIAGNOSIS >

| [VK56VD] |
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| Voltage (V) |
|-------------|
| 3.1 – 3.7 |
| 3.3 – 3.9 |
| 3.5 – 4.1 |
| 3.8 – 4.3 |
| 4.0 – 4.6 |
| 4.2 – 4.8 |
| |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace MAP sensor.

2.CHECK MAP SENSOR-II

- 1. Start engine and let it idle.
- 2. Check intake manifold vacuum.
- 3. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|----------|-----------|----------|--|--|
| | + | | _ | | |
| Connector | Terminal | Connector | Terminal | | |
| F111 | 67 | F111 | 70 | | |

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

| Intake manifold vacuum [kPA (mmHg)] | Voltage difference (V) |
|-------------------------------------|------------------------|
| -40 (-300) | 1.5 – 2.0 |
| -53.3 (-400) | 2.0 – 2.6 |
| -66.7 (-500) | 2.6 – 3.2 |
| -80 (-600) | 3.2 – 3.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace MAP sensor.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P010A is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-939</u>, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P010A | ABSL PRES SEN/CIRC [Manifold absolute pressure (MAP) sensor circuit] | An excessively low voltage from the sensor is sent to ECM. An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (Manifold absolute pressure sensor circuit is shorted.) Manifold absolute 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 10 seconds.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-768, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840965

1.check manifold absolute pressure (map) sensor power supply circuit-i

- 1. Disconnect manifold absolute pressure (MAP) sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage manifold absolute pressure (MAP) sensor harness connector and ground.

| Manifold absolute pressure (MAP) sensor | | — Ground Voltage | Voltage (V) |
|---|----------|------------------|-------------|
| Connector | Terminal | Ground | vollage (v) |
| F19 | 1 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit, short to ground in harness or connectors.

$2.\mathsf{CHECK}$ manifold absolute pressure (map) sensor ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between manifold absolute pressure (MAP) sensor harness connector and ECM harness connector.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Manifold absolute pres | ssure (MAP) sensor | EC | CM | Continuity |
|------------------------|--------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F19 | 3 | F111 | 70 | 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 power in harness or connectors.

3. CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between manifold absolute pressure (MAP) sensor harness connector and ECM harness connector.

| Manifold absolute pres | ssure (MAP) sensor | EC | СМ | Continuity |
|------------------------|--------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F19 | 2 | F111 | 67 | 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.

f 4.CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Refer to EC-769, "Component Inspection (MAP Sensor)".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace manifold absolute pressure (MAP) sensor. Refer to EM-190, "Exploded View".

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAP Sensor)

1.CHECK MAP SENSOR-I

Turn ignition switch OFF.

- Start engine and warm it up to normal operating temperature. 2.
- Turn ignition switch OFF, wait at least 5 seconds and then turn ON. 3.
- Check the voltage between ECM harness connector terminals as follows.

| ECM | | | |
|-----------|----------|-----------|----------|
| | + | | _ |
| Connector | Terminal | Connector | Terminal |
| F111 | 67 | F111 | 70 |

NOTE:

- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.
- Measure the atmospheric pressure.

NOTE:

As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

EC-769 Revision: 2010 June 2011 M37/M56

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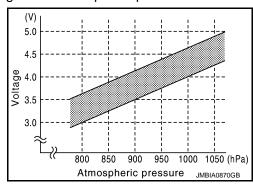
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< DTC/CIRCUIT DIAGNOSIS >

| Altitude (m) | Compensated pressure (hPa) |
|--------------|----------------------------|
| 0 | 0 |
| 200 | -24 |
| 400 | -47 |
| 600 | -70 |
| 800 | -92 |
| 1000 | -114 |
| 1500 | -168 |
| 2000 | -218 |

6. Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

| Atmospheric pressure (hPa) | Voltage (V) |
|----------------------------|-------------|
| 800 | 3.1 – 3.7 |
| 850 | 3.3 – 3.9 |
| 900 | 3.5 – 4.1 |
| 950 | 3.8 – 4.3 |
| 1000 | 4.0 – 4.6 |
| 1050 | 4.2 – 4.8 |



Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace MAP sensor.

2.CHECK MAP SENSOR-II

- 1. Start engine and let it idle.
- 2. Check intake manifold vacuum.
- 3. Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | |
|-----------|----------|-----------|----------|
| | + | | _ |
| Connector | Terminal | Connector | Terminal |
| F111 | 67 | F111 | 70 |

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

| Intake manifold vacuum [kPA (mmHg)] | Voltage difference (V) |
|-------------------------------------|------------------------|
| -40 (-300) | 1.5 – 2.0 |
| -53.3 (-400) | 2.0 – 2.6 |
| -66.7 (-500) | 2.6 – 3.2 |
| -80 (-600) | 3.2 – 3.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace MAP sensor.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0112, P0113 IAT SENSOR

DTC Logic

DTC DETECTION LOGIC

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| 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. | Harness or connectors (The intake air temperature sensor cir- |
| P0113 | IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | cuit 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.

>> 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-771, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840969

N

1. CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect mass air flow (MAF) sensor (bank 1) (intake air temperature sensor is built-in) harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between MAF sensor (bank 1) harness connector and ground.

| MAF sensor (bank 1) | | Ground | Voltage (V) |
|---------------------|------------------|--------|-------------|
| Connector | nnector Terminal | | |
| F86 | 2 | Ground | Approx. 5 |

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

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between MAF sensor (bank 1) harness connector and ECM harness connector.

| MAF senso | or (bank 1) | EC | Continuity | | |
|-----------|-------------|-----------|------------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| F86 | 1 | F110 | 25 | Existed | |

P0112, P0113 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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

Refer to EC-772, "Component Inspection (Intake Air Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace mass air flow sensor (bank 1) (with intake air temperature sensor). Refer to <u>EM-184</u>, "<u>Exploded View</u>".

4. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Air Temperature Sensor)

INFOID:0000000005840970

1. CHECK INTAKE AIR TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect mass air flow sensor (bank 1) harness connector.
- Check resistance between mass air flow sensor (bank 1) terminals as per the following.

| Terminals | Condition | Resistance ($k\Omega$) | |
|-----------|-----------------------|--------------------------|-------------|
| 1 and 2 | Temperature [°C (°F)] | 25 (77) | 1.94 - 2.06 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mass air flow sensor (bank 1) (with intake air temperature sensor). Refer to EM-184, "Exploded View".

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

P0116 ECT SENSOR

DTC Logic INFOID:0000000005840972

DTC DETECTION LOGIC

NOTE:

If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-775, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0116 | ECT SEN/CIRC (Engine coolant temperature sensor circuit range/performance) | Engine coolant temperature signal from engine coolant temperature sensor does not fluctuate, even when some time has passed after starting the engine with pre-warming up condition. | Harness or connectors (High or low resistance in the circuit) Engine coolant 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TEST CONDITION:

Before performing the following procedure, do not add fuel.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and warm it up to normal operating temperature.
- 2. Rev engine up to 2,000 rpm for more than 10 minutes.
- 3. Move the vehicle to a cool place, then stop engine.
- 4. Check resistance between "fuel level sensor unit and fuel pump (main)" terminals 4 and 5.
- 5. Soak the vehicle until the resistance between "fuel level sensor unit and fuel pump (main)" terminals 4 and 5 becomes $0.5 \text{ k}\Omega$ higher than the value measured before soaking.

CAUTION:

Never turn ignition switch ON during soaking.

NOTE:

Soak time changes depending on ambient air temperature. It may take several hours.

- 6. Start engine and let it idle for 20 minutes.
- 7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-773, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-774, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

OK >> GO TO 2.

NG >> Replace engine coolant temperature sensor. Refer to EM-263, "Exploded View".

2. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

EC-773 Revision: 2010 June 2011 M37/M56

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P0116 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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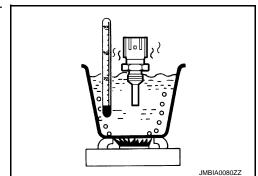
Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000005840974

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.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance ($k\Omega$) | |
|-----------|-----------------------|--------------------------|---------------|
| | | 20 (68) | 2.1 - 2.9 |
| 1 and 2 | Temperature [°C (°F)] | 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.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0117, P0118 ECT SENSOR

DTC Logic INFOID:0000000005840976

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | С |
|---------|---|--|---|---|
| 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 (The engine coolant temperature sensor) | D |
| P0118 | ECT SEN/CIRC (Engine coolant tempera- | An excessively high voltage from the sensor | circuit is open or shorted.) • Engine coolant temperature sensor | |

DTC CONFIRMATION PROCEDURE

ture sensor circuit high in-

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 5 seconds.
- 2. Check DTC.

Is DTC detected?

>> Proceed to EC-775, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

${f 1}$.CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

is sent to ECM.

- Disconnect engine coolant temperature (ECT) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between ECT sensor harness connector and ground.

| ECT: | ECT sensor | | Voltage (V) | |
|-----------|------------|--------|-------------|--|
| Connector | Terminal | Ground | voltage (v) | |
| F17 | 1 | Ground | Approx. 5 | |

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

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Check the continuity between ECT sensor harness connector and ECM harness connector.

| ECT sensor | | EC | Continuity | |
|------------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F17 | 2 | F110 | 40 | Existed |

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INFOID:0000000005840977

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P0117, P0118 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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

Refer to EC-774, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace engine coolant temperature sensor. Refer to EM-263, "Exploded View".

4. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

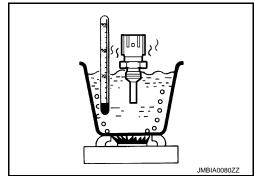
Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000006115618

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.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|---------------|
| | | 20 (68) | 2.1 - 2.9 |
| 1 and 2 | Temperature [°C (°F)] | 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.

P0122, P0123, P0227, P0228 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0122, P0123, P0227, P0228 TP SENSOR

DTC Logic INFOID:0000000005840980

DTC DETECTION LOGIC

NOTE:

If DTC P0122, P0123, P0227 or P0228 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-939, "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 (bank 1) circuit low input] | An excessively low voltage from the TP sensor 2 is sent to ECM. | | |
| P0123 | TP SEN 2/CIRC-B1 [Throttle position sensor 2 (bank 1) circuit high input] | An excessively high voltage from the TP sensor 2 is sent to ECM. | Harness or connectors (TP sensor 2 circuit is open or shorted.) | |
| P0227 | TP SEN 2/CIRC-B2 [Throttle position sensor 2 (bank 2) circuit low input] | An excessively low voltage from the TP sensor 2 is sent to ECM. | Electric throttle control actuator (TP sensor 2) | |
| P0228 | TP SEN 2/CIRC-B2 [Throttle position sensor 2 (bank 2) circuit high input] | An excessively high voltage from the TP sensor 2 is sent to ECM. | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- Check DTC.

Is DTC detected?

>> Proceed to EC-777, "Diagnosis Procedure". YES

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

- Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector and ground.

| DTC | Electric throttle control actuator | | | Ground | Voltage (V) | |
|--------------|------------------------------------|--------------------|---|---------|-------------|--|
| ыс | Bank | Connector Terminal | | Glound | voltage (v) | |
| P0122, P0123 | 1 | F66 | 2 | Ground | Approx. 5 | |
| P0227, P0228 | 2 | F64 | 2 | Giodila | Арргох. э | |
| | | | | | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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INFOID:000000000584098

< DTC/CIRCUIT DIAGNOSIS >

2.check throttle position sensor 2 ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | EC | Continuity | |
|--------------|------------------------------------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0122, P0123 | 1 | F66 | 4 | F111 | 97 | Existed |
| P0227, P0228 | 2 | F64 | 4 | 1 111 | 69 | LXISIEU |

^{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 throttle position sensor 2 input signal circuit for open and short

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|--------------|------------------------------------|-----------|----------|-----------|----------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0122, P0123 | 1 | F66 | 3 | E111 | 79 | Existed |
| P0227, P0228 | 2 | F64 | 3 | F111 | 89 | EXISTEC |

^{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 THROTTLE POSITION SENSOR

Refer to EC-778, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000005840982

1. CHECK THROTTLE POSITION SENSOR

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Perform EC-695, "Work Procedure".
- 4. Turn ignition switch ON.
- 5. Set selector lever position to D.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

P0122, P0123, P0227, P0228 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| ECM | | | | |
|-----------|------------------------------|----------|------------------------------------|----------------|
| Connector | + - | | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | 91 97 | | Accelerator pedal: Fully released | More than 0.36 |
| | [TP sensor 1 (bank 1)] | 91 | Accelerator pedal: Fully depressed | Less than 4.75 |
| • | 71 [TP sensor 1 (bank 2)] | 69 | Accelerator pedal: Fully released | More than 0.36 |
| F111 | | 09 | Accelerator pedal: Fully depressed | Less than 4.75 |
| ГШ | 79 | 97 | Accelerator pedal: Fully released | Less than 4.75 |
| | [TP sensor 2 (bank 1)] | 97 | Accelerator pedal: Fully depressed | More than 0.36 |
| • | 89 | 60 | Accelerator pedal: Fully released | Less than 4.75 |
| | [TP sensor 2 (bank 2)] 69 | | Accelerator pedal: Fully depressed | More than 0.36 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

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P0125 ECT SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-775, "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) | 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. | 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.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

(P) WITH CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "COOLAN TEMP/S" is above 10°C (50°F).

WITH GST

Follow the procedure "With CONSULT-III" above.

Is the temperature above 10°C (50°F)?

YES >> INSPECTION END

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

1. Start engine and run it for 65 minutes at idle speed.

If "COOLAN TEMP/S" increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.

CAUTION:

Never overheat engine.

- Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> EC-780, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840986

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-776, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

P0125 ECT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

INFOID:0000000006115619

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor.

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 >> GO TO 3.

NO >> Repair or replace thermostat. Refer to <u>CO-47</u>, "Removal and Installation".

3.check intermittent incident

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Engine Coolant Temperature Sensor)

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

- Turn ignition switch OFF.
- 2. Disconnect engine coolant temperature sensor harness connector.
- 3. Remove engine coolant temperature sensor.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

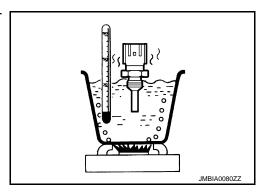
| Terminals | Condition | Resistance (k Ω) | |
|-----------|-----------------------|--------------------------|---------------|
| 1 and 2 | | 20 (68) | 2.1 - 2.9 |
| | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | 0.236 - 0.260 |

Is the inspection result normal?

>> INSPECTION END

YES

NO >> Replace engine coolant temperature sensor.



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P0127 IAT SENSOR

DTC Logic

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. | Harness or connectors (The 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.
- 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

(P) WITH CONSULT-III

- 1. Wait until engine coolant temperature is less than 90°C (194°F)
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch OFF and cool down
 engine.

NOTE:

Perform the following steps before engine coolant temperature is above 90°C (194°F).

- 2. Turn ignition switch ON.
- 3. Select "DATA MONITOR" mode with CONSULT-III.
- 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-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-782, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840990

1. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-783, "Component Inspection (Intake Air Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace mass air flow sensor (bank 1) (with intake air temperature sensor).

P0127 IAT SENSOR

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

2.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Air Temperature Sensor)

INFOID:0000000006115620

1. CHECK INTAKE AIR TEMPERATURE 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 per the following.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|-------------|
| 1 and 2 | Temperature [°C (°F)] | 25 (77) | 1.94 - 2.06 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace mass air flow sensor (bank 1) (with intake air temperature sensor). Refer to <u>EM-184</u>, <u>"Exploded View"</u>.

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P0128 THERMOSTAT FUNCTION

DTC Logic

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 DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308. Refer to EC-849, "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 leakage 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 (Thermostat function) | The engine coolant temperature does not reach to specified temperature even though the engine has run long enough. | ThermostatLeakage from sealing portion of thermostatEngine coolant 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:

- For best results, perform at ambient temperature of -10°C (14°F) or higher.
- For best results, perform at engine coolant temperature of -10°C (14°F) to 51°C (124°F).
- Before performing the following procedure, do not add fuel.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

- 1. Turn A/C switch OFF.
- Turn blower fan switch OFF.
- 3. Turn ignition switch ON.
- 4. Select "COOLAN TEMP/S" in "DATA MONITOR" mode with CONSULT-III.
- 5. Check the indication of "COOLAN TEMP/S".
 - If it is below 51°C (124°F), go to next step.
 - If it is above 51°C (124°F), cool engine down to less than 51°C (124°F). Then go to next step.
- 6. Start engine and drive vehicle for 10 consecutive minutes under the following conditions.

| Vehicle speed | More than 56 km/h (35 MPH) |
|---------------|----------------------------|

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If "COOLAN TEMP/S" increases to more than 70°C (158°F) within 10 minutes, turn ignition switch OFF because the test result will be OK.

7. Check 1st trip DTC.

WITH GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-785, "Diagnosis Procedure".

NO >> INSPECTION END

P0128 THERMOSTAT FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Diagnosis Procedure

INFOID:0000000005840993

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1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-785, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT

Remove and Check the thermostat. Refer to CO-47, "Removal and Installation" and CO-48, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace thermostat.

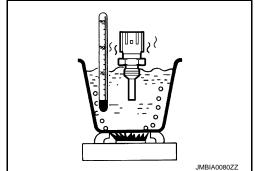
Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000006115621

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.
- 4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|---------------|
| 1 and 2 | | 20 (68) | 2.1 - 2.9 |
| | Temperature [°C (°F)] | 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.

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Revision: 2010 June **EC-785** 2011 M37/M56

P0130, P0150 A/F SENSOR 1

DTC Logic

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 | | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 1.5 V. | |
| | (bank 1) circuit] | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V. | Harness or connectors (The A/F sensor 1 circuit is open |
| 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.1.5 V. | or shorted.) • A/F sensor 1 |
| | | B) | The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V. | |

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 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-788, "Diagnosis Procedure".

NO-1 >> With CONSULT-III: GO TO 3.

NO-2 >> With GST: GO TO 7.

3.CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

(P) WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

Does the indication fluctuate around 1.5 V?

YES >> GO TO 4.

NO >> Proceed to EC-788, "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-III.
- 2. Touch "START".
- When the following conditions are met, "TESTING" will be displayed on the CONSULT-III screen.

| ENO ODEED | 4.750 2.000 | А |
|--|---|-----|
| ENG SPEED VHCL SPEED SE | 1,750 - 3,200 rpm | / \ |
| | More than 64 km/h (40 mph) | |
| B/FUEL SCHDL | 1.0 - 8.0 msec | EC |
| Selector lever | D position | |
| CAUTION: | isplayed after 20 seconds, retry from step 2. | С |
| Always drive vehicle | • | |
| Is "TESTING" displayed on | CONSULT-III screen? | |
| YES >> GO TO 5. NO >> Check A/F sen: | sor 1 function again. GO TO 3. | D |
| 5. PERFORM DTC CONFI | RMATION PROCEDURE FOR MALFUNCTION B-II | |
| Release accelerator pedal f | fully. | Е |
| • • • | leasing the accelerator pedal. | |
| Which does "TESTING" cha | | F |
| COMPLETED>>GO TO 6 | etry DTC CONFIRMATION PROCEDURE. GO TO 4. | |
| _ | RMATION PROCEDURE FOR MALFUNCTION B-III | G |
| | | |
| Touch "SELF-DIAG RESUL | | |
| Which is displayed on CON YES >> INSPECTION I | | Н |
| | -788, "Diagnosis Procedure". | |
| | NT FUNCTION CHECK FOR MALFUNCTION B | ı |
| With GST | | |
| | n check. Refer to EC-787, "Component Function Check". | |
| NOTE: | and to about the everall function of the A/F concert aircuit. During this about a | J |
| 1st trip DTC might not be co | neck to check the overall function of the A/F sensor 1 circuit. During this check, a onfirmed. | |
| Is the inspection result norm | | K |
| YES >> INSPECTION I | END | |
| NO >> Proceed to EC- | -788, "Diagnosis Procedure". | |
| Component Function | Check INFOID:000000005840997 | L |
| 1 DEDECTM COMPONEN | NIT FUNCTION OF FOR | |
| 1.PERFORM COMPONE | NT FUNCTION CHECK | M |
| With GST | Marie de la conseil de constitue de conseile de la | |
| | it up to normal operating temperature. peed of 80 km/h (50 MPH) for a few minutes in the suitable gear position. | |
| 3. Shift the selector leve | r position to D, then release the accelerator pedal fully until the vehicle speed | Ν |
| decreases to 50 km/h (CAUTION: | 31 MPH). | |
| Always drive vehicle | at a safe speed. | 0 |
| NOTÉ: | | |
| Never apply brake whe 4. Repeat steps 2 and 3 for | en releasing the accelerator pedal. | |
| Stop the vehicle and tu | | Р |
| | ds and turn ignition switch ON. | |
| Turn ignition switch OF Restart engine. | F and wait at least 10 seconds. | |
| 9. Repeat steps 2 and 3 fe | or 5 times. | |
| 10. Stop the vehicle. | | |
| 11. Check 1st trip DTC. | | |

< DTC/CIRCUIT DIAGNOSIS >

Is 1st trip DTC detected?

YES >> Proceed to EC-788, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005840998

1. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect air fuel ratio (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 | r 1 | Ground | Voltage | |
|-------|------|------------|----------|---------|---------|--|
| DIC | Bank | Connector | Terminal | Giodila | | |
| P0130 | 1 | F23 | 4 | Ground | 3.0 V | |
| P0150 | 2 | F24 | 4 | Giodila | 3.0 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 A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | |
|-------|--------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0130 | 1 | F23 | 3 | F111 | 88 | Existed |
| P0150 | 2 | F24 | 3 | ГП | 78 | Existed |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | EC | CM | Ground | Continuity |
|-------|--------------|-----------|----------|-----------|----------|---------|-------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Giodila | Continuity |
| P0130 | 1 | F23 | 3 | F111 | 88 | Ground | Not existed |
| P0150 | 2 | F24 | 3 | 1 111 | 78 | Giodila | NOI EXISIEU |

5. Also check harness for 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 GROUND CIRCUIT FOR OPEN AND SHORT

- 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 | | | EC | CM | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0130 | 1 | F23 | 6 | F111 | 94 | Existed |
| P0150 | 2 | F24 | 6 | 1 111 | 74 | LAISIEU |

4. Also check harness for short to power.

Is the inspection result normal?

P0130, P0150 A/F SENSOR 1 [VK56VD] < DTC/CIRCUIT DIAGNOSIS > YES >> GO TO 4. NO >> Repair open circuit, short to ground or short to power in harness or connectors. Α 4. CHECK INTERMITTENT INCIDENT Perform GI-38, "Intermittent Incident". EC Is the inspection result normal? YES >> GO TO 5. NO >> Repair or replace malfunctioning part. 5.REPLACE A/F SENSOR 1 Replace malfunctioning A/F sensor 1. Refer to EM-222, "Exploded View". **CAUTION:** D 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). F >> INSPECTION END Н

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Revision: 2010 June **EC-789** 2011 M37/M56

P0131, P0151 A/F SENSOR 1

DTC Logic

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 | |
| P0151 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage] | | shorted.) • A/F sensor 1 | |

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 10.5 V or more at idle.

>> GO TO 2.

2. CHECK A/F SENSOR FUNCTION

(P) WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.
- WITH GST

Follow the procedure "With CONSULT-III" above.

Is the indication constantly approx. 0 V?

YES >> Proceed to EC-791, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

(II) WITH CONSULT-III

- 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.
- 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 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

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

If this procedure is not completed within 1 minute after restarting engine at step 1, return to step

7. Check 1st trip DTC.

WITH GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-791</u>, "<u>Diagnosis Procedure</u>".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841001

1. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect air fuel ratio (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 senso | Ground | Voltage | | |
|-------|------|-----------|----------|---------|---------|--|
| DIC | Bank | Connector | Terminal | Giodila | voltage | |
| P0131 | 1 | F23 | 4 | Ground | 3.0 V | |
| P0151 | 2 | F24 | 4 | Giodila | 3.0 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 A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 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 | | | EC | CM | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|
| DIO | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0131 | 1 | F23 | 3 | F111 | 88 | Existed |
| P0151 | 2 | F24 | 3 | 1 111 | 78 | LAISIEU |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | EC | CM | Ground | Continuity |
|-------|--------------|-----------|----------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Giodila | Continuity |
| P0131 | 1 | F23 | 3 | F111 | 88 | Ground | Not existed |
| P0151 | 2 | F24 | 3 | 1 111 | 78 | Giodila | NOI EXISIEU |

5. Also check harness for 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 ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

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| DTC | | A/F sensor | 1 | EC | CM | Continuity |
|-------|------|------------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0131 | 1 | F23 | 6 | F111 | 94 | Existed |
| P0151 | 2 | F24 | 6 | 1 111 | 74 | LXISIEU |

4. 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

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace malfunctioning part.

5. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-222, "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

P0132, P0152 A/F SENSOR 1

DTC Logic INFOID:0000000005841003

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 | 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] | A/F sensor 1 signal is constantly approx. 5 V. | | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2 .CHECK A/F SENSOR FUNCTION

(P) WITH CONSULT-III

- Start engine and warm it up to normal operating temperature.
- Select "A/F SEN1 (B1)" or "A/F SEN1 (B2)" in "DATA MONITOR" mode with CONSULT-III.
- Check "A/F SEN1 (B1)" or "A/F SEN1 (B2)" indication.

WITH GST

Follow the procedure "With CONSULT-III" above.

Is the indication constantly approx. 5 V?

>> Proceed to EC-794, "Diagnosis Procedure".

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

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

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.

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P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- If this procedure is not completed within 1 minute after restarting engine at step 1, return to step
- 7. Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-794, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841004

1. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect air fuel ratio (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 | r 1 | Ground | Voltage | |
|-------|------|------------|----------|---------|---------|--|
| ыс | Bank | Connector | Terminal | Glound | | |
| P0132 | 1 | F23 | 4 | Ground | 3.0 V | |
| P0152 | 2 | F24 | 4 | Giodila | 3.0 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 A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 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 | EC | Continuity | | |
|---|-------|------|------------|----------|-----------|------------|------------|--|
| | ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| | P0132 | 1 | F23 | 3 | F111 | 88 | Existed | |
| | P0152 | 2 | F24 | 3 | ГШ | 78 | Existed | |

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | EC | CM | Ground | Continuity |
|-------|--------------|-----------|----------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Ground | Continuity |
| P0132 | 1 | F23 | 3 | F111 | 88 | Ground | Not existed |
| P0152 | 2 | F24 | 3 | FIII | 78 | Giodila | NOI EXISIEU |

5. Also check harness for 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 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

P0132, P0152 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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| DTC | A/F sensor 1 | | | EC | Continuity | |
|-------|--------------|-----------|----------|-----------|------------|------------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0132 | 1 | F23 | 6 | F111 | 94 | Existed |
| P0152 | 2 | F24 | 6 | ГШ | 74 | |

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

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace malfunctioning part.

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-222, "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

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P0133, P0153 A/F SENSOR 1

DTC Logic

DTC DETECTION LOGIC

To judge the malfunction of A/F sensor 1, 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 (Trouble diagnosis content) | DTC detecting condition | Possible Cause |
|---------|---|---|---|
| P0133 | A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response] | | Harness or connectors (The A/F sensor 1 circuit is open or shorted.) |
| P0153 | A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response] | The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time. | A/F sensor 1 A/F sensor 1 heater Fuel pressure Fuel injector Intake air leaks Exhaust gas leaks PCV Mass air flow sensor |

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 at idle.

Will CONSULT-III be used?

YES >> GO TO 2.

NO >> GO TO 5.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

(P) WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Restart 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.
- Select A/F SEN1(B1) P1278/P1279" (for DTC P0133) or "A/F SEN1(B2) P1288/P1289" (for DTC P0153) of "A/F SEN1" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 8. Touch "START".

Is "COMPLETED" displayed on CONSULT-III screen?

YES >> GO TO 3

NO >> GO TO 4.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Proceed to EC-797, "Diagnosis Procedure".

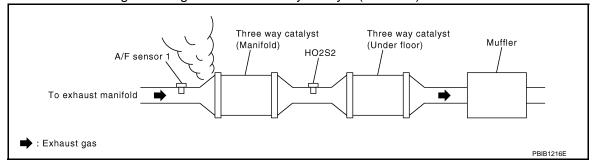
4.PERFORM DTC CONFIRMATION PROCEDURE-II

P0133, P0153 A/F SENSOR 1

| < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
|--|-------------------------|
| After perform the following procedure, "TESTING" will be displayed on the CONSULT-III screen Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for Fully release accelerator pedal and then let engine idle for approximately 10 seconds. If "TESTING" is not displayed after 10 seconds, refer to EC-709, "Component Function Component Func | 10 seconds. |
| 2. Wait for approximately 20 seconds at idle under the condition that "TESTING" is displayed SULT-III screen. | on the CON- |
| Check that "TESTING" changes to "COMPLETED". If "TESTING" changed to "OUT OF CONDITION", refer to EC-709, "Component Function Touch "SELF-DIAG RESULT". | on Check". |
| Which is displayed on CONSULT-III screen? | |
| OK >> INSPECTION END NG >> Proceed to <u>EC-797</u> , " <u>Diagnosis Procedure</u> ". | |
| 5. CHECK AIR-FUEL RATIO SELF-LEARNING VALUE | |
| WITH GSTStart engine and warm it up to normal operating temperature.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 ±15%? | |
| YES >> GO TO 7. NO >> GO TO 6. | |
| 6. DETECT MALFUNCTIONING PART | |
| Check the following. • Intake air leaks | |
| Exhaust gas leaksIncorrect fuel pressure | |
| Lack of fuel | |
| Fuel injector Incorrect PCV hose connection | |
| PCV valve | |
| Mass air flow sensor | |
| >> Repair or replace malfunctioning part. | |
| 7.PERFORM DTC CONFIRMATION PROCEDURE | |
| Turn ignition switch OFF and wait at least 10 seconds. | |
| 2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute u | nder no load. |
| 3. Let engine idle for 1 minute.4. Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for | 10 seconds. |
| 5. Fully release accelerator pedal and then let engine idle for approximately 1 minute. | |
| 6. Check 1st trip DTC. <u>Is 1st trip DTC detected?</u> | |
| YES >> Proceed to <u>EC-797</u> , " <u>Diagnosis Procedure</u> ". | |
| NO >> INSPECTION END | |
| Diagnosis Procedure | INFOID:0000000005841007 |
| 1. RETIGHTEN AIR FUEL RATIO SENSOR 1 | |
| Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-222, "Exploded View". | |
| CO TO 2 | |
| >> GO TO 2. 2.CHECK EXHAUST GAS LEAKAGE | |
| | |
| 1. Start engine and run it at idle. | |

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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 3.

3.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 4.

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to <u>EC-700</u>, "Work <u>Procedure</u>".
- 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 <u>EC-821, "DTC Logic"</u> or <u>EC-825, "DTC Logic"</u>.

NO >> GO TO 5.

${f 5.}$ CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect air fuel ratio (A/F) sensor 1 harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | | A/F sensor | r 1 | Ground | Voltage | |
|-------|------|------------|----------|---------|---------|--|
| ыс | Bank | Connector | Terminal | Ground | | |
| P0133 | 1 | F23 | 4 | Ground | 3.0 V | |
| P0153 | 2 | F24 | 4 | Giodila | 3.0 V | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

$oldsymbol{6}$.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | | A/F sensor | 1 | EC | Continuity | | |
|-------|------|------------|----------|-----------|------------|------------|--|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0133 | 1 | F23 | 3 | F111 | 88 | Existed | |
| P0153 | 2 | F24 | 3 | 1 111 | 78 | Existed | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

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| DTC | A/F sensor 1 | | | EC | CM | Ground | Continuity | |
|---|--------------|-----------|----------|-----------|----------|---------|-------------|--|
| | Bank | Connector | Terminal | Connector | Terminal | Giodila | Continuity | |
| P0133 | 1 | F23 | 3 | F111 | 88 | Ground | Not existed | |
| P0153 | 2 | F24 | 3 | | 78 | | | |
| 5. Also check harness for 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 A/F SENSOR 1 GROUND 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 | EC | Continuity | | |
|-------|------|------------|----------|-----------|------------|------------|--|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0133 | 1 | F23 | 6 | F111 | 94 | Existed | |
| P0153 | 2 | F24 | 6 | FIII | 74 | Existed | |

Also check harness for 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 A/F SENSOR 1 HEATER

Refer to EC-741, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 12.

9. CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1) and mass air flow sensor (bank 2).

Refer to EC-729, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace malfunctioning mass air flow sensor. Refer to .<u>EM-184, "Exploded View"</u>.

10.CHECK PCV VALVE

Refer to EC-1102, "Inspection".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair or replace PCV valve. Refer to EM-186, "Exploded View".

11. CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace malfunctioning part.

12.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-222, "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.

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P0133, P0153 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

• 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

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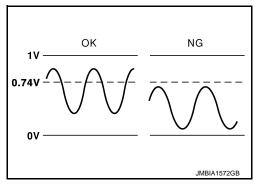
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P0137, P0157 HO2S2

DTC Logic INFOID:0000000005841009

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 | Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) |
| P0157 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit low voltage] | not reach the specified voltage. | Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

Will CONSULT-III be used?

YES >> GO TO 2.

NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE

(II) WITH CONSULT-III

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

- Start engine and warm it up to the normal operating temperature.
- 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.
- 5. Restart 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.
- Select "DATA MONITOR" mode with CONSULT-III.
- 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).
- 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-III.
- 11. Follow the instruction of CONSULT-III display.

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< DTC/CIRCUIT DIAGNOSIS >

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Proceed to EC-803, "Diagnosis Procedure".

CAN NOT BE DIAGNOSED>>GO TO 3.

3.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 2.

4.PERFORM COMPONENT FUNCTION CHECK

® WITH GST

Perform component function check. Refer to EC-802, "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 <u>EC-803</u>, "<u>Diagnosis Procedure</u>".

Component Function Check

INFOID:0000000005841010

1.PERFORM COMPONENT FUNCTION CHECK-I

With GST

- 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.
- Turn ignition switch OFF and wait at least 10 seconds.
- Restart 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 | DTC | + | _ | Condition | Voltage | |
|-------|------|----------|----------|--|---------------------------------------|--|
| | | Terminal | Terminal | | | |
| P0137 | F111 | 96 | 100 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.74 V at | |
| P0157 | | 87 | 100 | least 10 times | least once during this procedure. | |

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 | DTC | + | _ | Condition | Voltage | |
|-------|-------|----------|----------|---------------------------------------|---------------------------------------|--|
| | | Terminal | Terminal | | | |
| P0137 | F111 | 96 | 100 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at | |
| P0157 | 1 111 | 87 | 100 | | least once during this procedure. | |

Is the inspection result normal?

P0137, P0157 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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.

| | ECM | | | | | | |
|-----------|------------|----------|---|---------------------------------------|-----------------------------------|--|--|
| DTC | Connector | + | _ | Condition | Voltage | | |
| Connector | Comilector | Terminal | Terminal | | | | |
| P0137 | F111 96 87 | 100 | Coasting from 80 km/h (50 MPH) with se- | The voltage should be above 0.74 V at | | | |
| P0157 | | 87 | 100 | lector lever in the D position | least once during this procedure. | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-803, "Diagnosis Procedure".

Diagnosis Procedure

 ${f 1}$.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".
- 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-821, "DTC Logic".

NO >> GO TO 2.

2.CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | Continuity | |
|-------|----------------|-------|----------|-----------|------------|------------|
| ыс | Bank Connector | | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F87 | 1 | F111 | 100 | Existed |
| P0157 | 2 F88 | | 1 | 1 111 | 100 | LAISIEU |

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

Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | Continuity | |
|-------|----------------|-------|----------|-----------|------------|------------|
| ыс | Bank Connector | | Terminal | Connector | Terminal | Continuity |
| P0137 | 1 | F87 | 4 | F111 | 96 | Existed |
| P0157 | 2 | F88 | 4 | 1 111 | 87 | LAISIEU |

Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

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| DTC | HO2S2 | | | ECM | | Ground | Continuity |
|-------|-------|-----------|----------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Ground | Continuity |
| P0137 | 1 | F87 | 4 | F111 | 96 | Ground | Not existed |
| P0157 | 2 | F88 | 4 | 1 111 | 87 | Giodila | NOI EXISIEU |

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

Refer to EC-804, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EX-7</u>, "VK56VD: 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

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000005841012

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

YES >> GO TO 2.

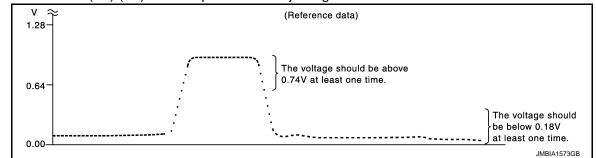
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

(P) WITH CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 3. Let engine idle for 1 minute.
- 4. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-III.

Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.74 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-I

M WITHOUT CONSULT-III

- 1. 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.
- 4. Let engine idle for 1 minute.
- Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-------------|---------------------------|----------|---|---|--|
| Connector - | + - | | Condition | Voltage | |
| | Terminal | Terminal | | | |
| F111 - | 96 [HO2S2 (bank 1)] | 100 | Revving up to 4,000 rpm under no load at least 10 times | The voltage should be above 0.74 V at least once during this procedure. | |
| | 87 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

f 4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

| | ECM | | | |
|-----------|---------------------------|----------|---------------------------------------|---|
| Connector | + - | | Condition | Voltage |
| | Terminal | Terminal | | |
| F111 - | 96 [HO2S2 (bank 1)] | 100 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at least once during this procedure. |
| | 87 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. |

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.

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| ECM | | | | | |
|-----------|---------------------------|----------|--|---|--|
| Connector | + - | | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Coasting from 80 km/h (50 MPH) with selector lever in the D position | The voltage should be above 0.74 V at least once during this procedure. | |
| | 87 [HO2S2 (bank 2)] | | | The voltage should be below 0.18 V at least once during this procedure. | |

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 <u>EX-7, "VK56VD : Exploded View"</u>.

- 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

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P0138, P0158 HO2S2

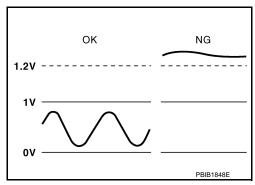
DTC Logic

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.

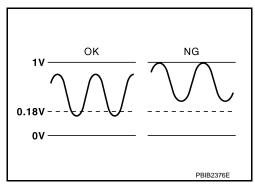
MALFUNCTION A

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 |
|---------|--|----|--|---|
| 1 ,0 | | A) | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The heated oxygen sensor 2 (bank 1) circuit is open or shorted) Heated oxygen sensor 2 |
| | [Heated oxygen sensor 2 (bank 1) circuit high voltage] | B) | The minimum voltage from the sensor is not reached to the specified voltage. | Harness or connectors (The heated oxygen sensor 2 (bank 1) circuit is open or shorted) Heated oxygen sensor 2 Fuel pressure Fuel injector |
| | HO252 (P2) | A) | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The heated oxygen sensor 2 (bank 2) circuit is open or shorted) Heated oxygen sensor 2 |
| P0158 | HO2S2 (B2) P0158 [Heated oxygen sensor 2 (bank 2) circuit high voltage | B) | The minimum voltage from the sensor is not reached to the specified voltage. | Harness or connectors (The heated oxygen sensor 2 (bank 2) circuit is open or shorted) Heated oxygen sensor 2 Fuel pressure Fuel injector |

DTC CONFIRMATION PROCEDURE

< DTC/CIRCUIT DIAGNOSIS >

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.
- 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-810, "Diagnosis Procedure".

NO-1 >> With CONSULT-III: GO TO 3.

NO-2 >> With GST: GO TO 5.

3.perform dtc confirmation procedure for malfunction b

(P) WITH CONSULT-III

NOTE:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

- 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. Select "DATA MONITOR" mode with CONSULT-III.
- 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.
- Select "HO2S2 (B1) P1146" (for DTC P0138) or "HO2S2 (B2) P1166" (for DTC P0158) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 11. Follow the instruction of CONSULT-III display.

NOTE:

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Proceed to EC-810. "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

WITH GST

Perform component function check. Refer to EC-809, "Component Function Check".

NOTE:

P0138, P0158 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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-810, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005841015

1.PERFORM COMPONENT FUNCTION CHECK-I

With GST

- Start engine and warm it up to the normal operating temperature.
- 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 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.
- Check the voltage between ECM harness connector terminals under the following conditions.

| | | ECM | | | | |
|-----------|--------------|----------|-----|--|---------------------------------------|--|
| DTC | TC Connector | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | | |
| P0138 | F111 | 96 100 | | Revving up to 4,000 rpm under no load at | The voltage should be below 0.18 V at | |
| P0158 | F 1111 | 87 | 100 | least 10 times | least once during this procedure. | |

Is the inspection result normal?

>> INSPECTION END YES

NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following conditions.

| | | ECM | | | |
|-------|-----------|----------|----------|--|---------------------------------------|
| DTC | Connector | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0138 | F111 | 96 | 100 | Keeping engine at idle for 10 minutes | The voltage should be below 0.18 V at |
| P0158 | 1 111 | 87 | 100 | Reeping engine at fulle for 10 minutes | least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

>> GO TO 3. NO

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

| | | ECM | | | |
|-------|-----------|----------|----------|---|---------------------------------------|
| DTC | Connector | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0138 | F111 | 96 | 100 | Coasting from 80 km/h (50 MPH) with se- | The voltage should be below 0.18 V at |
| P0158 | 1 111 | 87 | 100 | lector lever in the D position | least once during this procedure. |

Is the inspection result normal?

>> INSPECTION END YES

>> Proceed to EC-810, "Diagnosis Procedure". NO

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Diagnosis Procedure

INFOID:0000000005841016

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-807, "DTC Logic".

Which malfunction is detected?

A >> GO TO 2

B >> GO TO 8.

2.check heated oxygen sensor 2 connector

- 1. Disconnect heated oxygen sensor 2 (HO2S2) 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

- Disconnect ECM harness connector.
- 2. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | Continuity | |
|-------|------|-----------|----------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F87 | 1 | F111 | 100 | Existed |
| P0158 | 2 | F88 | 1 | 1 111 | 100 | LXISIEU |

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 HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F87 | 4 | F111 | 96 | Existed |
| P0158 | 2 | F88 | 4 | FIII | 87 | EXISTED |

Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | | HO2S2 | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|-----------|----------|---------|--------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Oround | Continuity |
| P0138 | 1 | F87 | 4 | F111 | 96 | Ground | Not existed |
| P0158 | 2 | F88 | 4 | 1 111 | 87 | Giodila | INOL EXISTED |

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

Refer to EC-812, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-7, "VK56VD: 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).

EC

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

8.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".
- 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-825, "DTC Logic".

NO >> GO TO 9.

9.CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

Turn ignition switch OFF.

- Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F87 | 1 | F111 | 100 | Existed |
| P0158 | 2 | F88 | 1 | 1 111 | 100 | LXISIEU |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0138 | 1 | F87 | 4 | F111 | 96 | Existed |
| P0158 | 2 | F88 | 4 | 1 111 | 87 | LAISIEU |

Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

| DTC | | HO2S2 | | ECM | | Ground | Continuity |
|-------|------|-----------|----------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Olouliu | Continuity |
| P0138 | 1 | F87 | 4 | F111 | 96 | Ground | Not existed |
| P0158 | 2 | F88 | 4 | FIII | 87 | Giodila | Not existed |

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< DTC/CIRCUIT DIAGNOSIS >

Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-812, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 12.

12. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EX-7</u>, "VK56VD: 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

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000006115626

1. INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

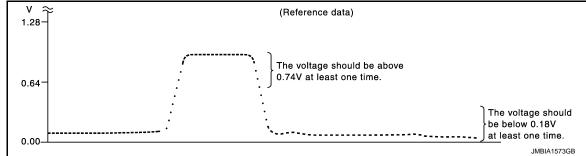
YES >> GO TO 2.

NO >> GO TO 3.

2.check heated oxygen sensor 2

(P) WITH CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. 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.
- Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-III.
- Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.74 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

M WITHOUT CONSULT-III

- 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.
- 4. Let engine idle for 1 minute.
- 5. Check the voltage between ECM harness connector terminals under the following conditions.

| | ECM | | | | |
|-----------|---------------------------|----------|--|---|--|
| Connector | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.74 V at least once during this procedure. | |
| 1 111 | 87 [HO2S2 (bank 2)] | 100 | least 10 times | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

>> INSPECTION END YES

NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|---------------------------|----------|--|---|--|
| Connector | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at least once during this procedure. | |
| 1 111 | 87 [HO2S2 (bank 2)] | 100 | Reeping engine at fulle for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. | |

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 | | | | |
|-----------|---------------------------|----------|---|---|--|
| Connector | + | _ | Condition | Voltage | |
| Connector | Terminal | Terminal | | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Coasting from 80 km/h (50 MPH) with se- | The voltage should be above 0.74 V at least once during this procedure. | |
| 1 111 | 87 [HO2S2 (bank 2)] | 100 | lector lever in the D position | The voltage should be below 0.18 V at least once during this procedure. | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

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6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EX-7</u>, "VK56VD: <u>Exploded View"</u>. **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).

