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PRECAUTION

PRECAUTIONS

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

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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. Information necessary to service the system safely is included in the SR and SB section of this Service Manual.

WARNING:

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

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

WARNING:

- **When working near the 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 or batteries, and wait at least three minutes before performing any service.**

Precaution Necessary for Steering Wheel Rotation After Battery Disconnect

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CAUTION:

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

- **Before removing and installing any control units, first turn the ignition power source and accessory power source to the OFF, then disconnect both battery cables.**
- **After finishing work, confirm that all control unit connectors are connected properly, then re-connect both battery cables.**
- **Always use CONSULT to perform self-diagnosis as a part of each function inspection after finishing work. If a DTC is detected, perform trouble diagnosis according to self-diagnosis results.**

For vehicle with steering lock unit, if the battery is disconnected or discharged, the steering wheel will lock and cannot be turned.

If turning the steering wheel is required with the battery disconnected or discharged, follow the operation procedure below before starting the repair operation.

OPERATION PROCEDURE

1. Connect both battery cables.
   NOTE:
   Supply power using jumper cables if battery is discharged.
2. Open driver door.
3. Turn the ignition switch to the ON position.
   (At this time, the steering lock will be released.)
4. Turn the ignition switch to OFF position with driver door open.
5. Wait for 3 minutes or longer with driver door open.
   NOTE:
   - Do not close driver door because the steering wheel locks when driver door is closed.

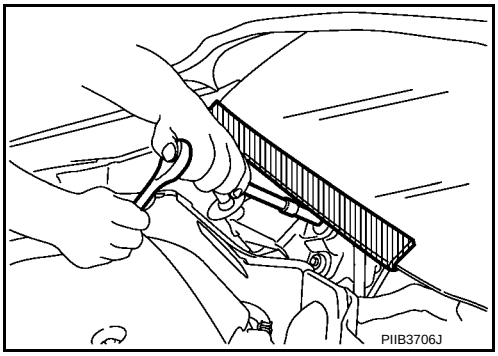
- The auto acc function is adapted to this vehicle. For this reason, even when the ignition switch is turned to OFF position, the accessory power source does not turned OFF and continues to be supplied for a certain amount of time.

6. Disconnect both battery cables. The steering lock will remain released with both battery cables disconnected and the steering wheel can be turned.
7. Perform the necessary repair operation.
8. When the repair work is completed, re-connect both battery cables. With the brake pedal released, turn the ignition switch from OFF position to ON position, then to LOCK position. (The steering wheel will lock when the ignition switch is turned to LOCK position.)
9. Perform self-diagnosis check of all control units using CONSULT.

Precaution for Procedure without Cowl Top Cover

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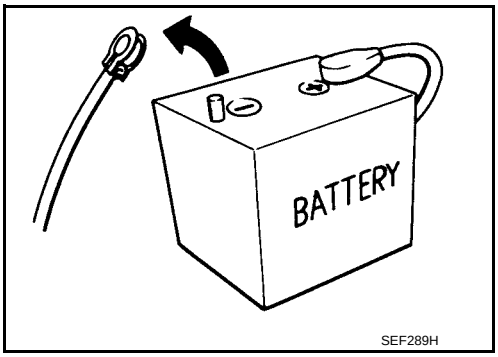
When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



Precautions for Removing Battery Terminal

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- With the adoption of Auto ACC function, ACC power is automatically supplied by operating the intelligent key or remote keyless entry or by opening/closing the driver side door. In addition, ACC power is supplied even after the ignition switch is turned to the OFF position, i.e. ACC power is supplied for a certain fixed time.
- When disconnecting the 12V battery terminal, turn off the ACC power before disconnecting the 12V battery terminal, observing “How to disconnect 12V battery terminal” described below.
  NOTE:
  Some ECUs operate for a certain fixed time even after ignition switch is turned OFF and ignition power supply is stopped. If the battery terminal is disconnected before ECU stops, accidental DTC detection or ECU data damage may occur.
- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.
  NOTE:
  If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.
- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
  NOTE:
  The removal of 12V battery may cause a DTC detection error.



HOW TO DISCONNECT 12V BATTERY TERMINAL

Disconnect 12V battery terminal according to instruction described below.