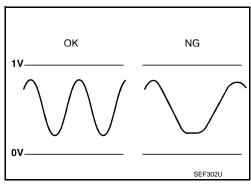
>> INSPECTION END

P0139, P0159 HO2S2

DTC Logic INFOID:0000000005841019

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 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] | It takes more time for the sensor to respond | Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) |
| P0159 | HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit slow response] | between rich and lean than the specified time. | Heated oxygen sensor 2 Fuel pressure Fuel injector Intake air 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.
- Turn ignition switch ON. 2.
- Turn ignition switch OFF and wait at least 10 seconds.

Will CONSULT-III be used?

YES >> GO TO 2.

NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE

(P) WITH CONSULT-III

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

- Start engine and warm it up to the normal operating temperature.
- 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.
- 5. Restart 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.
- Select "DATA MONITOR" mode with CONSULT-III.
- 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 to 70°C (158°F).
- Open engine hood.
- 10. Select "HO2S2 (B1) P0139" or "HO2S2 (B2) P0159" of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 11. Start engine and follow the instruction of CONSULT-III display. NOTE:

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< DTC/CIRCUIT DIAGNOSIS >

It will take at most 10 minutes until "COMPLETED" is displayed.

12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Proceed to <u>EC-817</u>, "<u>Diagnosis Procedure</u>".

CAN NOT BE DIAGNOSED>>GO TO 3.

3.perform dtc confirmation procedure again

- 1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
- Perform DTC confirmation procedure again.

>> GO TO 2.

4. PERFORM COMPONENT FUNCTION CHECK

® WITH GST

Perform component function check. Refer to EC-816, "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 <u>EC-817</u>, "<u>Diagnosis Procedure</u>".

Component Function Check

INFOID:0000000005841020

1.PERFORM COMPONENT FUNCTION CHECK-I

With GST

- 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.
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart 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.
- 7. Check the voltage between ECM harness connector terminals under the following conditions.

| | | ECM | | | |
|-------|-----------|----------|----------|--|--|
| DTC | Connector | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0139 | F111 | 96 | 100 | Revving up to 4,000 rpm under no load at | |
| P0159 | 1 111 | 87 | 100 | least 10 times | 0.24 V for 1 second during this procedure. |

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.

| | | ECM | | | |
|-------|-----------|----------|----------|---------------------------------------|--|
| DTC | Connector | + | _ | Condition | Voltage |
| | Connector | Terminal | Terminal | | |
| P0139 | F111 | 96 | 100 | Keeping engine at idle for 10 minutes | A change of voltage should be more than |
| P0159 | 1 111 | 87 | 100 | Reeping engine at lule for 10 minutes | 0.24 V for 1 second during this procedure. |

Is the inspection result normal?

P0139, P0159 HO2S2

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

A change of voltage should be more than

0.24 V for 1 second during this procedure.

YES >> INSPECTION END

NO >> GO TO 3.

P0139

P0159

3.PERFORM COMPONENT FUNCTION CHECK-III

96

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Check the voltage between ECM harness connector terminals under the following conditions.

| | | ECM | | | | |
|-----|-----------|----------|----------|-----------|---------|---|
| DTC | Connector | + | _ | Condition | Voltage | С |
| | Connector | Terminal | Terminal | | | |

Coasting from 80 km/h (50 MPH) with se-

lector lever in the D position

Is the inspection result normal?

F111

>> INSPECTION END

NO >> Proceed to EC-817, "Diagnosis Procedure".

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Diagnosis Procedure

 ${f 1}$.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

- Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".
- 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-821, "DTC Logic" or EC-825, "DTC Logic".

NO >> GO TO 2.

2.check heated oxygen sensor 2 ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
- Disconnect ECM harness connector.
- Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0139 | 1 | F87 | 1 | F111 | 100 | Existed |
| P0159 | 2 | F88 | 1 | 1 111 | 100 | LAISIEU |

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

Check the continuity between HO2S2 harness connector and ECM harness connector.

| DTC | | HO2S2 | | EC | CM | Continuity |
|-------|------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0139 | 1 | F87 | 4 | F111 | 96 | Existed |
| P0159 | 2 | F88 | 4 | 1 111 | 87 | LAISIEU |

Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

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| DTC | | HO2S2 | | EC | CM | Ground | Continuity |
|-------|------|-----------|----------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Giodila | Continuity |
| P0139 | 1 | F87 | 4 | F111 | 96 | Ground | Not existed |
| P0159 | 2 | F88 | 4 | 1 111 | 87 | Giodila | NOI EXISIEU |

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

Refer to EC-818, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to <u>EX-7</u>, "VK56VD: 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

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000006115628

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

YES >> GO TO 2.

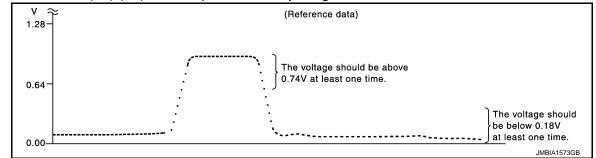
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

(P) WITH CONSULT-III

- 1. Start engine and warm it up to the normal operating temperature.
- 2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
- 3. Let engine idle for 1 minute.
- 4. Select "FUEL INJECTION" in "ACTIVE TEST" mode, and select "HO2S2 (B1)/(B2)" as the monitor item with CONSULT-III.

Check "HO2S2 (B1)/(B2)" at idle speed when adjusting "FUEL INJECTION" to ±25%.



"HO2S2 (B1)/(B2)" should be above 0.74 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-I

M WITHOUT CONSULT-III

- 1. 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.
- 4. Let engine idle for 1 minute.
- Check the voltage between ECM harness connector terminals under the following conditions.

| | ECM | | | |
|-----------|---------------------------|----------|--|---|
| Connector | + | _ | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Revving up to 4,000 rpm under no load at | The voltage should be above 0.74 V at least once during this procedure. |
| FIII | 87 [HO2S2 (bank 2)] | 100 | least 10 times | The voltage should be below 0.18 V at least once during this procedure. |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 4.

f 4.CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

| | ECM | | | |
|-----------|---------------------------|----------|---|---|
| Connector | + | _ | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Keeping engine at idle for 10 minutes | The voltage should be above 0.74 V at least once during this procedure. |
| 1 111 | 87 [HO2S2 (bank 2)] | 100 | recepting engine at tale for 10 minutes | The voltage should be below 0.18 V at least once during this procedure. |

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.

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| | ECM | | | |
|-----------|---------------------------|----------|---|---|
| Connector | + | _ | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| F111 | 96 [HO2S2 (bank 1)] | 100 | Coasting from 80 km/h (50 MPH) with se- | The voltage should be above 0.74 V at least once during this procedure. |
| | 87 [HO2S2 (bank 2)] | 100 | lector lever in the D position | The voltage should be below 0.18 V at least once during this procedure. |

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 <u>EX-7</u>, "VK56VD: Exploded View".

- 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

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic INFOID:0000000005841023

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. | Intake air leakage A/F sensor 1 Fuel injector |
| P0174 | FUEL SYS-LEAN-B2 [Fuel injection system too lean (bank 2)] | The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.) | Exhaust gas leakage Incorrect fuel pressure Lack of fuel Mass air flow sensor Incorrect PCV hose connection |

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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".
- 2. Start engine.

Is it difficult to start engine?

>> GO TO 3. YES

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-822, "Diagnosis Procedure".

>> Check exhaust and intake air leakage visually. NO

f 4.PERFORM DTC CONFIRMATION PROCEDURE-II

- Keep engine idle for at least 5 minutes.
- Check 1st trip DTC.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Is 1st trip DTC detected?

YES >> Proceed to EC-822, "Diagnosis Procedure".

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

- 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.
- 5. Maintain the following conditions for at least 10 consecutive minutes.

Hold the accelerator pedal as steady as possible.

Vehicle speed 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 <u>EC-822</u>, "<u>Diagnosis Procedure</u>".

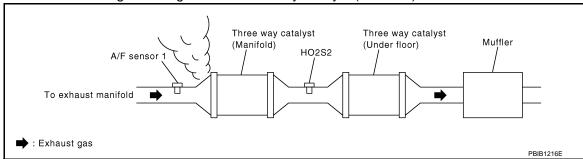
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841024

1. CHECK EXHAUST GAS LEAKAGE

- 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.
- 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 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/CIRCUIT DIAGNOSIS >

[VK56VD]

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| DTC | | A/F sensor | 1 | EC | CM | Continuity |
|-------|------|------------|----------|-----------|------------------------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal 88 90 94 78 80 | Continuity |
| | | | 3 | | 88 | |
| P0171 | 1 | F23 | 4 | 94 | 90 | |
| | | | 6 | | Existed | |
| | | | 3 | FIII | 78 | Existed |
| P0174 | 2 | F24 | 4 | | 80 | |
| | | | 6 | | 74 | |

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | ECM | | Continuity | Continuity | |
|-------|--------------|-----------|----------|-----------|----------|------------|-------------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | Continuity | |
| | 1 | F23 | 3 | F111 | 88 | Existed | Not existed | |
| P0171 | | | 4 | | 90 | | | |
| | | | 6 | | 94 | | | |
| P0174 | 2 | F24 | 3 | | 7 7111 | 78 | Existed | Not existed |
| | | | 4 | | 80 | | | |
| | | | 6 | | 74 | | | |

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.

CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-701, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

$oldsymbol{5}$. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

>> Replace "fuel filter and fuel pump assembly". Refer to FL-6, "Removal and Installation". YES

NO >> Repair or replace malfunctioning part.

6.CHECK MASS AIR FLOW SENSOR

(P) WITH CONSULT-III

- 1. Install all removed parts.
- Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III. For specification, refer to EC-1109, "Mass Air Flow Sensor".
- **WITH GST**
- Install all removed parts.
- Check mass air flow sensor signal in Service \$01 with GST. For specification, refer to EC-1109, "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-759, "Diagnosis Procedure".

.CHECK FUNCTION OF FUEL INJECTOR

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< DTC/CIRCUIT DIAGNOSIS >

(II) WITH CONSULT-III

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT-III

- 1. Start engine and let it idle.
- 2. Listen to each fuel injector operating sound.

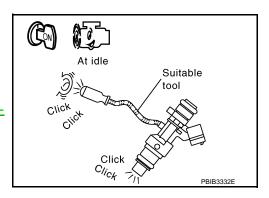
Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Perform

>> Perform trouble diagnosis for fuel injector, refer to <u>EC-1067</u>, "Diagnosis Procedure".



[VK56VD]

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace fuel injector. Refer to EM-197, "Removal and Installation".

NO >> Repair or replace malfunctioning part.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

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 Tyber of see legicage | |
| P0175 | FUEL SYS-RICH-B2 [Fuel injection system too rich (bank 2)] | | Exhaust gas leakageIncorrect fuel pressureMass 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- 1. Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".
- 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-826, "Diagnosis Procedure".

NO >> Remove spark plugs and check for fouling, etc.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

- 1. Keep engine idle for at least 5 minutes.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-826, "Diagnosis Procedure".

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

- 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.
- Start engine.
- 5. Maintain the following conditions for at least 10 consecutive minutes.

Hold the accelerator pedal as steady as possible.

Vehicle speed 50 - 120 km/h (31 - 75 MPH)

CAUTION:

Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-826, "Diagnosis Procedure".

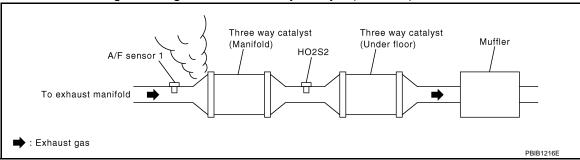
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841026

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

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 circuit

- Turn ignition switch OFF.
- Disconnect corresponding A/F sensor 1 harness connector.
- 3. Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| DTC | A/F sensor 1 | | | EC | Continuity | | |
|-------|----------------|-----|----------|-----------|------------|------------|--|
| DIC | Bank Connector | | Terminal | Connector | Terminal | Continuity | |
| | 1 | F23 | 3 | | 88 | | |
| P0171 | | | 4 | F444 | 90 | | |
| | | | 6 | | 94 | Existed | |
| P0174 | | F24 | 3 | F111 | 78 | Existed | |
| | 2 | | 4 | | 80 | | |
| | | | 6 | - | 74 | | |

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Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | ECM | | Continuity | Continuity |
|-------|--------------|-----------|----------|-----------|----------|------------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | Continuity |
| | 1 | F23 | 3 | F111 | 88 | Existed | Not existed |
| P0171 | | | 4 | | 90 | | |
| | | | 6 | | 94 | | |
| P0174 | 2 | F24 | 3 | | 78 | Existed | |
| | | | 4 | | 80 | | |
| | | | 6 | | 74 | | |

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.

CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-701, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace fuel filter and fuel pump assembly". Refer to FL-6, "Removal and Installation".

5. CHECK MASS AIR FLOW SENSOR

WITH CONSULT-III

- Install all removed parts.
- Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT-III. For specification, refer to <u>EC-1109</u>, "Mass Air Flow Sensor".

® WITH GST

- 1. Install all removed parts.
- Check mass air flow sensor signal in "Service \$01" with GST. For specification, refer to <u>EC-1109</u>, "Mass Air Flow Sensor".

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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 <u>EC-759</u>, "<u>Diagnosis Procedure</u>".

6. CHECK FUNCTION OF FUEL INJECTOR

(P) WITH CONSULT-III

- 1. Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that each circuit produces a momentary engine speed drop.

R WITHOUT CONSULT-III

Start engine and let it idle.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

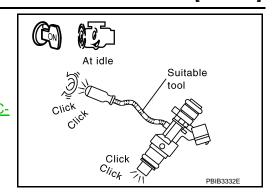
Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Perform trouble diagnosis for fuel injector, refer to <u>EC-1067</u>, "Diagnosis Procedure".



7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace fuel injector. Refer to EM-197, "Removal and Installation".

NO >> Repair or replace malfunctioning part.

P0181 FTT SENSOR

DTC Logic INFOID:0000000005841028

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P0181 | FTT SENSOR [Fuel tank temperature sensor circuit range/performance] | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | Harness or connectors (The FTT sensor circuit is open or shorted) Fuel tank temperature sensor Combination meter |

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

>> GO TO 2.

2.perform dtc confirmation procedure-i

- Turn ignition switch ON and wait at least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

>> Proceed to EC-829, "Diagnosis Procedure". YES

NO >> GO TO 3.

3.CHECK ENGINE COOLANT TEMPERATURE

- WITH CONSULT-III
- Select "COOLAN TEMP/S" in "DATA MONITOR" with CONSULT-III.
- Check "COOLAN TEMP/S" value.
- WITH GST

Follow the procedure "With CONSULT-III" above.

"COOLAN TEMP/S" less than 60°C (140°F)?

YES >> INSPECTION END

>> GO TO 4. NO

4. PERFORM DTC CONFIRMATION PROCEDURE-II

- (P) WITH CONSULT-III
- 1. Cool engine down until "COOLAN TEMP/S" is less than 60°C (140°F).
- 2. Wait at least 10 seconds.
- 3. Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

Diagnosis Procedure

YES >> Proceed to EC-829, "Diagnosis Procedure".

NO >> INSPECTION END

1. CHECK DTC WITH COMBINATION METER Refer to MWI-30, "CONSULT-III Function".

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< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to MWI-73, "Component Function Check".

2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump (main)" harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump (main)" harness connector and ground.

| Fuel level sensor unit and fuel pump (main) | | Ground | Voltage (V) |
|---|----------|--------|-------------|
| Connector | Terminal | | |
| B241 | 4 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and "fuel level sensor unit and fuel pump (main)"
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connector.

4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect "combination meter" harness connector.
- 3. Check the continuity between "fuel level sensor unit and fuel pump (main)" harness connector and "combination meter" harness connector.

| Fuel level sensor unit and fuel pump (main) | | Combination meter | | Continuity |
|---|----------|-------------------|----|------------|
| Connector | Terminal | Connector | | |
| B241 | 5 | M53 | 24 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between "fuel level sensor unit and fuel pump (main)" and "combination meter"
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connector.

6.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-831, "Component Inspection (Fuel Tank Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace fuel level sensor unit and fuel pump (main). Refer to FL-6, "Removal and Installation".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

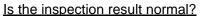
Component Inspection (Fuel Tank Temperature Sensor)

INFOID:0000000005841030

1. CHECK FUEL TANK TEMPERATURE SENSOR

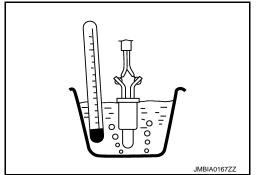
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump (main)" harness connector.
- 3. Remove fuel level sensor unit.
- 4. Check resistance between "fuel level sensor unit and fuel pump (main)" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|-------------|
| 4 and 5 | Tomporature [°C (°E)] | 20 (68) | 2.3 - 2.7 |
| | Temperature [°C (°F)] | 50 (122) | 0.79 - 0.90 |



YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump (main)".



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Revision: 2010 June **EC-831** 2011 M37/M56

P0182, P0183 FTT SENSOR

DTC Logic

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 FTT sensor circuit is open or shorted.) |
| P0183 | FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | Fuel tank temperature sensor Combination meter |

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.
- 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-832, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841033

1. CHECK DTC WITH COMBINATION METER

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to MWI-73, "Component Function Check".

2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump (main)" harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between "fuel level sensor unit and fuel pump (main)" harness connector and ground.

| | nsor unit and np (main) | Ground | Voltage (V) |
|-----------|----------------------------|--------|-------------|
| Connector | Terminal | | |
| B241 | 4 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

P0182, P0183 FTT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Check the following.

- Harness for open or short between ECM and "fuel level sensor unit and fuel pump (main)"
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connector.

4.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect combination meter harness connector.
- Check the continuity between "fuel level sensor unit and fuel pump (main)" harness connector and "combination meter" harness connector.

| Fuel level sensor unit and fuel pump (main) | | Combination meter | | Continuity |
|---|----------|----------------------|----|------------|
| Connector | Terminal | I Connector Terminal | | |
| B241 | 5 | M53 | 24 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between "fuel level sensor unit and fuel pump (main)" and "combination meter"
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connector.

6.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-833, "Component Inspection (Fuel Tank Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace "fuel level sensor unit and fuel pump". Refer to FL-6, "Removal and Installation".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Fuel Tank Temperature Sensor)

1. CHECK FUEL TANK TEMPERATURE SENSOR

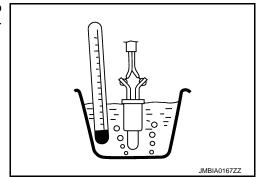
- 1. Turn ignition switch OFF.
- 2. Disconnect "fuel level sensor unit and fuel pump (main)" harness connector.
- Remove fuel level sensor unit.
- Check resistance between "fuel level sensor unit and fuel pump (main)" terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|-------------|
| 4 and 5 | Temperature [°C (°F)] | 20 (68) | 2.3 - 2.7 |
| 4 and 5 | remperature [*C (*F)] | 50 (122) | 0.79 - 0.90 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace "fuel level sensor unit and fuel pump (main)".



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INFOID:0000000006115630

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P0190, P0192, P0193 FRP SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P0190 | Fuel rail pressure sensor circuit low input and high input | Signal voltage from the fuel rail pressure sensor remains at more than 4.84 V / less than 0.2 V for 5 seconds or more. | Harness or connectors (Fuel rail pressure sensor circuit is open or shorted.) |
| P0192 | Fuel rail pressure sensor circuit low input | Signal voltage from the fuel rail pressure sensor remains at less than 0.37 V for 5 seconds or more. | (Power steering pressure sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) |
| P0193 | Fuel rail pressure sensor circuit high input | Signal voltage from the fuel rail pressure sensor remains at more than 3.46 V for 5 seconds or more. | (Engine oil pressure sensor circuit is open or shorted.) Fuel rail pressure sensor Power steering pressure sensor Low fuel pressure sensor Engine oil 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.
- 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 at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start the engine ON and wait at least 60 seconds.
- Check DTC or 1st trip DTC.

Is DTC or 1st trip DTC detected?

YES >> Proceed to EC-834, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005926902

1. CHECK FRP SENSOR POWER SUPPLY-I

- 1. Turn ignition switch OFF.
- 2. Disconnect FRP sensor connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between FRP sensor harness connector terminals.

| | V 16 | | |
|-----------|------|-------|----------------------|
| Connector | + | ı | Voltage (Approx.) |
| Connector | tern | ninal | , |
| F6 | 1 | 3 | 5 V |

Inspection result normal?

YES >> GO TO 6. NO >> GO TO 2.

2. CHECK FRP SENSOR POWER SUPPLY-II

P0190, P0192, P0193 FRP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Check the voltage between FRP sensor harness connector and the ground.

| | + | | \/alta = a | |
|--------------------|--------|--------|----------------------|--|
| FRP | sensor | _ | Voltage (Approx.) | |
| Connector Terminal | | | (11 / | |
| F6 | 1 | Ground | 5 V | |

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Is inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.check sensor power supply circuit

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check harness connector for short to power and short to ground, between the following terminals.

| ECM | | Sensor | | | |
|-----------|----------|--------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| | 27 | Power steering pressure sensor | F35 | 3 | |
| F110 | | Low fuel pressure sensor | F39 | 3 | |
| 1 110 | | FRP sensor | F6 | 1 | |
| | | Engine oil pressure sensor | F32 | 3 | |

Is inspection result normal?

>> Perform the trouble diagnosis for power supply circuit. Refer to EC-716, "Diagnosis Procedure".

NO >> Repair or replace error-detected parts.

4. CHECK FRP SENSOR GROUND CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- 3. Check the continuity between FRP sensor harness connector and ECM harness connector.

| + | | _ | | | | |
|-----------|----------|--------------------|----|---------|--|------------|
| FRP | sensor | ECM | | ECM | | Continuity |
| Connector | Terminal | Connector Terminal | | | | |
| F6 | 3 | F110 | 40 | Existed | | |

Is inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

${f 5.}$ CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| ECM | | Ground | Continuity | |
|-----------|----------|----------------|------------|--|
| Connector | Terminal | Giodila | Continuity | |
| F110 | 10 | | | |
| | 114 | | | |
| M160 | 115 | Ground Existed | Existed | |
| WITOO | 174 | | | |
| | 175 | | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

>> Repair or replace error-detected parts. NO

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< DTC/CIRCUIT DIAGNOSIS >

6. CHECK FRP SENSOR SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between FRP sensor harness connector and ECM harness connector.

| + | | 1 | | |
|-----------|----------|--------------------|----|------------|
| FRP | sensor | ECM | | Continuity |
| Connector | Terminal | Connector Terminal | | |
| F6 | 2 | F110 | 31 | Existed |

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7. CHECK FRP SENSOR

Refer to EC-836, "Component Inspection (Fuel Rail Pressure Sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38. "Intermittent Incident".

NO >> Repair or replace error-detected parts.

Component Inspection (Fuel Rail Pressure Sensor)

INFOID:0000000005926903

1. CHECK FRP SENSOR

(P)WITH CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connector disconnected.
- 3. Start the engine.
- Select "DATA MONITOR" mode with CONSULT-III.
- 5. Check that the "FUEL PRES SEN V" indication.

| Monitor Item | Condition | Values/Status |
|-----------------|---|------------------|
| | Engine speed: Idle | 980 – 1,200 mV |
| FUEL PRES SEN V | Engine speed: Revving engine from idle to 4,000 rpm quickly | 1,100 – 2,900 mV |

NUMBER OF THE PROPERTY OF THE

- 1. Turn ignition switch OFF.
- Reconnect harness connector disconnected.
- 3. Start the engine.
- Check FRP sensor signal voltage.

| | + | | _ | | Val. |
|-----------|----------|-----------|----------|---|--------------------|
| | EC | CM | | Condition | Value (Approx.) |
| Connector | Terminal | Connector | Terminal | | (44.5) |
| F110 | 31 | F110 | 40 | [Engine is running]Warm-up conditionIdle speed | 0.98 – 1.2 V |
| F110 | 31 | FIIO | 40 | [Engine is running]Warm-up conditionRevving engine from idle to 4,000 rpm quickly | 1.1 – 2.9 V |

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Replace FRP sensor. Refer to EM-197, "Exploded View".

P0191 FRP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0191 FRP SENSOR

DTC Logic INFOID:0000000005926904

DTC DETECTION LOGIC

| | | Ε | С |
|--|---|---|---|
| | _ | | |

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause | |
|---------|---------------------------|--|---|-------------|
| P0191 | Fuel rail pressure sensor | Fuel rail pressure remains at more than 1.5 MPa (15 bar, 15.3 kg/cm², 217.5 psi) for 0.2 seconds or more during ignition ON. | Harness or connectors (Fuel rail pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) (Engine oil pressure sensor circuit is open or shorted.) Fuel rail pressure sensor Power steering pressure sensor Low fuel pressure sensor Engine oil pressure sensor | C D E |

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 11 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

Start the engine and warm it up to the normal operating temperature.

Warm up the engine until "COOLAN TEMP/S" on "DATA MONITOR" of CONSULT-III reaches at least 70°C (158°F).

2. Turn the ignition switch OFF and cool the engine until the engine coolant temperature reaches 35°C (95°F) or less.

CAUTION:

- The difference between air temperature and engine coolant temperature must be 5°C or less.
- Do not turn ignition switch ON.
- 3. Turn ignition switch ON and wait at least 60 seconds.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-837, "Diagnosis Procedure".

NO >> INSPECTION END

1. CHECK FRP SENSOR POWER SUPPLY-I

Turn ignition switch OFF.

Diagnosis Procedure

- 2. Disconnect FRP sensor connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between FRP sensor harness connector terminals.

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INFOID:0000000005926905

| Connector | + - | | Voltage (Approx.) |
|-----------|------|-------|----------------------|
| Connector | tern | ninal | , , , |
| F6 | 1 | 3 | 5 V |

Inspection result normal?

YES >> GO TO 6.

NO >> GO TO 2.

2.CHECK FRP SENSOR POWER SUPPLY-II

Check the voltage between FRP sensor harness connector and the ground.

| | + | | Voltago | |
|------------|--------------------|--------|----------------------|--|
| FRP sensor | | _ | Voltage (Approx.) | |
| Connector | Connector Terminal | | (- / | |
| F6 | 1 | Ground | 5 V | |

Is inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.check sensor power supply circuit

- 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.

| ECM | | Sensor | | | |
|-----------|--------------------------|--------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| | 27 | Power steering pressure sensor | F35 | 3 | |
| F110 28 | Low fuel pressure sensor | F39 | 3 | | |
| | 28 | FRP sensor | F6 | 1 | |
| | 20 | Engine oil pressure sensor | F32 | 3 | |

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to <u>EC-716</u>, "<u>Diagnosis Procedure</u>".

NO >> Repair or replace error-detected parts.

4. CHECK FRP SENSOR GROUND CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between FRP sensor harness connector and ECM harness connector.

| + | | _ | | |
|-----------|----------|--------------------|----|------------|
| FRP | sensor | ECM | | Continuity |
| Connector | Terminal | Connector Terminal | | |
| F6 | 3 | F110 | 40 | Existed |

Is inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

| ECM | | Ground | Continuity | |
|-----------|----------|-------------------|------------|--|
| Connector | Terminal | Giouna | Continuity | |
| F110 | 10 | | | |
| | 114 | 114 115 174 | | |
| M160 | 115 | | Existed | |
| WHOO | 174 | | | |
| | 175 | | | |

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Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

6. CHECK FRP SENSOR SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between FRP sensor harness connector and ECM harness connector.

| + | | | | |
|-----------|------------|-----------|----------|------------|
| FRP | FRP sensor | | СМ | Continuity |
| Connector | Terminal | Connector | Terminal | |
| F6 | 2 | F110 | 31 | Existed |

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7. CHECK FRP SENSOR

Refer to EC-836, "Component Inspection (Fuel Rail Pressure Sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

Component Inspection (Fuel Rail Pressure Sensor)

INFOID:0000000006115631

1. CHECK FRP SENSOR

(A)WITH CONSULT-III

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connector disconnected.
- Start the engine.
- 4. Select "DATA MONITOR" mode with CONSULT-III.
- Check that the "FUEL PRES SEN V" indication.

| Monitor Item | Condition | Values/Status | |
|-----------------|---|------------------|---|
| | Engine speed: Idle | 980 – 1,200 mV | |
| FUEL PRES SEN V | Engine speed: Revving engine from idle to 4,000 rpm quickly | 1,100 – 2,900 mV | P |

NWITHOUT CONSULT-III

- Turn ignition switch OFF.
- Reconnect harness connector disconnected.
- 3. Start the engine.
- 4. Check FRP sensor signal voltage.

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P0191 FRP SENSOR

[VK56VD]

| | + EC | – M | | Condition | |
|-----------|----------|-----------|----------|---|--------------|
| Connector | Terminal | Connector | Terminal | Condition | (Approx.) |
| E110 | 24 | F110 | 40 | [Engine is running] • Warm-up condition • Idle speed | 0.98 – 1.2 V |
| F110 | 31 | FIIU | 40 | [Engine is running]Warm-up conditionRevving engine from idle to 4,000 rpm quickly | 1.1 – 2.9 V |

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Replace FRP sensor. Refer to EM-197, "Exploded View".

P0196 EOT SENSOR

DTC Logic INFOID:0000000005841036

DTC DETECTION LOGIC

NOTE:

If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197, P0198. Refer to EC-843, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0196 | EOT SENSOR (Engine oil temperature sensor range/performance) | Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor. | Harness or connectors (The EOT sensor circuit is open or shorted) Engine oil temperature sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and let it idle for 5 minutes and 10 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

>> EC-842, "Diagnosis Procedure". YES

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

(P) WITH CONSULT-III

- Select "DATA MONITOR" mode with CONSULT-III.
- 2. Check that "COOLAN TEMP/S" indicates above 80°C (176°F).

If it is above 80°C (176°F), go to the following steps.

If it is below 80°C (176°F), warm engine up until "COOLAN TEMP/S" indicates more than 80°C (176°F). Then perform the following steps.

- Turn ignition switch OFF and soak the vehicle in a cool place.
- Turn ignition switch ON.

NOTE:

Do not turn ignition switch OFF until step 8.

- Select "DATA MONITOR" mode with CONSULT-III.
- Check the following.

| COOLAN TEMP/S | Below 40°C (104°F) |
|--|--------------------|
| INT/A TEMP SE | Below 40°C (104°F) |
| Difference between "COOLAN TEMP/S" and "INT/A TEMP SE" | Within 6°C (11°F) |

If they are within the specified range, perform the following steps.

If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.

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< DTC/CIRCUIT DIAGNOSIS >

NOTE:

- · Do not turn ignition switch OFF.
- If it is supposed to need a long period of time, do not deplete the battery.
- 7. Start engine and let it idle for 5 minutes.
- Check 1st trip DTC.

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Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> EC-842, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841037

1. CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-842, "Component Inspection (Engine Oil Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine oil temperature sensor. Refer to EM-203, "2WD : Exploded View" (2WD) or EM-206, "AWD: Exploded View" (AWD).

2.check intermittent incident

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

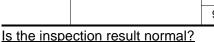
Component Inspection (Engine Oil Temperature Sensor)

INFOID:0000000005841038

1. CHECK ENGINE OIL TEMPERATURE SENSOR

- Turn ignition switch OFF.
- Disconnect engine oil temperature sensor harness connector.
- Remove engine oil temperature sensor.
- Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

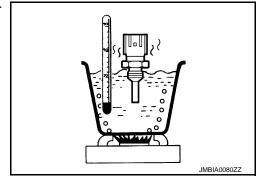
| Terminals | Condition | Resistance ($k\Omega$) | |
|-----------|-----------------------|--------------------------|---------------|
| | | 20 (68) | 2.1 - 2.9 |
| 1 and 2 | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | 0.236 - 0.260 |



>> INSPECTION END

YES

NO >> Replace engine oil temperature sensor.



P0197, P0198 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0197, P0198 EOT SENSOR

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC Detecting Condition | Possible Cause | |
|---------|---|---|---|--|
| P0197 | EOT SEN/CIRC (Engine oil temperature sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (The EOT sensor circuit is open or short- | |
| P0198 | EOT SEN/CIRC (Engine oil temperature sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | ed.) • Engine oil 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.
- 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 at least 5 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-843, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841041

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1. CHECK ENGINE OIL TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect engine oil temperature (EOT) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between EOT sensor harness connector and ground.

| EOT : | sensor | Ground | Voltage (V) |
|-----------|------------------|--------|-------------|
| Connector | nnector Terminal | | voltage (v) |
| F38 | 1 | Ground | Approx. 5 |

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 EOT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between EOT sensor harness connector and ECM harness connector.

| EOT sensor | | ECM | | Continuity |
|------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| F38 | 2 | F110 | 40 | Existed |

4. Also check harness for short to ground and short to power.

Revision: 2010 June **EC-843** 2011 M37/M56

P0197, P0198 EOT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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 oil temperature sensor

Refer to EC-844, "Component Inspection (Engine Oil Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace engine oil temperature sensor. Refer to <u>EM-203, "2WD : Exploded View"</u> (2WD) or <u>EM-</u>206, "AWD : Exploded View" (AWD).

4. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Engine Oil Temperature Sensor)

INFOID:0000000006115633

[VK56VD]

1. CHECK ENGINE OIL TEMPERATURE SENSOR

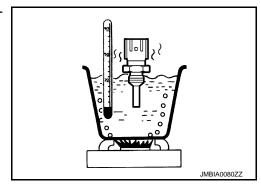
- 1. Turn ignition switch OFF.
- 2. Disconnect engine oil temperature sensor harness connector.
- 3. Remove engine oil temperature sensor.
- 4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.

| Terminals | Condition | Resistance (kΩ) | |
|-----------|-----------------------|-----------------|---------------|
| | | 20 (68) | 2.1 - 2.9 |
| 1 and 2 | Temperature [°C (°F)] | 50 (122) | 0.68 - 1.00 |
| | | 90 (194) | 0.236 - 0.260 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine oil temperature sensor.



P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208 INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208 INJECTOR

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|-----------------------------|--|--|
| P0201 | No.1 fuel injector circuit | ECM detects No. 1 injector circuit is open or shorted. | |
| P0202 | No. 2 fuel injector circuit | ECM detects No. 2 injector circuit is open or shorted. | |
| P0203 | No. 3 fuel injector circuit | ECM detects No. 3 injector circuit is open or shorted. | |
| P0204 | No. 4 fuel injector circuit | ECM detects No. 4 injector circuit is open or shorted. | The fuel injector circuit is open or shorted Fuel injector |
| P0205 | No. 5 fuel injector circuit | ECM detects No. 5 injector circuit is open or shorted. | • ECM |
| P0206 | No. 6 fuel injector circuit | ECM detects No. 6 injector circuit is open or shorted. | |
| P0207 | No. 7 fuel injector circuit | ECM detects No. 7 injector circuit is open or shorted. | |
| P0208 | No. 8 fuel injector circuit | ECM detects No. 8 injector circuit is open or shorted. | |

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, conform that battery voltage is 11 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. Start the engine and let it idle at least 30 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-845, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

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INFOID:00000000006034695

1. PERFORM TROUBLE DIAGNOSIS FOR INJECTOR

Refer to EC-1067, "Component Function Check".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

Revision: 2010 June **EC-845** 2011 M37/M56

P0222, P0223, P2132, P2133 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0222, P0223, P2132 or P2133 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-939</u>, "<u>DTC Logic"</u>.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0222 | TP SEN 1/CIRC-B1 [Throttle position sensor 1 (bank 1) circuit low input] | An excessively low voltage from the TP sensor 1 is sent to ECM. | |
| P0223 | TP SEN 1/CIRC-B1 [Throttle position sensor 1 (bank 1) circuit high input] | An excessively high voltage from the TP sensor 1 is sent to ECM. | Harness or connectors (TP sensor 1 circuit is open or shorted.) |
| P2132 | TP SEN 1/CIRC-B2 [Throttle position sensor 1 (bank 2) circuit low input] | An excessively low voltage from the TP sensor 1 is sent to ECM. | Electric throttle control actuator (TP sensor 1) |
| P2133 | TP SEN 1/CIRC-B2 [Throttle position sensor 1 (bank 2) circuit high input] | An excessively high voltage from the TP sensor 1 is sent to ECM. | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 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 and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-846, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841045

1.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

- 1. Disconnect electric throttle control actuator harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between electric throttle control actuator harness connector and ground.

| DTC | Electr | ic throttle cont | Ground | Voltage (V) | | |
|--------------|--------|------------------|----------|-------------|-------------|--|
| ыс | Bank | Connector | Terminal | Giodila | voitage (v) | |
| P0222, P0223 | 1 | F66 | 2 | Ground | Approx. 5 | |
| P2132, P2133 | 2 | F64 | 2 | Giodila | дрргох. 5 | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

P0222, P0223, P2132, P2133 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

2.check throttle position sensor 1 ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

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| DTC | Electric throttle control actuator | | | EC | Continuity | |
|--------------|------------------------------------|-----------|----------|-----------|------------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0222, P0223 | 1 | F66 | 4 | F111 | 97 | Existed |
| P2132, P2133 | 2 | F64 | 4 | 1 111 | 69 | LXISIGU |

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 THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electri | c throttle cont | rol actuator | EC | Continuity | |
|--------------|---------|-----------------|--------------|-----------|------------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0222, P0223 | 1 | F66 | 1 | F111 | 91 | Existed |
| P2132, P2133 | 2 | F64 | 1 | 1 111 | 71 | LXISIEU |

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 THROTTLE POSITION SENSOR

Refer to EC-847, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

1. CHECK THROTTLE POSITION SENSOR

- 1. Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- Perform <u>EC-695</u>, "Work Procedure".
- 4. Turn ignition switch ON.
- 5. Set selector lever position to D.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

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| | ECM | | | | |
|-----------|------------------------------|----------|------------------------------------|----------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| | Terminal | Terminal | | | |
| | 91 | 97 | Accelerator pedal: Fully released | More than 0.36 | |
| | [TP sensor 1 (bank 1)] | 91 | Accelerator pedal: Fully depressed | Less than 4.75 | |
| | 71 [TP sensor 1 (bank 2)] | 69 | Accelerator pedal: Fully released | More than 0.36 | |
| F111 | | 09 | Accelerator pedal: Fully depressed | Less than 4.75 | |
| 1 111 | 79 | 97 | Accelerator pedal: Fully released | Less than 4.75 | |
| | [TP sensor 2 (bank 1)] | 97 | Accelerator pedal: Fully depressed | More than 0.36 | |
| | 89 | 69 | Accelerator pedal: Fully released | Less than 4.75 | |
| | [TP sensor 2 (bank 2)] | 09 | Accelerator pedal: Fully depressed | More than 0.36 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

$2. \\ \text{REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR}$

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MIS-**FIRE**

DTC Logic INFOID:0000000005841049

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DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor signal to vary, ECM can determine that a misfire is occurring.

| Sensor | Input signal to ECM | ECM function |
|----------------------------|---------------------|-------------------------------|
| Crankshaft position sensor | Engine speed | On board diagnosis of misfire |

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)

On the 1st trip that 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 light 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. | |
| 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. | Improper spark plug Insufficient compression |
| P0303 | CYL 3 MISFIRE (No. 3 cylinder misfire detected) | No. 3 cylinder misfires. | Incorrect fuel pressure The fuel injector circuit is open or shorted |
| P0304 | CYL 4 MISFIRE (No. 4 cylinder misfire detected) | No. 4 cylinder misfires. | Fuel injector Intake air leakage The ignition signal circuit is open or shorted |
| P0305 | CYL 5 MISFIRE (No. 5 cylinder misfire detected) | No. 5 cylinder misfires. | Lack of fuelSignal plate |
| P0306 | CYL 6 MISFIRE (No. 6 cylinder misfire detected) | No. 6 cylinder misfires. | A/F sensor 1 Incorrect PCV hose connection |
| 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.

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

EC-849 Revision: 2010 June 2011 M37/M56

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< DTC/CIRCUIT DIAGNOSIS >

>> GO TO 2.

2.perform dtc confirmation procedure-i

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart engine and let it idle for about 15 minutes.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-850, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform dtc confirmation procedure-ii $\,$

- 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 $\pm400~\text{rpm}$ | | | |
|---|--|--|--|--|
| 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 |

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-850, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841050

1.CHECK FOR INTAKE AIR LEAKAGE AND PCV HOSE

- Start engine and run it at idle speed.
- Listen for the sound of the intake air leakage.
- Check PCV hose connection.

Is intake air leakage detected?

>> Discover air leakage location and repair. YES

NO >> GO TO 2.

< DTC/CIRCUIT DIAGNOSIS >

2.check for exhaust system clogging

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 3.

YES-2 >> Without CONSULT-III: GO TO 4.

NO >> Repair or replace malfunctioning part.

3.PERFORM POWER BALANCE TEST

(P) WITH CONSULT-III

- Start engine.
- 2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 4.

4. CHECK FUNCTION OF FUEL INJECTOR-I

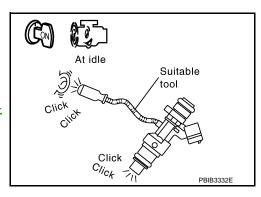
- 1. Start engine and let it idle.
- Listen to each fuel injector operation.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Perform trouble diagnosis for fuel injector, refer to <u>EC-1067</u>, "Diagnosis Procedure".



5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

- Turn ignition switch OFF.
- 2. Remove fuel pump fuse No. in IPDM E/R to release fuel pressure.

NOTE:

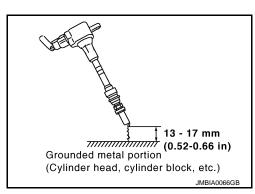
Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.

- Start engine.
- 4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
- Turn ignition switch OFF.
- 6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 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 approximately 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.



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< DTC/CIRCUIT DIAGNOSIS >

• It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.

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 9. NO >> GO TO 6.

6.CHECK FUNCTION OF IGNITION COIL-II

- Turn ignition switch OFF.
- Disconnect spark plug and connect a non-malfunctioning spark plug.
- 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 7.

NO >> Check ignition coil, power transistor and their circuits. Refer to EC-1075, "Diagnosis Procedure".

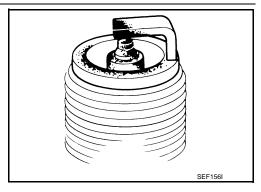
7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

>> Replace spark plug(s) with standard type one(s). For YES spark plug type, refer to EM-300, "Spark Plug".

NO >> Repair or clean spark plug. Then GO TO 8.



8.check function of ignition coil-iii

- Reconnect the initial spark plugs.
- 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-300, "Spark Plua".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-172, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10.CHECK FUEL PRESSURE

- Install all removed parts.
- Check fuel pressure. Refer to EC-701, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 12. >> GO TO 11. NO

1. DETECT MALFUNCTIONING PART

< DTC/CIRCUIT DIAGNOSIS >

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

>> Replace "fuel filter and fuel pump assembly". Refer to FL-6, "Removal and Installation".

NO >> Repair or replace malfunctioning part.

12. CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.

- Idle speed: For procedure, refer to EC-1098, "Inspection". For specification, refer to EC-1109, "Idle Speed"
- Ignition timing: For procedure, refer to EC-1099, "Inspection". For specification, refer to EC-1109, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Perform basic inspection. Refer to EC-687, "Work Procedure".

13. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect corresponding A/F sensor 1 harness connector.
- Disconnect ECM harness connector. 3.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| | A/F sensor | A/F sensor 1 ECM | | | Continuity | |
|------|------------|-----------------------------|------|----------|------------|--|
| Bank | Connector | Connector Terminal Connecto | | Terminal | Continuity | |
| | 3 | | | 88 | | |
| 1 | F23 | 4 | | 90 | | |
| | | 6 | F111 | 94 | Existed | |
| | | 3 | | 78 | Existed | |
| 2 | F24 | 4 | | 80 | | |
| | | 6 | | 74 | | |

Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| | A/F sensor | 1 | ECM | | Ground | Continuity | |
|------|------------|----------|-----------|----------|---------|------------|--|
| Bank | Connector | Terminal | Connector | Terminal | Olouliu | Continuity | |
| | | 3 | | 88 | | | |
| 1 | F23 | F23 4 | -23 4 | | 90 | | |
| | | 6 | F111 | 94 | Ground | Existed | |
| | 2 F24 4 6 | 3 | FIII | 78 | | | |
| 2 | | 4 | | 80 | | | |
| | | | 74 | | | | |

Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

14. CHECK A/F SENSOR 1 HEATER

Refer to EC-741, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 15.

>> Replace malfunctioning A/F sensor 1. Refer to EM-222, "Exploded View". NO

15. CHECK MASS AIR FLOW SENSOR

WITH CONSULT-III

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< DTC/CIRCUIT DIAGNOSIS >

Check mass air flow sensor signal in "DATA MONITOR" mode with CONSULT-III.

For specification, refer to EC-1109, "Mass Air Flow Sensor".

WITH GST

Check mass air flow sensor signal in Service \$01 with GST.

For specification, refer to EC-1109, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 16.

NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-759, "Diagnosis Procedure".

16. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-1091, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 17.

>> Repair or replace malfunctioning part.

17. 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 PEC-601, CONSULT-III Function" or ©EC-598, "On Board Diagnosis Function".

>> GO TO 18.

18. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0327, P0328, P0332, P0333 KS

DTC Logic

DTC DETECTION LOGIC

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| 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. | | |
| P0328 | KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit high input] | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (The knock sensor circuit is open or | |
| P0332 | KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit low input] | An excessively low voltage from the sensor is sent to ECM. | shorted.) • Knock sensor | |
| 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

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 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 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-855, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841053

1. CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Disconnect knock sensor harness connector and ECM harness connector.
- Check the continuity between knock sensor harness connector and ECM harness connector.

| DTC | Knock sensor | | | EC | Continuity | |
|--------------|--------------|-----------|----------|-----------|------------|------------|
| D10 | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0327, P0328 | 1 | F212 | 2 | F110 | 10 35 | Existed |
| P0332, P0333 | 2 | F213 | 2 | F110 33 | | LXISTEG |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.

Revision: 2010 June **EC-855** 2011 M37/M56

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- · Harness for open or short between knock sensor and ECM
- Loose or poor connection for each connector and harness
 - >> Repair open circuit or short to power in harness or connectors.

${f 3.}$ CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between knock sensor harness connector and ECM harness connector.

| DTC | Knock sensor | | ECM | | Continuity | |
|--------------|--------------|-----------|----------|-----------|------------|------------|
| ы | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0327, P0328 | 1 | F212 | 1 | F110 | 29 | Existed |
| P0332, P0333 | 2 | F213 | 1 | FIIU | 33 | EXISTEC |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and knock sensor
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK KNOCK SENSOR

Refer to EC-856, "Component Inspection (Knock Sensor)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning knock sensor. Refer to EM-273, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Knock Sensor)

INFOID:0000000005841054

1. CHECK KNOCK SENSOR

- 1. Turn ignition switch OFF.
- Disconnect knock sensor harness connector.
- Check resistance between knock sensor terminals as per the following.

NOTE

It is necessary to use an ohmmeter which can measure more than 10 M Ω .

| Terminals | Resistance |
|-----------|---|
| 1 and 2 | Approx. 532 - 588 k Ω [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-273, "Exploded View".

P0335 CKP SENSOR

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0335 | CKP SEN/CIRCUIT (Crankshaft position sensor circuit) | The crankshaft position sensor signal is not detected by the ECM during the first few seconds of engine cranking. The proper pulse signal from the crankshaft position sensor is not sent to ECM while the engine is running. The crankshaft position sensor signal is not in the normal pattern during engine running. | Harness or connectors (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Crankshaft position sensor Camshaft position sensor Camshaft position sensor (bank 1) Accelerator pedal position sensor 2 Battery current sensor EVAP control system pressure sensor Refrigerant pressure sensor Signal plate |

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 10.5 V or more 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-857, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841057

1. CHECK CRANKSHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect crankshaft position (CKP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between CKP sensor harness connector and ground.

| CKP sensor | | Ground | Voltage (V) | |
|------------|----------|---------|-------------|--|
| Connector | Terminal | Giodila | voltage (v) | |
| F2 | 1 | Ground | Approx. 5 V | |

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 2.

2.CHECK CKP SENSOR POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch ON.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CKP sensor harness connector and ECM harness connector.

| CKP sensor | | ECM | | Continuity |
|------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F2 | 1 | F111 | 76 | Existed |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit.

3. 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 | | |
| 76 | | CKP sensor | F2 | 1 | | |
| F111 — | 77 | Camshaft position sensor (bank 1) | F84 | 1 | | |
| M160 | 133 | Battery current sensor | E21 | 1 | | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | | |
| | 133 | Refrigerant pressure sensor | E77 | 3 | | |
| | 137 | APP sensor 2 (Without ICC) | M9 | 5 | | |
| | 137 | APP sensor 2 (With ICC) | M153 | 6 | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 1) (Refer to <u>EC-864, "Component Inspection (Camshaft Position Sensor)"</u>.)
- Battery current sensor (Refer to EC-989, "Component Inspection (Battery Current Sensor)".)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)"</u>.)
- Refrigerant pressure sensor (Refer to EC-1089, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-1039, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 11. NO >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to following.

 Models with Distance Control Assist system: <u>ACC-3</u>, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"

P0335 CKP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Models without Distance Control Assist system: <u>ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"</u>

>> INSPECTION END

7.CHECK CKP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between CKP sensor harness connector and ECM harness connector.

| CKP sensor | | ECM | | Continuity |
|------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F2 | 2 | F111 | 98 | Existed |

4. 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 CKP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor harness connector and ECM harness connector.

| CKP s | ensor | EC | CM | Continuity |
|-----------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F2 | 3 | F111 | 86 | 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 CRANKSHAFT POSITION SENSOR

Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO

>> Replace crankshaft position sensor. Refer to <u>EM-203, "2WD : Exploded View"</u> (2WD) or <u>EM-206, "AWD : Exploded View"</u> (AWD).

10. CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace the signal plate. Refer to EM-273, "Exploded View"

11. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Crankshaft Position Sensor)

1. CHECK CRANKSHAFT POSITION SENSOR-I

- Turn ignition switch OFF.
- Loosen the fixing bolt of the sensor.
- Disconnect crankshaft position sensor harness connector.
- Remove the sensor.

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INFOID:0000000005841058

P0335 CKP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

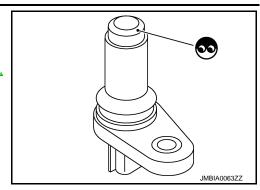
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace

>> Replace crankshaft position sensor. Refer to <u>EM-225</u>, <u>"Exploded View"</u>.



2.CHECK CRANKSHAFT POSITION SENSOR-II

Check resistance between crankshaft position sensor terminals as per the following.

| Terminals (Polarity) | Resistance |
|----------------------|--|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ Ω [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace crankshaft position sensor. Refer to EM-225, "Exploded View".

P0340, P0345 CMP SENSOR

DTC Logic INFOID:0000000005841060

DTC DETECTION LOGIC

NOTE:

If DTC P0345 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-939, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P0340 | CMP SEN/CIRC-B1 [Camshaft position sensor (bank 1) circuit] | 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. | Harness or connectors [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Camshaft position sensor (bank 1) Crankshaft position sensor Accelerator pedal position sensor 2 Battery current sensor EVAP control system pressure sensor Refrigerant pressure sensor Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery |
| P0345 | Camshaft position sensor (bank 2) circuit (CMP SEN/CIRC-B2) | | Harness or connectors [Camshaft position sensor (bank 2) circuit is open or shorted.] Camshaft position sensor (bank 2) Camshaft (INT) Starter motor Starting system circuit Dead (Weak) battery |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 10.5 V or more 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-862, "Diagnosis Procedure".

NO >> GO TO 3.

EC-861 Revision: 2010 June 2011 M37/M56

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< DTC/CIRCUIT DIAGNOSIS >

3.perform dtc confirmation procedure-i

- 1. Maintain engine speed at more than 800 rpm for at least 5 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-862, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841061

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 STR-13, "Work Flow".

2.CHECK CAMSHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect camshaft position (CMP) sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between CMP sensor harness connector and ground.

| DTC | CMP sensor | | | Ground | Voltage (V) |
|-------|------------|-----------|----------|---------|-------------|
| DIC | Bank | Connector | Terminal | Ground | voltage (v) |
| P0340 | 1 | F84 | 1 | Ground | Approx. 5 |
| P0345 | 2 | F83 | 1 | Giodila | Арргох. 3 |

Is the inspection result normal?

YES >> GO TO 8.

NO-1 >> P0340: GO TO 3.

NO-2 >> P0345: Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK CMP SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between CMP sensor harness connector and ECM harness connector.

| CMP sensor | | | EC | Continuity | | |
|------------|-----------|----------|-----------|------------|------------|--|
| Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| 1 | F84 | 1 | F111 | 77 | Existed | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit.

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 | |
| F111 | 76 | CKP sensor | F2 | 1 | |
| 1 1111 | 77 | Camshaft position sensor (bank 1) | F84 | 1 | |

P0340, P0345 CMP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| ECM | | Sensor | | | |
|-----------|----------|-------------------------------------|------|----------|--|
| Connector | Terminal | Terminal Name | | Terminal | |
| | 133 | Battery current sensor | E21 | 1 | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | |
| | 137 | APP sensor 2 (Without ICC) | M9 | 5 | |
| | 137 | APP sensor 2 (With ICC) | M153 | 6 | |

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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.

- CKP sensor (Refer to <u>EC-859</u>, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to <u>EC-864, "Component Inspection (Camshaft Position Sensor)"</u>.)
- Battery current sensor (Refer to <u>EC-989, "Component Inspection (Battery Current Sensor)"</u>.)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System</u>) Pressure Sensor)".)
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-1039, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to following.

- Models without Distance Control Assist system: <u>ACC-3, "MODELS WITHOUT DISTANCE CONTROL</u> ASSIST SYSTEM: Removal and Installation"
- Models with Distance Control Assist system: ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYS-TEM: Removal and Installation"

>> INSPECTION END

8.CHECK CMP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between CMP sensor harness connector and ECM harness connector.

| DTC | CMP sensor | | | ECM | | Continuity |
|-------|------------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0340 | 1 | F84 | 2 | F111 | 68 | Existed |
| P0345 | 2 | F83 | 2 | | 99 | LAISIEU |

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 CMP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between CMP sensor harness connector and ECM harness connector.

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| DTC | CMP sensor | | | ECM | | Continuity |
|-------|------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P0340 | 1 | F84 | 3 | F111 | 95 | Existed |
| P0345 | 2 | F83 | 3 | | 73 | LAISIGU |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK CAMSHAFT POSITION SENSOR

Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning camshaft position sensor.

11. CHECK CAMSHAFT SPROCKET (SIGNAL PLATE)

Check the following.

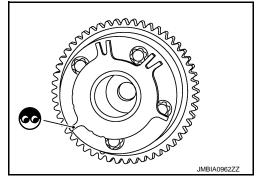
- Accumulation of debris to the signal plate of camshaft sprocket (INT)
- Chipping signal plate of camshaft sprocket (INT)

Is the inspection result normal?

YES >> GO TO 12.

NO

>> Remove debris and clean the signal plate of camshaft sprocket (INT).



12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Camshaft Position Sensor)

INFOID:0000000005841062

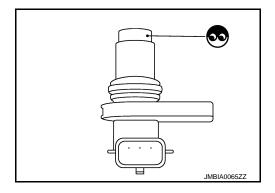
1. CHECK CAMSHAFT POSITION SENSOR-I

- 1. Turn ignition switch OFF.
- 2. Loosen the fixing bolt of the sensor.
- 3. Disconnect camshaft position sensor 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.



2. CHECK CAMSHAFT POSITION SENSOR-II

Check resistance camshaft position sensor terminals as per the following.

P0340, P0345 CMP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Terminals (Polarity) | Resistance |
|----------------------|----------------------------------|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ Ω [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

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Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning camshaft position sensor.

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[VK56VD]

P0420, P0430 THREE WAY CATALYST FUNCTION

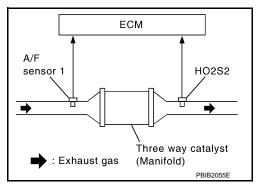
DTC Logic

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)] | Three way catalyst (manifold) does not operate properly. | Three way catalyst (manifold) Exhaust tube Intake air leakage |
| P0430 | TW CATALYST SYS-B2 [Catalyst system efficiency below threshold (bank 2)] | Three way catalyst (manifold) does not have enough oxygen storage capacity. | Fuel injectorFuel injector leakageSpark plugImproper ignition timing |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

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.
- Turn ignition switch OFF and wait at least 10 seconds.

Will CONSULT-III be used?

YES >> GO TO 2.

NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

(P) WITH CONSULT-III

TESTING CONDITION:

Do not maintain engine speed for more than the specified minutes below.

- 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.
- 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.
- Select "DATA MONITOR" mode with CONSULT-III.
- 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 to 70°C (158°F).
- Open engine hood.
- 10. Select "DTC & SRT CONFIRMATION" then "SRT WORK SUPPORT" mode with CONSULT-III.
- Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
- Check the indication of "CATALYST".

Which is displayed on CONSULT-III screen?

P0420, P0430 THREE WAY CATALYST FUNCTION [VK56VD] < DTC/CIRCUIT DIAGNOSIS > CMPLT>> GO TO 5. INCMP >> GO TO 3. Α 3.PERFORM DTC CONFIRMATION PROCEDURE-II Wait 5 seconds at idle. EC 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 5. NO >> GO TO 4. f 4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN Stop engine and cool it down to less than 70°C (158°F). Perform DTC CONFIRMATION PROCEDURE again. Е >> GO TO 2. 5. PERFORM DTC CONFIRMATION PROCEDURE-III Check 1st trip DTC. Is 1st trip DTC detected? YES >> Proceed to EC-868, "Diagnosis Procedure". NO >> INSPECTION END O.PERFORM COMPONENT FUNCTION CHECK WITH GST Perform component function check. Refer to EC-867, "Component Function Check". 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 >> Proceed to EC-868, "Diagnosis Procedure" NO Component Function Check INFOID:0000000005841064 ${f 1}$.PERFORM COMPONENT FUNCTION CHECK With GST 1. Start engine and warm it up to the normal operating temperature.

- 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.
- Open engine hood.
- Check the voltage between ECM harness connector terminals under the following conditions.

| | | ECM | | | | |
|-------|-----------|---------------------------|----------|--|--|--|
| DTC | Connector | + | _ | Condition | Voltage | |
| | Connector | Terminal | Terminal | | | |
| P0420 | F110 | 96 [HO2S2 (bank 1)] | 100 | constant under no load than 5 seconds. | The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0 | |
| P0430 | 1 110 | 87 [HO2S2 (bank 2)] | 100 | | | |

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Is the inspection result normal?

YES >> INSPECTION END

>> Proceed to EC-868, "Diagnosis Procedure". NO

EC-867 Revision: 2010 June 2011 M37/M56

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Diagnosis Procedure

INFOID:0000000005841065

1. CHECK EXHAUST SYSTEM

Visually check exhaust tubes and muffler for dents.

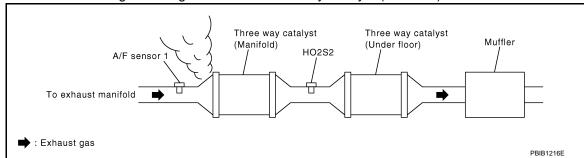
Is the inspection result normal?

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 IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.

For procedure, refer to EC-687, "Work Procedure".

For specification, refer to EC-1109, "Idle Speed" and EC-1109, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Follow the <u>EC-687</u>, "Work Procedure".

${f 5.}$ CHECK FUEL INJECTORS

Refer to EC-1067, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Perform <u>EC-1067</u>, "<u>Diagnosis Procedure</u>".

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:

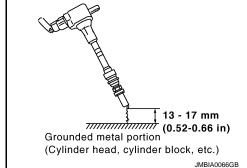
- For the fuse number, refer to EC-656, "Wiring Diagram".
- For the fuse arrangement, refer to PG-133, "Fuse, Connector and Terminal Arrangement".
- Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
- Start engine.
- 4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
- Turn ignition switch OFF.

P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
- 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 approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

- 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.

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

- Turn ignition switch OFF.
- 2. Disconnect spark plug and connect a non-malfunctioning spark plug.
- 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.

>> Check ignition coil, power transistor and their circuits. Refer to EC-1075, "Diagnosis Procedure". NO

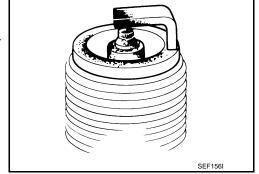
8.CHECK SPARK PLUG

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-300, "Spark Plug".

NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

- Reconnect the initial spark plugs.
- 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?

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YES >> INSPECTION END

> **EC-869** 2011 M37/M56

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P0420, P0430 THREE WAY CATALYST FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-300, "Spark Plug".

10. CHECK FUEL INJECTOR

- 1. Turn ignition switch OFF.
- 2. Remove fuel injector assembly.

Refer to EM-197, "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 fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping.

NO >> GO TO 11.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace three way catalyst assembly.

NO >> Repair or replace harness or connector.

[VK56VD]

P0441 EVAP CONTROL SYSTEM

DTC Logic INFOID:0000000005841066

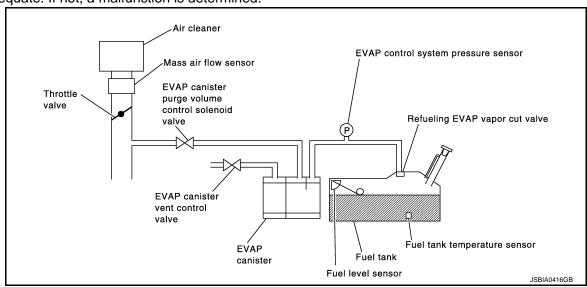
DTC DETECTION LOGIC

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 incor- rect purge flow) | EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor. | EVAP canister purge volume control sole- noid 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 sole- noid valve circuit Accelerator pedal position sensor Blocked purge port 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.

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

Will CONSULT-III be used?

YES >> GO TO 2.

>> GO TO 5. NO

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[VK56VD]

2.perform dtc confirmation procedure-i

(II) WITH CONSULT-III

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

- Start engine and warm it up to normal operating temperature.
- 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.
- Select "PURG FLOW P0441" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CON-SULT-III.
- 7. Touch "START".

Is "COMPLETED" displayed on CONSULT-III screen?

YES >> GO TO 4.

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, "TESTING" will be displayed on the CONSULT-III 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 | 1.3 - 9.0 msec |
| COOLAN TEMP/S | More than 0°C (32°F) |

CAUTION:

Always drive vehicle at a safe speed.

NOTE

If "TESTING" does not change for a long time, retry from step 2.

Is "COMPLETED" displayed on CONSULT-III screen?

YES >> GO TO 4.

NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 2.

4. PERFORM DTC CONFIRMATION PROCEDURE-III

Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

NG >> Proceed to <u>EC-873</u>, "<u>Diagnosis Procedure</u>".

5.PERFORM COMPONENT FUNCTION CHECK

WITH GST

Perform component function check. Refer to EC-872, "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-873, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005841067

1. PERFORM COMPONENT FUNCTION CHECK

WITH GST

- 1. Lift up drive wheels.
- Start engine (VDC switch OFF) and warm it up to normal operating temperature.

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P0441 EVAP CONTROL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- Turn ignition switch OFF and wait at least 10 seconds.
- 4. Start engine and wait at least 70 seconds.
- Set voltmeter probes to ECM harness connector terminals under the following conditions. 5.

| ECM | | | | |
|-----------|--|----------|--|--|
| Connector | + | _ | | |
| Connector | Terminal | Terminal | | |
| M160 | 143 (EVAP control system pressure sensor signal) | 150 | | |

Check EVAP control system pressure sensor value at idle speed and note it.

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 |

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

>> Proceed to EC-873, "Diagnosis Procedure". NO

Diagnosis Procedure

INFOID:0000000005841068

1. CHECK EVAP CANISTER

- Turn ignition switch OFF.
- Check EVAP canister for cracks. 2.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 2.

YES-2 >> Without CONSULT-III: GO TO 3.

>> Replace EVAP canister. Refer to EC-1108, "Removal and Installation".

2.CHECK PURGE FLOW

- (P) WITH CONSULT-III
- Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP ser-
- Start engine and let it idle.
- Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.
- Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL CONT/V" opening and check vacuum existence.

| PURG VOL CONT/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-III

- Start engine and warm it up to normal operating temperature.
- Stop engine.

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< DTC/CIRCUIT DIAGNOSIS >

- 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-580, "EVAPORATIVE EMISSION SYSTEM: System Description".
- 4. Start engine and let it idle.

Never 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.
- Check EVAP purge line for improper connection or disconnection. Refer to <u>EC-1106</u>, "<u>Hydraulic Layout</u>".

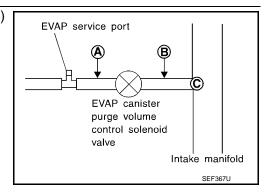
Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair EVAP purge line.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

- 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**).

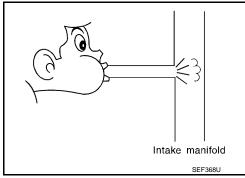


3. Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 6. YES-2 >> Without CONSULT-III: GO TO 7.

NO >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

- (P) WITH CONSULT-III
- Start engine.
- 2. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. 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.

P0441 EVAP CONTROL SYSTEM

[VK56VD] < DTC/CIRCUIT DIAGNOSIS > 7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE Refer to EC-879, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)". Is the inspection result normal? YES >> GO TO 8. EC >> Replace EVAP canister purge volume control solenoid valve. Refer to EC-1106, "Exploded View" NO 8.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR Disconnect EVAP control system pressure sensor harness connector. Check that water is not inside connectors. Is the inspection result normal? D YES >> GO TO 9. NO >> Replace EVAP control system pressure sensor. Refer to EC-1106, "Exploded View". 9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION Е Refer to EC-895, "DTC Logic" for DTC P0452, EC-900, "DTC Logic" for DTC P0453. Is the inspection result normal? F YES >> GO TO 10. NO >> Replace EVAP control system pressure sensor. 10.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? Н YES >> GO TO 11. NO >> Clean the rubber tube using an air blower. 11. CHECK EVAP CANISTER VENT CONTROL VALVE Refer to EC-886, "Component Inspection (EVAP Canister Vent Control Valve)". Is the inspection result normal? YES >> GO TO 12. NO >> Replace EVAP canister vent control valve. 12. CHECK EVAP PURGE LINE Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks. Refer to EC-1106, "Hydraulic Layout". Is the inspection result normal? YES >> GO TO 13. >> Repair or replace malfunctioning part. NO 13. CLEAN EVAP PURGE LINE Clean EVAP purge line (pipe and rubber tube) using air blower. N >> GO TO 14. 14. CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END

Revision: 2010 June **EC-875** 2011 M37/M56

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | | DTC detecting condition | Possible cause |
|---------|--|---|--|--|
| | PURG VOLUME CONT/V (EVAP canister purge vol- | А | 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. | EVAP control system pressure sensor EVAP canister purge volume control solenoid valve (The valve is stuck open.) |
| P0443 | ume control solenoid valve) | В | The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed. | EVAP canister vent control valve EVAP canister Hoses (Hoses are connected incorrectly or clogged.) |

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-III

YES >> GO TO 2. NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE A

(P)WITH CONSULT-III

- 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?

OK >> Proceed to EC-877, "Diagnosis Procedure".

NG >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE B

(P)WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Select "PURG VOL CN/V P1444" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.
- 7. Touch "START".
- 8. Start engine and let it idle until "TESTING" on CONSULT-III changes to "COMPLETED". (It will take approximately 10 seconds.)

If "TESTING" is not displayed after 5 minutes, retry from step 2.

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END

>> Proceed to EC-877, "Diagnosis Procedure". NG

4. PERFORM DTC CONFIRMATION PROCEDURE A

WITH GST

- 1. Turn ignition switch ON.
- 2. Set voltmeter probes to ECM harness connector terminals.

| | ECM | | |
|-------------|--|------------------------|-------------|
| Connector + | | _ | Voltage (V) |
| Connector | Terminal | Terminal | |
| M160 | 134 (Fuel tank temperature sensor signal) | 175 (Sensor ground) | 3.1 - 4.0 |

- Start engine and wait at least 60 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-877, "Diagnosis Procedure".

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE B

■WITH GST

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and let it idle for at least 20 seconds.
- Check 1st trip DTC.

Is 1st trip DTC displayed?

>> Proceed to EC-877, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

- 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.

| EVAP canister purge volume control solenoid valve | | Ground | Voltage | |
|---|--|--------|-----------------|--|
| Connector Terminal | | Ground | | |
| F10 1 | | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Loose or poor connection for each connector and harness

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD] >> Repair open circuit, short to ground or short to power in harness or connectors.

3.check evap canister purge volume control solenoid valve output signal circuit FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| EVAP canister purge volum | EC | М | Continuity | |
|---------------------------|----------|-----------|------------|---------|
| Connector | Terminal | Connector | Continuity | |
| F10 | 2 | 2 F111 64 | | 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.

f 4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- Disconnect EVAP control system pressure sensor harness connector.
- Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace EVAP control system pressure sensor.

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 6.

YES-2 >> Without CONSULT-III: GO TO 7.

>> Replace EVAP control system pressure sensor.

6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

(P) WITH CONSULT-III

- 1. Turn ignition switch OFF.
- Reconnect harness connectors disconnected.
- Start engine.
- 4. Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. 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.

.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-879, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to EC-1106, "Exploded View".

8.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 9.

NO >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

Refer to EC-886, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 10.

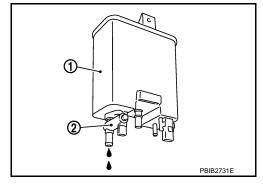
NO >> Replace EVAP canister vent control valve. Refer to <u>EC-1106</u>, "Exploded View".

10.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.
- 2. Check if water will drain from EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 11. NO >> GO TO 13.



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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 13. 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 EC-1106. "Hydraulic Layout".

13. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

- (P) WITH CONSULT-III
- 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. Turn ignition switch ON.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.

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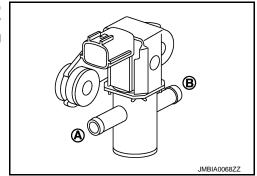
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< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

6. Touch "Qd" and "Qu" on CONSULT-III 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 |

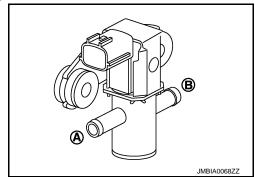


⊗ WITHOUT CONSULT-III

- 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

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic INFOID:0000000005841077

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 | 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 | Harness or connectors (The solenoid valve circuit is shorted.) EVAP canister purge volume control solenoid valve |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 11 V or more 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-881, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841078

1.check evap canister purge volume control solenoid valve power supply circuit

- Turn ignition switch OFF.
- Disconnect EVAP canister purge volume control solenoid valve harness connector.
- Turn ignition switch ON.
- 4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

| | r purge volume enoid valve | Ground | Voltage |
|-----------|-------------------------------|--------|-----------------|
| Connector | Terminal | | |
| F10 | 1 | Ground | Battery voltage |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- · Loose or poor connection for each connector and harness
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R

EC-881 Revision: 2010 June 2011 M37/M56

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- · Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

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.
- Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

| EVAP canister purge volume control solenoid valve | | ECM | | Continuity |
|---|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| F10 | 2 | F111 | 64 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 4.

YES-2 >> Without CONSULT-III: 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

(P) WITH CONSULT-III

- Reconnect all harness connectors disconnected.
- 2. Start engine.
- Perform "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 6.

NO >> GO TO 5.

${f 5.}$ CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-882, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to EC-1106, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)

INFOID:0000000006115637

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

(P) WITH CONSULT-III

- 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. Turn ignition switch ON.
- 5. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode with CONSULT-III.

< DTC/CIRCUIT DIAGNOSIS >

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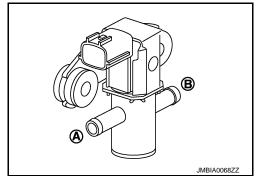
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 Touch "Qd" and "Qu" on CONSULT-III screen to adjust "PURG VOL C/V" opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

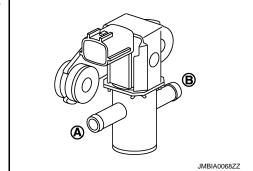
| Condition (PURG VOL C/V value) | Air passage continuity between (A) and (B) |
|-----------------------------------|--|
| 100% | Existed |
| 0% | Not existed |



(R) WITHOUT CONSULT-III

- 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

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

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. | Harness or connectors (The valve circuit is open or shorted.) EVAP canister vent control valve |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 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 11 V or more 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-884, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841082

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

YES >> GO TO 2.

NO >> GO TO 3.

2.check evap canister vent control valve circuit

(II) WITH CONSULT-III

- 1. Turn ignition switch OFF and then ON.
- Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Touch "ON/OFF" on CONSULT-III screen.
- 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 CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect EVAP canister vent control valve harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between EVAP canister vent control valve harness connector and ground.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| | I valve | Ground | Voltage | | nd Voltage | age | |
|---|---|---|---|-------------------------|---|-----|--|
| Connector B74 | Terminal 1 | Ground | Battery v | voltage | | | |
| the insp | | ult normal? | - | | | | |
| | > GO TO : > GO TO : | | | | | | |
| .DETEC | T MALFU | NCTIONIN | G PART | | | | |
| | following. | or chart hat | woon EV | AD conjete | vent control valve and IPDM E/R | | |
| | | nection for | | | | | |
| | | | | | | | |
| | • | - | | • | short to power in harness or connectors. | | |
| | | | ENT CON | NTROL VA | LVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT | | |
| | gnition swi nect ECM | tch OFF. I harness c | onnector. | | | | |
| Check | the contin | | | | nt control valve harness connector and ECM harness con- | | |
| nector | • | | | | | | |
| EVAP car | ister vent | EC | N / | | | | |
| contro | | | | Continuity | | | |
| Connector | Terminal | Connector | Terminal | Frietral | | | |
| B74 | 2 | M160 | 120 | Existed | ort to nower | | |
| | | ult normal? | _ | na ana sn | ort to power. | | |
| | > GO TO 7 | | | | | | |
| | > GO TO (| | | | | | |
| .DETEC | T MALFU | NCTIONIN | G PART | | | | |
| | following. | naction for | ooob oon | nactor and | harnoce | | |
| | | nection for or short bet | | | vent control valve and ECM | | |
| | | | | | | | |
| | > Repair o | pen circuit | | • | short to power in harness or connectors. | | |
| | • | | | \sim INI \sim | | | |
| | • | TUBE FO | R CLOG | טוווט | | | |
| .CHECK Discor | RUBBER | er tube cor | nected to | | nister vent control valve. | | |
| .CHECK Discor Check | RUBBER | er tube cor er tube for c | nnected to clogging. | | nister vent control valve. | | |
| CHECK Discor Check the inspe | RUBBER | er tube cor er tube for c ult normal? | nnected to clogging. | | nister vent control valve. | | |
| CHECK Discor Check the insper | RUBBER nnect rubbe the rubbe ection resi > GO TO 8 > Clean th | er tube corer tube for coult normal? 3. e rubber tu | nnected to clogging. | EVAP ca | ver. | | |
| Discor Check the insperyes | RUBBER nnect rubbe the rubbe ection resi > GO TO 8 > Clean th | er tube cor er tube for c ult normal? 3. | nnected to clogging. | EVAP ca | ver. | | |
| Discor Check the insperyes >: NO >: CHECK | RUBBER nnect rubbe the rubbe ection resi > GO TO 8 > Clean th EVAP CA | er tube corer tube for coult normal? 3. e rubber tu ANISTER V | nnected to clogging. the using ENT COI | an air blov | ver. | | |
| CHECK Discor Check the insp YES >: NO >: CHECK efer to E the insp | RUBBER nnect rubbe the rubbe ection resi > GO TO 8 > Clean th EVAP CA C-886, "Co ection resi | er tube corer tube for cult normal? 3. e rubber tu ANISTER Vomponent I | nnected to clogging. the using ENT COI | an air blov | rer. LVE | | |
| CHECK Discor Check the insper YES >: CHECK CHECK efer to E(the insper YES >: | RUBBER nnect rubbe the rubbe ection resi > GO TO 8 > Clean th EVAP CA C-886. "Co ection resi > GO TO 9 | er tube corer tube for cult normal? 3. e rubber tu ANISTER Vomponent I | nnected to clogging. the using ENT COI | an air blov NTROL VA | rer. LVE | | |

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Component Inspection (EVAP Canister Vent Control Valve)

INFOID:0000000005841083

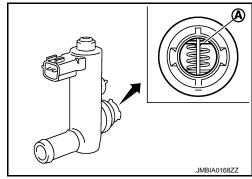
1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- 2. Remove EVAP canister vent control valve from EVAP canister.
- 3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve. <u>EC-1106</u>, <u>"Exploded View"</u>.

NO >> GO TO 2.



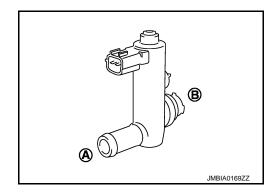
2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

(II) WITH CONSULT-III

- 1. Reconnect harness connectors disconnected.
- 2. Turn ignition switch ON.
- 3. Perform "VENT CONTROL/V" in "ACTIVE TEST" mode.
- Check air passage continuity and operation delay time.
 Check that new O-ring is installed properly.

| VENT CONTROL/V Condition | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.



WITHOUT CONSULT-III

- 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 >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to EC-1106, "Exploded View".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

(II) WITH CONSULT-III

- 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.

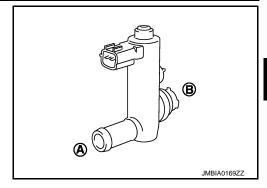
< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

3. Check air passage continuity and operation delay time. Check that new O-ring is installed properly.

| VENT CONTROL/V Condition | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.



® WITHOUT CONSULT-III

- 1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
- 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 >> Replace EVAP canister vent control valve Refer to EC-1106, "Exploded View".

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P0448 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

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. | 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

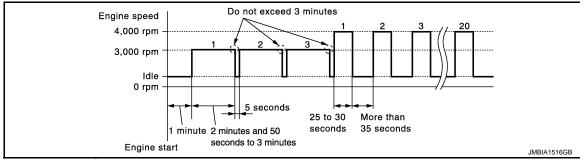
>> GO TO 2.

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 3 times.
- Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes and 50 seconds to 3 minutes.

Do not exceed 3 minutes.

- Fully released accelerator pedal and keep engine idle for approximately 5 seconds.
- 5. Repeat next procedure 20 times.
- Quickly increase the engine speed up to between 4,000 and 4,500 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 <u>EC-888</u>, "<u>Diagnosis Procedure</u>".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841086

1. CHECK RUBBER TUBE

- Turn ignition switch OFF.
- 2. Disconnect rubber tube connected to EVAP canister vent control valve.

Revision: 2010 June **EC-888** 2011 M37/M56

P0448 EVAP CANISTER VENT CONTROL VALVE [VK56VD] < DTC/CIRCUIT DIAGNOSIS > Check the rubber tube for clogging. Α Is the inspection result normal? YES >> GO TO 2. NO >> Clean rubber tube using an air blower. EC 2.CHECK EVAP CANISTER VENT CONTROL VALVE Refer to EC-886, "Component Inspection (EVAP Canister Vent Control Valve)". Is the inspection result normal? YES >> GO TO 3. NO >> Replace EVAP canister vent control valve. Refer to EC-1106, "Exploded View". 3.check if evap canister is saturated with water D Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Е 2. Check if water will drain from the EVAP canister (1). EVAP canister vent control valve (2) Does water drain from EVAP canister? F YES >> GO TO 4. ന NO >> GO TO 6. PBIB2731E 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 2.1 kg (4.6 lb). Is the inspection result normal? YES >> GO TO 6. NO >> GO TO 5. ${f 5.}$ DETECT MALFUNCTIONING PART K 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 EC-1106, "Hydraulic Layout". M 6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR Disconnect EVAP control system pressure sensor harness connector. 2. Check that water is not inside connectors. N Is the inspection result normal? YES >> GO TO 7. NO >> Replace EVAP control system pressure sensor. Refer to EC-1106, "Exploded View".

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP control system pressure sensor. Refer to <u>EC-1106</u>, "Exploded View".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Revision: 2010 June **EC-889** 2011 M37/M56

< DTC/CIRCUIT DIAGNOSIS >

>> INSPECTION END

Component Inspection (EVAP Canister Vent Control Valve)

INFOID:0000000006115638

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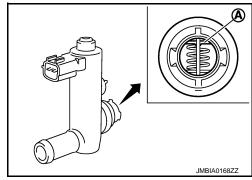
1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

- 1. Turn ignition switch OFF.
- Remove EVAP canister vent control valve from EVAP canister.
- 3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve. <u>EC-1106.</u> "Exploded View".

NO >> GO TO 2.



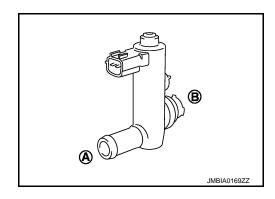
2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

(II) WITH CONSULT-III

- 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.

| VENT CONTROL/V Condition | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.



N WITHOUT CONSULT-III

- 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 >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to <u>EC-1106</u>, "Exploded View".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

(P) WITH CONSULT-III

- 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.

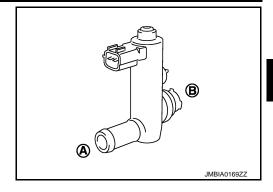
< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

3. Check air passage continuity and operation delay time. Check that new O-ring is installed properly.

| VENT CONTROL/V Condition | Air passage continuity between (A) and (B) |
|--------------------------|--|
| ON | Not existed |
| OFF | Existed |

Operation takes less than 1 second.



® WITHOUT CONSULT-III

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.

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 >> Replace EVAP canister vent control valve Refer to EC-1106, "Exploded View".

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[VK56VD]

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

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 perfor- mance) | ECM detects a sloshing signal from the EVAP control system pressure sensor | Harness or connectors (EVAP control system pressure sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) EVAP control system pressure sensor Crankshaft position sensor Camshaft position sensor (bank 1) Accelerator pedal position sensor 2 Battery current 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.
- Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.perform dtc confirmation procedure

1. Start engine and wait at 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-892, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841090

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

- 1. Disconnect EVAP control system pressure sensor harness connector.
- 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 CIRCUIT

- 1. Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

< DTC/CIRCUIT DIAGNOSIS >

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| | trol system e sensor | Ground | Voltage (V) |
|--------------------|-------------------------|--------|-------------|
| Connector Terminal | | | |
| B73 3 | | Ground | Approx. 5 V |

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Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 3.

3.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 |
| F111 | 76 | CKP sensor | F2 | 1 |
| FIII | 77 | Camshaft position sensor (bank 1) | F84 | 1 |
| | 133 | Battery current sensor | E21 | 1 |
| | 133 | EVAP control system pressure sensor | B73 | 3 |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- CKP sensor (Refer to <u>EC-859</u>, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to <u>EC-989, "Component Inspection (Battery Current Sensor)"</u>.)
- EVAP control system pressure sensor (Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1089, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-1039, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"

(Without distance control assist system)

Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (With distance control assist system).

>> INSPECTION END

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".

EC-893 Revision: 2010 June 2011 M37/M56

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace EVAP control system pressure sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000005841091

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 under the following conditions.

| ECM | | | O a maliti a m | | |
|-----------|----------|----------|---|-----------------------------------|--|
| Connector | + | _ | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) | |
| Connector | Terminal | Terminal | [Applied recount in a (ligroin , poly] | | |
| F160 | 143 | 150 | Not applied | 1.8 - 4.8 | |
| 1 100 | 143 | 130 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 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.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic INFOID:0000000005841093

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|---|--|---|--|
| P0452 | EVAP SYS PRES SEN (EVAP control system pres- sure sensor low input) | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (EVAP control system pressure sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) EVAP control system pressure sensor Crankshaft position sensor Camshaft position sensor (bank 1) Accelerator pedal position sensor 2 Battery current 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.

- 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:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- (P) WITH CONSULT-III
- 1. Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Turn ignition switch ON.
- 6. Select "DATA MONITOR" mode with CONSULT-III.
- 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.
- Start engine and warm it up to normal operating temperature.
- Set voltmeter probes to ECM harness connector terminals under the following conditions.

| ECM | | | | |
|-----------|--|----------|--|--|
| Connector | + | _ | | |
| Connector | Terminal | Terminal | | |
| M160 | 134 (Fuel tank temperature sensor signal) | 175 | | |
| | | | | |

- 3. Check that the voltage is less than 4.2 V.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- Turn ignition switch OFF and wait at least 10 seconds.
- 7. Start engine and wait at least 20 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-896, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841094

1. 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 2.

NO >> Repair or replace harness connector.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch ON.
- 2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

| EVAP control system pressure sensor | | Ground | Voltage (V) |
|-------------------------------------|------------------|--------|-------------|
| Connector | nnector Terminal | | |
| B73 | 3 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control system pressure sensor | | ECM | | Continuity |
|-------------------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | |
| B73 | 3 | M160 | 133 | Existed |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open between ECM and EVAP control system pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| ECM | | Sensor | | | |
|------------|----------|-------------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| 76 F111 | | CKP sensor | F2 | 1 | |
| 1 111 | 77 | Camshaft position sensor (bank 1) | F84 | 1 | |
| M160 | 133 | Battery current sensor | E21 | 1 | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | |
| | 133 | Refrigerant pressure sensor | E77 | 3 | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.

- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to <u>EC-864, "Component Inspection (Camshaft Position Sensor)"</u>.)
- Battery current sensor (Refer to <u>EC-989</u>, "Component Inspection (Battery Current Sensor)".)
- EVAP control system pressure sensor (Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".)
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-1039. "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 14.

>> GO TO 8. NO

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (Without distance control assist system)

Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (With distance control assist system).

>> INSPECTION END

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control system pressure sensor | | ECM | | Continuity |
|--|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | |
| B73 | 1 | M160 | 150 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP control system pressure sensor and ECM
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control system pressure sensor | | ECM | | Continuity |
|-------------------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | |
| B73 | 2 | M160 | 143 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between EVAP control system pressure sensor and ECM
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-898. "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace EVAP control system pressure sensor. Refer to EC-1106, "Exploded View".

14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000006115639

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.
- Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| | ECM | | Condition | | |
|-----------|----------|----------|---|-----------------------------------|--|
| Connector | + | _ | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) | |
| Connector | Terminal | Terminal | [rippiiou racaaiii iii a (iigreiii ; pei/] | | |
| F160 | 143 | 150 | Not applied | 1.8 - 4.8 | |
| 1 100 143 | 143 | 150 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 lower than above value | |

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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.

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P0453 | EVAP SYS PRES SEN (EVAP control system pres- sure sensor high input) | An excessively high voltage from the sensor is sent to ECM. | Harness or connectors (EVAP control system pressure sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) EVAP control system pressure sensor Crankshaft position sensor Camshaft position sensor Camshaft position sensor (bank 1) Accelerator pedal position sensor 2 Battery current sensor Refrigerant 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 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

(P) WITH CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.
- Turn ignition switch ON.
- 6. Select "DATA MONITOR" mode with CONSULT-III.
- 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.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| | | FOM | | | · · · · · · · · · | | |
|--|--|---|--|-----------------------------|-----------------------|---|----|
| | | ECM + | | | Ground | | |
| Connector | | Terminal | | Te | erminal | | I |
| | | 134 | | | | | |
| M160 | (Fuel ta | ank temperature s | ensor signal) | | 175 | | • |
| Turn iç Turn iç Turn iç Start e | gnition s gnition s gnition s engine a | e voltage is les switch OFF and switch ON. switch OFF and nd wait at leas | d wait at lea d wait at lea | ast 10 se ast 10 se | | | |
| 1st trip [| : 1st trip | | | | | | |
| • | | ed to <u>EC-901,</u> | "Diagnosis | Procedu | ıre". | | |
| 10 > | > INSPE | ECTION END | _ | | | | |
| iagnos | is Pro | cedure | | | | INFOID:00000000058410 | 98 |
| CLIECK | (E) (A D) | CONTROL CV | CTEM DD | COLUDE | CENCOD | CONNECTOR | |
| | | | | | | | _ |
| | | VAP control synter is not insid | | | or harness | connector. | |
| | | | e connecto | ors. | | | |
| - | | esult normal? | | | | | |
| /ES > | | ^ ^ | | | | | |
| | > GO TO | | WID 0.00 0.00 W | | | | |
| NO > | > Repai | r or replace ha | | | OENIOOD | DOWED OURDLY OID OUT | |
| .CHECK | > Repai (EVAP | r or replace ha CONTROL SY | | | SENSOR | POWER SUPPLY CIRCUIT | |
| NO > CHECK | > Repai | r or replace ha CONTROL SY witch ON. | STEM PR | ESSURE | | | |
| IO > CHECK Turn i | > Repai | r or replace ha CONTROL SY witch ON. | STEM PR | ESSURE | | POWER SUPPLY CIRCUIT sensor harness connector and ground. | _ |
| NO > CHECk Turn iţ Check | > Repai (EVAP gnition s the vol | r or replace ha CONTROL SY witch ON. tage between | STEM PR | ESSURE | | | _ |
| IO > CHECK Turn iq Check | > Repai (EVAP gnition s the vol | r or replace hat CONTROL SY switch ON. tage between pressure sensor | STEM PR | ESSURE | m pressure | | _ |
| CHECK Turn iq Check EVAP conti | > Repaid EVAP In Section Sector | r or replace hat CONTROL SY switch ON. tage between to pressure sensor Terminal | EVAP cont | rol syster Voltage | m pressure (V) | | _ |
| CHECK Turn iq Check VAP conti | > Repai (EVAP gnition s the volitorol system ctor | r or replace hat CONTROL SY switch ON. tage between pressure sensor Terminal | STEM PR | ESSURE | m pressure (V) | | _ |
| CHECK Turn iq Check VAP control Conne B73 the insp | > Repai | r or replace hat CONTROL SY switch ON. tage between to pressure sensor Terminal 3 | EVAP cont | rol syster Voltage | m pressure (V) | | _ |
| CHECK Turn iq Check EVAP control Conne B73 the insp | > Repai (EVAP gnition s the voltage of the voltage | r or replace hat CONTROL SY switch ON. tage between the pressure sensor Terminal 3 sesult normal? O 9. | EVAP cont | rol syster Voltage | m pressure (V) | | |
| CHECK Turn iq Check EVAP contri Conne B73 the insp (ES > NO > | > Repai (EVAP gnition s the volt rol system ctor ection re > GO TC > GO TC | r or replace hat CONTROL SY switch ON. tage between to pressure sensor Terminal 3 esult normal? O 9. | EVAP cont Ground Ground | rol syster Voltage Approx | m pressure (V) | sensor harness connector and ground. | |
| CHECK Turn iq Check EVAP contri Conne B73 the insp /ES > NO > | > Repai (EVAP gnition s the volt rol system ctor ection re > GO TC > GO TC | r or replace hat CONTROL SY switch ON. tage between to pressure sensor Terminal 3 esult normal? O 9. | EVAP cont Ground Ground | rol syster Voltage Approx | m pressure (V) | | _ |
| CHECK Turn iq Check EVAP contr Conne B73 the insp 'ES > NO > CHECK Turn iq Discon Check | > Repai (EVAP gnition s the volidation rector B ection rector > GO TO (EVAP gnition s nnect EO | r or replace hat CONTROL SY switch ON. tage between pressure sensor Terminal 3 esult normal? O 9. O 3. CONTROL SY switch OFF. CM harness continuity between the control of | EVAP cont Ground Ground STEM PRI | rol syster Voltage Approx | (V) | sensor harness connector and ground. | |
| CHECK Turn iq Check EVAP contr Conne B73 the insp (ES > NO > CHECK Turn iq Discon Check | > Repai (EVAP gnition s the volt rol system ctor ection re > GO TO (EVAP gnition s nnect EO t the col | r or replace hat CONTROL SY switch ON. tage between pressure sensor Terminal 3 esult normal? O 9. O 3. CONTROL SY switch OFF. CM harness continuity between the control of | EVAP cont Ground Ground STEM PRI | rol syster Voltage Approx | (V) | sensor harness connector and ground. POWER SUPPLY CIRCUIT-II | |
| CHECK Turn iq Check EVAP control Conne B73 the insp (ES > NO > CHECK Turn iq Discon Check ness of | > Repai (EVAP gnition s the volidation rector | r or replace hat CONTROL SY switch ON. tage between pressure sensor Terminal 3 esult normal? O 9. O 3. CONTROL SY switch OFF. CM harness continuity between the control of | EVAP cont Ground Ground STEM PRI | rol syster Voltage Approx | n pressure (V) SENSOR | sensor harness connector and ground. POWER SUPPLY CIRCUIT-II | |
| EVAP control Sthe insp YES > NO > CHECK Turn iq Turn iq Turn iq Discort Check Check | > Repai (EVAP gnition s the volt rol system ctor B ection re > GO T(> GO T(C EVAP gnition s nnect E(the con connector rol system | r or replace hat CONTROL SY switch ON. tage between pressure sensor Terminal 3 esult normal? O 9. O 3. CONTROL SY switch OFF. CM harness continuity between. | EVAP cont Ground Ground STEM PRI Onnector. en EVAP c | rol syster Voltage Approx | (V) | sensor harness connector and ground. POWER SUPPLY CIRCUIT-II | |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open between ECM and EVAP control system pressure sensor
- Loose or poor connection for each connector and harness

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

>> Repair open circuit.

${f 5}.$ 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 | |
| F111 | 76 | CKP sensor | F2 | 1 | |
| | 77 | Camshaft position sensor (bank 1) | F84 | 1 | |
| | 133 | Battery current sensor | E21 | 1 | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair short to ground or short to power in harness or connectors.

CHECK COMPONENTS

Check the following.

- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-989, "Component Inspection (Battery Current Sensor)".)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".</u>)
- Refrigerant pressure sensor (Refer to EC-1089, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-1039, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 19.

NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to <u>ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"</u> (Without distance control assist system)

Refer to <u>ACC-4</u>, "<u>MODELS WITH DISTANCE CONTROL ASSIST SYSTEM</u>: Removal and Installation" (With distance control assist system).

>> INSPECTION END

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

| EVAP control | , | EC | Continuity | |
|--------------|----------|-----------|------------|---------|
| Connector | Terminal | Connector | Terminal | |
| B73 | 1 | M160 | 150 | Existed |

[VK56VD] < DTC/CIRCUIT DIAGNOSIS > Also check harness for short to ground and short to power. Α Is the inspection result normal? YES >> GO TO 11. NO >> GO TO 10. EC 10.DETECT MALFUNCTIONING PART Check the following. Harness for open or short between EVAP control system pressure sensor and ECM Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. D 11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector. F EVAP control system **ECM** pressure sensor Continuity Connector Connector Terminal Terminal B73 M160 143 2 Existed Also check harness for short to ground and short to power. Is the inspection result normal? Н YES >> GO TO 13. NO >> GO TO 12. 12. DETECT MALFUNCTIONING PART Check the following. Harness for open or short between EVAP control system pressure sensor and ECM · Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. K 13. CHECK RUBBER TUBE Disconnect rubber tube connected to EVAP canister vent control valve. Refer to EC-1106, "Hydraulic Lay-Check the rubber tube for clogging. Is the inspection result normal? YES >> GO TO 14. NO >> Clean the rubber tube using an air blower, repair or replace rubber tube. 14.CHECK EVAP CANISTER VENT CONTROL VALVE Refer to EC-886, "Component Inspection (EVAP Canister Vent Control Valve)". N Is the inspection result normal? YES >> GO TO 15. NO >> Replace EVAP canister vent control valve. Refer to EC-1106, "Exploded View". 15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR Refer to EC-904, "Component Inspection (EVAP Control System Pressure Sensor)". Is the inspection result normal? YES >> GO TO 16. NO >> Replace EVAP control system pressure sensor. Refer to EC-1106, "Exploded View". 16.CHECK IF EVAP CANISTER IS SATURATED WITH WATER Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor

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attached.

< DTC/CIRCUIT DIAGNOSIS >

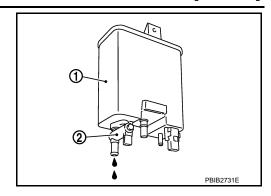
[VK56VD]

Check if water will drain from the EVAP canister (1).

- EVAP canister vent control valve (2)

Does water drain from EVAP canister?

YES >> GO TO 17. NO >> GO TO 19.



17. 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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 19. NO >> GO TO 18.

18. 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 EC-1106. "Hydraulic Layout".

19. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000006115640

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.
- Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

| ECM | | | Condition | | |
|-----------|----------|----------|---|-----------------------------------|--|
| Connector | + | _ | Condition [Applied vacuum kPa (kg/cm ² , psi)] | Voltage (V) | |
| Connector | Terminal | Terminal | [Applied vacuum ki a (kg/em , psi/)] | | |
| F160 | 143 | 150 | Not applied | 1.8 - 4.8 | |
| 1 100 | 143 | 130 | -26.7 (-0.272, -3.87) | 2.1 to 2.5 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.

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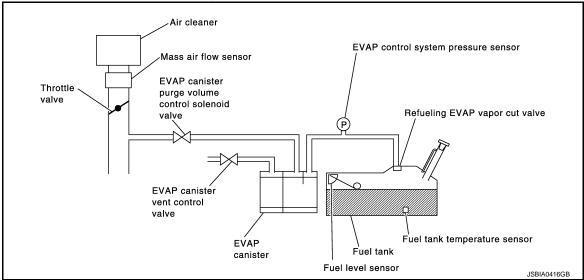
P0456 EVAP CONTROL SYSTEM

DTC Logic

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 | Evaporative emission control system leak | EVAP system has a leak. EVAP system does not operate properly. | 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. 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

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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-III?

YES >> GO TO 2. NO >> GO TO 4.

2.perform dtc confirmation procedure-i

®WITH CONSULT-III

- 1. Turn ignition switch ON and select "EVAP DIAG READY" in "DATA MONITOR" mode with CONSULT-III.
- 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 with CONSULT-III.
- 5. Check that "EVAP LEAK DIAG" indication.

Which is displayed on CONSULT-III?

CMPLT>> GO TO 3.

YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3.perform dtc confirmation procedure-ii

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-906, "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.

- Turn ignition switch ON.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-906, "Diagnosis Procedure".

NO >> INSPECTION END.

Diagnosis Procedure

INFOID:0000000005841105

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

< DTC/CIRCUIT DIAGNOSIS >

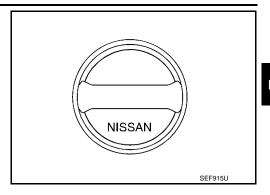
[VK56VD]

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 reteaching 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-910, "Component Inspection (Fuel Filler Cap)".

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-1108, "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 EC-1106, "Exploded View".

EVAP canister vent control valve.

Refer to EC-890, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to EC-1106, "Exploded View"

7.CHECK IF EVAP CANISTER SATURATED WITH WATER

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< DTC/CIRCUIT DIAGNOSIS >

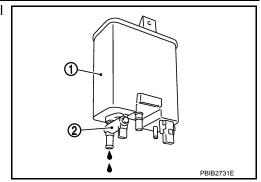
[VK56VD]

- 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 8.

NO-1 >> With CONSULT-III: GO TO 10. NO-2 >> Without CONSULT-III: 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. Refer to <u>EC-1106</u>, "Exploded View".

The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 10.

YES-2 >> Without CONSULT-III: 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 EC-1106, "Hydraulic Layout".

10. Check evap canister purge volume control solenoid valve operation

(P)WITH CONSULT-III

- 1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port.
- 2. Start engine and let it idle.
- 3. Select "PURG VOL CONT/V" in "ACTIVE TEST" mode.
- 4. Touch "Qu" on CONSULT-III screen to increase "PURG VOL CONT/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

NWITHOUT CONSULT-III

- 1. Start engine and warm it up to normal operating temperature.
- 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.

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 <u>EC-1106</u>, "<u>Hydraulic Layout</u>". Is the inspection result normal?

| P0456 EVAP CONTROL SYSTEM | |
|--|---------------|
| < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
| YES >> GO TO 13. | |
| NO >> Repair or reconnect the hose. 13 CHECK EVAD CANISTED BURGE VOLUME CONTROL SOLENOID VALVE | А |
| 13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE | \ |
| Refer to EC-882, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve | <u>e)"</u> . |
| Is the inspection result normal? YES >> GO TO 14. | |
| NO >> Replace EVAP canister purge volume control solenoid valve. Refer to EC-1106, "Ex | ploded View". |
| 14. CHECK FUEL TANK TEMPERATURE SENSOR | C |
| Refer to EC-831, "Component Inspection (Fuel Tank Temperature Sensor)". | |
| Is the inspection result normal? | D |
| YES >> GO TO 15. NO >> Replace fuel level sensor unit. Refer to FL-6, "Removal and Installation". | |
| 15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR | Е |
| | |
| Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)"</u> . <u>Is the inspection result normal?</u> | F |
| YES >> GO TO 16. | Г |
| NO >> Replace EVAP control system pressure sensor. Refer to EC-894, "Component Inst | pection (EVAP |
| Control System Pressure Sensor)". | G |
| 16.CHECK EVAP PURGE LINE | |
| Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper Refer to EC-1106 , "Hydraulic Layout". | connection. |
| Is the inspection result normal? | |
| YES >> GO TO 17. | 1 |
| NO >> Repair or reconnect the hose. 17.CLEAN EVAP PURGE LINE | 1 |
| | |
| Clean EVAP purge line (pipe and rubber tube) using air blower. | J |
| >> GO TO 18. | |
| 18.check evap/orvr line | K |
| Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kink, looseness and | improper con- |
| nection. For location, refer to EC-1106, "Hydraulic Layout". | L |
| Is the inspection result normal? YES >> GO TO 19. | |
| NO >> Repair or replace hoses and tubes. | M |
| 19.check recirculation line | IVI |
| Check recirculation line between fuel filler tube and fuel tank for clogging, kink, cracks, le improper connection. | poseness and |
| Is the inspection result normal? | |
| YES >> GO TO 20. | _ |
| NO >> Repair or replace hose, tube or fuel filler tube. Refer to <u>FL-10, "Exploded View"</u> . | 0 |
| 20. CHECK REFUELING EVAP VAPOR CUT VALVE | |
| Refer to EC-1087. "Component Inspection (EVAP Vapor Cut Valve)". | P |
| Is the inspection result normal? | |
| YES >> GO TO 21. NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-10, "Exploded V | ïew" |
| 21. CHECK FUEL LEVEL SENSOR | |
| Refer to MWI-74, "Component Inspection". | |
| Total to <u>MINITER, Component mapeuton</u> . | |

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Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

YES >> GO TO 22.

NO >> Replace fuel level sensor unit. Refer to FL-6, "Removal and Installation".

22. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

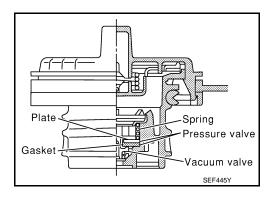
>> INSPECTION END

Component Inspection (Fuel Filler Cap)

INFOID:0000000005880087

1. CHECK FUEL FILLER CAP

- Turn ignition switch OFF.
- Remove fuel filler cap.
- Wipe clean valve housing.



- Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
- 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,

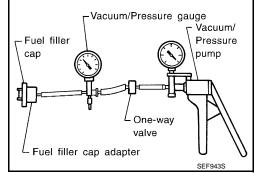
-0.87 to -0.48 psi)

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 >

[VK56VD]

P0460 FUEL LEVEL SENSOR

DTC Logic INFOID:0000000005841108

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-936, "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. | 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.
- 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 wait maximum of 2 consecutive minutes.
- Check 1st trip DTC. 2.

Is 1st trip DTC detected?

>> Proceed to EC-911, "Diagnosis Procedure". YES

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is any DTC detected?

YES >> Perform trouble diagnosis of detected DTC.

NO >> GO TO 2.

2.check fuel level sensor signal circuit

Check fuel level sensor signal circuit. Refer to MWI-73, "Component Function Check".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Perform trouble diagnosis of fuel level sensor signal circuit. Refer to MWI-73, "Diagnosis Procedure".

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P0461 FUEL LEVEL SENSOR

DTC Logic

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 <u>EC-936, "DTC Logic"</u>.

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. | 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-912, "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-913, "Diagnosis Procedure".

Component Function Check

1.PRECONDITIONING

WARNING.

When performing the following procedure, always observe the handling of the fuel. Refer to <u>FL-2</u>, <u>"General Precautions"</u>.

TESTING CONDITION:

Before starting component function check, preparation of draining fuel and refilling fuel is required.

>> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 $\,\ell$ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

- 1. Prepare a fuel container and a spare hose.
- Release fuel pressure from fuel line. Refer to EC-701, "Work Procedure".
- 3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-6, "Removal and Installation".
- 4. Connect a spare fuel hose where the fuel feed hose was removed.
- Turn ignition switch ON.
- 6. Drain fuel by 30 $\,\ell$ (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?

| P0461 FUEL LEVEL SENSOR | |
|--|----|
| < DTC/CIRCUIT DIAGNOSIS > [VK56VD] | _ |
| YES >> INSPECTION END NO >> Proceed to <u>EC-913</u> , " <u>Diagnosis Procedure"</u> . | А |
| Diagnosis Procedure | |
| 1. CHECK DTC WITH "COMBINATION METER" | EC |
| Refer to MWI-30, "CONSULT-III Function". | |
| Is any DTC detected? | С |
| YES >> Perform trouble diagnosis of detected DTC. NO >> GO TO 2. | |
| 2.CHECK FUEL LEVEL SENSOR SIGNAL CIRCUIT | D |
| Check fuel level sensor signal circuit. Refer to MWI-73, "Component Function Check". | |
| Is the inspection result normal? | Е |
| YES >> Check intermittent incident. Refer to <u>GI-38, "Intermittent Incident"</u> . NO >> Perform trouble diagnosis of fuel level sensor signal circuit. Refer to <u>MWI-73, "Diagnosis Procedure"</u> . | |
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P0462, P0463 FUEL LEVEL SENSOR

DTC Logic

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 <u>EC-936</u>, "<u>DTC Logic"</u>.

This diagnosis indicates the former, to detect open or short circuit malfunction.

| 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. • Harness or connectors (The CAN communication line • Harness or connectors | (The CAN communication line is open or shorted) |
| P0463 | FUEL LEVL SEN/CIRC (Fuel level sensor circuit high input) | An excessively high voltage from the sensor is sent to ECM. | (The sensor circuit is open or shorted)Combination meterFuel level sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 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-914, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841116

1. CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

Is any DTC detected?

YES >> Perform trouble diagnosis of detected DTC.

NO >> GO TO 2.

2.CHECK FUEL LEVEL SENSOR SIGNAL CIRCUIT

Check fuel level sensor signal circuit. Refer to MWI-73, "Component Function Check".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Perform trouble diagnosis of fuel level sensor signal circuit. Refer to MWI-73, "Diagnosis Procedure".

P0500 VSS

Description INFOID:0000000005841117

The vehicle speed signal is sent to the "combination meter" from the "ABS actuator and electric unit (control unit)" by CAN communication line. The "combination meter" then sends a signal to the ECM by CAN communication line.

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DTC Logic INFOID:0000000005841118

DTC DETECTION LOGIC

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-936, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0500 | VEH SPEED SEN/CIRC (Vehicle speed sensor) | The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven. | Harness or connectors (The CAN communication line is open or shorted) Harness or connectors (The vehicle speed signal circuit is open or shorted) Wheel sensor Combination meter ABS actuator and electric unit (control unit) |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

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.

Will CONSULT-III be used?

YES >> GO TO 2.

NO >> GO TO 4.

2.CHECK VEHICLE SPEED SIGNAL

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.

- (P) WITH CONSULT-III
- Start engine (VDC switch OFF).
- Read "VHCL SPEED SE" in "DATA MONITOR" mode with CONSULT-III. The vehicle speed on CONSULT-III should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Proceed to EC-916, "Diagnosis Procedure".

${f 3.}$ PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode with CONSULT-III.
- Warm engine up to normal operating temperature.
- Maintain the following conditions for at least 50 consecutive seconds. **CAUTION:**

Always drive vehicle at a safe speed.

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| ENG SPEED | More than 1,500 rpm |
|----------------|------------------------|
| COOLAN TEMP/S | More than 70°C (158°F) |
| B/FUEL SCHDL | 5.5 - 31.8 msec |
| Selector lever | Except P or N position |
| PW/ST SIGNAL | OFF |

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-916, "Diagnosis Procedure".

NO >> INSPECTION END

4. PERFORM COMPONENT FUNCTION CHECK

WITH GST

Perform Component Function Check. Refer to EC-916, "Component Function Check".

Use Component Function Check to check the overall function of the vehicle speed 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-916, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005841119

1. PERFORM COMPONENT FUNCTION CHECK

With GST

- 1. Lift up drive wheels.
- 2. Start engine.
- 3. Read vehicle speed signal in Service \$01 with GST.

The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-916, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005841120

1. CHECK DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-41, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace malfunctioning part.

2.CHECK DTC WITH "COMBINATION METER"

Refer to MWI-30, "CONSULT-III Function".

>> INSPECTION END

P0506 ISC SYSTEM

Description INFOID:0000000005841121

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 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:0000000005841122

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. | Electric throttle control actuator Intake air leakage |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

If the target idle speed is out of the specified value, perform EC-696, "Work Procedure", before conducting DTC Confirmation Procedure.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.
- Always perform the test at a temperature above –10°C (14°F).

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.

>> GO TO 2.

- Turn ignition switch OFF and wait at least 10 seconds.
- 5. Restart engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-917, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.CHECK INTAKE AIR LEAKAGE

- Start engine and let it idle.
- Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.

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INFOID:0000000005841123

P0506 ISC SYSTEM

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

NO >> GO TO 2.

2.REPLACE ECM

- Stop engine.
 Replace ECM.
- Perform additional service when replacing ECM. Refer to EC-691, "Work Procedure".

>> INSPECTION END

P0507 ISC SYSTEM

Description INFOID:0000000005844213

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 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:0000000005841125

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. | Electric throttle control actuatorIntake air leakagePCV system |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

If the target idle speed is out of the specified value, perform EC-696, "Work Procedure", before conducting DTC Confirmation Procedure.

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.
- Always perform the test at a temperature above –10°C (14°F).

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and warm it up to normal operating temperature.
- Turn ignition switch OFF and wait at least 10 seconds. 2.
- Turn ignition switch ON.
- 4. Turn ignition switch OFF and wait at least 10 seconds.
- Start engine and run it for at least 1 minute at idle speed.
- Check 1st trip DTC.

Is 1st trip DTC detected?

Diagnosis Procedure

YES >> Proceed to EC-919, "Diagnosis Procedure".

>> INSPECTION END NO

CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

>> GO TO 2. YES

NO >> Repair or replace malfunctioning part.

EC-919 Revision: 2010 June 2011 M37/M56

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INFOID:0000000005841126

P0507 ISC SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

$\overline{2}$.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 >> GO TO 3.

3. REPLACE ECM

- 1. Stop engine.
- 2. Replace ECM.
- 3. Perform additional service when replacing ECM. Refer to EC-691, "Work Procedure".

>> INSPECTION END

P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P050E COLD START CONTROL

Description INFOID:0000000005995482

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.

INFOID:0000000005995483

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P050E | 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. | Lack of intake air volume Fuel injection system ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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 11 V or more at idle.

>> GO TO 2.

2.perform dtc confirmation procedure-i

(P)WITH CONSULT-III

- Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- Check the indication of "COOLAN TEMP/S".

WITH GST

Follow the procedure "With CONSULT-III" above.

Is the value of "COOLAN TEMP/S" between 5°C (41°F) and 36°C (97°F)?

>> 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-II

(P)WITH CONSULT-III

- 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.

WITH GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-921, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.PERFORM IDLE AIR VOLUME LEARNING

INFOID:0000000005995484

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P050E COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Perform EC-696, "Work Procedure".

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-821, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Proceed to EC-822, "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 <u>EC-921</u>, "<u>DTC Logic</u>".

Is the 1st trip DTC P050E displayed again?

YES >> GO TO 5.

NO >> INSPECTION END

5. REPLACE ECM

Replace ECM. Refer to EC-1103, "Removal and Installation".

>> INSPECTION END

P0520 EOP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0520 EOP SENSOR

DTC Logic INFOID:0000000005926907

DTC DETECTION LOGIC

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| 0.26 V for 5 seconds or more. (FRP sensor circuit is open or shorted.) • Engine oil level abnormality • EOP sensor | DTC No. | Trouble diagnosis (Trouble diagnosis content) | Detecting condition | Possible cause | С |
|---|---------|--|--|---|--------|
| Low fuel pressure sensor FRP sensor | P0520 | EOP sensor circuit | remains at more than 4.9 V / less than | (EOP sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) (FRP sensor circuit is open or shorted.) • Engine oil level abnormality • EOP sensor • Power steering pressure sensor • Low fuel pressure sensor | D E |

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.
- 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 5 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-923, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005926908

1. CHECK ENGINE OIL

- Turn ignition switch OFF.
- Check engine oil level and pressure. Refer to LU-23, "Inspection".

Is inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.CHECK EOP SENSOR POWER SUPPLY-I

- Disconnect EOP sensor connector.
- Turn ignition switch ON. 2.
- Check the voltage between EOP sensor harness connector terminals.

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< DTC/CIRCUIT DIAGNOSIS >

| Connector | + | _ | Voltage (Approx.) |
|-----------|------|-------|----------------------|
| Connector | tern | ninal | (11 - 7 |
| F32 | 3 | 1 | 5 V |

Inspection result normal?

YES >> GO TO 7.

NO >> GO TO 3.

3.check eop sensor power supply-ii

Check the voltage between EOP sensor harness connector and the ground.

| | + | | Maltana |
|-----------|----------|--------|----------------------|
| EOP : | sensor | _ | Voltage (Approx.) |
| Connector | Terminal | | () |
| F32 | 3 | Ground | 5 V |

Is inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

- 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.

| ECM | | Sensor | | |
|-----------|----------|--------------------------------|-----------|----------|
| Connector | Terminal | Name | Connector | Terminal |
| | 27 | Power steering pressure sensor | F35 | 3 |
| F110 | 21 | Low fuel pressure sensor | F39 | 3 |
| | 28 | FRP sensor | F6 | 1 |
| | | Engine oil pressure sensor | F32 | 3 |

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to <u>EC-716</u>, "<u>Diagnosis Procedure</u>".

NO >> Repair or replace error-detected parts.

5. CHECK EOP SENSOR GROUND CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between EOP sensor harness connector and ECM harness connector.

| | + | | _ | |
|-----------|----------|-----------|----------|------------|
| EOP | sensor | E | СМ | Continuity |
| Connector | Terminal | Connector | Terminal | |
| F32 | 1 | F110 | 40 | Existed |

Is 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 ground.

| E | СМ | Ground | Continuity |
|-----------|----------|--------|------------|
| Connector | Terminal | Giouna | Continuity |
| F110 | 10 | | |
| | 114 | | |
| M160 | 115 | Ground | Existed |
| IVITOU | 174 | | |
| | 175 | | |

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Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

7. CHECK EOP SENSOR SIGNAL CIRCUIT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between EOP sensor harness connector and ECM harness connector.

| + | | | _ | |
|-----------|----------|-----------|----------|------------|
| EOP | sensor | E | СМ | Continuity |
| Connector | Terminal | Connector | Terminal | |
| F32 | 2 | F110 | 41 | Existed |

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace error-detected parts.

8. CHECK EOP SENSOR

Refer to EC-925, "Component Inspection (EOP sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

Component Inspection (EOP sensor)

INFOID:0000000005926909

1. CHECK EOP SENSOR

- Turn ignition switch OFF.
- Disconnect EOP sensor harness connector.
- Check resistance between EOP sensor connector terminals.

| + | _ | | |
|----------|--------|-----------|--------------------------|
| EOP | sensor | Condition | Resistance (k Ω) |
| Terminal | | | |
| 1 | 2 | | 4 kΩ – 10 kΩ |
| ' | 3 | None | 2 kΩ – 8 kΩ |
| 2 | 1 | | 4 kΩ – 10 kΩ |
| | 3 | | 1 kΩ – 3 kΩ |
| 3 | 1 | | 2 kΩ – 8 kΩ |
| | 2 | | 1 kΩ – 3 kΩ |

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Replace EOP sensor.

P0524 ENGINE OIL PRESSURE

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0524 is displayed with DTC P0520, P0075, or P0081, perform trouble diagnosis for DTC P0520, P0075, or P0081 first. Refer to EC-746, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | Detecting condition | Possible cause |
|---------|--|--|--|
| P0524 | ENGINE OIL PRESSURE (Engine oil pressure too low) | Engine oil pressure is low because there is a gap between angle of target and phase-control angle. | Engine oil pressure or level too low Crankshaft position sensor Camshaft position sensor Intake valve timing 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 |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-I

- 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.PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-23, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Proceed to <u>LU-23</u>, "Inspection".

3.perform dtc confirmation procedure

(P) WITH CONSULT-III

- 1. Select "DATA MONITOR" mode with CONSULT-III.
- 2. Maintain the following conditions for at least 20 consecutive seconds.

| ENG SPEED | More than 1,700 rpm |
|-------------------------|--|
| COOLAN TEMP/S | More than 70°C (158°F) |
| Selector lever | 1st or 2nd position |
| Driving location uphill | 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.

WITH GST

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-927</u>, "<u>Diagnosis Procedure</u>"

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P0524 ENGINE OIL PRESSURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841128

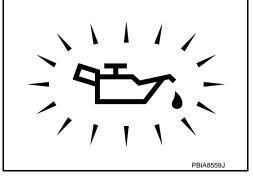
1. CHECK OIL PRESSURE WARNING LAMP

- Start engine.
- Check oil pressure warning lamp and confirm it is not illuminated.

Is oil pressure warning lamp illuminated?

YES >> Proceed to LU-23, "Inspection".

NO >> GO TO 2.



2.check intake valve timing control solenoid valve

Refer to EC-734, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace malfunctioning intake valve timing control solenoid valve.

3.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace crankshaft position sensor.

f 4.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-864, "Component Inspection (Camshaft Position Sensor)",

Is the inspection result normal?

YES >> GO TO 5.

>> Replace malfunctioning camshaft position sensor. NO

${f 5.}$ CHECK CAMSHAFT SPROCKET (SIGNAL PLATE)

Check the following.

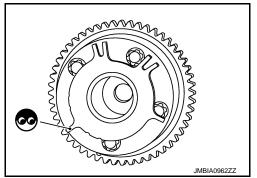
- Accumulation of debris to the signal plate of camshaft sprocket (INT)
- Chipping signal plate of camshaft sprocket (INT)

Is the inspection result normal?

YES >> GO TO 6.

NO

>> Remove debris and clean the signal plate of camshaft sprocket (INT) or replace camshaft sprocket (INT). Refer to EM-230, "Exploded View".



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-230, "Exploded View".

NO >> GO TO 7.

7.CHECK LUBRICATION CIRCUIT

Perform "Inspection of Camshaft Sprocket (INT) Oil Groove". Refer to LU-23, "Inspection".

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P0524 ENGINE OIL PRESSURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Is the inspection result normal?

YES >> GO TO 8.

NO >> Clean lubrication line.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0550 PSP SENSOR

DTC Logic INFOID:000000005841130

DTC DETECTION LOGIC

EC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | С |
|---------|---|--|---|--------|
| P0550 | PW ST P SEN/CIRC (Power steering pressure sensor circuit) | An excessively low or high voltage from the sensor is sent to ECM. | Harness or connectors (Power steering pressure sensor circuit is open or shorted.) (EOP sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) (FRP sensor circuit is open or shorted.) Power steering pressure sensor EOP sensor Low fuel pressure sensor FRP sensor | D E |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-929, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841131

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1. CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY-I

- 1. Disconnect power steering pressure (PSP) sensor connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between PSP sensor harness connector terminals.

| Connector | + | _ | Voltage (Approx.) |
|-----------|----------|---|----------------------|
| Connector | terminal | | (11 - 7 |
| F35 | 3 | 1 | 5 V |

Inspection result normal?

YES >> GO TO 6.

NO >> GO TO 2.

2.CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY-II

Check the voltage between PSP sensor harness connector and the ground.

< DTC/CIRCUIT DIAGNOSIS >

| | + | | Valtana | |
|------------|----------|--------|----------------------|--|
| PSP sensor | | _ | Voltage (Approx.) | |
| Connector | Terminal | | , , , | |
| F35 3 | | Ground | 5 V | |

Is inspection result normal?

YES >> GO TO 4.

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.

| ECM | | Sensor | | | |
|-----------|----------|--------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| | 27 | Power steering pressure sensor | F35 | 3 | |
| F110 | | Low fuel pressure sensor | F39 | 3 | |
| FIIO | 20 | FRP sensor | F6 | 1 | |
| | 28 | Engine oil pressure sensor | F32 | 3 | |

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to <u>EC-716</u>, "<u>Diagnosis Procedure</u>".

NO >> Repair or replace error-detected parts.

4. CHECK PSP SENSOR GROUND CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between PSP sensor harness connector and ECM harness connector.

| + | | | | |
|------------|----------|--------------------|----|------------|
| PSP sensor | | ECM | | Continuity |
| Connector | Terminal | Connector Terminal | | |
| F35 | 1 | F110 | 45 | Existed |

Is inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and ground.

| E | СМ | Ground | Continuity | |
|--------------------|-----|---------|------------|--|
| Connector Terminal | | Giodila | Continuity | |
| F110 | 10 | | | |
| M160 | 114 | | | |
| | 115 | Ground | Existed | |
| WITOO | 174 | | | |
| | 175 | | | |

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

P0550 PSP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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6. CHECK PSP SENSOR SIGNAL CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between PSP sensor harness connector and ECM harness connector.

| + | | _ | | |
|-----------|----------|--------------------|----|------------|
| PSP : | sensor | E | CM | Continuity |
| Connector | Terminal | Connector Terminal | | |
| F35 | 2 | F110 | 39 | Existed |

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7. CHECK PSP SENSOR

Refer to EC-931, "Component Inspection (Power Steering Pressure Sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38. "Intermittent Incident".

NO >> Repair or replace error-detected parts.

Component Inspection (Power Steering Pressure Sensor)

INFOID:0000000005841132

1. CHECK POWER STEERING PRESSURE SENSOR

- Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Start engine and let it idle.
- 4. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|----------|----------|-----------------------------|------------------|-------------|
| Connector | + | _ | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| F110 | 39 | 45 | Steering wheel Being turned | | 0.5 - 4.5 |
| 1110 | 39 | 7 | Oteening wheel | Not being turned | 0.4 - 0.8 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace power steering pressure sensor.

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P0603 ECM POWER SUPPLY

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P0603 | ECM BACK UP/CIRCUIT (ECM power supply circuit) | ECM back up RAM system does not function properly. | Harness or connectors [ECM power supply (back up) circuit is open or shorted.] 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 wait at least 10 seconds.
- Turn ignition switch OFF and wait at least 5 minutes.
- 3. Turn ignition switch ON, wait at least 10 seconds.
- 4. Repeat step 2 and 3 for five times.
- 5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-932, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841135

1. CHECK ECM POWER SUPPLY

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the voltage between ECM harness connector terminals.

| | + - | | | |
|-----------|----------|-----------|----------|-----------------|
| Connector | Terminal | Connector | Terminal | |
| M160 | 156 | M160 | 175 | Battery voltage |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- 15 A fuse (No. 51)
- Harness for open or short between ECM and battery
- Loose or poor connection for each connector and harness

>> Repair or replace harness or connectors.

| P0603 ECM POWER SUPPLY | |
|---|----------|
| < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
| 3. CHECK INTERMITTENT INCIDENT | A |
| Refer to GI-38, "Intermittent Incident". | |
| Is the inspection result normal? | |
| YES >> GO TO 4. NO >> Repair or replace harness or connectors. | EC |
| 4.PERFORM DTC CONFIRMATION PROCEDURE | |
| 1. Turn ignition switch ON. | C |
| Erase DTC. Perform DTC Confirmation Procedure. | |
| See EC-932, "DTC Logic". | D |
| Is the 1st trip DTC P0603 displayed again? | |
| YES >> GO TO 5. NO >> INSPECTION END | E |
| 5. REPLACE ECM | |
| Replace ECM. Refer to EC-1103, "Removal and Installation". | |
| | F |
| >> INSPECTION END | |
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INFOID:0000000005926917

P0605 ECM

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | | Possible cause |
|---------|------------------------|-------------------------|---|----------------|
| P0605 | Engine control module | A) | ECM calculation function is malfunctioning. | - ECM |
| | | B) | ECM EEP-ROM system is malfunctioning. | |
| | | C) | ECM self shut-off function is malfunctioning. | |
| | | D) | ECM temperature sensor is malfunctioning. | |

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 at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND D

- Turn ignition switch ON.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-934, "Diagnosis Procedure".

NO >> GO TO 3.

3.perform dtc confirmation procedure for malfunction b

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-934, "Diagnosis Procedure".

NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

- 1. Turn ignition switch ON and wait at least 1 second.
- 2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
- Repeat step 2 for 32 times.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-934, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.INSPECTION START

- Turn ignition switch ON.
- Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-934</u>, "<u>DTC Logic"</u>.

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.

P0605 ECM [VK56VD] < DTC/CIRCUIT DIAGNOSIS > >> INSPECTION END NO 2.REPLACE ECM Α Replace ECM. Refer to EC-1103, "Removal and Installation". EC >> INSPECTION END С D Е F G Н Κ L

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P0607 ECM

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|----------------|
| P0607 | ECM (CAN communication bus) | When detecting error during the initial diagnosis of CAN controller of ECM. | ECM |

DTC CONFIRMATION PROCEDURE

1. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-936, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841141

1. INSPECTION START

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-936</u>, "<u>DTC Logic</u>".
- 4. Check DTC.

Is the DTC P0607 displayed again?

YES >> Replace ECM and perform additional service when replacing ECM. Refer to <u>EC-691, "Work Procedure"</u>.

NO >> INSPECTION END

P0611 ECM PROTECTION [VK56VD] < DTC/CIRCUIT DIAGNOSIS > P0611 ECM PROTECTION Α Description INFOID:0000000006034785 This DTC is detected when the ECM protective function is activated due to an extreme temperature increase EC in ECM, resulting from severe conditions such as heavy load driving. DTC Logic INFOID:00000000006034786 DTC DETECTION LOGIC D DTC No. Trouble diagnosis name DTC detecting condition Possible cause P0611 **ECM PROTECTION** ECM overheat protection control is activated. ECM overheated DTC CONFIRMATION PROCEDURE Е 1. PERFORM DTC CONFIRMATION PROCEDURE This DTC is displayed as protection function history. If no malfunction is detected after the diagnosis, the customer must be informed of the activation of the protection function. >> Proceed to EC-937, "Diagnosis Procedure". Diagnosis Procedure INFOID:0000000006034787 1. INSPECTION START Н Perform DTC confirmation procedure. Refer to EC-934, "DTC Logic". Check 1st trip DTC. Is DTC P0605 detected? YES >> Proceed to EC-934, "Diagnosis Procedure". >> Explain the customer about the activation of the protection function. NO

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Revision: 2010 June **EC-937** 2011 M37/M56

[VK56VD]

P062B ECM

Description INFOID:000000005926913

This DTC is detected when the ECM-integrated injector driver unit has a malfunction. For injector driver unit, refer to EC-557, "ECM".

DTC Logic (INFOID:000000005926914

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P062B | Internal control module fuel injector control performance | Injector driver unit is malfunctioning. | Harness and connectors (Injector circuit is open or shorted) Battery power supply ECM (injector driver unit) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 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 at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start the engine and keep the engine speed at idle for 30 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-938, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005926915

1. CHECK FUEL INJECTOR

Check fuel injector. Refer to EC-1067, "Component Function Check".

Is inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC.
- Perform DTC cfirmation procedure again. Refer to <u>EC-938, "DTC Logic"</u>.
- 4. Check 1st trip DTC.

Is the DTC P062B displayed again?

YES >> Replace ECM. Refer to EC-1103, "Removal and Installation".

NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0643 SENSOR POWER SUPPLY

DTC Logic INFOID:0000000005841142

DTC DETECTION LOGIC

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| 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. | Harness or connectors (Throttle position sensor circuit is shorted.) [Camshaft position sensor (bank 2) circuit is shorted.] (Manifold absolute pressure sensor circuit is shorted.) (Accelerator pedal position sensor 1 circuit is shorted.) Throttle position sensor Camshaft position sensor (bank 2) Manifold absolute pressure sensor Accelerator pedal position sensor 1 |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 1 second.
- 2. Check DTC.

Is DTC detected?

>> Proceed to EC-939, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841143

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground.

| APP sens | Ground | Voltage (V) | |
|------------------|----------|-------------|-------------|
| Connector | Terminal | Giodila | voitage (v) |
| M9 (Without ICC) | 5 | Ground | Approx. 5 |
| M153 (With ICC) | 6 | Ground | дрргох. 3 |

Is the inspection result normal?

YES >> GO TO 6. NO >> GO TO 2.

2.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

EC-939 Revision: 2010 June 2011 M37/M56

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| ECM | | Sensor | | | |
|-----------|----------|-----------------------------------|----------|---|--|
| Connector | Terminal | Name | Terminal | | |
| | 81 | Throttle position sensor (bank 1) | F66 | 2 | |
| F111 | 82 | Throttle position sensor (bank 2) | F64 | 2 | |
| 1 111 | 83 | Camshaft position sensor (bank 2) | F83 | 1 | |
| | 85 | Manifold absolute pressure sensor | F19 | 1 | |
| M160 | 5 | APP sensor 1 (Without ICC) | M9 | 5 | |
| IVITOU | 6 | APP sensor 1 (With ICC) | M153 | 6 | |

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.

- Camshaft position sensor (bank 2) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- Manifold absolute pressure sensor (Refer to EC-766, "Component Inspection (MAP Sensor)".)

Is the inspection result normal?

YES >> GO TO 4.

NO >> Replace malfunctioning component.

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-847, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 5.

REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

6.CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to EC-1039, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to <u>ACC-3</u>, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (Without distance control assist system).

Refer to <u>ACC-4</u>, "<u>MODELS WITH DISTANCE CONTROL ASSIST SYSTEM</u>: Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P0850 PNP SWITCH

Description INFOID:0000000005841144

When the selector lever position is P or N, park/neutral position (PNP) signal is sent to ECM from TCM.

DTC Logic INFOID:0000000005841145

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. | Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] TCM |

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

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.

- 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

(P) WITH CONSULT-III

- 1. Turn ignition switch ON.
- Select "P/N POSI SW" in "DATA MONITOR" mode with CONSULT-III. 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-942, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE

- Select "DATA MONITOR" mode with CONSULT-III.
- 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 | 1,300 - 6,375 rpm |
|---------------|------------------------|
| COOLAN TEMP/S | More than 70°C (158°F) |

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P0850 PNP SWITCH

< 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-942, "Diagnosis Procedure".

NO >> INSPECTION END

${f 5}$.PERFORM COMPONENT FUNCTION CHECK

WITH GST

Perform Component Function Check. Refer to EC-942, "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 <u>EC-942</u>, "<u>Diagnosis Procedure</u>".

Component Function Check

INFOID:0000000005841146

[VK56VD]

1. PERFORM COMPONENT FUNCTION CHECK

With GST

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | | |
|-----------|----------|----------|----------------|-----------------------|-----------------|--|
| Connector | + | _ | | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| F110 | 11 | 175 | Selector lever | P or N position | Battery voltage | |
| | 11 | 173 | Delector level | Except above position | Approx. 0 V | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-942, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005841147

1. CHECK DTC WITH TCM

Refer to TM-57, "CONSULT-III Function (TRANSMISSION)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace malfunctioning part.

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 <u>BCS-13</u>, "COMMON ITEM : CONSULT-III Function (BCM - COM-MON ITEM)".

${f 3.}$ CHECK PNP SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect A/T assembly harness connector.
- Disconnect ECM harness connector.
- Check the continuity between A/T assembly harness connector and ECM harness connector.

P0850 PNP SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| Connector Terminal Connector Terminal Connector Terminal Estated | A/T ass | embly | EC | CM | | | А |
|---|-----------------------------|------------|--------------|------------|------------|--|-----|
| 5. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 5. NO >> GO TO 4. 4. DETECT MALFUNCTIONING PART Check the following. • Harness for open or short between A/T assembly and ECM • Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. 5. CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G H | | | Connector | Terminal | Continuity | | |
| 5. Also check harness for short to ground and short to power. Is the inspection result normal? YES >> GO TO 5. NO >> GO TO 4. 4. DETECT MALFUNCTIONING PART Check the following. • Harness for open or short between A/T assembly and ECM • Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. 5. CHECK INTERMITTENT INCIDENT Refer to GI-38. "Intermittent Incident". >> INSPECTION END G K | F301 | 9 | F110 | 11 | Existed | | EC |
| YES >> GO TO 5. NO >> GO TO 4. 4. DETECT MALFUNCTIONING PART Check the following. • Harness for open or short between A/T assembly and ECM • Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. 5. CHECK INTERMITTENT INCIDENT Refer to GI:38. "Intermittent Incident". >> INSPECTION END G K L | | | | | nd and sho | ort to power. | |
| NO >> GO TO 4. 4. DETECT MALFUNCTIONING PART Check the following. • Harness for open or short between A/T assembly and ECM • Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. 5. CHECK INTERMITTENT INCIDENT Refer to GI:33. "Intermittent Incident". >> INSPECTION END G K L | • | | | <u> </u> | | | |
| Check the following. Harness for open or short between A/T assembly and ECM Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. 5.CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G K L | | | | | | | С |
| Check the following. • Harness for open or short between A/T assembly and ECM • Loose or poor connection for each connector and harness > Repair open circuit, short to ground or short to power in harness or connectors. 5.CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G K L M N O | 4 | | | IG PART | | | |
| • Harness for open or short between A/T assembly and ECM • Loose or poor connection for each connector and harness >> Repair open circuit, short to ground or short to power in harness or connectors. 5. CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G H I I I I I I I I I I I I | Check the | following. | | | | | D |
| >> Repair open circuit, short to ground or short to power in harness or connectors. 5.CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G H I J K L M N O | Harness | for open o | or short bet | tween A/T | assembly | and ECM | |
| 5.CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G H J K L M N O | • Loose of | poor com | nection for | each con | nector and | namess | Е |
| S.CHECK INTERMITTENT INCIDENT Refer to GI-38, "Intermittent Incident". >> INSPECTION END G H J K L M N O | >> | > Repair c | pen circuit | , short to | ground or | short to power in harness or connectors. | |
| Refer to GI-38, "Intermittent Incident". >>> INSPECTION END G H K L M N | | | | | - | · | Е |
| H I J K L M N O | Refer to GI | -38, "Inte | rmittent Inc | cident". | | | 1 |
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Revision: 2010 June **EC-943** 2011 M37/M56

P100A, P100B VVEL SYSTEM

DTC Logic INFOID:000000005841148

DTC DETECTION LOGIC

NOTE:

If DTC P100A or P100B is displayed with DTC P1090 or P1093, first perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-958, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|---|------------------------------------|--|--|
| P100A | VVEL SYSTEM-B1 [VVEL response malfunction (bank 1)] | Actual event response to target is | Harness or connectors (VVEL actuator motor circuit is open or shorted.) VVEL actuator motor | |
| P100B | VVEL SYSTEM-B2 [VVEL response malfunction (bank 2)] | poor. | VVEL actuator sub assemblyVVEL ladder assemblyVVEL control module | |

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 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine.
- 2. Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.
- 3. Wait at idle for 5 seconds or more.
- 4. Repeat steps 2 to 3 for three times.
- Check 1st trip DTC.

Is DTC detected?

YES >> Proceed to EC-944, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841149

1.vvel actuator motor output signal circuit for open and short

- Disconnect VVEL control module harness connector.
- Disconnect VVEL actuator motor harness connector.
- Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

| DTC No. | V | VEL control module | | VVEL actuator motor | | Continuity |
|---------|---------------|--------------------|-------------|---------------------|----------|--------------------------------|
| DIC NO. | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| | | | 10 | | 1 | Existed |
| P100A | 1 | 25 | 12 | F72 | 2 | Not existed |
| PTOUA | I | | 25 | F73 | 1 | Not existed |
| | | | 25 | | 2 | Existed |
| P100B | 0 | - E15 | 2 | F71 | 1 | Existed |
| | | | | | 2 | Not existed |
| | 2 | | 15 | | 1 | Not existed |
| | | | | | 2 | Existed |
| | k harness for | short to grou | nd and powe | r. | | |

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL actuator motor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK VVEL ACTUATOR MOTOR

Refer to EC-946, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

>> GO TO 5. YES

NO >> GO TO 4.

f 4.REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38. "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-1104, "Removal and Installation".

>> GO TO 7.

7. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- 2. Erase 1st trip DTC.
- Perform DTC Confirmation Procedure. See EC-944, "DTC Logic".

Is the DTC P100A or P100B displayed again?

YES >> GO TO 8.

NO >> INSPECTION END

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P100A, P100B VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

8.CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-946, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

$\mathbf{9}.$ REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

10. CHECK VVEL LADDER ASSEMBLY

Refer to EM-245, "Exploded View".

Is the inspection result normal?

YES >> GO TO 12. NO >> GO TO 11.

11. REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY

Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly.

Refer to EM-263, "Exploded View" (Cylinder head).

Refer to EM-245, "Exploded View" (VVEL ladder assembly and VVEL actuator sub assembly)

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000005841150

1. CHECK VVEL ACTUATOR MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor harness connector.
- 3. Check resistance between VVEL actuator motor terminals as per the following.

| VVEL actuator motor | Resistance | |
|---------------------|--------------|--|
| Terminal | | |
| 1 and 2 | 16 Ω or less | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:0000000005841151

1. CHECK VVEL ACTUATOR SUB ASSEMBLY

- Turn ignition switch OFF.
- 2. Remove VVEL actuator sub assembly. Refer to EM-245, "Exploded View".
- Turn the ball screw shaft to check that it works smoothly.

| P100A, P100B VVEL SYSTEM < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
|---|----------|
| Is the inspection result normal? | |
| YES >> INSPECTION END | А |
| NO >> GO TO 2. | |
| 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY | EC |
| Replace VVEL actuator sub assembly. Refer to EM-245 , "Exploded View". | |
| >> INSPECTION END | С |
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[VK56VD]

P1078, P1084 EVT CONTROL POSITION SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|--|
| P1078 | EXH TIM SEN/CIRC-B1 [Exhaust valve timing control position sensor (bank 1) circuit] | An excessively high or low voltage from the sensor is sent to ECM. | Harness or connectors [Exhaust valve timing control position sensor (bank 1) circuit is open or shorted) Exhaust valve timing control position sensor (bank 1) Crankshaft position sensor Camshaft position sensor (bank 1) Accumulation of debris to the signal pick-up portion of the camshaft |
| P1084 | EXH TIM SEN/CIRC-B2 [Exhaust valve timing control position sensor (bank 2) circuit] | | Harness or connectors [Exhaust valve timing control position sensor (bank 2) circuit is open or shorted) Exhaust valve timing control position sensor (bank 2) Crankshaft position sensor Camshaft position sensor (bank 2) Accumulation of debris to the signal pick-up portion of the camshaft |

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 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-948, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841155

1.check exhaust valve timing control position sensor power supply circuit-i

- 1. Disconnect exhaust valve timing (EVT) control position sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between exhaust valve timing control position sensor harness connector and ground.

| DTC | EVT | control positi | on sensor | or Ground Voltage (V) | | |
|-------|------|----------------|-----------|-----------------------|-------------|--|
| DIC | Bank | Connector | Terminal | Ground | voltage (v) | |
| P1078 | 1 | F59 | 1 | Ground | Approx 5 | |
| P1084 | 2 | F63 | 1 | Giodila | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair open circuit, short to ground in harness or connectors.

P1078, P1084 EVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

2.check evt control position sensor ground circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between EVT control position sensor harness connector and ECM harness connec-

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| DTC | EVT control position sensor | | | EC | CM | Continuity |
|-------|-----------------------------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1078 | 1 | F59 | 2 | F111 | 68 | Existed |
| P1084 | 2 | F63 | 2 | F111 | 99 | LXISIGU |

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Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit, short to power in harness or connectors.

3.CHECK EVT CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between EVT control position sensor harness connector and ECM harness connec-

| DTC | DTC EVT control position sensor | | | EC | Continuity | |
|-------|---------------------------------|-----------|----------|-----------|------------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1078 | 1 | F59 | 3 | F111 | 75 | Existed |
| P1084 | 2 | F63 | 3 | | 93 | LAISIGU |

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.

f 4.CHECK EXHAUST VALVE TIMING CONTROL POSITION SENSOR

Refer to EC-950, "Component Inspection (Exhaust Valve Timing Control Position Sensor)".

Is the inspection result normal?

YES >> GO TO 5.

NO

>> Replace malfunctioning exhaust valve timing control position sensor. Refer to EM-230, "Exploded View".

CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.

>> Replace crankshaft position sensor. Refer to EM-203, "2WD: Exploded View" (2WD) or EM-206, NO "AWD: Exploded View" (AWD).

6.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace malfunctioning camshaft position sensor. Refer to EM-230, "Exploded View".

1. CHECK CAMSHAFT SPROCKET (SIGNAL PLATE)

Check the following.

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P1078, P1084 EVT CONTROL POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- Accumulation of debris to the signal plate of ccamshaft sprocket (EXH)
- Chipping signal plate of camshaft sprocket (EXH)

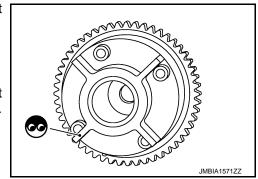
Is the inspection result normal?

YES

>> GO TO 8.

NO

>> Remove debris and clean the signal plate of camshaft sprocket (EXH) or replace camshaft sprocket (EXH). Refer to EM-230, "Exploded View".



8. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Exhaust Valve Timing Control Position Sensor)

INFOID:0000000005841156

1. EXHAUST VALVE TIMING CONTROL POSITION SENSOR-I

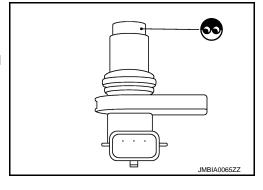
- 1. Turn ignition switch OFF.
- 2. Disconnect exhaust valve timing control position sensor harness connector.
- 3. Loosen the fixing bolt of the sensor.
- 4. Remove the sensor.
- 5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.

NO

>> Replace malfunctioning exhaust valve timing control position sensor. Refer to EM-230, "Exploded View".



2.EXHAUST VALVE TIMING CONTROL POSITION SENSOR-II

Check resistance exhaust valve timing control position sensor terminals as shown below.

| Terminals | Resistance |
|---------------|----------------------------------|
| 1 (+) - 2 (-) | |
| 1 (+) - 3 (-) | Except 0 or ∞ Ω [at 25°C (77°F)] |
| 2 (+) - 3 (-) | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning exhaust valve timing control position sensor. Refer to EM-230, "Exploded View".

P1087, P1088 VVEL SYSTEM

< DTC/CIRCUIT DIAGNOSIS >

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P1087, P1088 VVEL SYSTEM

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.

Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-955, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---------------------------------|---|
| P1087 | VVEL SYSTEM-B1 [VVEL small event angle malfunction (bank 1)] | The event angle of VVEL control | Harness or connectors (VVEL actuator motor circuit is open or shorted.) |
| P1088 | VVEL SYSTEM-B2 [VVEL small event angle malfunction (bank 2)] | shaft is always small. | VVEL actuator motor VVEL actuator sub assembly VVEL ladder assembly VVEL control module |

Diagnosis Procedure

INFOID:0000000005888599

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093. Perform the trouble diagnosis for DTC P1090 or P1093. Refer to <u>EC-955</u>, "DTC Logic".

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[VK56VD]

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608. Refer to <u>EC-1029</u>, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1089 | VVEL POS SEN/CIRC-B1 [VVEL control shaft position sensor (bank 1) circuit] | An excessively low voltage from the sensor is sent to VVEL control module. An excessively high voltage from the sensor | Harness or connectors (VVEL control shaft position sen- |
| P1092 | VVEL POS SEN/CIRC-B2 [VVEL control shaft position sensor (bank 2) circuit] | is sent to VVEL control module. Rationally incorrect voltage is sent to VVEL control module compared with the signals from VVEL control shaft position sensor 1 and VVEL control shaft position sensor 2. | sor circuit is open or shorted.) VVEL control shaft position sensor VVEL control module |

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 10 V or more 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-952, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841160

1. VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

- 1. Disconnect VVEL control shaft position sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

| DTC No. | VVEL co | ontrol shaft position | Ground | Voltage (V) | | |
|---------|---------|-----------------------|--------|-------------|-----------|----------|
| DIC No. | Bank | Connector Terminal | | | Ground | |
| P1089 | 1 | F72 | 3 | | | |
| F 1009 | 1 172 | 6 | 172 | 6 | Ground | Approx 5 |
| P1092 | 2 | F70 | 3 | Ground | Approx. 5 | |
| F 1092 | 2 | F70 | 6 | | | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.check vvel control shaft position sensor ground circuit for open and short

- Turn ignition switch OFF.
- Disconnect VVEL control module harness connector.
- Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

| DTC No. | VVEL control shaft position sensor | | | VVEL control module | | Continuity | | |
|---------|------------------------------------|-----------|----------|---------------------|----------|------------|----|---------|
| DIC No. | Bank | Connector | Terminal | Connector | Terminal | Continuity | | |
| P1089 | 1 | F72 | 2 | | 6 | | | |
| F 1069 | 1 112 | F72 | F72 | 172 | 5 | E15 | 19 | Existed |
| P1092 | 2 | E70 | 2 | E13 | 4 | Existed | | |
| F 1092 | 2 | F70 | 5 | | 17 | | | |

Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- · Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.VVEL CONTROL SHAFT POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

| DTC No. | VVEL control shaft position sensor | | | VVEL control module | | Continuity | | | |
|---------|------------------------------------|-----------|----------|---------------------|----------|------------|-----|----|---------|
| DIC No. | Bank | Connector | Terminal | Connector | Terminal | Continuity | | | |
| P1089 | 1 | F72 | 1 | | 3 | | | | |
| F 1009 | 4 | F/Z | F72 | 172 | 172 | 1 172 | E15 | 16 | Existed |
| P1092 | 2 | F70 | 1 | EIS | 5 | Existed | | | |
| F 1092 | 2 | F70 | 4 | | 1 | 18 | | | |

Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

EC-953 2011 M37/M56 Revision: 2010 June

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P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace.

8. REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-1104, "Removal and Installation".

>> GO TO 9.

9. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See EC-952, "DTC Logic".

Is the DTC P1089 or P1092 displayed again?

YES >> GO TO 10.

NO >> INSPECTION END

10. REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1090, P1093 VVEL ACTUATOR MOTOR

DTC Logic INFOID:0000000005841163

DTC DETECTION LOGIC

NOTE:

If DTC P1090 or P1093 is displayed with DTC P1091, first perform the trouble diagnosis for DTC P1091. Refer to EC-958, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P1090 | VVEL ACTR MOT-B1 [VVEL system performance (bank 1)] | Event angle difference between the actual and the target is detected. | Harness or connectors (VVEL actuator motor circuit is open or shorted.) VVEL actuator motor |
| P1093 | VVEL ACTR MOT-B2 [VVEL system performance (bank 2)] | Abnormal current is sent to VVEL actuator motor. | VVEL actuator sub assemblyVVEL ladder assemblyVVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for 10 second.
- Keep the engine speed at approximately 3,500 rpm for at least 10 seconds under no load.
- Check DTC.

Is DTC detected?

YES >> Proceed to EC-955, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1.vvel actuator motor output signal circuit for open and short

- Disconnect VVEL control module harness connector.
- Disconnect VVEL actuator motor harness connector.
- Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

| DTC No. | V | VEL control mode | ule | VVEL actu | uator motor | Continuity |
|---------|------|------------------|----------|-----------|-------------|-----------------------------------|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| | | | 12 | | 1 | Existed |
| P1090 | 1 | | 12 | F73 | 2 | Not existed Not existed Existed |
| P1090 | ' | | 25 | 173 | 1 | |
| | | E15 | 25 | | 2 | |
| P1093 | | LIS | 2 | | 1 | Existed |
| | 2 | | 2 | F71 | 2 | Not existed |
| | 2 | | 15 | 171 | 1 | Not existed |
| | | | 15 | | 2 | Existed |

EC-955 Revision: 2010 June 2011 M37/M56

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INFOID:0000000005841164

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P1090, P1093 VVEL ACTUATOR MOTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

4. Also check harness for short to ground and power.

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL actuator motor and VVEL control module
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK VVEL ACTUATOR MOTOR

Refer to EC-957, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

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

4. REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

5. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace.

6. REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-1104, "Removal and Installation".

>> GO TO 7.

7.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- Erase DTC.
- 3. Perform DTC Confirmation Procedure. See <u>EC-955</u>, "<u>DTC Logic"</u>.

Is the DTC P1090 or P1093 displayed again?

YES >> GO TO 8.

NO >> INSPECTION END

8.CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-957, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 9.

9. REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

10. CHECK VVEL LADDER ASSEMBLY

Refer to EM-245, "Exploded View".

P1090, P1093 VVEL ACTUATOR MOTOR

[VK56VD] < DTC/CIRCUIT DIAGNOSIS > Is the inspection result normal? Α YES >> GO TO 12. NO >> GO TO 11. 11. REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY EC Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly. Refer to EM-263, "Exploded View" (Cylinder head) Refer to EM-245, "Exploded View" (VVEL ladder assembly and VVEL actuator sub assembly). >> INSPECTION END 12. CHECK INTERMITTENT INCIDENT D Refer to GI-38, "Intermittent Incident". >> INSPECTION END Component Inspection (VVEL ACTUATOR MOTOR) INFOID:0000000006115641 F 1. CHECK VVEL ACTUATOR MOTOR Turn ignition switch OFF. Disconnect VVEL actuator motor harness connector. Check resistance between VVEL actuator motor terminals as per the following. VVEL actuator motor Resistance Terminal 1 and 2 16 Ω or less Is the inspection result normal? >> INSPECTION END YES NO >> GO TO 2. 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View". K >> INSPECTION END Component Inspection (VVEL ACTUATOR SUB ASSEMBLY) 1. CHECK VVEL ACTUATOR SUB ASSEMBLY Turn ignition switch OFF. Remove VVEL actuator sub assembly. Refer to EM-245, "Exploded View". Turn the ball screw shaft to check that it works smoothly. Is the inspection result normal? N YES >> INSPECTION END NO >> GO TO 2. 2.REPLACE VVEL ACTUATOR SUB ASSEMBLY Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View". Р >> INSPECTION END

[VK56VD]

P1091 VVEL ACTUATOR MOTOR RELAY

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P1091 | VVEL ACTR MOT PWR [VVEL actuator motor relay circuit] | VVEL control module detects the VVEL actuator motor relay is stuck OFF. VVEL control module detects the VVEL actuator motor relay is stuck ON. | Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.) VVEL actuator motor relay VVEL control module 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 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON and wait at least 1 seconds.
- 2. Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON and wait at least 1 seconds.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-958</u>, "<u>Diagnosis Procedure</u>".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841170

1. VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect VVEL actuator motor relay.
- Check the voltage between VVEL actuator motor relay harness connector and ground.

| VVEL actuat | or motor relay | Ground | Voltage | |
|--------------------|----------------|--------|-----------------|--|
| Connector Terminal | | Glound | voltage | |
| E16 | 1 | Ground | Battery voltage | |
| | 5 | Glound | Battery voltage | |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- 50A fusible link (letter G)
- Harness for open or short between VVEL actuator motor relay and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

3.vvel actuator motor relay power supply circuit-ii

- Disconnect VVEL control module harness connector.
- 2. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

| VVEL control module | | VVEL actuate | VVEL actuator motor relay | | |
|---------------------|----------|--------------------|---------------------------|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| E15 | 23 | E16 | 2 | Existed | |

Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to ground or short to power in harness or connectors.

f 4.VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

| VVEL control module VVEL ac | | VVEL actuat | or motor relay | Continuity | |
|-----------------------------|-----------|-------------|----------------|------------|------------|
| Bank | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | E15 | 13 | E16 | 2 | Existed |
| 2 | E15 | 1 | L10 | 3 | LAISIEU |

2. Also check harness for short to ground and 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.

${f 5.}$ CHECK VVEL ACTUATOR MOTOR RELAY

Refer to EC-960, "Component Inspection (VVEL Actuator Motor Relay)".

Is the inspection result normal?

YES >> GO TO 6.

>> Replace VVEL actuator motor relay. NO

6.CHECK ABORT CIRCUIT FOR OPEN AND SHORT

- Disconnect ECM harness connector.
- Check the continuity between VVEL control module harness connector and ECM harness connector.

| VVEL control module | | E | СМ | Continuity |
|---------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E15 | 21 | M160 | 122 | Existed |

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open and short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

8 check intermittent incident

Refer to GI-38, "Intermittent Incident".

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P1091 VVEL ACTUATOR MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace.

9. REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-1104. "Removal and Installation".

>> GO TO 10.

10. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Erase DTC.
- 3. Perform DTC Confirmation Procedure. See EC-958, "DTC Logic".

Is the DTC P1091 displayed again?

YES >> GO TO 11.

NO >> INSPECTION END

11.REPLACE ECM

Replace ECM. Refer to EC-1103, "Removal and Installation".

>> INSPECTION END

Component Inspection (VVEL Actuator Motor Relay)

INFOID:0000000005841171

2011 M37/M56

[VK56VD]

1. CHECK VVEL ACTUATOR MOTOR RELAY

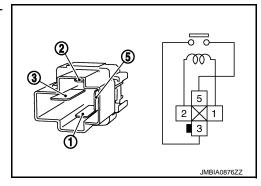
- 1. Turn ignition switch OFF.
- 2. Remove VVEL actuator motor relay.
- 3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.

| Terminal | Condition | Continuity |
|----------|---|-------------|
| 3 and 5 | 12V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace VVEL actuator motor relay.



P1148, P1168 CLOSED LOOP CONTROL

< DTC/CIRCUIT DIAGNOSIS >

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P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

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. | Harness or connectors (The A/F sensor 1 circuit is open or shorted.) |
| 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. | A/F sensor 1 A/F sensor 1 heater |

Diagnosis Procedure

INFOID:0000000005886007

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-639, "DTC Index".

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P1197 OUT OF GAS

Description INFOID:000000005926918

This diagnosis result is detected when the fuel level of the fuel tank is extremely low and the engine does not run normally.

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1197 | FUEL RUN OUT (Out of gas) | Fuel rail pressure remains at 1.5 MPa (15 bar, 15.3 kg/cm², 217.5 psi) or less for 3 seconds or more with the fuel level too low. Fuel rail pressure remains 2.7 MPa (27 bar, 27.5 kg/cm², 392 psi) lower than a target fuel pressure for 5 seconds or more with the fuel level too low. Fuel rail pressure remains at 0.23 MPa (2.3 bar, 2.346 kg/cm², 33.35 psi) or less for 5 seconds or more with the fuel level too low. NOTE: Allow engine coolant temperature to reach 70°C (158°F) or more once. | Out of gas Harness or connectors (The low pressure fuel pump circuit is open or shorted.) Low pressure fuel pump Fuel pressure regulator Low pressure fuel system Low fuel pressure sensor Harness or connectors (The high pressure fuel pump circuit is shorted.) High pressure fuel pump High pressure fuel system Fuel rail pressure sensor Disconnection of the fuel hose |

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 at idle.

>> GO TO 2.

2.perform dtc confirmation procedure-i

Start the engine.

Does the engine start?

YES >> GO TO 3.

NO >> Proceed to <u>EC-963</u>, "<u>Diagnosis Procedure</u>".

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Warm up the engine to the normal operating temperature.

NOTE:

For best results, warm up the engine until "COOLAN TEMP/S" on "DATA MONITOR" of CONSULT-III reaches at least 70°C (158°F).

- 2. Keep the engine speed at 3,500 rpm for 5 seconds and let it idle at least 60 seconds...
- 3. Check the 1st trip DTC.

NOTE:

If the fuel tank has sufficient fuel, this diagnosis result may not be detected.

Is 1st trip DTC detected?

YES >> Proceed to EC-963, "Diagnosis Procedure".

NO >> INSPECTION END

P1197 OUT OF GAS

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

Diagnosis Procedure INFOID:0000000005926920

| 1.1 | REFUEL THE VEHICLE | |
|-----|---|----|
| 1. | Refuel 10 liter (10 US qt, 8 imp qt). CAUTION: | EC |
| 2. | Never refuel more than 10 liter. Start the engine and keep the engine speed at 3,000 rpm for 30 seconds. NOTE: For best results, warm up the engine until "COOLAN TEMP/S" on "DATA MONITOR" of CONSULT-III | С |
| | reaches at least 70°C (158°F). | |

- 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. Turn ignition switch ON.
- 7. Erase the DTC.
- 8. Start the engine and let it idle at least 60 seconds.
- 9. Perform the confirmation procedure again. Refer to <a>EC-962, "DTC Logic".

Is 1st trip DTC detected?

YES >> GO TO 2.

NO >> INSPECTION END

2.CHECK LOW PRESSURE FUEL PUMP

Refer to EC-1081, "Component Function Check".

Is inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace error-detected parts.

3.CHECK HIGH PRESSURE FUEL PUMP

Refer to EC-1070, "Component Function Check".

Is inspection result normal?

YES >> Check the fuel hose for disconnection and looseness.

NO >> Repair or replace error-detected parts.

EC-963 Revision: 2010 June 2011 M37/M56

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[VK56VD]

INFOID:0000000005841175

P1211 TCS CONTROL UNIT

Description INFOID:0000000005841173

The malfunction information related to TCS is transferred through 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

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 C/U FUNCTN (TCS control unit) | ECM receives malfunction information from "ABS actuator and electric unit (control unit)". | ABS actuator and electric unit (control unit) TCS related parts |

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 10.5 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for at least 60 seconds.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-964, "Diagnosis Procedure"

NO >> INSPECTION END

Diagnosis Procedure

Revision: 2010 June

Perform the trouble diagnosis for TCS. Refer to BRC-64, "Work Flow".

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P1212 TCS COMMUNICATION LINE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1212 TCS COMMUNICATION LINE

Description INFOID:0000000005841176

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:0000000005841177

DTC DETECTION LOGIC

NOTE:

- If DTC P1212 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.
- If DTC P1212 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607.

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 | F |
|---------|--|---|--|---|
| P1212 | TCS/CIRC (TCS communication line) | ECM cannot receive the information from "ABS actuator and electric unit (control unit)" continuously. | Harness or connectors (The CAN communication line is open or shorted.) ABS actuator and electric unit (control unit) Dead (Weak) battery | G |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 10.5 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 10 seconds.
- Check 1st trip DTC. 2.

Is 1st trip DTC detected?

YES >> Proceed to EC-965, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

Perform the trouble diagnosis for TCS. Refer to BRC-64, "Work Flow".

If DTC P1212 is displayed with DTC UXXXX and/or P0607, perform the following trouble diagnosis.

- Trouble diagnosis for DTC UXXXX Refer to EC-639, "DTC Index".
- Trouble diagnosis for DTC P0607 Refer to <u>EC-936</u>, "<u>DTC Logic</u>".

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P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1217 ENGINE OVER TEMPERATURE

DTC Logic INFOID:0000000006034988

DTC DETECTION LOGIC

- 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-936, "DTC Logic".

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will

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)] | 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. | 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-33, "Draining" and CO-34, "Refilling". Also, replace the engine oil. Refer to LU-24, "Draining" and LU-25, "Refilling".

- 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-13, "Anti-Freeze Coolant Mixture Ratio".
- 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-966, "Component Function Check".

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

>> Proceed to EC-967, "Diagnosis Procedure".

Component Function Check

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.

INFOID:0000000006034989

Wrap a thick cloth around cap. Carefully remove the cap by turning it a guarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

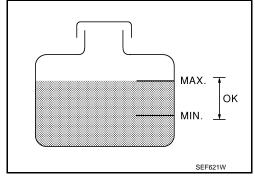
Check the coolant level in the reservoir tank and radiator.

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-967, "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-967, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

WITH CONSULT-III

- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that cooling fan speed varies according to the percentage.

R WITHOUT CONSULT-III

Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-11, "Diagnosis Description".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-967, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK COOLING FAN OPERATION

- (I) WITH CONSULT-III
- 1. Turn ignition switch ON.
- Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that cooling fan speed varies according to the percentage.
- ® WITHOUT CONSULT-III
- 1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-11, "Diagnosis Description".
- Check that cooling fan operates.

Is the inspection result normal?

YFS >> GO TO 2.

NO >> Proceed to EC-1060, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAKAGE-I

Check cooling system for leakage. Refer to CO-33, "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

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P1217 ENGINE OVER TEMPERATURE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap. Refer to CO-37, "RADIATOR CAP: Inspection".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace radiator cap.

5.CHECK THERMOSTAT

Check thermostat. Refer to CO-48, "Inspection".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace thermostat. Refer to CO-47, "Exploded View".

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-781, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace engine coolant temperature sensor. Refer to EM-263, "Exploded View".

7. OVERHEATING CAUSE ANALYSIS

If the cause cannot be isolated, check the CO-31, "Troubleshooting Chart".

>> INSPECTION END

P1220 FUEL PUMP CONTROL MODULE (FPCM)

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1220 FUEL PUMP CONTROL MODULE (FPCM)

DTC Logic INFOID:0000000005841183

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P1220 | FPCM (Fuel pump control module) | During engine cranking, the signal voltage of the FPCM to the ECM is too low. | Harness or connectors (FPCM circuit is open or shorted) (Fuel pump circuit is open or shorted) FPCM |

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.
- 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 between 12 15 V at idle.
- Before performing the following procedure, check that the engine coolant temperature is -10°C (14°F) or more.

>> 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 5 seconds.
- Check DTC.

Is DTC detected?

YES >> Proceed to EC-969, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK FPCM POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect FPCM harness connector.
- Turn ignition switch ON.
- Check the voltage between FPCM harness connector and ground.

| FP | СМ | Ground | Voltage | |
|--------------------|----|--------|-----------------|--|
| Connector Terminal | | Glound | Voltage | |
| B221 | 10 | Ground | Battery voltage | |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- 15 A fuse (No.41)
- Harness for open or short between FPCM and IPDM E/R
- Loose or poor connection for each connector and harness

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P1220 FUEL PUMP CONTROL MODULE (FPCM)

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Check the continuity between FPCM harness connector and ground.

| FP | CM | Ground | Continuity | |
|--------------------|----|--------|------------|--|
| Connector Terminal | | Ground | Continuity | |
| B221 | 5 | Ground | Existed | |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to power in harness or connectors.

4. CHECK FPCM INPUT AND OUTPUT CIRCUITS FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check the continuity between FPCM harness connector and ECM harness connector.

| FPCM | | ECM | | Continuity | |
|--------------------|---|-----------|----------|------------|--|
| Connector Terminal | | Connector | Terminal | Continuity | |
| B221 | 8 | M160 | 125 | Existed | |
| DZZ I | 9 | IVITOO | 142 | | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between FPCM and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK FUEL PUMP CONTROL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect "fuel level sensor unit and fuel pump (main)" harness connector.
- 2. Check the continuity between FPCM harness connector and "fuel level sensor unit and fuel pump (main)" harness connector.

| FPCM | | Fuel level sensor unit and fuel pump (main) | | Continuity | |
|-----------|----------|---|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| B221 | 6 | B241 | 3 | Existed | |
| DZZI | 7 | D241 | 1 | LXISTEG | |

3. 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 FPCM

Refer to EC-971, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace FPCM. Refer to EC-1105, "Removal and Installation".

P1220 FUEL PUMP CONTROL MODULE (FPCM)

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

8.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (FPCM)

INFOID:0000000006037278

1. CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Check the voltage between FPCM terminals under the following conditions.

| FPCM | | | | |
|-----------|----------|----------|---|--------------|
| Connector | + | - | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| | | | For 1 second after turning ignition switch ON | Approx. 10 V |
| B221 | 7 | 6 | More than 1 second after turning ignition switch ON | Approx. 0 V |
| | | | Idle speed | Approx. 10 V |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace FPCM.

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[VK56VD]

P1225, P1234 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|--|--|------------------------------------|--|
| P1225 | CTP LEARNING-B1 C[losed throttle position learning performance (bank 1)] | Closed throttle position learning value is | Electric throttle control actuator | |
| P1234 | CTP LEARNING-B2 [Closed throttle position learning performance (bank 2)] | excessively low. | (TP sensor 1 and 2) | |

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 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 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 <u>EC-972</u>, "<u>Diagnosis Procedure</u>".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841188

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Turn ignition switch OFF.
- Remove the intake air duct.
- Check that no 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.

2.replace electric throttle control actuator

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

P1226, P1235 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1226, P1235 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|---|--|---|--|
| P1226 | CTP LEARNING-B1 [Closed throttle position learning performance (bank 1)] | Closed throttle position learning is not | Electric throttle control actuator (TP sensor 1 and 2) | |
| P1235 | CTP LEARNING-B2 [Closed throttle position learning performance (bank 2)] | performed successfully, repeatedly. | | |

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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 10 V or more at idle.

>> GO TO 2.

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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.
- Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to <u>EC-973</u>, "<u>Diagnosis Procedure</u>".

NO >> INSPECTION END

INFOID:0000000005841192

Diagnosis Procedure

CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY Turn ignition switch OFF.

- Remove the intake air duct.
- 3. Check that no foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.

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NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.replace electric throttle control actuator

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1233 or P2101 is displayed with DTC P1238, P2119, perform the trouble diagnosis for DTC P1238, P2119. Refer to <u>EC-980, "DTC Logic"</u>.

If DTC P1233 or P2101 is displayed with DTC P2100, perform the trouble diagnosis for DTC P1290, P2100. Refer to EC-1035, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|--|---|--|--|
| P1233 | ETC FNCTN/CIRC-B2 [Electric throttle control performance (bank 2)] | Electric throttle control function does not | Harness or connectors (Throttle control motor circuit is open or | |
| P2101 | ETC FNCTN/CIRC-B1 [Electric throttle control performance (bank 1)] | operate properly. | shorted) • Electric throttle control actuator | |

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 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.
- Check DTC.

Is DTC detected?

YES >> Proceed to EC-974, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841196

1. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector terminals as per the following.

| | | E | СМ | | | |
|-------|-----------|----------|-----------|----------|---------------------|-----------------|
| DTC | | + | _ | | Condition | Voltage (V) |
| | Connector | Terminal | Connector | Terminal | | |
| P1233 | M160 | 173 | M160 | 175 | Ignition switch OFF | Approx. 0 |
| P2101 | IVITOO | 173 | WITOO | 173 | Ignition switch ON | Battery voltage |

Is the inspection result normal?

YES >> GO TO 8. NO >> GO TO 2.

2. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

- 2. Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector E5.
- Check the continuity between IPDM E/R harness connector and ECM harness connector.

| IPDM | E/R | EC | Continuity | |
|--------------------|-----|-----------|------------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| E5 | 7 | M160 | 173 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Check the continuity between IPDM E/R harness connector and ECM harness connector.

| DTC | IPDM E/R | | ECM | | Continuity | |
|----------------|-----------|----------|-----------|----------|------------|--|
| ыс | Connector | Terminal | Connector | Terminal | Continuity | |
| P1233 P2101 | E7 | 71 | M160 | 123 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK FUSE

- 1. Disconnect 15 A fuse (No. 50) from IPDM E/R.
- Check if 15 A fuse is blown.

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace 15 A fuse.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

NO >> Repair or replace harness or connectors.

8.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- Disconnect ECM harness connector.

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P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

 Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|--------|------------------------------------|-----------|----------|-----------|----------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| | | | 5 | | 62 | Not existed |
| P1233 | 2 | F64 | 5 | F111 | 58 | Existed |
| F 1233 | | | 6 | | 62 | Existed |
| | | | | o | | 58 |
| | | F66 | 5 | | 57 | Not existed |
| P2101 | 1 | | 5 | F111 | 63 | Existed |
| | | | 6 | | 57 | Existed |
| | | | 0 | | 63 | Not existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair or replace malfunctioning part.

9. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

- 1. Remove the intake air duct. Refer to EM-184, "Exploded View".
- 2. Check that no foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

10. CHECK THROTTLE CONTROL MOTOR

Refer to EC-976, "Component Inspection (Electric Throttle Control Motor)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 12.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Repair or replace harness or connectors.

12. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunction electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

Component Inspection (Electric Throttle Control Motor)

INFOID:0000000005841197

1. CHECK THROTTLE CONTROL MOTOR

- 1. Turn ignition switch OFF.
- 2. Disconnect electric throttle control actuator harness connector.
- Check resistance between electric throttle control actuator terminals as per the following.

| E | ectric throttle contr | Resistance | |
|------|-----------------------|------------|--------------------------------------|
| Bank | Connector | Terminals | Resistance |
| 1 | F66 | 5 and 6 | Approx. 1 - 15 Ω [at 25°C (77°F)] |
| 2 | F64 | 5 and 6 | - Αρρίολ: 1 - 13 s2 [at 23 G (77 T)] |

P1233. P2101 ELECTRIC THROTTLE CONTROL FUNCTION

| P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION < DTC/CIRCUIT DIAGNOSIS > | [VK56VD] |
|---|----------|
| Is the inspection result normal? | |
| YES >> INSPECTION END | А |
| NO >> GO TO 2. | |
| 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR | EC |
| Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installa | ution". |
| >> INSPECTION END | |
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< DTC/CIRCUIT DIAGNOSIS >

P1236, P2118 THROTTLE CONTROL MOTOR

DTC Logic INFOID:0000000005841200

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|--|--|--|--|
| P1236 | ETC MOT-B2 [Throttle control motor (bank 2) circuit short] | ECM detects short in both circuits between ECM and throttle control motor. | Harness or connectors (Throttle control motor circuit is shorted.) | |
| P2118 | ETC MOT-B1 [Throttle control motor (bank 1) circuit short] | | 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.

- 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?

>> Proceed to EC-978, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841201

[VK56VD]

${f 1.}$ 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.

| DTC | Electri | c throttle cont | rol actuator | ECM | | Continuity |
|-------|---------|-----------------|--------------|-----------|----------|-------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| | | | 5 | | 62 | Not existed |
| P1233 | 2 | F64 | 5 | F111 - | 58 | Existed |
| | | | 6 | | 62 | Existed |
| | | | | | 58 | Not existed |
| | 1 | 1 F66 | 5 | | 57 | Not existed |
| P2101 | | | | F111 | 63 | Existed |
| | | | 6 | | 57 | Existed |
| | | | 0 | | 63 | Not existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

| <pre> < DTC/CIRCUIT DIAGNOSIS > YES</pre> | [VK56VD] |
|---|-------------------------|
| NO >> Repair or replace malfunctioning part. 2.CHECK THROTTLE CONTROL MOTOR Refer to EC-976, "Component Inspection (Electric Throttle Control Motor)". Is the inspection result normal? YES >> GO TO 3. NO >> GO TO 4. | |
| 2.CHECK THROTTLE CONTROL MOTOR Refer to EC-976, "Component Inspection (Electric Throttle Control Motor)". Is the inspection result normal? YES >> GO TO 3. NO >> GO TO 4. | |
| Refer to EC-976. "Component Inspection (Electric Throttle Control Motor)". s the inspection result normal? YES >> GO TO 3. NO >> GO TO 4. | |
| s the inspection result normal? YES >> GO TO 3. NO >> GO TO 4. | |
| YES >> GO TO 3. NO >> GO TO 4. | |
| NO >> GO TO 4. | |
| 3.CHECK INTERMITTENT INCIDENT | |
| | |
| Refer to GI-38, "Intermittent Incident". | |
| s the inspection result normal? | |
| YES >> GO TO 4. NO >> Repair or replace harness or connectors. | |
| 1. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR | |
| Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | estallation" |
| eplace manufictioning electric trifottle control actuator. Refer to <u>EM-191, Removal and In</u> | istaliation . |
| >> INSPECTION END | |
| | |
| Component Inspection (Electric Throttle Control Motor) | INFOID:0000000006115643 |
| .CHECK THROTTLE CONTROL MOTOR | |
| I. Turn ignition switch OFF. | |
| 2. Disconnect electric throttle control actuator harness connector. | |
| Check resistance between electric throttle control actuator terminals as per the following | ıg. |
| Electric throttle control actuator | |
| Bank Connector Terminals Resistance | |
| 1 F66 5 and 6 | |
| Approx. 1 - 15 Ω [at 25°C (77°F)] | |
| s the inspection result normal? | |
| o the mepodient recuit normal. | |
| YES >> INSPECTION END | |
| YES >> INSPECTION END NO >> GO TO 2. | |
| YES >> INSPECTION END NO >> GO TO 2. | |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR | nstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | ıstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR | ıstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | nstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | nstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | nstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | nstallation". |
| YES >> INSPECTION END NO >> GO TO 2. 2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and In | nstallation". |

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[VK56VD]

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | | DTC detecting condition | Possible cause |
|---|--|----|---|------------------------------------|
| ETC ACTR-B2 | | A) | Electric throttle control actuator does not function properly due to the return spring malfunction. | |
| P1238 | [Electric throttle control actuator (bank 2)] | B) | Throttle valve opening angle in fail-safe mode is not in specified range. | |
| | | C) | ECM detect that the throttle valve is stuck open. | Electric throttle control actuator |
| | ETC ACTR-B1 | A) | Electric throttle control actuator does not function properly due to the return spring malfunction. | Liectic unothe control actuator |
| P2119 [Electric throttle control actuator (bank 1)] | | 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

- 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 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

- 1. Turn ignition switch ON and wait at least 1 second.
- Shift selector lever position to D and wait at least 3 seconds.
- 3. Shift selector lever position to P.
- 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 position to D and wait at least 3 seconds.
- Shift selector lever position to P.
- 8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
- Check DTC.

Is DTC detected?

YES >> Proceed to EC-980, "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.
- Shift selector lever position to D and wait at least 3 seconds.
- Shift selector lever position to P.
- 4. Start engine and let it idle for 3 seconds.
- Check DTC.

Is DTC detected?

YES >> Proceed to EC-980, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841206

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

VK56VD]
 Turn ignition switch OFF.
 Remove the intake air duct.

3. Check that no 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.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

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[VK56VD]

P1239, P2135 TP SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1239 or P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-939</u>, "<u>DTC Logic"</u>.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|---|---|--|--|
| P1239 | TP SENSOR-B2 [Throttle position sensor (bank 2) circuit range/per- formance] | Rationally incorrect voltage is sent to ECM compared with the signals from TP | Harness or connector (Throttle position sensor 1 or 2 circuit is open or shorted.) | |
| P2135 | TP SENSOR-B1 [Throttle position sensor (bank 1) circuit range/per- formance] | sensor 1 and TP sensor 2. | Electric throttle control actuator (Throttle position sensor 1 or 2) | |

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 8 V or more 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-982, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841210

${f 1}$.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

- Disconnect electric throttle control actuator harness connector.
- 2. Turn ignition switch ON.
- Check the voltage between electric throttle control actuator harness connector and ground.

| DTC | Electr | ic throttle cont | Ground | Voltage (V) | | |
|-------|--------|------------------|----------|-------------|-------------|--|
| DIC | Bank | Connector | Terminal | Giodila | voltage (v) | |
| P1239 | 2 | F64 | 2 | Ground | Approx. 5 | |
| P2135 | 1 | F66 | 2 | Ground | Αρρίολ. 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 throttle position sensor ground circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.

P1239, P2135 TP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|-------|------------------------------------|-----------|----------|-----------|----------|------------|
| ыс | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | F64 | 4 | F111 | 69 | Existed |
| P2135 | 1 | F66 | 4 | ГШ | 97 | Existed |

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 throttle position sensor input signal circuit for open and short

Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

| DTC | Electric throttle control actuator | | | ECM | | Continuity |
|-------|------------------------------------|-----------|----------|-----------|----------|------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity |
| P1239 | 2 | F64 | 1 | F111 | 71 | Existed |
| P1239 | 2 | 1 04 | 3 | | 89 | |
| P2135 | P2135 1 F66 | | 1 | 1 111 | 91 | LAISIEU |
| P2135 | 1 | 1 00 | 3 | | 79 | |

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 THROTTLE POSITION SENSOR

Refer to EC-983, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

${f 1}$.CHECK THROTTLE POSITION SENSOR

- Turn ignition switch OFF.
- Reconnect all harness connectors disconnected.
- 3. Perform EC-695, "Work Procedure".
- 4. Turn ignition switch ON.
- 5. Set selector lever position to D.
- Check the voltage between ECM harness connector terminals under the following conditions.

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INFOID:0000000006115644

| | ECM | | | | |
|-----------|------------------------------|----------|------------------------------------|----------------|--|
| Connector | + | - | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | 91 | 97 | Accelerator pedal: Fully released | More than 0.36 | |
| | [TP sensor 1 (bank 1)] | | Accelerator pedal: Fully depressed | Less than 4.75 | |
| | 71 [TP sensor 1 (bank 2)] | 69 | Accelerator pedal: Fully released | More than 0.36 | |
| F111 | | | Accelerator pedal: Fully depressed | Less than 4.75 | |
| 1 111 | 79 | 97 | Accelerator pedal: Fully released | Less than 4.75 | |
| | [TP sensor 2 (bank 1)] | 97 | Accelerator pedal: Fully depressed | More than 0.36 | |
| | 89 | 00 | Accelerator pedal: Fully released | Less than 4.75 | |
| | [TP sensor 2 (bank 2)] | 69 | Accelerator pedal: Fully depressed | More than 0.36 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunctioning electric throttle control actuator. Refer to EM-191, "Removal and Installation".

>> INSPECTION END

P1423, P1424 COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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P1423, P1424 COLD START CONTROL

Description INFOID:0000000005926924

ECM controls fuel injection timing and fuel injection quantity when engine is started with the engine cold. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

INFOID:0000000005926925

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1423 or P1424 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 |
|---------|--|---|----------------|
| P1423 | COLD START CONTROL (Cold start emission reduction strategy monitoring) | ECM does not control fuel injection timing properly when engine is started with the engine cold. | ECM |
| P1424 | COLD START CONTROL (Cold start emission reduction strategy monitoring) | ECM does not control fuel injection quantity properly when engine is started with with the engine cold. | LOW |

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

- WITH CONSULT-III
- 1. Turn ignition switch OFF and wait at least 10 seconds.
- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III.
- Check that "COOLAN TEMP/S".
- If it is between 5°C (41°F) and 40°C (104°F) go to the following steps.
- If it is below 5°C (41°F) warm engine up to more than 5°C (41°F) and retry from step 1.
- If it is above 40°C (104°F) cool engine down to less than 40°C (104°F) and retry from step 1.
- Start engine and let it idle for 5 minutes.
- Check 1st trip DTC.
- **WITH GST**

Follow the procedure "With CONSULT-III" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-985, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

1. INSPECTION START

- Turn ignition switch ON.
- 2. Erase DTC.
- Perform DTC confirmation procedure. Refer to <u>EC-985</u>, "DTC Logic". 3.
- Check 1st trip DTC.

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INFOID:0000000005926926

P1423, P1424 COLD START CONTROL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Is the 1st trip DTC P1423 or P1424 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

Replace ECM. Refer to EC-1103, "Removal and Installation".

>> INSPECTION END

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1550 BATTERY CURRENT SENSOR

DTC Logic INFOID:0000000005841220

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | С |
|---------|---|--|----------------|--------|
| P1550 | BAT CURRENT SENSOR (Battery current sensor cir- cuit range/performance) | The output voltage of the battery current sensor remains within the specified range while engine is running. | ed.) | D E |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 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 8 V or more at idle.

>> GO TO 2.

2.perform dtc confirmation procedure

- 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-987, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841221

1. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- Disconnect battery current sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between battery current sensor harness connector and ground.

| Battery cur | rent sensor | Ground | Voltage (V) | |
|-------------|-------------|---------|-------------|--|
| Connector | Terminal | Giodila | voltage (v) | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 2.

2.check battery current sensor power supply circuit-ii

- 1. Turn ignition switch ON.
- Disconnect ECM harness connector.

EC-987 Revision: 2010 June 2011 M37/M56

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P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | EC | Continuity | |
|------------------------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 1 | M160 | 133 | Existed |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit.

3. 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 | | |
| 76 CKP sensor | | F2 | 1 | | | |
| F111 7 | 77 | Camshaft position sensor (bank 1) | F84 | 1 | | |
| | 133 | Battery current sensor | E21 | 1 | | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 1) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)"</u>.)
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5. CHECK APP SENSOR

Refer to EC-1047, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to following.

- Models without Distance Control Assist system: <u>ACC-3</u>, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"
- Models with Distance Control Assist system: <u>ACC-4</u>, "<u>MODELS WITH DISTANCE CONTROL ASSIST SYS-TEM</u>: <u>Removal and Installation</u>"

>> INSPECTION END

7. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.

P1550 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | EC | Continuity | |
|------------------------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 3 | M160 | 150 | Existed |

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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | EC | Continuity | | |
|------------------------|----------|--------------------|------------|-------------|--|
| Connector | Terminal | Connector Terminal | | Outilitally | |
| E21 | 4 | M160 | 138 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

>> GO TO 9. YES

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK BATTERY CURRENT SENSOR

Refer to EC-989, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace battery negative cable assembly.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

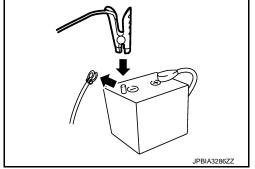
>> INSPECTION END

Component Inspection (Battery Current Sensor)

${f 1}$.CHECK BATTERY CURRENT SENSOR

- Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable.
- 4. Install jumper cable between battery negative terminal and body ground.
- Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

| Connector | + | _ | Voltage (V) |
|-----------|--|-------------------|-------------|
| Connector | Terminal | Terminal Terminal | |
| M160 | 138 (Battery current sensor signal) | 150 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152. "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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[VK56VD]

P1551, P1552 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P1551 | BAT CURRENT SENSOR (Battery current sensor circuit low input) | An excessively low voltage from the sensor is sent to ECM. | Harness or connectors (Battery current sensor circuit is shorted.) (Crankshaft position sensor circuit is open or |
| P1552 | Battery current sensor circuit high input (BAT CURRENT SENSOR) | An excessively high voltage from the sensor is sent to ECM. | shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Battery current sensor • Crankshaft position sensor • Camshaft position sensor (bank 1) • Accelerator pedal position sensor 2 • EVAP control system pressure sensor • Refrigerant pressure sensor |

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 8 V or more with ignition switch ON

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 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-990, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841225

1. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- 2. Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

| Battery cur | rent sensor | Ground | Voltage (V) | |
|--------------------|-------------|---------|-------------|--|
| Connector Terminal | | Giodila | voltage (v) | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 2.

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

$\overline{2}$.check battery current sensor power supply circuit-ii

- 1. Turn ignition switch ON.
- Disconnect ECM harness connector. 2.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity | |
|------------------------|----------|--------------------|-----|------------|--|
| Connector | Terminal | Connector Terminal | | Continuity | |
| E21 | 1 | M160 | 133 | Existed | |

Is the inspection result normal?

>> GO TO 3. YES

NO >> Repair open circuit.

3.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 | | |
| F111 | 76 | CKP sensor | F2 | 1 | | |
| FIII | 77 | Camshaft position sensor (bank 1) | F84 | 1 | | |
| | 133 | Battery current sensor | E21 | 1 | | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 1) (Refer to <u>EC-864</u>, "Component Inspection (Camshaft Position Sensor)".)
- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".)
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-1047, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 6.

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6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to following.

- Models without Distance Control Assist system: ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"
- Models with Distance Control Assist system: <u>ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYS-</u> TEM: Removal and Installation"

>> INSPECTION END

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P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

7.check battery current sensor ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 3 | M160 | 150 | Existed |

4. 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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 4 | M160 | 138 | 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 BATTERY CURRENT SENSOR

Refer to EC-992, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace battery negative cable assembly.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

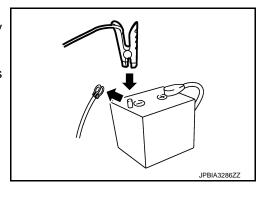
Component Inspection (Battery Current Sensor)

INFOID:0000000006115645

1. CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable.
- 4. Install jumper cable between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

| Connector | + | _ | Voltage (V) |
|-----------|--|----------|-------------|
| Connector | Terminal | Terminal | |
| M160 | 138 (Battery current sensor signal) | 150 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

P1551, P1552 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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P1553 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|---|
| P1553 | BAT CURRENT SENSOR (Battery current sensor per- formance) | The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation. | Harness or connectors (Battery current sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Battery current sensor Crankshaft position sensor Camshaft position sensor (bank 1) Accelerator pedal position sensor 2 EVAP control system pressure sensor Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 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 8 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- 1. Start engine and let it idle for least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-994, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841229

1. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

| Battery cur | rent sensor | Ground | Voltage (V) | |
|--------------------|-------------|---------|-------------|--|
| Connector Terminal | | Giodila | voltage (v) | |
| E21 | 1 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

P1553 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

- Turn ignition switch ON.
- Disconnect ECM harness connector. 2.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 1 | M160 | 133 | Existed |

Is the inspection result normal?

YES >> GO TO 31

NO >> Repair open circuit.

3.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 | | |
| 76 F111 | | CKP sensor | F2 | 1 | | |
| FIII | 77 | Camshaft position sensor (bank 1) | F84 | 1 | | |
| | 133 | Battery current sensor | E21 | 1 | | |
| • | 133 | EVAP control system pressure sensor | B73 | 3 | | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 1) (Refer to <u>EC-864, "Component Inspection (Camshaft Position Sensor)"</u>.)
- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-894, "Component Inspection (EVAP Control System) Pressure Sensor)".)
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-1047, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 6.

O.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

- Models without Distance Control Assist system: ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation"
- Models with Distance Control Assist system: ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYS-TEM: Removal and Installation"

>> INSPECTION END

7.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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< DTC/CIRCUIT DIAGNOSIS >

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E21 | 3 | M160 | 150 | Existed |

4. 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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 4 | M160 | 138 | 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 BATTERY CURRENT SENSOR

Refer to EC-996, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Replace battery negative cable assembly.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

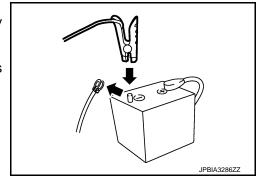
Component Inspection (Battery Current Sensor)

INFOID:0000000006115646

1. CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable.
- 4. Install jumper cable between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

| Connector | + | _ | Voltage (V) |
|-----------|--|----------|-------------|
| Connector | Terminal | Terminal | |
| M160 | 138 (Battery current sensor signal) | 150 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

Is the inspection result normal?

P1553 BATTERY CURRENT SENSOR

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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P1554 BATTERY CURRENT SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|--|--|
| P1554 | BAT CURRENT SENSOR (Battery current sensor per- formance) | The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough. | Harness or connectors (Battery current sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Battery current sensor Crankshaft position sensor Camshaft position sensor (bank 1) Accelerator pedal position sensor 2 EVAP control system pressure sensor Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1. PERFORM COMPONENT FUNCTION CHECK

Perform Component Function Check. Refer to EC-998, "Component Function Check".

NOTE:

Use Component Function Check to check the overall function of the battery current 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-999, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005841233

1.PRECONDITIONING

TESTING CONDITION:

- Before performing the following procedure, confirm that battery voltage is 12.8 V or more at idle.
- Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

(P) WITH CONSULT-III

- 1. Start engine and let it idle.
- Select "BAT CUR SEN" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BAT CUR SEN" indication for 10 seconds.
 - "BAT CUR SEN" should be above 2,300 mV at least once.

N WITHOUT CONSULT-III

- Start engine and let it idle.
- Check the voltage between ECM harness connector terminals as per the following.

P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| | ECM | | |
|-----------|--|----------|-------------------------|
| Connector | + | _ | Voltage (V) |
| Connector | Terminal | Terminal | |
| M160 | 138 (Battery current sensor signal) | 150 | Above 2.3 at least once |

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Is the inspection result normal?

>> INSPECTION END YES

>> Proceed to EC-999, "Diagnosis Procedure". NO

Diagnosis Procedure

INFOID:0000000005841234

1. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

- Disconnect battery current sensor harness connector.
- Turn ignition switch ON. 2.
- Check the voltage between battery current sensor harness connector and ground.

| Battery current sensor | | Ground | Voltage (V) |
|------------------------|----------|---------|-------------|
| Connector | Terminal | Giodila | voltage (v) |
| E21 | 1 | Ground | Approx. 5 |

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch ON.
- 2. Disconnect ECM harness connector.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 1 | M160 | 133 | Existed |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit.

3.check sensor power supply circuit

Check harness for short to power and short to ground, between the following terminals.

| ECM | | Sensor | Sensor | | | | |
|--------------------|-----|-------------------------------------|-----------|----------|--|--|--|
| Connector Terminal | | Name | Connector | Terminal | | | |
| 76 F111 | | CKP sensor | F2 | 1 | | | |
| 1 1111 | 77 | Camshaft position sensor (bank 1) | F84 | 1 | | | |
| | 133 | Battery current sensor | E21 | 1 | | | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | | | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | | | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | | | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | | | |
| | | 1. 10 | • | · | | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

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< DTC/CIRCUIT DIAGNOSIS >

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 1) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".</u>)
- Refrigerant pressure sensor (Refer to EC-1089, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5. CHECK APP SENSOR

Refer to EC-1047, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

- Models without Distance Control Assist system: <u>ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"</u>
- Models with Distance Control Assist system: <u>ACC-4</u>, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation"

>> INSPECTION END

7.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 3 | M160 | 150 | Existed |

4. 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.

f 8.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E21 | 4 | M160 | 138 | 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 BATTERY CURRENT SENSOR

Refer to EC-1001, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 10.

P1554 BATTERY CURRENT SENSOR

< DTC/CIRCUIT DIAGNOSIS >

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NO >> Replace battery negative cable assembly.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

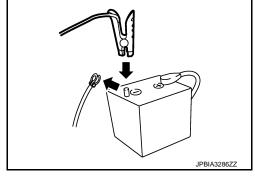
Component Inspection (Battery Current Sensor)

INFOID:0000000006115647

1. CHECK BATTERY CURRENT SENSOR

- 1. Turn ignition switch OFF.
- 2. Reconnect harness connectors disconnected.
- 3. Disconnect battery negative cable.
- 4. Install jumper cable between battery negative terminal and body ground.
- 5. Turn ignition switch ON.
- 6. Check the voltage between ECM harness connector terminals under the following conditions.

| Connector + | | _ | Voltage (V) |
|-------------|--|----------|-------------|
| Connector | Terminal | Terminal | |
| M160 | 138 (Battery current sensor signal) | 150 | Approx. 2.5 |



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-152, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

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P1556, P1557 BATTERY TEMPERATURE SENSOR

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|---|
| P1556 | BAT TMP SEN/CIRC (Battery temperature sensor circuit low input) | Signal voltage from Battery temperature sensor remains 0.16V or less for 5 seconds or more. | Harness or connectors [Battery current sensor (Battery temperature sensor) circuit is shorted.] |
| P1557 | BAT TMP SEN/CIRC (Battery temperature sensor circuit high input) | Signal voltage from Battery temperature sensor remains 4.84V or more for 5 seconds or more. | (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Battery current sensor (Battery temperature sensor) • Crankshaft position sensor • Camshaft position sensor (bank 1) • Accelerator pedal position sensor 2 • EVAP control system pressure sensor • Refrigerant pressure sensor |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 1. Turn ignition switch OFF and wait at least 10 seconds.
- 2. 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 10 V or more at idle.

>> GO TO 2.

2.perform dtc confirmation procedure

- 1. Start the engine and let it idle at least 10 seconds.
- 2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-1002, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000006037331

1. CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-I

- 1. Disconnect battery current sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between battery current sensor harness connector and ground.

| Battery current sensor | | Ground | Voltage (V) | |
|------------------------|----------|--------|-------------|--|
| Connector | Terminal | Cround | voltage (v) | |
| E21 | 2 | Ground | Approx. 5 | |

Is the inspection result normal?

YES >> GO TO 7.

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P1556, P1557 BATTERY TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> GO TO 2.

2.CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-II

Turn ignition switch ON.

- Disconnect ECM harness connector.
- Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery curr | ent sensor | EC | CM | Continuity |
|--------------|------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| F21 | 2 | M160 | 139 | Fxisted |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit.

3.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 | | |
| F111 76 CKP sensor 77 Camshaft position sensor (bank 1) | | CKP sensor | F2 | 1 | | |
| | | Camshaft position sensor (bank 1) | F84 | 1 | | |
| | 133 | Battery current sensor | E21 | 1 | | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | | |
| M160 | 133 | Refrigerant pressure sensor | E77 | 3 | | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | | |

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair short to ground or short to power in harness or connectors.

4. CHECK COMPONENTS

Check the following.

- Camshaft position sensor (bank 1) (Refer to <u>EC-864, "Component Inspection (Camshaft Position Sensor)"</u>.)
- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- Battery current sensor (Refer to EC-1001, "Component Inspection (Battery Current Sensor)".)
- EVAP control system pressure sensor (Refer to EC-894, "Component Inspection (EVAP Control System) Pressure Sensor)".)
- Refrigerant pressure sensor (Refer to <u>EC-1089, "Diagnosis Procedure"</u>.)

Is the inspection result normal?

YES >> GO TO 5.

NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-1047, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to following.

- Models without Distance Control Assist system: <u>ACC-3, "MODELS WITHOUT DISTANCE CONTROL</u> ASSIST SYSTEM: Removal and Installation"
- Models with Distance Control Assist system: ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYS-TEM: Removal and Installation"

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P1556, P1557 BATTERY TEMPERATURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

>> INSPECTION END

7.CHECK BATTERY TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between battery current sensor harness connector and ECM harness connector.

| Battery current sensor | | ECM | | Continuity |
|------------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E21 | 3 | M160 | 150 | Existed |

4. 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 BATTERY TEMPERATURE SENSOR

Refer to EC-1004, "Component Inspection (Battery Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Temperature Sensor)

INFOID:0000000006037332

1. CHECK BATTERY TEMPERATURE SENSOR

- 1. Turn ignition switch OFF.
- 2. Disconnect battery current sensor.
- 3. Check the resistance between battery current sensor connector terminals.

| Battery cur | | |
|-------------|------------|---|
| + | Resistance | |
| Terr | | |
| 2 | 3 | continuity with the resistance value 100 Ω or more |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace battery negative cable assembly.

P1564 ASCD STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1564 ASCD STEERING SWITCH

DTC Logic INFOID:0000000005841237

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-934, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---|
| P1564 | ASCD SW (ASCD steering switch) | 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. | Harness or connectors (The 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 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 RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Check DTC.

Is DTC detected?

>> Proceed to EC-1005, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

1. CHECK ASCD STEERING SWITCH CIRCUIT

- WITH CONSULT-III
- Turn ignition switch ON.
- 2. Select "MAIN SW", "CANCEL SW", "RESUME/ACC SW" and "SET SW" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check each item indication under the following conditions.

| Monitor item | Condition | Indication | |
|-------------------------|--------------|------------|-----|
| MAIN SW | MAIN switch | Pressed | ON |
| WAIN SW | WAIN SWILCH | Released | OFF |
| CANCEL SW CANCEL switch | | Pressed | ON |
| CANCLE SW | CANCEL SWIGH | Released | OFF |

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< DTC/CIRCUIT DIAGNOSIS >

| Monitor item | Condition | | Indication |
|----------------|-------------------|----------|------------|
| RESUME/ACC SW | RESUME/ACCELERATE | Pressed | ON |
| RESONIE/ACC SW | switch | Released | OFF |
| SET SW | SET/COAST switch | Pressed | ON |
| OL I OVV | SE1/OOAS1 SWILCH | Released | OFF |

⊗ WITHOUT CONSULT-III

- Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|------------------------------------|----------|--------------------------------------|-------------|--|
| Connector | + | _ | Condition | Voltage (V) | |
| Connector | Terminal | Terminal | | | |
| | | | MAIN switch: Pressed | Approx. 0 | |
| | | 130 | CANCEL switch: Pressed | Approx. 1 | |
| M160 | 128 (ASCD steering switch signal) | | COAST/SET switch: Pressed | Approx. 2 | |
| | (71000 discrining current digital) | | ACCELERATE/RESUME switch: Pressed | Approx. 3 | |
| | | | All ASCD steering switches: Released | Approx. 4 | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 2.

2.check ascd steering switch ground circuit for open and short

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect combination switch harness connector.
- 4. Check the continuity between combination switch and ECM harness connector.

| Combina | Combination switch ECM | | ECM | |
|-----------|------------------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M303 | 16 | M160 | 130 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

| Combina | tion switch | ECM | | Continuity | |
|-----------|-------------|--------------------|-----|------------|--|
| Connector | Terminal | Connector Terminal | | | |
| M303 | 13 | M160 | 128 | Existed | |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

P1564 ASCD STEERING SWITCH

[VK56VD] < DTC/CIRCUIT DIAGNOSIS > NO >> GO TO 5. 5. DETECT MALFUNCTIONING PART

Check the following.

Combination switch (spiral cable)

· Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

$\mathsf{6}.$ CHECK ASCD STEERING SWITCH

Refer to EC-1007, "Component Inspection (ASCD Steering Switch)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace ASCD steering switch. Refer to ST-35, "Disassembly and Assembly".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Steering Switch)

1. CHECK ASCD STEERING SWITCH

Turn ignition switch OFF.

2. Disconnect combination switch (spiral cable) harness connector M303.

Check resistance between combination switch harness connector terminals under the following conditions.

| Combination switch | | Condition | Resistance (Ω) | |
|--------------------|-----------|--------------------------------------|------------------|--|
| Connector | Terminals | Condition | rresistance (22) | |
| | | MAIN switch: Pressed | Approx. 0 | |
| M303 13 and 1 | • | CANCEL switch: Pressed | Approx. 250 | |
| | 13 and 16 | SET/COAST switch: Pressed | Approx. 660 | |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 1,480 | |
| | • | All ASCD steering switches: Released | Approx. 4,000 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD steering switch. Refer to ST-35, "Disassembly and Assembly".

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INFOID:0000000005841239

[VK56VD]

P1564 ICC STEERING SWITCH

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-934, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|----------------|
| P1564 | ASCD SW (ICC steering switch) | An excessively high voltage signal from the ICC steering switch is sent to ECM. ECM detects that input signal from the ICC steering switch is out of the specified range. ECM detects that the ICC steering switch is stuck ON. | |

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 10 seconds.
- 2. 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.
- 5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 6. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
- 7. Press LDP switch for at least 10 seconds, then release it at wait at least 10 seconds.
- 8. Check DTC.

Is DTC detected?

YES >> Proceed to EC-1008, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841242

1. CHECK ICC STEERING SWITCH CIRCUIT

- Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

P1564 ICC STEERING SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| ECM | | | | |
|-----------|-------------------------------------|----------|--|-------------|
| Connector | + - | | Condition | Voltage (V) |
| Connector | Terminal | Terminal | | |
| | | | MAIN switch: Pressed | Approx. 0 |
| | 102 (ICC steering switch signal) | 111 | DYNAMIC DRIVE ASSISTANCE switch: Pressed | Approx. 1.0 |
| | | | CANCEL switch: Pressed | Approx. 1.9 |
| M160 | | | DISTANCE switch: Pressed | Approx. 2.6 |
| | | | COAST/SET switch: Pressed | Approx. 3.2 |
| | | | ACCELERATE/RESUME switch: Pressed | Approx. 3.7 |
| | | | All ICC steering switches: Released | Approx. 4.2 |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 2.

2.CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect combination switch harness connector.
- 4. Check the continuity between combination switch and ECM harness connector.

| Combina | EC | Continuity | | |
|--------------------|----|------------|----------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| M303 | 16 | M160 | 130 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK ICC STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

| Combina | EC | Continuity | | |
|--------------------|----|------------|----------|------------|
| Connector Terminal | | Connector | Terminal | Continuity |
| M303 | 13 | M160 | 128 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

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>> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK ICC STEERING SWITCH

Refer to EC-1010, "Component Inspection (ICC Steering Switch)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace ICC steering switch. Refer to ST-35, "Disassembly and Assembly".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident",

>> INSPECTION END

Component Inspection (ICC Steering Switch)

INFOID:0000000005841243

1. CHECK ICC STEERING SWITCH

- 1. Turn ignition switch OFF.
- 2. Disconnect combination switch (spiral cable) harness connector M303.
- 3. Check resistance between combination switch harness connector terminals under the following conditions.

| Combination switch | | Condition | Resistance (Ω) | |
|--------------------|-----------|--|-------------------|--|
| Connector | Terminals | Condition | ivesistatice (22) | |
| | | MAIN switch: Pressed | Approx. 0 | |
| | 13 and 16 | DYNAMIC DRIVE ASSISTANCE switch: Pressed | Approx. 270 | |
| | | CANCEL switch: Pressed | Approx. 620 | |
| M303 | | DISTANCE switch: Pressed | Approx. 1,100 | |
| | | SET/COAST switch: Pressed | Approx. 1,810 | |
| | | RESUME/ACCELERATE switch: Pressed | Approx. 3,000 | |
| | | All ICC steering switches: Released | Approx. 5,420 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC steering switch. Refer to ST-35, "Disassembly and Assembly".

P1568 ICC FUNCTION

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

P1568 ICC FUNCTION

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1568 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.
- If DTC P1568 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-934, "DTC Logic".
- If DTC P1568 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-936, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC Detecting Condition | Possible Cause |
|---------|--|--|--|
| P1568 | ICC COMMAND VALUE (ICC function) | ECM detects a difference between signals from ADAS control unit is out of specified range. | Harness or connectors (The CAN communication line is open or shorted.) ADAS control unit 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.
- Turn ignition switch ON.
- Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Step 2 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

- 1. Turn ignition switch ON.
- 2. Press MAIN switch on ICC steering switch.
- 3. Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION:

Always drive vehicle at a safe speed.

- 4. Press SET/COAST switch.
- 5. Check DTC.

Is DTC detected?

YES >> Proceed to EC-1011, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1 REPLACE ADAS CONTROL UNIT

- Replace ADAS control unit. Refer to <u>DAS-67</u>, "Removal and Installation".
- 2. Check DTC of ADAS control unit. Refer to DAS-22, "CONSULT-III Function (ICC/ADAS)".

>> INSPECTION END

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P1572 ASCD BRAKE SWITCH

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to <u>EC-934, "DTC Logic"</u>.
- 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 |
|---------|--|-------------------------|--|---|
| | 1000 00 1/5 01/ | 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. | Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors (The ASCD brake switch circuit is short- |
| P1572 | ASCD BRAKE SW (ASCD brake switch) | В) | ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | ed.) • Stop lamp switch • ASCD brake switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • 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.

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 check that CRUISE indicator is displayed in combination meter.
- 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.

| 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 <u>EC-1013, "Diagnosis Procedure"</u>.

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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.

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| 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. |

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2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-1013, "Diagnosis Procedure".

NO >> INSPECTION END

INFOID:0000000005841248

Diagnosis Procedure

1. CHECK OVERALL FUNCTION-I

(P) WITH CONSULT-III

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | | Indication |
|----------------------------------|-------------|--------------------|------------|
| BRAKE SW1 (ASCD brake switch) | Brake pedal | Slightly depressed | OFF |
| | Бтаке рецаг | Fully released | ON |

WITHOUT CONSULT-III

- Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

| ECM | | | | | |
|-----------|--------------------------------|-----|-------------|--------------------|-----------------|
| Connector | + | _ | - Condition | | Voltage (V) |
| Connector | Terminal Terminal | | | | |
| M160 | 147 | 175 | Brake pedal | Slightly depressed | Approx. 0 |
| IVITOU | (ASCD brake switch signal) 175 | | Brake pedar | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

(P) WITH CONSULT-III

Select "BRAKE SW2" and check indication under the following conditions.

| Monitor item | C | Indication | |
|---------------------------------|-------------|--------------------|-----|
| BRAKE SW2 (Stop lamp switch) | Brake pedal | Slightly depressed | ON |
| | Diake pedal | Fully released | OFF |

(R) WITHOUT CONSULT-III

Check the voltage between ECM harness connector terminals under the following conditions.

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< DTC/CIRCUIT DIAGNOSIS >

| ECM | | | | | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|--|
| Connector | + | _ | Condition | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| M160 158 | | 175 | Brake pedal | Slightly depressed | Battery voltage | |
| WITOU | (Stop lamp switch signal) | 175 | Diake pedai | Fully released | Approx. 0 | |

Is the inspection result normal?

YES >> GO TO 13. NO >> GO TO 8.

3.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect ASCD brake switch harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between ASCD brake switch harness connector and ground.

| ASCD bra | ike switch | Ground | Voltage | |
|--------------------|------------|---------|-----------------|--|
| Connector Terminal | | Giodila | voltage | |
| E109 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 3)
- · Harness for open or short between ASCD brake switch and fuse
- Loose or poor connection for each connector and harness
 - >> Repair open circuit or short to ground in harness or connectors.

5. 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.

| ASCD bra | ke switch | EC | Continuity | |
|-----------|--------------------|------|------------|------------|
| Connector | Connector Terminal | | Terminal | Continuity |
| E109 | 2 | M160 | 147 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and ASCD brake switch
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH

Refer to EC-1016, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

P1572 ASCD BRAKE SWITCH

| < DTC/CIRC | CUIT DIAC | SNOSIS > | > | | /] | /K56VD] |
|--|-----------------------------|--------------|-------------|------------|--|---------|
| | GO TO 13 | | | | | |
| _ | Replace A | | | | DIV 01D 01 11T | |
| | | | H POW | ER SUP | PLY CIRCUIT | |
| | ition switcl ect stop la | | harnos | c conno | ctor | E |
| | | | | | n harness connector and ground. | |
| | | | - | | • | |
| Stop lamp | p switch | Ground | Volta | ane | | |
| Connector | Terminal | Ground | Volte | <u> </u> | | |
| E110 | 1 | Ground | Battery | voltage | | |
| Is the inspec | | | | | | |
| | GO TO 10 GO TO 9. |). | | | | |
| 9.DETECT | | CTIONING | | | | |
| | | STIONING | PARI | | | |
| Check the fo10 A fuse (| | | | | | |
| Harness fo | r open or | | | | switch and battery | |
| Loose or p | oor conne | ction for e | ach con | nector a | and harness | |
| | . · | , | | | | |
| 4.0 | | | | _ | or short to power in harness or connectors. | |
| | | | | | NAL CIRCUIT FOR OPEN AND SHORT | |
| | ect ECM h | | | | tch harness connector and ECM harness connector. | |
| Z. CHECK II | ie continu | ity betwee | iii stop ie | IIIIP SWII | torriamess connector and Low namess connector. | • |
| Stop lamp s | switch | ECM | 1 | | _ | |
| | | Connector | Terminal | Continu | ity | |
| E110 | 2 | M160 | 158 | Existed | d | |
| 3. Also che | ck harnes | s for shor | t to grou | nd and s | short to power. | |
| Is the inspec | | | J | | · | |
| | GO TO 12 | | | | | |
| | GO TO 11 | | | | | |
| 11.DETEC | T MALFUI | NCTIONIN | NG PART | Ī | | |
| Check the fo | | | | NA l - | ton long with | |
| Harness toLoose or p | | | | | top lamp switch and harness | |
| 20000 0. p | 001 0011110 | 0011.101.0 | | 100101 4 | | ' |
| >> | Repair ope | en circuit, | short to | ground (| or short to power in harness or connectors. | |
| 12. CHECK | STOP LA | AMP SWIT | ГСН | | | |
| Refer to EC- | 1016, "Co | mponent l | Inspection | n (Stop | Lamp Switch)". | |
| Is the inspec | | • | | | | |
| YES >> 0 | GO TO 13 | . . | | | | |
| | - | | | | <u> 3R-18, "Exploded View"</u> . | |
| 13. CHECK | INTERM | ITTENT IN | NCIDEN. | Γ | | |
| Refer to GI-3 | 88, "Interm | ittent Incid | dent". | | | |
| | | | | | | |

>> INSPECTION END

P1572 ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Component Inspection (ASCD Brake Switch)

INFOID:0000000005841249

1.CHECK ASCD BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| | brake pedar | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

- 1. Adjust ASCD brake switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brako podal | Fully released | Existed |
| | Brake pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to <u>BR-18</u>, "<u>Exploded View</u>".

Component Inspection (Stop Lamp Switch)

INFOID:0000000005841250

1. CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | Drake pedar | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

- Adjust stop lamp switch installation. Refer to <u>BR-19, "Inspection and Adjustment"</u>.
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| | brake pedar | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View".

< DTC/CIRCUIT DIAGNOSIS >

P1572 ICC BRAKE SWITCH

DTC Logic INFOID:0000000005841252

DTC DETECTION LOGIC

NOTE:

- If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-934, "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 |
|---------|--|---|---|---|
| | A) | ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time. | Harness or connectors (The stop lamp switch circuit is shorted.) Harness or connectors | |
| P1572 | ASCD BRAKE SW (ICC brake switch) | B) | ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven | (The ICC brake switch circuit is shorted.) Stop lamp switch ICC brake switch ICC brake hold relay Incorrect stop lamp switch installation Incorrect ICC brake switch installation ECM |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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

- Start engine (VDC switch OFF).
- 2. Press MAIN switch and check that CRUISE indicator is displayed in combination meter.
- 3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

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 |

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-1018, "Diagnosis Procedure".

NO >> GO TO 3.

3 Perform DTC Confirmation procedure

Drive the vehicle for at least 5 consecutive seconds under the following conditions. **CAUTION:**

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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-1018, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841253

1. CHECK DTC WITH ADAS CONTROL UNIT

Refer to DAS-22, "CONSULT-III Function (ICC/ADAS)".

Are any DTCs detected?

YES >> Perform the Diagnosis Procedure corresponding to the detected DTC.

NO >> GO TO 2.

2.CHECK OVERALL FUNCTION-I

(P) WITH CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Co | Indication | |
|---------------------------------|-------------|--------------------|-----|
| BRAKE SW1 (ICC brake switch) | Brake pedal | Slightly depressed | OFF |
| | втаке редаг | Fully released | ON |

(X) WITHOUT CONSULT-III

- Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-------------|---------------------------|----------|-------------|--------------------|-----------------|
| Connector + | | _ | Condition | | Voltage (V) |
| Connector | Terminal | Terminal | | | |
| M160 | 147 | 175 | Brake pedal | Slightly depressed | Approx. 0 |
| IVI160 | (ICC brake switch signal) | 173 | Brake pedar | Fully released | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK OVERALL FUNCTION-II

(P) WITH CONSULT-III

Select "BRAKE SW2" and check indication under the following conditions.

| Monitor item | C | Indication | |
|--------------------|-------------|--------------------|-----|
| BRAKE SW2 | Brake pedal | Slightly depressed | ON |
| (Stop lamp switch) | brake pedar | Fully released | OFF |

< DTC/CIRCUIT DIAGNOSIS >

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Check the voltage between ECM harness connector terminals under the following conditions.

| ECM | | | | | |
|-----------|---------------------------|----------|--------------------------------|----------------|-----------------|
| Connector | + – Condition | | Voltage (V) | | |
| Connector | Terminal | Terminal | | | |
| M160 | 158 | 175 | Brake pedal Slightly depressed | | Battery voltage |
| WITOU | (Stop lamp switch signal) | 175 | Diake pedai | Fully released | Approx. 0 |

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Is the inspection result normal?

YES >> GO TO 14. NO >> GO TO 9.

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4. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF.
- Disconnect ICC brake switch harness connector. 2.
- Turn ignition switch ON.
- Check the voltage between ICC brake switch harness connector and ground.

| ICC brake switch Connector Terminal | | Ground | Voltage | |
|--------------------------------------|---|--------|-----------------|--|
| | | Glound | voltage | |
| E114 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5. DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 3)
- · Harness for open or short between ICC brake hold relay and fuse
- Loose or poor connection for each connector and harness

>> Repair open circuit or short to ground in harness or connectors.

6.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brake switch | | ECM | | Continuity |
|------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E114 | 2 | M160 | 147 | Existed |

Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ICC brake switch and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK ICC BRAKE SWITCH

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Refer to EC-1021, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace ICC brake switch. Refer to <u>BR-18</u>, "Exploded View".

9. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- 3. Disconnect ICC brake hold relay.
- 4. Check the voltage between stop lamp switch harness connector and ground.

| Stop lamp switch | | Ground | Voltage |
|------------------|--------------------|--------|-----------------|
| Connector | Connector Terminal | | voltage |
| E110 | 1 | Ground | Battery voltage |

5. Check the voltage between ICC brake hold relay harness connector and ground.

| ICC brake hold relay | | Ground | Voltage | |
|----------------------|---|--------|-----------------|--|
| Connector Terminal | | Glound | voltage | |
| E92 | 5 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 11.

NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 7)
- Harness for open or short between battery and stop lamp switch
- Harness for open or short between battery and ICC brake hold relay
- Loose or poor connection for each connector and harness

>> Repair open circuit or short to ground in harness or connectors.

11. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect ECM harness connector.
- 2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

| Stop lamp switch | | ECM | | Continuity |
|------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E110 | 2 | M160 | 158 | Existed |

3. Check the continuity between ICC brake hold relay harness connector and ECM harness connector.

| ICC brake hold relay | | ECM | | Continuity |
|----------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E92 | 3 | M160 | 158 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- · Harness for open or short between ECM and stop lamp switch
- Harness for open or short between ECM and ICC brake hold relay

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Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK STOP LAMP SWITCH

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Refer to EC-1021, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace stop lamp switch. Refer to BR-18, "Exploded View".

14. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

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Component Inspection (ICC Brake Switch)

INFOID:0000000005841254

1. CHECK ICC BRAKE SWITCH-I

- Turn ignition switch OFF.
- Disconnect ICC brake switch harness connector. 2.
- Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| 1 4114 2 | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ICC BRAKE SWITCH-II

- Adjust ICC brake switch installation. Refer to BR-19, "Inspection and Adjustment".
- Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|---------------------|--------------------|-------------|
| 1 and 2 | 1 and 2 Brake pedal | Fully released | Existed |
| 1 4114 2 | | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch.

Component Inspection (Stop Lamp Switch)

1. CHECK STOP LAMP SWITCH-I

- Turn ignition switch OFF.
- Disconnect stop lamp switch harness connector.
- Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | C | Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| 1 410 2 | | Slightly depressed | Existed |

Is the inspection result normal?

>> INSPECTION END YES

NO >> GO TO 2.

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INFOID:0000000006115648

< DTC/CIRCUIT DIAGNOSIS >

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2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Not existed |
| 1 4114 2 | Бтакс редаг | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View".

< DTC/CIRCUIT DIAGNOSIS >

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P1574 ASCD VEHICLE SPEED SENSOR

Description INFOID:000000005841256

The ECM receives two vehicle speed signals by 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-582, "AUTOMATIC SPEED CONTROL DEVICE (ASCD): System Description" for ASCD functions.

INFOID:0000000005841257

DTC Logic

DTC DETECTION LOGIC

NOTE:

- If DTC P1574 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.
- If DTC P1574 is displayed with DTC P0500, perform the trouble diagnosis for DTC P0500. Refer to EC-915, "DTC Logic".
- If DTC P1574 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-934, "DTC Logic".
- If DTC P1574 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to <u>EC-936, "DTC Logic"</u>.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|--|---|---|---|
| P1574 | ASCD VHL SPD SEN (ASCD vehicle speed sensor) | ECM detects a difference between two vehicle speed signals is out of the specified range. | Harness or connectors (The CAN communication line is open or shorted.) Combination meter ABS actuator and electric unit (control unit) Wheel sensor TCM ECM | ı |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- Turn ignition switch OFF and wait at least 10 seconds.
- 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.

Check DTC.

Is DTC detected?

YES >> Proceed to EC-1023, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841258

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1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-57, "CONSULT-III Function (TRANSMISSION)".

Is the inspection result normal?

P1574 ASCD VEHICLE SPEED SENSOR

[VK56VD]

P13/4 A3CD VEHICLE SPEED SENSO

YES >> GO TO 2.

NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

 $2.\mathsf{CHECK}$ DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-41, "CONSULT-III Function".

Is the inspection result normal?

< DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 3.

NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

3.check dtc with "combination meter"

Refer to MWI-30, "CONSULT-III Function".

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

INFOID:0000000005841260

P1574 ICC VEHICLE SPEED SENSOR

Description INFOID:0000000005841259

The ECM receives two vehicle speed signals by 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 ICC control. Refer to CCS-12, "System Description" for ICC functions.

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DTC Logic

DTC DETECTION LOGIC

- 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-915, "DTC Logic".
- If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-934, "DTC Logic".
- If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-936, "DTC Logic".

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P1574 | ASCD VHL SPD SEN (ICC vehicle speed sensor) | ECM detects a difference between two vehicle speed signals is out of the specified range. | 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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Start engine (VDC switch OFF).
- Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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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-1025, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841261

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-57, "CONSULT-III Function (TRANSMISSION)".

Is the inspection result normal?

YES >> GO TO 2.

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P1574 ICC VEHICLE SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

 $2.\mathsf{CHECK}$ DTC WITH "ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)"

Refer to BRC-41, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

3.check dtc with "combination meter"

Check combination meter function.

Refer to MWI-30, "CONSULT-III Function".

>> INSPECTION END

P1606 VVEL CONTROL MODULE

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

P1606 VVEL CONTROL MODULE

DTC Logic INFOID:0000000005841263

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---------------------|
| P1606 | VVEL CONTROL MODULE (VVEL control module) | VVEL control module calculation function is malfunctioning. VVEL EEP-ROM system is malfunctioning. | VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

- Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.

Is DTC detected?

>> Proceed to EC-1027, "Diagnosis Procedure". YES

>> INSPECTION END NO

Diagnosis Procedure

1. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Erase DTC. 2.
- Perform DTC Confirmation Procedure.

See EC-1027, "DTC Logic".

Is the DTC P1606 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.replace vvel control module

- Replace VVEL control module.
- Perform additional service when replacing VVEL control module. Refer to <u>EC-692</u>, "Work Procedure".

>> INSPECTION END

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P1607 VVEL CONTROL MODULE

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1607 VVEL CONTROL MODULE

DTC Logic INFOID:0000000005841266

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|--|---------------------|
| P1607 | VVEL CONTROL MODULE (VVEL control module circuit) | The internal circuit of the VVEL control module is malfunctioning. | VVEL control module |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 10 V or more at idle.

>> GO TO 2.

2. PERFORM DTC CONFIRMATION PROCEDURE

- Start engine and let it idle for at least 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-1028, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841267

1. PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON.
- Erase DTC.
- Perform DTC Confirmation Procedure.

See EC-1028, "DTC Logic".

Is the DTC P1607 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2. REPLACE VVEL CONTROL MODULE

- Replace VVEL control module.
- Perform additional service when replacing VVEL control module. Refer to EC-692, "Work Procedure".

>> INSPECTION END

P1608 VVEL SENSOR POWER SUPPLY

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1608 VVEL SENSOR POWER SUPPLY

DTC Logic INFOID:0000000005841268

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|---|--|--|--|
| P1608 | VVEL SENSOR POWER/CIRC (VVEL sensor power supply circuit) | VVEL control module detects a voltage of power source for sensor is excessively low or high. | Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) VVEL control shaft position sensor VVEL control module | |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Turn ignition switch ON and wait at least 1 second.
- 2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-1029, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841269

1. CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

- Disconnect VVEL control shaft position sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between VVEL control shaft position sensor harness connector and ground.

| VVEL control shaft position sensor | | | Ground | Voltage |
|------------------------------------|-----------|----------|--------|-------------|
| Bank | Connector | Terminal | Ground | voltage |
| 1 | F72 | 3 | | Approx. 5 V |
| 1 | 172 | 6 | Ground | |
| 2 | F70 | 3 | Ground | |
| 2 | 170 | 6 | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 2.

2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect VVEL control module harness connector.
- Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

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| VVEL control shaft position sensor | | | VVEL control module | | Continuity | |
|------------------------------------|-----------|----------|---------------------|----------|------------|--|
| Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| 1 | 1 F72 | E72 | 3 F72 | | 7 | |
| ı | | 6 | E15 | 20 | Existed | |
| 2 F70 | E70 | 3 | LIS | 9 | Existed | |
| | F/U | 6 | | 22 | | |

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- · Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace.

5. REPLACE VVEL CONTROL MODULE

- 1. Replace VVEL control module.
- 2. Perform additional service when replacing VVEL control module. Refer to EC-692, "Work Procedure".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace.

/ REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-245, "Exploded View".

>> INSPECTION END

P1715 INPUT SPEED SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1715 INPUT SPEED SENSOR

Description INFOID:0000000005841271

ECM receives input speed sensor signal from TCM by the CAN communication line. ECM uses this signal for engine control.

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DTC Logic

INFOID:0000000005841272

DTC DETECTION LOGIC

NOTE:

- If DTC P1715 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.
- If DTC P1715 is displayed with DTC P0335, perform the trouble diagnosis for DTC P0335. Refer to EC-857, "DTC Logic".
- If DTC P1715 is displayed with DTC P0340, perform the trouble diagnosis for DTC P0340. Refer to EC-861, "DTC Logic".
- If DTC P1715 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-934, "DTC Logic".
- If DTC P1715 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-936, "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. | Harness or connectors (The CAN communication line is open or shorted) (Input speed sensor circuit is open or shorted) TCM | |

Diagnosis Procedure

INFOID:0000000005841273

1. CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-57, "CONSULT-III Function (TRANSMISSION)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform Diagnosis Procedure corresponding to DTC indicated.

2.REPLACE TCM

Replace TCM.

>> INSPECTION END

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P1805 BRAKE SWITCH

DTC Logic

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|--|---|---|
| P1805 | BRAKE SW/CIRCUIT (Brake switch) | A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven. | Harness or connectors (Stop lamp switch circuit is open or shorted.) Stop lamp switch |

DTC CONFIRMATION PROCEDURE

${f 1}$.PERFORM DTC CONFIRMATION PROCEDURE

- 1. Turn ignition switch ON.
- 2. Fully depress the brake pedal for at least 5 seconds.
- Erase the DTC.
- 4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-1032, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841276

1. CHECK STOP LAMP SWITCH CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Check for stop lamp illumination under the following conditions.

| Condition | | Stop lamp |
|-------------|--------------------|-----------------|
| Brake pedal | 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

- 1. Disconnect stop lamp switch harness connector.
- 2. Check the voltage between stop lamp switch harness connector and ground.

| Stop lam | p switch | Ground | Voltage | |
|--------------------|----------|--------|-----------------|--|
| Connector Terminal | | Ground | voilage | |
| E110 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 7)
- · Harness for open or short between stop lamp switch and battery
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

P1805 BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

${f 4.}$ CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- 1. Disconnect stop lamp switch harness connector.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between stop lamp switch harness connector and ECM harness connector.

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| Stop lamp switch | | ECM | | Continuity |
|------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E110 | 2 | M160 | 158 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and stop lamp switch
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK STOP LAMP SWITCH

Refer to EC-1033, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View".

.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000006115649

1. CHECK STOP LAMP SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect stop lamp switch harness connector.
- Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|---------------------|-------------|--------------------|-------------|
| 1 and 2 Brake peda | Brake pedal | Fully released | Not existed |
| r and 2 Brake pedar | | Slightly depressed | Existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

- 1. Adjust stop lamp switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between stop lamp switch terminals under the following conditions.

| Terminals | Condition | | Condition | | Continuity |
|-----------|--------------------------------|----------------|-------------|--|------------|
| 1 and 2 | Brako podal | Fully released | Not existed | | |
| 1 and 2 | Brake pedal Slightly depressed | | Existed | | |
| | | | | | |

P1805 BRAKE SWITCH

[VK56VD]

YES >> INSPECTION END

NO >> Replace stop lamp switch. Refer to <u>BR-18</u>, "Exploded View".

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

DTC DETECTION LOGIC

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| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P2100 | ETC MOT PWR-B1 [Throttle control motor relay circuit open (bank 1)] | ECM detects that the voltage of power source for throttle control motor is excessively low. | 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 detects that the throttle control motor relay is stuck ON. | Harness or connectors (Throttle control motor relay circuit is shorted) Throttle control motor relay |

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 8 V or more at idle.

Which DTC is detected?

P2100 >> GO TO 2.

P2103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2100

- 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-1035, "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-1035, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841215

1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Disconnect IPDM E/R harness connector E7.
- 4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

| IPDM E/R | | ECM | | Continuity |
|-----------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E7 | 71 | M160 | 123 | Existed |

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Check the continuity between IPDM E/R sensor harness connector and ECM harness connector.

| DTC | IPDM E/R | | ECM | | Continuity |
|-------|-----------|----------|-----------|----------|------------|
| DIC | Connector | Terminal | Connector | Terminal | Continuity |
| P2100 | E5 | 7 | M160 | 173 | Existed |
| P2103 | E3 | 1 | IVITOU | 173 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK FUSE

- 1. Disconnect 15 A fuse (No. 50) from IPDM E/R.
- 2. Check if 15 A fuse is blown.

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace 15 A fuse.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

NO >> Repair or replace harness or connectors.

P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P2122, P2123 APP SENSOR

DTC Logic INFOID:0000000005841279

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-939, "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. | Harness or connectors (APP sensor 1 circuit is open or shorted.) |
| 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. | Accelerator pedal position sensor (APP sensor 1) |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 8 V or more 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-1037, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

 ${f 1}$.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage (V) | |
|---------------------|----------|---------|-------------|--|
| Connector | Terminal | Ground | voltage (v) | |
| M9 (Without ICC) | 5 | Ground | Approx. 5 | |
| M153 (With ICC) | 6 | Sibulia | Αρρίολ. 3 | |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

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>> Repair open circuit, short to ground or short to power in harness or connectors.

${f 3.}$ CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M9 (Without ICC) | 4 | M160 | 140 | Existed |
| M153 (With ICC) | 5 | IVITOO | 140 | LXISIGU |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- · Harness for open or short between ECM and APP sensor
- · Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M9 (Without ICC) | 3 | M160 | 136 | Existed |
| M153 (With ICC) | 4 | IVITOO | 130 | LAISIGU |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK APP SENSOR

Refer to EC-1039, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

P2122, P2123 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (Without distance control assist system).

Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (With distance control assist system).

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000005841281

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- Check the voltage ECM harness connector terminals under the following conditions.

| ECM | | Condition | | | | |
|---------------|---------------------|-----------|-------------------|-------------------|-----------------|------------|
| Connector + - | | | | Voltage (V) | | |
| Connector | Terminal | Terminal | | | | |
| | 136 (APP sensor 1) | 140 | | | Fully released | 0.45 - 1.0 |
| M160 | 130 (AFF SellSOI I) | | | Accelerator pedal | Fully depressed | 4.4 - 4.8 |
| IVITOU | | 129 | Accelerator pedar | Fully released | 0.22 - 0.5 | |
| | 120 (AFF SellSOI 2) | 129 | | Fully depressed | 2.1 - 2.5 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (Without distance control assist system).

Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (With distance control assist system).

>> INSPECTION END

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P2127, P2128 APP SENSOR

DTC Logic

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. | Harness or connectors (Accelerator pedal position sensor 2 circuit is 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. | (Battery current sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor 2 • Battery current sensor • Crankshaft position sensor • Camshaft position sensor (bank 1) • EVAP control system pressure sensor • Refrigerant pressure sensor |

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 8 V or more 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-1040. "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841285

${f 1}$.CHECK ACCELERATOR PEDAL POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- 3. Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage (V) |
|---------------------|----------|---------|-------------|
| Connector | Terminal | Ground | voltage (v) |
| M9 (Without ICC) | 6 | Ground | Approx. 5 V |
| M153 (With ICC) | 3 | Giodila | дррюх. 3 V |

Is the inspection result normal?

YES >> GO TO 6.

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

NO >> GO TO 2.

2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

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| APP sensor | | ECM | | Continuity | |
|---------------------|----------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| M9 (Without ICC) | 6 | M160 | 131 | Existed | |
| M153 (With ICC) | 3 | IVITOO | 131 | LAISIGU | |

Is the inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.

- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

| E | CM | Sensor | | | |
|-----------|----------|-------------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| F111 | 76 | CKP sensor | F2 | 1 | |
| 77 | | Camshaft position sensor (bank 1) | F84 | 1 | |
| | 133 | Battery current sensor | E21 | 1 | |
| M160 | 133 | EVAP control system pressure sensor | B73 | 3 | |
| | 133 | Refrigerant pressure sensor | E77 | 3 | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | |

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.

- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to <u>EC-989</u>, "Component Inspection (Battery Current Sensor)".)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".)</u>
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace malfunctioning component.

6. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

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< DTC/CIRCUIT DIAGNOSIS >

- 2. Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

| APP sensor | | ECM | | Continuity |
|---------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M9 (Without ICC) | 2 | M160 | 129 Exis | Existed |
| M153 (With ICC) | 2 | IVITOO | 129 | LAISIEU |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Loose or poor connection for each connector and harness
- · Harness for open or short between ECM and APP sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

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.

| APP sensor | | ECM | | Continuity |
|---------------------|----------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| M9 (Without ICC) | 1 | M160 | 126 | Existed |
| M153 (With ICC) | 1 | 191100 | 120 | LAISIGU |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- · Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK APP SENSOR

Refer to EC-1047, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> GO TO 11.

11. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to <u>ACC-3</u>, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (Without distance control assist system).

Refer to <u>ACC-4</u>, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (With distance control assist system).

P2127, P2128 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000006115650

[VK56VD]

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

- Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.
- 3. Turn ignition switch ON.
- 4. Check the voltage ECM harness connector terminals under the following conditions.

| ECM | | | | | | |
|-------------|--------------------|-----|--------------------|-----------------|-------------|--|
| Connector + | | _ | Condition | | Voltage (V) | |
| Connector | Terminal | | | | | |
| | 136 (APP sensor 1) | 140 | A coolerator pedal | Fully released | 0.45 - 1.0 | |
| M160 | | | | Fully depressed | 4.4 - 4.8 | |
| | 126 (APP sensor 2) | 129 | Accelerator pedal | Fully released | 0.22 - 0.5 | |
| | | | | Fully depressed | 2.1 - 2.5 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to <u>ACC-3</u>, "<u>MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM</u>: Removal and Installation" (Without distance control assist system).

Refer to <u>ACC-4</u>, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (With distance control assist system).

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P2138 APP SENSOR

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to <u>EC-939, "DTC Logic"</u>.

| 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. | Harness or connectors (APP sensor 1 or 2 circuit is open or shorted.) (Battery current sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) Accelerator pedal position sensor (APP sensor 1 or 2) Battery current sensor Crankshaft position sensor (bank 1) EVAP control system pressure sensor Refrigerant pressure sensor |

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 8 V or more 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-1044, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005841290

1. CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Disconnect accelerator pedal position (APP) sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground.

| APP sensor | | Ground | Voltage (V) |
|---------------------|----------|--------|-------------|
| Connector | Terminal | | voltage (v) |
| M9 (Without ICC) | 5 | Ground | Approx. 5 |
| M153 (With ICC) | 6 | Ground | дрргох. 3 |

Is the inspection result normal?

P2138 APP SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

- Turn ignition switch ON.
- Check the voltage between APP sensor harness connector and ground. 2.

| APP sensor | | Ground | Voltage (V) | |
|---------------------|----------|---------|-------------|--|
| Connector | Terminal | Giodila | voltage (v) | |
| M9 (Without ICC) | 6 | Ground | Approx. 5 | |
| M153 (With ICC) | 3 | Oloulia | Αμρίολ. 3 | |

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 4.

4.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between APP sensor harness connector and ECM harness connector.

| APP ser | nsor | EC | ECM | | |
|---------------------|----------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| M9 (Without ICC) | 6 | M160 | 131 | Existed | |
| M153 (With ICC) | 3 | 101100 | 131 | | |

Is the inspection result normal?

YES >> GO TO 6.

NO >> GO TO 5.

${f 5.}$ DETECT MALFUNCTIONING PART

Check the following.

- · Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

6.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 | |
| F111 | 76 | CKP sensor | F2 | 1 | |
| | 77 | Camshaft position sensor (bank 1) | F84 | 1 | |
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< DTC/CIRCUIT DIAGNOSIS >

| ECM | | Sensor | | | |
|-----------|----------|-------------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| | 133 | Battery current sensor | E21 | 1 | |
| | 133 | EVAP control system pressure sensor | B73 | 3 | |
| | 133 | Refrigerant pressure sensor | E77 | 3 | |
| 13 | 137 | APP sensor 1 (Without ICC) | M9 | 5 | |
| | 137 | APP sensor 1 (With ICC) | M153 | 6 | |
| | 131 | APP sensor 2 (Without ICC) | M9 | 6 | |
| | 131 | APP sensor 2 (With ICC) | M153 | 3 | |

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair short to ground or short to power in harness or connectors.

7. CHECK COMPONENTS

Check the following.

- CKP sensor (Refer to EC-859, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-864, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-989, "Component Inspection (Battery Current Sensor)".)
- EVAP control system pressure sensor (Refer to <u>EC-894, "Component Inspection (EVAP Control System Pressure Sensor)".</u>)
- Refrigerant pressure sensor (Refer to <u>EC-1089</u>, "<u>Diagnosis Procedure</u>".)

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace malfunctioning component.

8. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between APP sensor harness connector and ECM harness connector.

| APP ser | nsor | EC | ECM | | |
|---------------|----------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| M9 | 4 | M160 | 140 | Existed | |
| (Without ICC) | 2 | WITOU | 129 | | |
| M153 | 5 | M160 | 140 | Existed | |
| (With ICC) | 2 | IVITOU | 129 | LXISIEU | |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10. NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

10. Check app sensor input signal circuit for open and short

1. Check the continuity between APP sensor harness connector and ECM harness connector.

P2138 APP SENSOR

| _ | DT | C/ | CIR | CI | IIT | DIA | GNI | SISC | _ |
|---|----|----|-----|----|-----|-----|-----|------|---|
| | | | | | | | | | |

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| APP ser | nsor | E | СМ | 0 | | Α |
|--|-------------|------------------|---------------|-------------|--|-----|
| Connector | Terminal | Connector | Terminal | Continuity | | |
| M9 | 3 | M160 | 136 | Existed | | EC |
| (Without ICC) | 1 | | 126 | | | |
| M153 (With ICC) | 4 | M160 | 136 | Existed | | 0 |
| | 1 | o for obort | 126 | | a nawar | C |
| 2. Also chec | | | to ground | and short | o power. | |
| • | O TO 12. | | | | | D |
| NO >> G | O TO 11. | | | | | |
| 11.DETECT | MALFUN | NCTIONIN | G PART | | | Е |
| Check the follo | | | _ | | | |
| Harness forLoose or po | | | | | rator pedal position sensor | |
| 2 Loose of po | or corniec | Stion for Ga | ich comile | noi and na | iness | F |
| >> R | epair ope | n circuit, s | hort to gro | ound or sho | ort to power in harness or connectors. | |
| 12. CHECK | APP SEN | ISOR | | | · | G |
| Refer to EC-1 | 047, "Cor | nponent Ir | nspection (| Accelerato | r Pedal Position Sensor)". | |
| Is the inspecti | | | • | | | Н |
| | O TO 14. | | | | | |
| | O TO 13. | | DED 41 4 | 005145137 | | |
| 13.REPLAC | | | | SSEMBLY | | I |
| Replace accel | | | | TANCE CO | ONTROL ASSIST SYSTEM : Removal and Installation" | |
| (Without dista | nce contr | ol assist s | ystem). | | | J |
| Refer to ACC- distance contr | | | DISTANC | E CONTR | OL ASSIST SYSTEM : Removal and Installation" (With | |
| distance conti | UI assist . | system). | | | | IZ. |
| >> IN | ISPECTION | ON END | | | | K |
| 14. CHECK | INTERMI | TTENT IN | CIDENT | | | |
| Refer to GI-38 | 3, "Intermi | ttent Incid | <u>ent"</u> . | | | L |
| | | | | | | |
| >> IN | ISPECTION | ON END | | | | M |
| Componen | t Insped | ction (Ad | celerate | or Pedal | Position Sensor) INFOID:0000000006115651 | |
| 1. CHECK ACCELERATOR PEDAL POSITION SENSOR | | | | | | |
| 1. Turn igniti | | | | | | |
| Reconnect Turn igniti | | ess conne NON | ctors disc | onnected. | | 0 |
| | | | ess conne | ctor termin | als under the following conditions. | |
| | | | | | | |
| | | | | | | Р |
| | | | | | | |

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| ECM | | | Condition | | , | |
|---------------|---------------------|-------------|-------------------|-----------------------|-----------------|------------|
| Connector + - | | Voltage (V) | | | | |
| Connector | Terminal | Terminal | | | | |
| | 136 (APP sensor 1) | 140 | 140 | 26 (ADD concer 1) 140 | Fully released | 0.45 - 1.0 |
| M160 | 130 (Al 1 361301 1) | | | Accelerator pedal | Fully depressed | 4.4 - 4.8 |
| | 126 (APP sensor 2) | 129 | Accelerator pedar | Fully released | 0.22 - 0.5 | |
| | | | | Fully depressed | 2.1 - 2.5 | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

Refer to <u>ACC-3</u>, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM: Removal and Installation" (Without distance control assist system).

Refer to <u>ACC-4</u>, "<u>MODELS WITH DISTANCE CONTROL ASSIST SYSTEM</u>: Removal and <u>Installation</u>" (With distance control assist system).

>> INSPECTION END

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

P2539, P2541, P2542 LOW FUEL PRESSURE SENSOR

DTC Logic INFOID:0000000005926927

DTC DETECTION LOGIC

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause | |
|---------|--|---|---|--|
| P2539 | LOW FUEL PRES SEN (Low fuel pressure sensor circuit low input and high in- put) | Signal voltage from the low fuel pressure sensor remains at more than 4.84 V / less than 0.3 V for 5 seconds or more. | Harness or connectors (Low fuel pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is | |
| P2541 | LOW FUEL PRES SEN (Low fuel pressure sensor circuit low input) | Signal voltage from the low fuel pressure sensor remains at less than 0.49 V for 5 seconds or more. | open or shorted.) (EOP sensor circuit is open or shorted.) (FRP sensor circuit is open or shorted.) • Low fuel pressure sensor | |
| P2542 | LOW FUEL PRES SEN (Low fuel pressure sensor circuit high input) | Signal voltage from the low fuel pressure sensor remains at more than 4.1 V for 5 seconds or more. | 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.
- 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 at idle.

>> GO TO 2.

2.perform dtc confirmation procedure

- Start engine and let it idle for at least 60 seconds.
- Check 1st trip DTC. 2.

Is 1st trip DTC detected?

YES >> Proceed to EC-1049, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

1. CHECK LOW FUEL PRESSURE SENSOR POWER SUPPLY-I

- Turn ignition switch OFF.
- Disconnect low fuel pressure sensor connector.
- Turn ignition switch ON.
- Check the voltage between low fuel pressure sensor harness connector terminals.

| Low | V. II. | | |
|-----------|----------|---|----------------------|
| Connector | + | - | Voltage (Approx.) |
| Connector | terminal | | (44) |
| F39 | 3 | 1 | 5 V |

Inspection result normal?

YES >> GO TO 6.

NO >> GO TO 2.

2.CHECK LOW FUEL PRESSURE SENSOR POWER SUPPLY-II

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< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Check the voltage between low fuel pressure sensor harness connector and the ground.

| | + | | Valtana | | |
|--------------------------|----------|--------|----------------------|--|--|
| Low fuel pressure sensor | | _ | Voltage (Approx.) | | |
| Connector | Terminal | | (11 -) | | |
| F39 | 3 | Ground | 5 V | | |

Is inspection result normal?

YES >> GO TO 4. NO >> GO TO 3.

3.check sensor power supply circuit

- 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.

| ECM | | Sensor | | | |
|-----------|----------|--------------------------------|-----------|----------|--|
| Connector | Terminal | Name | Connector | Terminal | |
| | 27 | Power steering pressure sensor | F35 | 3 | |
| F110 | 21 | Low fuel pressure sensor | F39 | 3 | |
| FIIU - | 28 | FRP sensor | F6 | 1 | |
| | | Engine oil pressure sensor | F32 | 3 | |

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to <u>EC-716</u>, "<u>Diagnosis Procedure</u>".

NO >> Repair or replace error-detected parts.

4. CHECK LOW FUEL PRESSURE SENSOR GROUND CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- 3. Check the continuity between low fuel pressure sensor harness connector and ECM harness connector.

| + | | , | | |
|--------------|--------------------------|-----------|----------|---------|
| Low fuel pre | Low fuel pressure sensor | | ECM | |
| Connector | Terminal | Connector | Terminal | |
| F39 | 1 | F110 | 27 | Existed |

Is inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace error-detected parts.

5. CHECK ECM GROUND CIRCUIT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between ECM harness connector and the ground.

| Е | CM | Ground | Continuity | |
|-----------|----------|--------|------------|--|
| Connector | Terminal | Ground | | |
| F110 | 10 | | | |
| M160 | 114 | | | |
| | 115 | Ground | Existed | |
| | 174 | | | |
| | 175 | | | |

Is inspection result normal?

< DTC/CIRCUIT DIAGNOSIS > [VK56VD]

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

6.CHECK LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT

Turn ignition switch OFF.

- 2. Disconnect ECM harness connector.
- Check the continuity between low fuel pressure sensor harness connector and ECM harness connector.

| + | | | | |
|--------------------------|----------|-----------|----------|------------|
| Low fuel pressure sensor | | ECM | | Continuity |
| Connector | Terminal | Connector | Terminal | |
| F39 | 2 | F110 | 23 | Existed |

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace error-detected parts.

7.CHECK LOW FUEL PRESSURE SENSOR

Refer to EC-1051, "Component Inspection".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Replace low fuel pressure sensor.

Component Inspection

1. CHECK LOW FUEL PRESSURE SENSOR

WITH CONSULT-III

- Turn ignition switch OFF.
- Reconnect harness connector disconnected.
- Start the engine.
- 4. Select "DATA MONITOR" mode with CONSULT-III.
- 5. Check that the "L/FUEL PRES SEN V" value.

| Data monitor item Condition | | Value (Approx.) | |
|-----------------------------|-----------------------------------|--------------------|--|
| L/FUEL PRES SEN V | Engine speed: idle | 3,000 –3,300 mV | |
| LI OLL I RES SEN V | Engine speed: 3,000 rpm (no load) | | |

®WITHOUT CONSULT-III

- Turn ignition switch OFF.
- 2. Reconnect harness connector disconnected.
- 3. Start the engine.
- Check low fuel pressure sensor signal voltage.

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| + Low fuel pressure sensor | | - | | Val. | | |
|-------------------------------|----------|---|--|----------------------------------|--|--|
| | | Ground | Condition | Value (Approx.) | | |
| Connector | Terminal | Giodila | | (44.5) | | |
| F39 2 G | 2 | Ground | [Engine is running]Warm-up conditionIdle speed | 50mSec/div 2V/div JPBIA3367ZZ | | |
| | Glouid | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | 50mSec/div WWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWWW | | | |

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Replace low fuel pressure sensor.

< DTC/CIRCUIT DIAGNOSIS >

P2A00, P2A03 A/F SENSOR 1

DTC Logic INFOID:0000000005841294

DTC DETECTION LOGIC

To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored so it will not shift to LEAN side or RICH side.

| DTC No. | Trouble diagnosis name (Trouble diagnosis content) | DTC detecting condition | Possible cause |
|---------|---|---|--|
| P2A00 | A/F SENSOR1 (B1) (Air fuel ratio (A/F) sensor 1 (bank 1) circuit range/performance) | The output voltage computed by ECM from the A/F sensor 1 signal shifts to the lean side for a specified period. | A/F sensor 1 A/F sensor 1 heater Fuel pressure |
| P2A03 | A/F SENSOR1 (B2) (Air fuel ratio (A/F) sensor 1 (bank 2) circuit range/performance) | The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the rich side for | Fuel injector Intake air leaks |

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

- 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 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

- Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".
- Turn ignition switch OFF and wait at least 10 seconds.
- 3. Turn ignition switch ON.
- 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.
- 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-1053, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

$1_{-RETIGHTEN}$ A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to EM-222, "Exploded View".

>> GO TO 2.

2.CHECK A/F SENSOR 1 CONNECTOR

- Disconnect A/F sensor 1 harness connector.
- 2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 3.

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NO >> Repair or replace harness connector.

3.CHECK FOR INTAKE AIR LEAKAGE

- Reconnect A/F sensor 1 harness connector.
- Start engine and run it at idle.

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< DTC/CIRCUIT DIAGNOSIS >

3. 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

- Clear the mixture ratio self-learning value. Refer to <u>EC-700, "Work Procedure"</u>.
- 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 <u>EC-822, "Diagnosis Procedure"</u>.

NO >> GO TO 5.

CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF and then turn it ON.
- 2. Disconnect A/F sensor 1 harness connector.
- 3. Check the voltage between A/F sensor 1 harness connector and ground.

| DTC | A/F sensor 1 | | | Ground | Voltage |
|-------|--------------|-----------|----------|---------|---------|
| | Bank | Connector | Terminal | Giodila | voltage |
| P2A00 | 1 | F23 | 4 | Ground | 3 V |
| P2A03 | 2 | F24 | 4 | Giodila | 3 V |

Is the inspection result normal?

YES >> GO TO 7.

NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between A/F sensor 1 and ECM
- Loose or poor connection for each connector and harness
 - >> Repair or replace harness or connectors.

7.check a/f sensor 1 input signal circuit for open and short

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- 3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | | |
|-------|--------------|-----------|----------|-----------|------------|------------|--|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0130 | 1 | F23 | 3 | F111 | 88 | Existed | |
| P0150 | 2 | F24 | 3 | 1 111 | 78 | EXISTEC | |

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

| DTC | A/F sensor 1 | | | ECM | | Ground | Continuity |
|-------|--------------|-----------|----------|-----------|----------|--------|-------------|
| DIC | Bank | Connector | Terminal | Connector | Terminal | Ground | Continuity |
| P0130 | 1 | F23 | 3 | F111 | 88 | Ground | Not existed |
| P0150 | 2 | F24 | 3 | FIII | 78 | Ground | Not existed |

Also check harness for 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.

< DTC/CIRCUIT DIAGNOSIS >

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$8.\mathsf{CHECK}$ A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

- 1. Turn ignition switch OFF.
- Disconnect ECM harness connector.
- Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

| DTC | A/F sensor 1 | | | EC | Continuity | | |
|-------|--------------|-----------|----------|-----------|------------|------------|--|
| | Bank | Connector | Terminal | Connector | Terminal | Continuity | |
| P0130 | 1 | F23 | 6 | F111 | 94 | Existed | |
| P0150 | 2 | F24 | 6 | 1 111 | 74 | Existed | |

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-741, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 11.

10. CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair or replace malfunctioning part.

11.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to EM-222, "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).

Will CONSULT-III be used?

YES >> GO TO 12.

NO >> GO TO 13.

12.CONFIRM A/F ADJUSTMENT DATA

WITH CONSULT-III

- 1. Turn ignition switch ON.
- Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT-III.
- Check that "0.000" is displayed on CONSULT-III screen.

Is "0.000" displayed?

YES >> INSPECTION END

NO >> GO TO 13.

13.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-700, "Work Procedure".

Will CONSULT-III be used?

YES >> GO TO 14.

NO >> INSPECTION END

$14.\mathsf{confirm}$ a/f adjustment data

(P) WITH CONSULT-III

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P2A00, P2A03 A/F SENSOR 1

< DTC/CIRCUIT DIAGNOSIS >

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- 1. Turn ignition switch ON.
- 2. Select "A/F ADJ-B1" and "A/F ADJ-B2" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check that "0.000" is displayed on CONSULT-III screen.

>> INSPECTION END

ASCD BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

ASCD BRAKE SWITCH

Component Function Check

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${f 1}$. CHECK ASCD BRAKE SWITCH FUNCTION

WITH CONSULT-III

- Turn ignition switch ON.
- Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Co | Indication | |
|----------------------------------|-------------|--------------------|-----|
| BRAKE SW1 (ASCD brake switch) | Brake pedal | Slightly depressed | OFF |
| | Diake pedai | Fully released | ON |

M WITHOUT CONSULT-III

- 1. Turn ignition switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | Condition | | | |
|-----------|----------------------------|----------|-------------|--------------------|-----------------|--|
| Connector | + | _ | | | Voltage (V) | |
| Connector | Terminal | Terminal | | | | |
| M160 | 147 | 175 | Brake pedal | Slightly depressed | Approx. 0 | |
| | (ASCD brake switch signal) | 173 | Біаке рецаі | Fully released | Battery voltage | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1057, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect ASCD brake switch harness connector. 2.
- Turn ignition switch ON.
- Check the voltage between ASCD brake switch harness connector and ground.

| ASCD bra | ASCD brake switch | | Voltage |
|-----------|-------------------|--------|-----------------|
| Connector | Terminal | Ground | voltage |
| E109 | 1 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 3)
- · Harness for open or short between ASCD brake switch and fuse
- Loose or poor connection for each connector and harness

>> Repair open circuit or short to ground in harness or connectors.

3.check ascd brake switch input signal circuit for open and short

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.
- Check the continuity between ASCD brake switch harness connector and ECM harness connector.

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| ASCD brake switch | | ECM | | Continuity |
|-------------------|----------|--------------------|-----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E109 | 2 | M160 | 147 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and ASCD brake switch
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK ASCD BRAKE SWITCH

Refer to EC-1016, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ASCD brake switch. Refer to <u>BR-18</u>, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000006115652

1. CHECK ASCD BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ASCD brake switch harness connector.
- 3. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| 1 and 2 | brake pedar | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

- Adjust ASCD brake switch installation. Refer to <u>BR-19</u>. "Inspection and Adjustment".
- 2. Check the continuity between ASCD brake switch terminals under the following conditions.

| Terminals | Condition | | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brako podal | Fully released | Existed |
| T and 2 | Brake pedal | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ASCD brake switch. Refer to <u>BR-18</u>. "Exploded View".

ASCD INDICATOR

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

ASCD INDICATOR

Component Function Check

INFOID:0000000005841301

1. CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

| ASCD INDICATOR | CON | CONDITION | |
|----------------|--|--|--------------|
| CRUISE LAMP | Ignition switch: ON | MAIN switch: Pressed at the 1st time → at the 2nd time | $ON \to OFF$ |
| | MAIN switch: ON | ASCD: Operating | ON |
| SET LAMP | When vehicle speed is be- tween 40 km/h (25 MPH) and 144 km/h (89 MPH) | ASCD: Not operating | OFF |

Is the inspection result normal?

YES >> INSPECTION END

>> Proceed to EC-1059, "Diagnosis Procedure". NO

Diagnosis Procedure

INFOID:0000000005841302

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-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace malfunctioning part.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-90, "Removal and Installation".

NO >> Repair or replace malfunctioning part. EC

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[VK56VD]

COOLING FAN

Description INFOID.000000006025283

COOLING FAN CONTROL MODULE

Cooling fan control module receives ON/OFF pulse duty signal from IPDM E/R. Corresponding to this ON/OFF pulse duty signal, cooling fan control module sends cooling fan motor operating voltage to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

COOLING FAN MOTOR

Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

Component Function Check

INFOID:00000000006025284

1. CHECK COOLING FAN FUNCTION

- (II) WITH CONSULT-III
- 1. Turn ignition switch ON.
- 2. Perform "FAN DUTY CONTROL" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that cooling fan speed varies according to the percentage.
- **®** WITHOUT CONSULT-III
- Perform IPDM E/R auto active test and check cooling fan motors operation, refer to <u>PCS-11, "Diagnosis Description"</u>.
- Check that cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1060, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:00000000006025285

1. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

- 1. Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connectors E37, E38.
- Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module harness connector and ground.

| Cooling fan control me | Ground | Voltage | |
|---------------------------------------|--------|---------|-----------------|
| Connector Terminal | | | Giodila |
| E37 (Cooling fan control module 1) | 3 | Ground | Rattery voltage |
| E39 (Cooling fan control module 2) | 3 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 7.

2.CHECK COOLING FAN CONTROL MODULE GROUND CIRCUIT

- Turn ignition switch OFF.
- 2. Check the continuity between cooling fan control module harness connector and ground.

| Cooling fan control mo | Ground | Continuity | |
|---------------------------------------|--------|------------|------------|
| Connector Terminal | | Giodila | Continuity |
| E37 (Cooling fan control module 1) | 1 | Ground | Existed |
| E39 (Cooling fan control module 2) | 1 | Glound | LXISIGU |

3. Also check harness for short to power.

Is the inspection result normal?

>> GO TO 3.

NO >> Repair open circuit or short to power in harness or connectors.

3.CHECK IPDM E/R GROUND CIRCUIT

- 1. Disconnect IPDM E/R harness connectors E5, E6.
- Check the continuity between IPDM E/R harness connector and ground.

| IPDM E/R | | Ground | Continuity |
|-----------|----------|---------|------------|
| Connector | Terminal | Giodila | Continuity |
| E5 | 11 | Ground | Existed |
| E6 | 41 | Giouna | LAISIEU |

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair open circuit or short to power in harness or connectors.

4. CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

- Disconnect IPDM E/R harness connector E9.
- Check the continuity between IPDM E/R harness connector and cooling fan control module harness connector.

| IPDI | M E/R | Cooling fan control module | | Continuity |
|-----------|----------|---------------------------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E9 | 97 | E37 (Cooling fan control module 1) | 2 | Existed |
| L9 | 31 | E39 (Cooling fan control module 2) | 2 | Existed |

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 cooling fan control module output signal circuit

- Reconnect all harness connectors disconnected.
- 2. Disconnect cooling fan control module harness connectors E301, E303.
- Turn ignition switch ON.
- 4. Check the voltage between cooling fan control module terminals and ground.

| Cooling fan control r | Ground | Voltage | |
|---------------------------------------|--------|---------|-----------------|
| Connector Terminal | | | Ground |
| E37 (Cooling fan control module 1) | 4 | Ground | Battery voltage |
| E39 (Cooling fan control module 2) | 6 | Ground | battery voltage |

EC-1061 Revision: 2010 June 2011 M37/M56

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[VK56VD]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace malfunctioning cooling fan control module.

O.CHECK COOLING FAN MOTORS -1 AND -2

Refer to EC-1063, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning cooling fan motor. Refer to CO-43, "Exploded View".

7.CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-II

- Turn ignition switch OFF.
- 2. Disconnect cooling fan relay-1 and cooling fan relay-2.
- Check the voltage between cooling fan relay harness connector and ground.

| Cooling fan relay | | Ground | Voltage |
|------------------------------|----------|---------|-----------------|
| Connector | Terminal | Giodila | voltage |
| E17 (Cooling fan relay-1) | 3 | Ground | Battery voltage |
| E19 (Cooling fan relay-2) | 3 | Giodila | Dattery Voltage |

- 4. Turn ignition switch ON.
- 5. Check the voltage between cooling fan relay harness connector and ground.

| Cooling fan re | elay | Ground | Voltage |
|------------------------------|----------|---------|-----------------|
| Connector | Terminal | Glodila | |
| E17 (Cooling fan relay-1) | 2 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 9. NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 42)
- 50 A fusible link (letter O)
- 50 A fusible link (letter R)
- IPDM E/R harness connector E7
- · Harness for open or short between cooling fan relay and fuse
- Harness for open or short between cooling fan relay and battery
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-III

- 1. Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connector E6.
- 3. Check the continuity between cooling fan relay harness connector and IPDM E/R harness connector.

| Cooling fan relay | | IPDM E/R | | Continuity |
|------------------------------|----------|--------------------|----|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E17 (Cooling fan relay-1) | 1 | E6 | 42 | Existed |

 Check the continuity between cooling fan relay harness connector and cooling fan control module harness connector.

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| Cooling fan relay | | Cooling fan control module | | Continuity |
|------------------------------|----------|---------------------------------------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E17 (Cooling fan relay-1) | 5 | E37 (Cooling fan control module-1) | 3 | Existed |
| E19 (Cooling fan relay-2) | 5 | E39 (Cooling fan control module-2) | 3 | Existed |

Check the continuity between cooling fan relay-1 harness connector and cooling fan relay-2 harness connector.

| Cooling fan relay | | | | Continuity |
|------------------------------|-----------------------------|------------------------------|---|------------|
| Connector | Terminal Connector Terminal | | | Continuity |
| E17 (Cooling fan relay-1) | 5 | E19 (Cooling fan relay-2) | 2 | Existed |

6. Check the continuity between cooling fan relay-2 harness connector and ground.

| Cooling fan re | Ground | Continuity | |
|------------------------------|----------|------------|------------|
| Connector | Terminal | Oloulia | Continuity |
| E17 (Cooling fan relay-1) | 1 | Ground | Existed |

7. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK COOLING FAN RELAYS -1 AND -2

Refer to EC-1064, "Component Inspection (Cooling Fan Relay)".

Is the inspection result normal?

YES >> GO TO 11.

NO >> Replace malfunctioning cooling fan relay.

11. CHECK INTERMITTENT INCIDENT

Perform GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-33, "Removal and Installation".

NO >> Repair or replace harness connectors.

Component Inspection (Cooling Fan Motor)

1. CHECK COOLING FAN MOTOR

- Turn ignition switch OFF.
- 2. Disconnect cooling fan control module harness connectors E301, E303.
- Supply cooling fan control module harness connector terminals with battery voltage as per the following, and check operation.

| Co | oling fan contro | | | | | |
|---------|------------------|-----|-----------------|------------------------|-------|-----------|
| Motor | Motor Connector | | Motor Connector | | ninal | Operation |
| IVIOLOI | Connector | (+) | (-) | | | |
| 1 | E301 | 4 | 5 | Cooling fan operates. | | |
| 2 | E303 | 6 | 7 | - Cooling lan operates | | |

Is the inspection result normal?

YES >> INSPECTION END

[VK56VD]

NO >> Replace malfunctioning cooling fan motor.

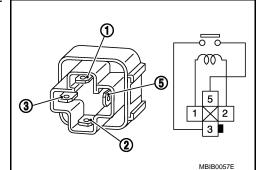
Component Inspection (Cooling Fan Relay)

INFOID:00000000006025287

1. CHECK COOLING FAN RELAY

- 1. Turn ignition switch OFF.
- 2. Remove cooling fan relay.
- Check the continuity between cooling fan relay terminals under the following conditions.

| Terminals | Conditions | Continuity |
|-----------|--|-------------|
| 3 and 5 | 12 V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace cooling fan relay.

ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

INFOID:0000000005841309

ELECTRICAL LOAD SIGNAL

Description INFOID:0000000005841308

The electrical load signal (Rear window defogger switch signal, headlamp switch signal, blower fan switch signal, etc.) is transferred via the CAN communication line.

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Component Function Check

1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

- Turn ignition switch ON.
- Select "DATA MONITOR" mode with CONSULT-III. 2.
- Select "LOAD SIGNAL" and check indication under the following conditions.

| Monitor item | Condition | Indication | |
|--------------|-------------------------------|------------|-----|
| LOAD SIGNAL | Rear window defogger switch | ON | ON |
| | rteal willdow delogger switch | OFF | OFF |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to EC-1065, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check "LOAD SIGNAL" indication under the following conditions.

| Monitor item | Co | Indication | |
|-----------------------------|--------------------|------------|-----|
| LOAD SIGNAL Lighting switch | ON at 2nd position | ON | |
| LOAD SIGNAL | Lighting switch | OFF | OFF |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Proceed to <u>EC-1065</u>, "Diagnosis Procedure".

3.CHECK BLOWER FAN CONTROL SWITCH FUNCTION

Select "HEATER FAN SW" and check indication under the following conditions.

| Monitor item | Condition | Indication | |
|----------------|----------------------------|------------|-----|
| HEATER FAN SW | Blower fan control switch | ON | ON |
| TILATER TAN 5W | blower fair control switch | OFF | OFF |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1065, "Diagnosis Procedure".

Diagnosis Procedure

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or blower fan). Refer to EC-1065, "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

Refer to DEF-20, "Work Flow".

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ELECTRICAL LOAD SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

>> INSPECTION END

3. CHECK HEADLAMP SYSTEM

Refer to EXL-62, "Work Flow".

>> INSPECTION END

4. CHECK BLOWER FAN CONTROL SYSTEM

Refer to HAC-80, "Work Flow".

>> INSPECTION END

FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

FUEL INJECTOR

Component Function Check

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1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.

NO >> Proceed to <u>EC-1067</u>, "<u>Diagnosis Procedure</u>".

2.check fuel injector function

(P) WITH CONSULT-III

- 1. Start engine.
- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- 3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT-III

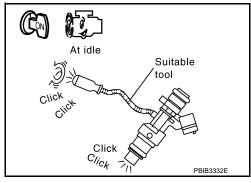
- 1. Start engine.
- 2. Listen to each fuel injector operating sound.

Clicking sound should be heard.

Is the inspection result normal?

YES >> INSPECTION END

>> Proceed to EC-1067, "Diagnosis Procedure". NO



Diagnosis Procedure

1.CHECK FUEL INJECTOR POWER SUPPLY

Turn ignition switch ON.

Check the voltage between ECM harness connector and ground.

| + ECM | | _ | Voltage | |
|-----------|----------|--------|-----------------|--|
| Connector | Terminal | | | |
| F110 | 46 | | | |
| FIIO | 51 | Ground | Battery voltage | |
| M160 | 111 | Glound | | |
| IVI 100 | 112 | | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform the trouble diagnosis for power supply circuit. Refer to EC-716, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR CIRCUIT

- Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector and ECM harness connector.
- Check the continuity between fuel injector harness connector and ECM harness connector.

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| | - | + | - | _ | |
|----------|-----------|----------|-----------|----------|------------|
| Cylinder | Fuel in | njector | EC | CM | Continuity |
| | Connector | Terminal | Connector | Terminal | |
| 1 | F131 | 1 | F111 | 101 | |
| | 1 131 | 2 | 1 111 | 108 | |
| 2 | F132 | 1 | F110 | 7 | |
| 2 | 1 132 | 2 | 1110 | 4 | |
| 3 | F400 | 1 | F110 | 6 | |
| 3 | F133 | 2 | | 3 | |
| 4 | F134 | 1 | F111 | 107 | |
| 4 | F134 | 2 | | 104 | Existed |
| 5 | F135 | 1 | E440 | 2 | Existed |
| 5 | F133 | 2 | F110 | 9 | |
| 6 | F136 | 1 | F111 | 102 | |
| 0 | F130 | 2 | ГП | 109 | |
| 7 | E127 | 1 | F111 | 106 | |
| 1 | F137 | 2 | ГШ | 103 | |
| 8 | F138 | 1 | F110 | 1 | |
| | F130 | 2 | FIIU | 8 | |

4. 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 ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and ground.

| | + | | | |
|-----------|----------|--------|------------|--|
| E | СМ | _ | Continuity | |
| Connector | Terminal | | | |
| F110 | 5 | | | |
| M160 | 114 | Ground | Existed | |
| | 115 | | | |

Is inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK FUEL INJECTOR

Refer to EC-1068, "Component Inspection".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Replace malfunctioning fuel injector.

Component Inspection

1. CHECK FUEL INJECTOR

- Turn ignition switch OFF.
- 2. Disconnect fuel injector harness connector.
- 3. Check the resistance between fuel injector terminals as per the following.

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FUEL INJECTOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

| | + | _, | | | |
|----------|---|-----------|-------------|------------------------|---------------|
| Injector | | Condition | | Resistance | |
| Terminal | | | | | |
| | 1 | 2 | Temperature | 10 - 60°C (50 - 140°F) | 1.44 - 1.73 Ω |

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Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning fuel injector.

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HIGH PRESSURE FUEL PUMP

Component Function Check

1. CHECK HIGH PRESSURE FUEL PUMP FUNCTION

- ® WITH CONSULT-III
- Start engine.
- 2. Check "FUEL PRES SEN V" in "DATA MONITOR" mode with CONSULT-III.

| Monitor Item | Condition | Values/Status |
|-----------------|---|------------------|
| | Engine speed: Idle | 980 – 1,200 mV |
| FUEL PRES SEN V | Engine speed: Revving engine from idle to 4,000 rpm quickly | 1,100 – 2,900 mV |

⊗ WITHOUT CONSULT-III

- Start engine.
- 2. Check the voltage between ECM harness connector and ground.

| | ECM | | | | | |
|-----------|----------|-----------|----------|---|---|--|
| + | | _ | | Condition | Voltage | |
| Connector | Terminal | Connector | Terminal | | | |
| F111 | 105 | M160 | 175 | [Engine is running] Warm-up condition Idle speed NOTE: The pulse cycle changes depending on rpm at idle | BATTERY VOLTAGE (11 - 14 V)★ 20mSec/div 10V/div JPBIA3340ZZ | |
| | 103 | WITOU | 173 | [Engine is running]Warm-up conditionEngine speed: 2,000 rpm | BATTERY VOLTAGE (11 - 14 V) 20mSec/div 10V/div JPBIA3341ZZ | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1070, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005926945

1. CHECK HIGH PRESSURE FUEL PUMP CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ECM harness connector and high pressure fuel pump harness connector.
- 3. Check the continuity between ECM harness connector and high pressure fuel pump harness connector.

| | + | | | |
|-----------|----------|-------------|------------|---------|
| E | СМ | High pressu | Continuity | |
| Connector | Terminal | Connector | Terminal | |
| F111 | 110 | F4 | 2 | Existed |
| | 105 | 14 | 1 | Existed |

HIGH PRESSURE FUEL PUMP [VK56VD] < DTC/CIRCUIT DIAGNOSIS > Also check harness for short to ground and to power. Α Is inspection result normal? YES >> GO TO 2. NO >> Repair or replace error-detected parts. EC 2.CHECK HIGH PRESSURE FUEL PUMP Refer to EC-1071, "Component Inspection". Is inspection result normal? YES >> GO TO 3. NO >> Replace high pressure fuel pump. Refer to EM-193, "Removal and Installation". 3.check high pressure fuel pump installation condition D Turn ignition switch OFF. Check that the high pressure fuel pump is installed with no backlash and looseness. Е Is the inspection result normal? YES >> GO TO 4. NO >> Repair or replace error-detected parts. F 4. CHECK CAMSHAFT Remove camshaft. Refer to EM-245, "Exploded View". 2. Check camshaft. Refer to EM-245, "Exploded View". Is inspection result normal? YES >> INSPECTION END NO >> Replace camshaft. Н Component Inspection INFOID:0000000005926946 1. CHECK HIGH PRESSURE FUEL PUMP SOLENOID Turn ignition switch OFF. Disconnect high pressure fuel pump harness connector. Check the resistance between high pressure fuel pump connector terminals as per the following. High pressure fuel pump Condition Resistance Terminal $20 - 30^{\circ}C (68 - 86^{\circ}F)$ Temperature $9-11 \Omega$ Is the inspection result normal? YES >> INSPECTION END NO >> Replace high pressure fuel pump. Ν

Revision: 2010 June **EC-1071** 2011 M37/M56

[VK56VD]

ICC BRAKE SWITCH

Component Function Check

INFOID:0000000005841320

1. CHECK ICC BRAKE SWITCH FUNCTION

(P) WITH CONSULT-III

- 1. Turn ignition switch ON.
- 2. Select "BRAKE SW1" in "DATA MONITOR" mode with CONSULT-III.
- 3. Check "BRAKE SW1" indication under the following conditions.

| Monitor item | Condition | | Indication |
|--------------------|-------------|--------------------|------------|
| BRAKE SW1 | Brake pedal | Slightly depressed | OFF |
| (ICC brake switch) | Brake pedar | Fully released | ON |

- 1. Turn ignition switch ON.
- 2. Check the voltage between ECM harness connector terminals as per the following.

| - | ECM | | | | | |
|-----------|---------------------------|----------|-------------|--------------------|-----------------|--|
| Connector | + - | | Condition | | Voltage | |
| Connector | Terminal | Terminal | | | | |
| M160 | 147 | 175 | Brake pedal | Slightly depressed | Approx. 0 V | |
| WITOU | (ICC brake switch signal) | 173 | brake pedar | Fully released | Battery voltage | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1072, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005841321

1. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Turn ignition switch ON.
- Check the voltage between ICC brake switch harness connector and ground.

| ICC brak | e switch | Ground | Voltage |
|-----------|--------------------|--------|-----------------|
| Connector | Connector Terminal | | voltage |
| E114 | 114 1 | | Battery voltage |

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- 10 A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse
- · Loose or poor connection for each connector and harness

>> Repair open circuit or short to ground in harness or connectors.

3.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Disconnect ECM harness connector.

ICC BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

| ICC brak | e switch | EC | Continuity | |
|-----------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E114 | 2 | M160 | 147 | Existed |

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4. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

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Check the following.

- · Harness for open or short between ECM and ICC brake switch
- Loose or poor connection for each connector and harness

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>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK ICC BRAKE SWITCH

Refer to EC-1021, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace ICC brake switch.

6. CHECK INTERMITTENT INCIDENT

Н

Refer to GI-38. "Intermittent Incident".

INFOID:0000000006115653

>> INSPECTION END

Component Inspection (ICC Brake Switch)

1. CHECK ICC BRAKE SWITCH-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ICC brake switch harness connector.
- 3. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | (| Condition | Continuity |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| 1 and 2 | Бтаке рецаг | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

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2. CHECK ICC BRAKE SWITCH-II

- 1. Adjust ICC brake switch installation. Refer to BR-19, "Inspection and Adjustment".
- 2. Check the continuity between ICC brake switch terminals under the following conditions.

| Terminals | (| Continuity | |
|-----------|-------------|--------------------|-------------|
| 1 and 2 | Brake pedal | Fully released | Existed |
| r and z | Бтаке рецаг | Slightly depressed | Not existed |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake switch.

ICC BRAKE SWITCH

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

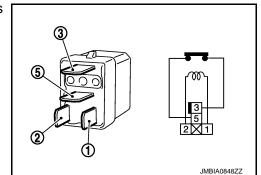
Component Inspection (ICC Brake Hold Relay)

INFOID:0000000006135449

1. CHECK ICC BRAKE HOLD RELAY

- 1. Turn ignition switch OFF.
- 2. Remove ICC brake hold relay.
- 3. Check the continuity between ICC brake hold relay terminals under the following conditions.

| Terminals | Condition | Continuity |
|-----------|---|-------------|
| 3 and 5 | 12V direct current supply between terminals 1 and 2 | Existed |
| | No current supply | Not existed |



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace ICC brake hold relay

IGNITION SIGNAL

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

IGNITION SIGNAL

Component Function Check

INFOID:0000000005841325

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT-III: GO TO 2.

YES-2 >> Without CONSULT-III: GO TO 3.

>> Proceed to EC-1075, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

WITH CONSULT-III

- Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT-III.
- Check that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

>> INSPECTION END YES

>> Proceed to EC-1075, "Diagnosis Procedure". NO

3 . CHECK IGNITION SIGNAL FUNCTION

WITHOUT CONSULT-III

1. Let engine idle.

2. Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

| Cylinder | + | | _ | | Voltage signal | |
|-----------|-----------|----------|-----------|----------|----------------|---|
| Cyllilder | Connector | Terminal | Connector | Terminal | | |
| 1 | | 12 | | | | |
| 2 | | 13 | | | | |
| 3 | F110 | 14 | M160 | 175 | | |
| 4 | | 15 | | | | |
| 5 | | 17 | | 173 | | |
| 6 | | 18 | | | | N 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 |
| 7 | | 19 | | | PBIB0044E | |
| 8 | | 20 | | | | |

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1075, "Diagnosis Procedure".

Diagnosis Procedure

1. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

- Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
- Check the voltage between ECM harness connector terminals under the following conditions.

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| Connector | + | _ | Voltage | |
|-----------|----------|----------|-----------------|--|
| Connector | Terminal | Terminal | | |
| M160 | 171 | 175 | Battery voltage | |
| 101100 | 172 | 173 | Dattery Voltage | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Proceed to <u>EC-716</u>, "<u>Diagnosis Procedure</u>".

2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

- 1. Turn ignition switch OFF.
- 2. Disconnect condenser harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between condenser harness connector and ground.

| Condenser | | Ground | Voltage | |
|-----------|----------|---------|-----------------|--|
| Connector | Terminal | Giodila | voltage | |
| F41 | 1 | Ground | Battery voltage | |

Is the inspection result normal?

YES >> GO TO 5.

NO >> GO TO 3.

3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

- Turn ignition switch OFF.
- 2. Disconnect IPDM E/R harness connector E7.
- 3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

| IPDM E/R | | Cond | Continuity | |
|-----------|----------|--------------------|------------|------------|
| Connector | Terminal | Connector Terminal | | Continuity |
| E5 | 5 | F41 | 1 | Existed |

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Proceed to EC-716, "Diagnosis Procedure".

NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between IPDM E/R and condenser
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- 2. Check the continuity between condenser harness connector and ground.

| Condenser | | Ground | Continuity | |
|-----------|----------|--------|------------|--|
| Connector | Terminal | Ground | Continuity | |
| F41 | 2 | Ground | Existed | |

3. Also check harness for short to power.

Is the inspection result normal?

IGNITION SIGNAL

[VK56VD] < DTC/CIRCUIT DIAGNOSIS >

YES >> GO TO 6.

NO >> Repair open circuit or short to power in harness or connectors.

6.CHECK CONDENSER

Refer to EC-1079, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.

NO >> Replace condenser. Refer to EM-186, "Exploded View".

7.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

- Reconnect all harness connectors disconnected.
- 2. Disconnect ignition coil harness connector.
- 3. Turn ignition switch ON.
- Check the voltage between ignition coil harness connector and ground.

| Ignition coil | | | Ground | Voltage |
|---------------|-----------|----------|----------------------|-----------------|
| Cylinder | Connector | Terminal | Giodila | voltage |
| 1 | F91 | 3 | | |
| 2 | F92 | 3 | | |
| 3 | F93 | 3 | | |
| 4 | F94 | 3 | Ground | Battery voltage |
| 5 | F95 | 3 | Ground Battery voita | |
| 6 | F96 | 3 | | |
| 7 | F97 | 3 | | |
| 8 | F98 | 3 | | |

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

- Harness connector F40 or E20
- Harness for open or short between ignition coil and harness connector F40

>> Repair or replace harness or connectors.

9. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Check the continuity between ignition coil harness connector and ground.

| Ignition coil | | | Ground | Continuity |
|---------------|-----------|----------|---------|------------|
| Cylinder | Connector | Terminal | Giodila | Continuity |
| 1 | F91 | 2 | | Existed |
| 2 | F92 | 2 | | |
| 3 | F93 | 2 | | |
| 4 | F94 | 2 | Ground | |
| 5 | F95 | 2 | Giodila | |
| 6 | F96 | 2 | | |
| 7 | F97 | 2 | | |
| 8 | F98 | 2 | | |

^{3.} Also check harness for short to power.

Is the inspection result normal?

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YES >> GO TO 10.

NO >> Repair open circuit or short to power in harness or connectors.

10.check ignition coil output signal circuit for open and short

- Disconnect ECM harness connector.
- 2. Check the continuity between ignition coil harness connector and ECM harness connector.

| Ignition coil | | | ECM | | Continuity |
|---------------|-----------|----------|-----------|----------|------------|
| Cylinder | Connector | Terminal | Connector | Terminal | Continuity |
| 1 | F91 | 1 | | 12 | |
| 2 | F92 | 1 | | 13 | |
| 3 | F93 | 1 | F110 | 14 | |
| 4 | F94 | 1 | | 15 | Existed |
| 5 | F95 | 1 | FIIU | 17 | Existed |
| 6 | F96 | 1 | | 18 | |
| 7 | F97 | 1 | | 19 | |
| 8 | F98 | 1 | | 20 | |

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1078, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 12.

NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-186. "Exploded View".

12. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000005841327

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

- 1. Turn ignition switch OFF.
- 2. Disconnect ignition coil harness connector.
- Check resistance between ignition coil terminals as per the following.

| Terminals | Resistance [at 25°C (77°F)] | |
|-----------|-----------------------------|--|
| 1 and 2 | Except 0 or $\infty \Omega$ | |
| 1 and 3 | - Except 0 Ω | |
| 2 and 3 | | |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace malfunctioning ignition coil with power transistor.

2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

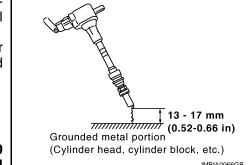
- 1. Turn ignition switch OFF.
- 2. Reconnect all harness connectors disconnected.

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Remove fuel pump fuse in IPDM E/R to release fuel pressure.

NOTE:

- For the fuse number, refer to EC-656, "Wiring Diagram".
- For the fuse arrangement, refer to PG-133, "Fuse, Connector and Terminal Arrangement".
- Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
- Start engine.
- 5. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
- 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.
- 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:

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.

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 >> INSPECTION END

NO >> Replace malfunctioning ignition coil with power transistor.

Component Inspection (Condenser)

1. CHECK CONDENSER

- Turn ignition switch OFF.
- Disconnect condenser harness connector.
- Check resistance between condenser terminals as per the following.

| Terminals | Resistance |
|-----------|-----------------------------|
| 1 and 2 | Above 1 MΩ [at 25°C (77°F)] |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace condenser.

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INFORMATION DISPLAY (ASCD)

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

INFORMATION DISPLAY (ASCD)

Component Function Check

INFOID:0000000005841330

1. CHECK INFORMATION DISPLAY

- Start engine.
- Press MAIN switch on ASCD steering switch.
- 3. Drive the vehicle at more than 40 km/h (25 MPH).

CAUTION:

Always drive vehicle at a safe speed.

- 4. Press SET/COAST switch.
- 5. Check that the reading of the speedometer shows the same value as the set speed indicated in the information display while driving the vehicle on a flat road.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to <u>EC-1080</u>, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005841331

1.CHECK DTC

Check that DTC UXXXX, P0500 or P1574 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.

NO-1 >> Perform trouble diagnosis for DTC UXXXX.

NO-2 >> Perform trouble diagnosis for DTC P0500. Refer to EC-915, "DTC Logic".

NO-3 >> Perform trouble diagnosis for DTC P1574. Refer to <u>EC-1023, "DTC Logic"</u> (Without ICC) or <u>EC-1025, "DTC Logic"</u> (With ICC).

2. CHECK DTC WITH COMBINATION METER

Refer to MWI-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble diagnosis for DTC indicated.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-90, "Removal and Installation".

NO >> Repair or replace.

LOW PRESSURE FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

LOW PRESSURE FUEL PUMP

Component Function Check

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1. CHECK FUEL PUMP FUNCTION

- 1. Turn ignition switch ON.
- 2. Pinch fuel feed hose with two fingers.

NOTE:

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 >> EC-1081, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005926941

1. CHECK FPCM POWER SUPPLY CIRCUIT

- Turn ignition switch OFF.
- Disconnect FPCM harness connector.
- 3. Turn ignition switch ON.
- 4. Check the voltage between FPCM harness connector and ground.

| | + | | |
|-----------|--------------------|--------|-----------------|
| FPCM | | _ | Voltage |
| Connector | Connector Terminal | | |
| B221 | 10 | Ground | Battery voltage |

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform the trouble diagnosis for power supply circuit. Refer to EC-716, "Diagnosis Procedure".

2.CHECK FPCM GROUND CIRCUIT

- Turn ignition switch OFF.
- 2. Check the continuity between FPCM harness connector and ground.

| | CM Terminal 5 | | |
|-----------|---------------|--------|------------|
| FP | CM | _ | Continuity |
| Connector | Terminal | | |
| B221 | 5 | Ground | Existed |

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair open circuit or short to power in harness or connectors.

3.CHECK FPCM INPUT AND OUTPUT CIRCUIT

- Disconnect ECM harness connector.
- 2. Check the continuity between FPCM harness connector and ECM harness connector.

| | + | | _ | |
|-----------|----------|-----------|----------|------------|
| FP | FPCM ECM | | CM | Continuity |
| Connector | Terminal | Connector | Terminal | |
| B221 | 8 | M160 | 125 | Existed |
| | 9 | IVITOO | 142 | LXISIEU |

3. Also check harness for short to ground and to power.

Is the inspection result normal?

LOW PRESSURE FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

YES >> GO TO 4.

NO >> Repair or replace error-detected parts.

4. CHECK FUEL PUMP CONTROL CIRCUIT

- 1. Disconnect fuel level sensor unit and fuel pump (main) harness connector.
- Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump (main) harness connector.

| | + | | _ | | |
|-----------|----------|-----------------|------------|---------|--|
| FP | СМ | Fuel level sens | Continuity | | |
| Connector | Terminal | Connector | | | |
| B221 6 | | B241 | 3 | Existed | |
| BZZT | 7 | D241 | 1 | LXISIEU | |

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 LOW PRESSURE FUEL PUMP

Refer to EC-1082, "Component Inspection (Low Pressure Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 6.

NO >> Replace low pressure fuel pump. Refer to FL-6, "Removal and Installation".

6.CHECK FPCM

Refer to EC-1083, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-38, "Intermittent Incident".

NO >> Replace FPCM. Refer to EC-1105, "Removal and Installation".

Component Inspection (Low Pressure Fuel Pump)

INFOID:0000000005926942

1. CHECK FUEL PRESSURE REGULATOR

- 1. Turn ignition switch OFF.
- Check low fuel pressure. Refer to <u>EC-701, "Work Procedure"</u>.

Is inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK LOW PRESSURE FUEL PUMP

- 1. Turn ignition switch OFF.
- 2. Disconnect fuel level sensor unit and fuel pump (main).
- 3. Check resistance between fuel level sensor unit and fuel pump (main) terminals as follows.

| + | _ | | | | | |
|---|---|--------------------------|-------------|--|--|--|
| Fuel level sensor unit and fuel pump (main) Terminals 1 3 Terminals | | Condition | Resistance | | | |
| | | | | | | |
| | | Temperature: 25°C (77°F) | 0.2 - 5.0 Ω | | | |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace fuel level sensor unit and fuel pump (main).

LOW PRESSURE FUEL PUMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

Component Inspection (FPCM)

INFOID:0000000006115654

1. CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Check the voltage between FPCM terminals under the following conditions.

| | FPCM | | | |
|---------------|----------|---|---|--------------|
| Connector + - | | | Condition | Voltage |
| Connector | Terminal | Terminal | | |
| | | | For 1 second after turning ignition switch ON | Approx. 10 V |
| | | More than 1 second after turning ignition switch ON | Approx. 0 V | |
| | | | Idle speed | Approx. 10 V |

Is the inspection result normal?

YES >> INSPECTION END NO >> Replace FPCM.

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MALFUNCTION INDICATOR LAMP

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

INFOID:0000000005841333

MALFUNCTION INDICATOR LAMP

Component Function Check

1. CHECK MIL FUNCTION

- 1. Turn ignition switch ON.
- Check that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-1084, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005841334

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-30, "CONSULT-III Function".

Is the inspection result normal?

YES >> GO TO 3.

NO >> Perform trouble diagnosis for DTC indicated.

3. CHECK INTERMITTENT INCIDENT

Refer to GI-38. "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-90, "Removal and Installation".

NO >> Repair or replace malfunctioning part.

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:0000000005841336

1. CHECK ORVR FUNCTION

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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-1085, "Diagnosis Procedure".

>> INSPECTION END NO

Diagnosis Procedure

INFOID:0000000005841337

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?

Α >> GO TO 2.

В >> GO TO 7.

2.CHECK EVAP CANISTER

- 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 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

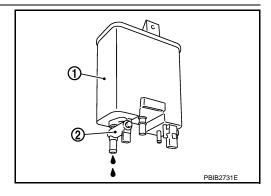
Check if water will drain from EVAP canister (1).

EVAP canister vent control valve (2)

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.

>> 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.

O.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1087, "Component Inspection (EVAP Vapor Cut Valve)".

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Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

7.CHECK EVAP CANISTER

- Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
- Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> GO TO 8.

NO >> GO TO 9.

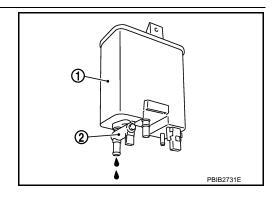
8.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

• EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 9. NO >> GO TO 11.



9. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> 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.

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

Refer to EC-1087, "Component Inspection (EVAP Vapor Cut Valve)".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

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[VK56VD]

< DTC/CIRCUIT DIAGNOSIS >

Is the inspection result normal?

YES >> GO TO 15.

NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-I

Check one-way fuel valve for clogging.

Is the inspection result normal?

>> GO TO 16. YES

NO >> Repair or replace one-way fuel valve with fuel tank.

16. CHECK ONE-WAY FUEL VALVE-II

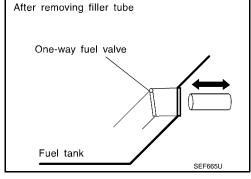
- Check that fuel is drained from the tank.
- 2. Remove fuel filler tube and hose.
- 3. Check one-way fuel valve for operation as per the following. When a stick is inserted, the valve should open, when removing stick it should close.

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.



Component Inspection (EVAP Vapor Cut Valve)

1. CHECK REFUELING EVAP VAPOR CUT VALVE

- Turn ignition switch OFF.
- Remove fuel tank. Refer to FL-10, "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.

Always replace O-ring with new one.

Turn fuel tank upside down.

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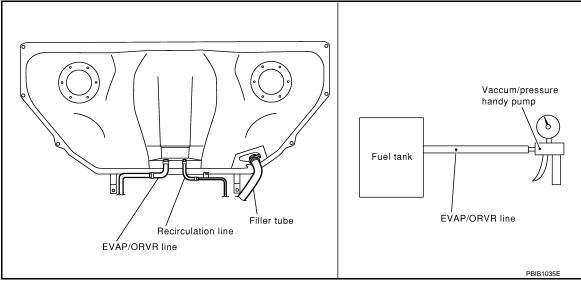
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- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm³, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:0000000005841342

1. CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

- Start engine and warm it up to normal operating temperature.
- 2. Turn A/C switch and blower fan switch ON.
- Check the voltage between ECM harness connector terminals as per the following.

| | ECM | | |
|-----------|---|----------|-------------|
| Connector | + | _ | Voltage (V) |
| Connector | Terminal | Terminal | |
| M160 | 144 (Refrigerant pressure sensor signal) | 150 | 1.0 - 4.0 |

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-1089, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005841343

1. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

- Disconnect refrigerant pressure sensor harness connector.
- Turn ignition switch ON.
- Check the voltage between refrigerant pressure sensor harness connector and ground.

| Refrigerant pr | essure sensor | Ground | Voltage (V) | | | |
|----------------|---------------|---------|-------------|--|--|--|
| Connector | Terminal | Orodria | voitage (v) | | | |
| E77 | 3 | Ground | Approx. 5 V | | | |

Is the inspection result normal?

YFS >> GO TO 3. >> GO TO 2. NO

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

${f 3.}$ CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

- Turn ignition switch OFF.
- Disconnect ECM harness connector. 2.
- Check the continuity between refrigerant pressure sensor harness connector and ECM harness connec-

| Refrigerant pre | essure sensor | EC | CM | Continuity | |
|-----------------|---------------|-----------|----------|------------|--|
| Connector | Terminal | Connector | Terminal | Continuity | |
| E77 | 1 | M160 | 150 | Existed | |

Also check harness for short to ground and short to power.

Is the inspection result normal?

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

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REFRIGERANT PRESSURE SENSOR

< DTC/CIRCUIT DIAGNOSIS >

[VK56VD]

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between ECM and refrigerant pressure sensor
- · Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

| Refrigerant pre | essure sensor | EC | CM | Continuity |
|-----------------|---------------|-----------|----------|------------|
| Connector | Terminal | Connector | Terminal | Continuity |
| E77 | 2 | M160 | 144 | Existed |

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7. NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.

- · Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness
 - >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-38, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.

NO >> Repair or replace malfunctioning part.

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS >

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SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table EC

SYSTEM — BASIC ENGINE CONTROL SYSTEM

| | | | | | | | S' | YMPT | ОМ | | | | | | | С |
|----------|---------------------------------------|-----------------|--------------|-------------------------|------------------------|----------------|--------------------|--------------------|------------------|----------------|----------------------------------|-------------|---------------|---------------------|--------------------------------------|--------|
| | | | | | | z | | | | | GH GH | | | | | |
| | | TART (EXCP. HA) | | /FLAT SPOT | IATION | R ACCELERATION | | (1) | | IDLE | OVERHEATS/WATER TEMPERATURE HIGH | CONSUMPTION | CONSUMPTION | ER CHARGE) | Reference | D E |
| | | START/RESTART | ALL | HESITATION/SURGING/FLAT | SPARK KNOCK/DETONATION | POWER/POOR | LOW IDLE | ROUGH IDLE/HUNTING | RATION | RETURN TO IDLE | S/WATER T | FUEL | | BATTERY DEAD (UNDER | page | F |
| | | HARD/NO S | ENGINE STALL | HESITATIOI | SPARK KNO | LACK OF P | HIGH IDLE/LOW IDLE | ROUGH IDI | IDLING VIBRATION | SLOW/NO F | OVERHEAT | EXCESSIVE | EXCESSIVE OIL | BATTERY D | | G H |
| Warrant | y symptom code | AA | AB | AC | AD | AE | AF | AG | АН | AJ | AK | AL | AM | НА | | П |
| Fuel | Low pressure fuel pump circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 3 | | 2 | EC-1081 | |
| | Low fuel pressure sensor circuit | | | 4 | | 4 | | | | | | | | | EC-1049 | |
| | Fuel pressure regulator system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-701 | |
| | Fuel injector circuit | 1 | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-1067 | |
| | Evaporative emission system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | | | EC-1100 | J |
| | FRP sensor circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-834 EC-837 | K |
| | High pressure fuel pump circuit | | | 4 | | 3 | | | | | | | | | EC-1070 | 11 |
| Air | Positive crankcase ventilation system | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | | 4 | 1 | | EC-1102 | L |
| | Incorrect idle speed adjustment | | | | | | 1 | 1 | 1 | 1 | | 1 | | | EC-687 | |
| | Electric throttle control actuator | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | | 2 | | 2 | EC-974 EC-980 | M |
| Ignition | Incorrect ignition timing adjustment | 3 | 3 | 1 | 1 | 1 | | 1 | 1 | | | 1 | | | EC-1075 | |
| | Ignition circuit | 1 | 1 | 2 | 2 | 2 | | 2 | 2 | | | 2 | | | EC-1075 | |
| Main po | wer supply and ground circuit | 2 | 2 | 3 | 3 | 3 | | 3 | 3 | | 2 | 3 | | | EC-716 | Ν |
| Mass ai | r flow sensor circuit | 1 | | | 2 | | | | | | | | | | EC-726 | |
| Engine | coolant temperature sensor circuit | ' | | | | | 3 | | | 3 | | | | | EC-773 | 0 |
| Air fuel | ratio (A/F) sensor 1 circuit | | 1 | 2 | 3 | 2 | | 2 | 2 | | | 2 | | | EC-786 EC-790 EC-793 EC-796 | Р |
| Throttle | position sensor circuit | | | | | | 2 | | | 2 | | | | | EC-846 EC-972 EC-973 EC-982 | |
| Accelera | ator pedal position sensor circuit | | | 3 | 2 | 1 | | | | | | | | | EC-1037 EC-1040 EC-1044 | |

[VK56VD]

| | | | | | | S' | YMPT | ОМ | | | | | | |
|--|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|--------------------|
| | 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) | Reference page |
| Warranty symptom code | AA | AB | AC | AD | AE | AF | AG | АН | AJ | AK | AL | AM | НА | |
| Knock sensor circuit | | | 2 | | | | | | | | 3 | | | EC-855 |
| Engine oil temperature sensor | | | 4 | | 2 | | | | | | 3 | | | EC-841 EC-843 |
| Engine oil pressure sensor | | | 4 | | 4 | 3 | 3 | 3 | | | 3 | | | EC-923 |
| Crankshaft position sensor circuit | 2 | 2 | | | | | | | | | | | | EC-857 |
| Camshaft position sensor circuit | 3 | 2 | | | | | | | | | | | | EC-861 |
| Vehicle speed signal circuit | | 2 | 3 | | 3 | | | | | | 3 | | | EC-915 |
| Power steering pressure sensor circuit | | 2 | | | | | 3 | 3 | | | | | | EC-929 |
| ECM | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | | EC-934 EC-936 |
| Intake valve timing control solenoid valve circuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | EC-732 EC-746 |
| Exhaust valve timing control solenoid valve circuit | | 3 | 2 | | 1 | 3 | 2 | 2 | 3 | | 3 | | | EC-736 EC-749 |
| Exhaust valve timing control position sensor circuit | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EC-948 |
| VVEL control module | 3 | | 4 | 4 | 3 | | | | | | | | | EC-1027 EC-1028 |
| VVEL actuator motor | 3 | | 4 | 4 | 3 | | | | | | | | | EC-955 |
| VVEL actuator motor relay | 3 | | 4 | 4 | 3 | | | | | | | | | EC-958 |
| VVEL control shaft position sensor | 3 | | 4 | 4 | 3 | | | | | | | | | EC-952 |
| PNP signal circuit | | | 3 | | 3 | | 3 | 3 | | | 3 | | | EC-941 |
| Refrigerant pressure sensor circuit | | 2 | | | | 3 | | | 3 | | 4 | | | EC-1089 |
| Electrical load signal circuit | | | | | | | 3 | | | | | | | EC-1065 |
| Air conditioner circuit | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | | 3 | | 2 | HAC-80 |
| ABS actuator and electric unit (control unit) | | | 4 | | | | | | | | | | | BRC-64 |
| Cooling fan control module | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | 5 | 4 | 5 | | | EC-1060 |
| Manifold absolute pressure sensor circuit | | | | | | | | | | | 3 | | | EC-764 EC-768 |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS > [VK56VD]

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| | 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) | Reference page | |
| Warranty symptom code | AA | AB | AC | AD | ΑE | AF | AG | АН | AJ | AK | AL | AM | НА | | |
| Battery current sensor | | | | | | 4 | 5 | 5 | | | | | 3 | EC-987 EC-990 EC-994 EC-998 EC-1002 | _ |
| Heated oxygen sensor 2 | | | 6 | | 6 | | 6 | 6 | | | 5 | | | EC-801 EC-807 EC-815 | - |

^{1 - 6:} The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

| | | | SYMPTOM | | | | | | | | | | | | |
|----------|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-------------------|
| | | 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) | Reference page |
| Warranty | y symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | НА | · |
| Fuel | Fuel tank | 5 | | | | | | | | | | | | | El 4 |
| | Fuel piping | 5 | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | <u>FL-4</u> |
| | Vapor lock | | 5 | | | | | | | | | | | | _ |
| | Valve deposit | | | | | | | | | | | | | | _ |
| | Poor fuel (Heavy weight gasoline, Low octane) | 5 | | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | _ |

| < SYMPT | OM DIAGNOSIS > | | | | | | | | | | | | | | [VK56VD] |
|----------------|---|----------------------------------|--------------|------------------------------|------------------------|---------------------------------|--------------------|--------------------|------------------|------------------------|----------------------------------|----------------------------|---------------------------|-----------------------------|-------------------|
| | | | | | | | S | /MPT | MC | | | | | | |
| | | 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) | Reference page |
| Warranty s | ymptom code | AA | AB | AC | AD | AE | AF | AG | АН | AJ | AK | AL | AM | НА | |
| Air | Air duct | | | | | | | | | | | | | | EM-185 |
| | Air cleaner | | | | | | | | | | | | | | EM-178 |
| | Air leakage from air duct (Mass air flow sensor — electric throttle control actuator) | | 5 | 5 | | 5 | | 5 | 5 | | | 5 | | | <u>EM-185</u> |
| | Electric throttle control actuator | 5 | | | 5 | | 5 | | | 5 | | | | | EC-980 |
| | Air leakage from intake manifold/ Collector/Gasket | | | | | | | | | | | | | | <u>EM-190</u> |
| Cranking | Battery | 1 | 1 | 1 | | 1 | | 1 | 1 | | | | | 1 | PG-154 |
| | Generator circuit | | ' | ' | | ' | | ' | ' | | | | | ' | CHG-15 |
| | Starter circuit | 3 | | | | | | | | | | 1 | | | STR-13 |
| | Signal plate | 6 | | | | | | | | | | | | | EM-273 |
| | PNP signal | 4 | | | | | | | | | | | | | TM-107 |
| Engine | Cylinder head | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-269 |
| | Cylinder head gasket | 3 | 3 | 3 | 3 | 3 | | 3 | 3 | | 4 | , | 3 | | <u>LIVI-209</u> |
| | Cylinder block | | | | | | | | | | | | | | |
| | Piston | | | | | | | | | | | | 4 | | |
| | Piston ring | 6 | 6 | 6 | 6 | 6 | | 6 | 6 | | | 6 | | | EM-283 |
| | Connecting rod | | 0 | | 0 | | | 0 | U | | | | | | <u>LIW-203</u> |
| | Bearing | | | | | | | | | | | | | | |
| | Crankshaft | | | | | | | | | | | | | | |
| Valve | Timing chain | | | | | | | | | | | | | | EM-243 |
| mecha- nism | Camshaft | | | | | | | | | | | | | | EM-254 |
| | Intake valve timing control | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-230 |
| | Exhaust valve timing control | | | | | 5 | | | J | | | | | | <u></u> |
| | Intake valve | | | | | | | | | | | | 3 | | EM-269 |
| | Exhaust valve | | | | | | | | | | | | | | |
| Exhaust | Exhaust manifold/Tube/Muffler/ Gasket | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EX-4 EX-8 |
| | Three way catalyst | | | | | | | | | | | | | | |

ENGINE CONTROL SYSTEM SYMPTOMS

< SYMPTOM DIAGNOSIS > [VK56VD]

| | | | | | | | S | /MPT | ОМ | | | | | | |
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| | | 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) | Reference page |
| Warranty | symptom code | AA | AB | AC | AD | AE | AF | AG | AH | AJ | AK | AL | AM | НА | |
| Lubrica- tion | Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | | 5 | | | EM-205 EM-208 LU-29 LU-28 |
| | Oil level (Low)/Filthy oil | | | | | | | | | | | | | | <u>LU-23</u> |
| Cooling | Radiator/Hose/Radiator filler cap | | | | | | | | | | | | | | CO-37 CO-37 |
| | Thermostat | | | | | | | | | 5 | | | | | <u>CO-48</u> |
| | Water pump | 5 | 5 | 5 | 5 | 5 | | 5 | 5 | | 4 | 5 | | | <u>CO-46</u> |
| | Water gallery | | | | | | | | | |]] | | | | <u>CO-48</u> |
| | Cooling fan | | | | | | | | | | | | | | <u>CO-43</u> |
| | Coolant level (Low)/Contaminated coolant | | | | | | | | | 5 | | | | | <u>CO-33</u> |
| IVIS (INFI NATS) | NITI Vehicle Immobilizer System — | 1 | 1 | | | | | | | | | | | | SEC-50 |

^{1 - 6:} The numbers refer to the order of inspection.

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[VK56VD]

INFINITI DRIVE MODE SELECTOR

Symptom Table

SYSTEM - DRIVE MODE SELECTOR -

| Malfunction | Chec | k item | Probable malfunctioning part/ Action | | |
|--|--|--|--|--|--|
| | | The central switch of the navigation system operates normally. | Perform self-diagnosis of the engine control system. Refer to EC-102, "DTC Index". | | |
| ECO pedal reaction force is not | Only ECO pedal reaction force is not generated. [Intelligent pedal (distance control assist) operates normally.] | The central switch of the navigation system malfunctions. | Perform self-diagnosis of the navigation system. Refer to AV-114, "Symptom Table" (BASE AUDIO WITHOUT NAVIGATION) or AV-288, "Symptom Table" (BOSE AUDIO WITH NAVIGATION) | | |
| | Intelligent pedal (distance contro generated as well. | Perform self-diagnosis of the ADAS control unit, ICC sensor, and Accelerator pedal actuator. • ADAS C/U: Refer to DAS-40, "DTC Index". • ICC SENSOR: Refer to DAS-111, "DTC Index". • ACCELERATOR PEDAL ACTUATOR:Refer to DAS-114, "DTC Index". | | | |
| When in ECO mode, settings of ECO pedal reaction force cannot be changed or vehicle behavior does not agree to the settings. | Intelligent pedal (distance contromalfunction as well. | ol assist) reaction force has a | Perform self-diagnosis of the ADAS control unit, ICC sensor, and Accelerator pedal actuator. • ADAS C/U: Refer to DAS-40, "DTC Index". • ICC SENSOR: Refer to DAS-111, "DTC Index". • ACCELERATOR PEDAL ACTUATOR:Refer to DAS-114, "DTC Index". | | |
| | | The central switch of the navigation system operates normally. | Perform self-diagnosis of the engine control system. Refer to <u>EC-102</u> , "DTC Index". | | |
| | Intelligent pedal (distance control assist) reaction force is normal. | The central switch of the navigation system malfunctions. | Perform self-diagnosis of the navigation system. Refer to AV-114, "Symptom Table" (BASE AUDIO WITHOUT NAVIGATION) or AV-288, "Symptom Table" (BOSE AUDIO WITH NAVIGATION) | | |

NORMAL OPERATING CONDITION

< SYMPTOM DIAGNOSIS > [VK56VD]

NORMAL OPERATING CONDITION

Description INFOID:000000005926836

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 1,800 rpm under no load (for example, the selector lever position is neutral and engine speed is over 1,800 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 1,500 rpm, then fuel cut will be cancelled. **NOTE:**

This function is different from deceleration control listed under direct injection gasoline system, <u>EC-570</u>, "<u>DIRECT INJECTION GASOLINE SYSTEM</u>: <u>System Description</u>".

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[VK56VD]

PERIODIC MAINTENANCE

IDLE SPEED

Inspection INFOID:0000000005840850

1. CHECK IDLE SPEED

(I) With CONSULT-III

Check idle speed in "DATA MONITOR" mode with CONSULT-III.

With GST

Check idle speed with Service \$01 of GST.

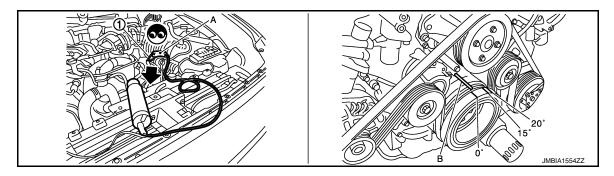
>> INSPECTION END

IGNITION TIMING

Inspection INFOID:000000005840852

1. CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



- 1. Loop wire
- A. Timing light

- B. Timing indicator
- 2. Check ignition timing.

>> INSPECTION END

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EVAP LEAK CHECK

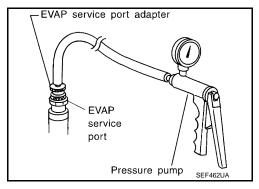
Inspection INFOID:0000000005841360

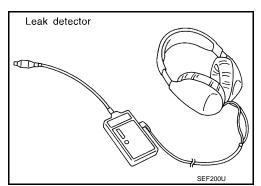
CAUTION:

- 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.
- Do not start engine.
- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leak.

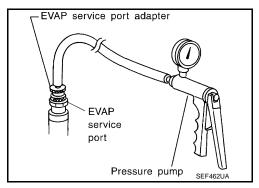
(P) WITH CONSULT-III

- 1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
- 2. Turn ignition switch ON.
- Select the "EVAP SYSTEM CLOSE" of "WORK SUPPORT" mode with CONSULT-III.
- 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.
- 7. Locate the leak using a leak detector (commercial service tool). Refer to <u>EC-580</u>, "EVAPORATIVE EMISSION SYSTEM: System Diagram".





- To locate the EVAP leak, 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.
- 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 (commercial service tool) and hose with pressure pump.

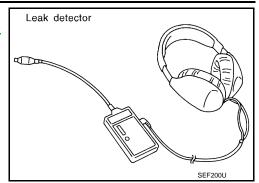


EVAP LEAK CHECK

< PERIODIC MAINTENANCE >

[VK56VD]

5. Locate the leak using a leak detector (commercial service tool). Refer to <u>EC-580</u>, "<u>EVAPORATIVE EMISSION SYSTEM</u>: <u>System Diagram</u>".



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POSITIVE CRANKCASE VENTILATION

< PERIODIC MAINTENANCE >

[VK56VD]

POSITIVE CRANKCASE VENTILATION

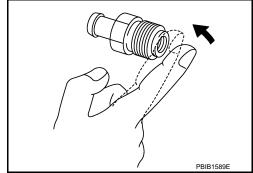
Inspection INFOID:0000000005841340

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.



REMOVAL AND INSTALLATION

ECM

Removal and Installation

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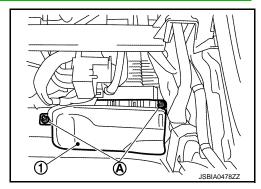
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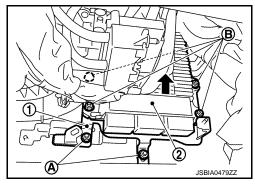
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REMOVAL

- 1. Remove the instrument lower cover. Refer to IP-13, "Removal and Installation".
- 2. Remove the dash side finisher (LH). Refer to INT-38, "DASH SIDE FINISHER: Removal and Installation".
- 3. Remove the ECM cover bolts (A) and remove ECM cover (1).



- 4. Disconnect ECM harness connectors.
- 5. Remove ECM bracket bolt (A)
- 6. Slide the ECM bracket (1) upward and then remove ECM bracket with ECM.
- 7. Remove ECM bracket bolts (B) and separate ECM (2) and ECM bracket.



INSTALLATION

Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing ECM. Refer to EC-691, "Work Procedure".

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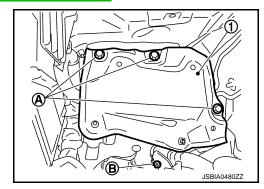
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VVEL CONTROL MODULE

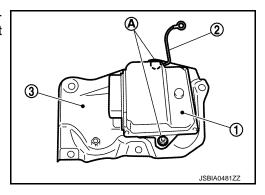
Removal and Installation

REMOVAL

- 1. Remove hoodledge cover (RH) and cowl top cover (RH). Refer to EXT-21, "Removal and Installation".
- 2. Remove the battery and battery tray. Refer to PG-157, "Removal and Installation".
- 3. Remove VVEL control module bracket bolts (A).
- 4. Remove the ground harness fix bolt (B).
- 5. Remove VVEL control module bracket (1).



- 6. Disconnect VVEL control module harness connector.
- Remove the fix bolts (A). And then separate VVEL control module (1), ground harness (2) and VVEL control module bracket (3).



INSTALLATION

Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing VVEL control module. Refer to <u>EC-692</u>, "Work <u>Procedure"</u>.

FUEL PUMP CONTROL MODULE (FPCM)

< REMOVAL AND INSTALLATION >

[VK56VD]

FUEL PUMP CONTROL MODULE (FPCM)

Removal and Installation

INFOID:00000000006069544

REMOVAL

- Remove the rear wheel house finisher (RH). Refer to <u>INT-54, "TRUNK SIDE FINISHER: Removal and Installation"</u>.
- 2. Disconnect fuel pump control module (FPCM) connector.
- 3. Remove mounting bolts and then remove fuel pump control module (FPCM).

INSTALLATION

Install in the reverse order of removal.

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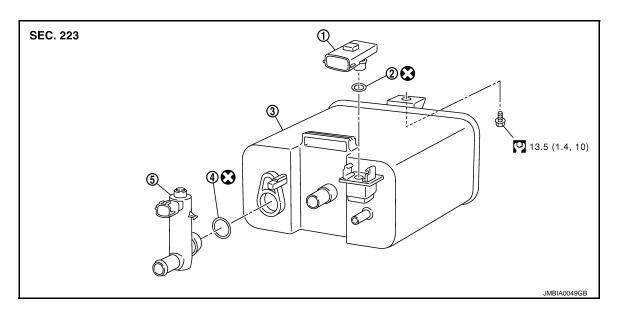
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EVAP CANISTER

Exploded View



- 1. EVAP control system pressure sen- 2.
 - 2. O-ring

3. EVAP canister

4. O-ring

5. EVAP canister vent control valve

Refer to GI-4, "Components" for symbols not described on the above.

Hydraulic Layout

EVAPORATIVE EMISSION LINE DRAWING

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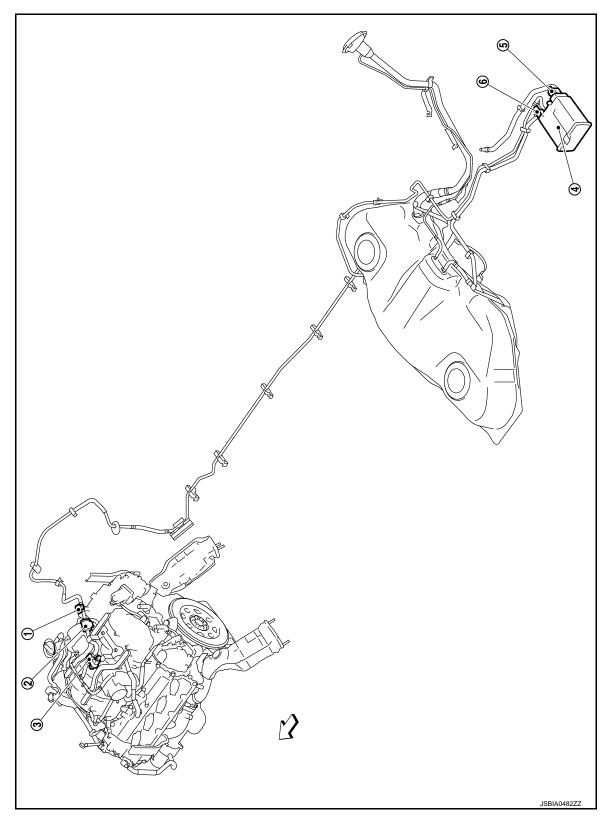
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- EVAP service port
- 4. EVAP canister

- EVAP purge resonator
- 5. EVAP canister vent control valve
- 3. EVAP canister purge volume control solenoid valve
- EVAP control system pressure sensor

 $\ \ \, \ \ \, \ \ \,$: Vehicle front

NOTE:

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< REMOVAL AND INSTALLATION >

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

Removal and Installation

INFOID:0000000005841362

REMOVAL

- 1. Remove the rear diffuser. Refer to EXT-29, "REAR DIFFUSER: Removal and Installation".
- 2. Disconnect harness connectors and hoses.
- 3. Remove EVAP canister fixing bolt.
- 4. Remove EVAP canister.

NOTE:

The EVAP canister vent control valve and EVAP control system pressure sensor can be removed without removing the EVAP canister.

INSTALLATION

Install in the reverse order of removal.

NOTE:

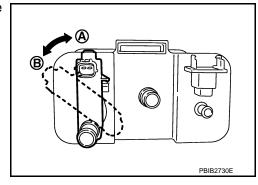
Tighten EVAP canister fixing bolt to the specified torque.

Disassembly and Assembly

INFOID:0000000006056684

DISASSEMBLY

- Disengage the pawl and turn EVAP canister vent control valve counterclockwise.
 - Lock (A)
 - Unlock (B)
- 2. Remove the EVAP canister vent control valve.



ASSEMBLY

Assemble in the reverse order of disassembly.

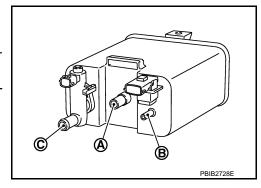
CAUTION:

Always replace O-ring with a new one.

Inspection INFOID:0000000005841363

Check EVAP canister as per the following:

- 1. Block port (B).
- 2. Blow air into port (A) and check that it flows freely out of port (C).
- 3. Release blocked port (B).
- 4. Apply vacuum pressure to port (B) and check that vacuum pressure exists at the ports (A) and (C).
- 5. Block port (A) and (B).
- 6. Apply pressure to port (C) and check that there is no leakage.



SERVICE DATA AND SPECIFICATIONS (SDS)

< SERVICE DATA AND SPECIFICATIONS (SDS)

[VK56VD]

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

| INFOID:0000000005841364 | EC |
|-------------------------|----|
| | |

| Condition | Specification |
|-------------------------------|--|
| No load* (in P or N position) | 600 ± 50 rpm (Without 4WAS) 675 ± 50 rpm (With 4WAS) |

*: 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:0000000005841365

| Condition | Specification |
|-------------------------------|---------------|
| No load* (in P or N position) | 11 ± 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:0000000005841366

| Condition | Specification (Using CONSULT-III or GST) |
|--------------|--|
| At idle | 5 – 35% |
| At 2,500 rpm | 5 – 35% |

Mass Air Flow Sensor

INFOID:0000000005841367

| Supply voltage | Battery voltage (11 – 14 V) |
|--|---|
| Output voltage at idle | 0.95 – 1.35 V* |
| Mass air flow (Using CONSULT-III or GST) | 1.0 – 5.0 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.

Р

EC-1109 Revision: 2010 June 2011 M37/M56

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