1. Open the hood.
2. Turn ignition switch to the ON position.
3. Turn ignition switch to the OFF position with the driver side door opened.
4. Get out of the vehicle and close the driver side door.
5. Wait at least 3 minutes. For vehicle with the engine listed below, remove the battery terminal after a lapse of the specified time.

D4D engine	: 20 minutes	YS23DDT	: 4 minutes
HRA2DDT	: 12 minutes	YS23DDTT	: 4 minutes
K9K engine	: 4 minutes	ZD30DDTi	: 60 seconds
M9R engine	: 4 minutes	ZD30DDTT	: 60 seconds

R9M engine : 4 minutes
V9X engine : 4 minutes
YD25DDTi : 2 minutes

CAUTION:
While waiting, never operate the vehicle such as locking, opening, and closing doors. Violation of this caution results in the activation of ACC power supply according to the Auto ACC function.

6. Remove 12V battery terminal.

CAUTION:
After installing 12V battery, always check self-diagnosis results of all ECUs and erase DTC.

On Board Diagnostic (OBD) System of Engine and CVT

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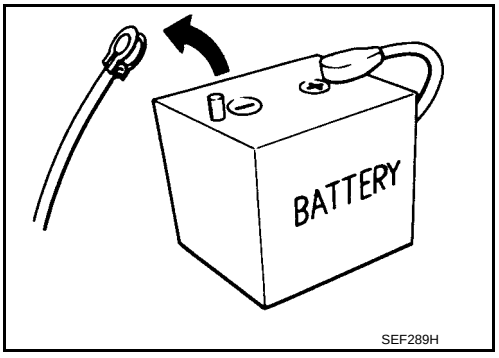
The ECM has an on board diagnostic system. It will light up the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:
- **Be sure to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to light up 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.**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to light up due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

General Precautions

INFOID:0000000014631090

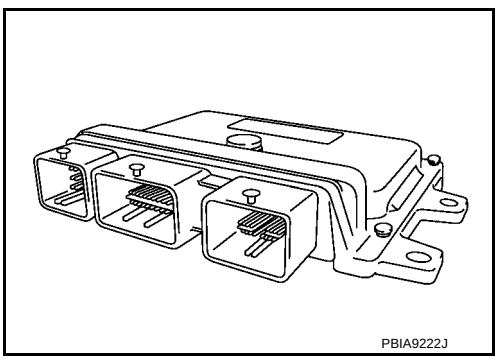
- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because 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.**



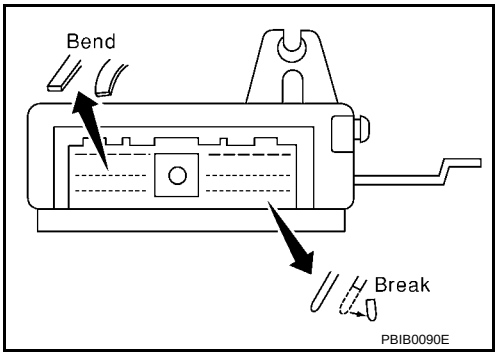
SEF289H

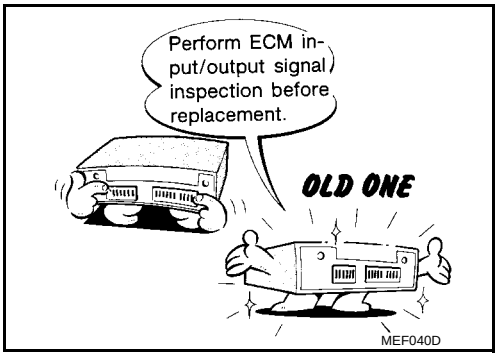
- **Do not disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not 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**

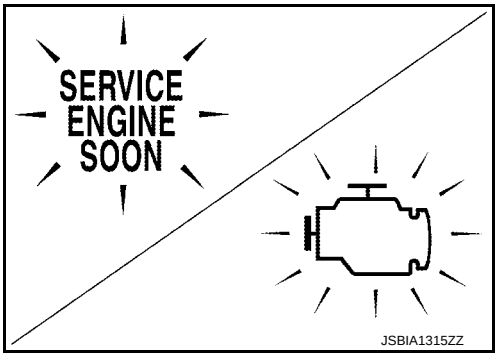

PBIA9222J

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend 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 EC-87, "Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**

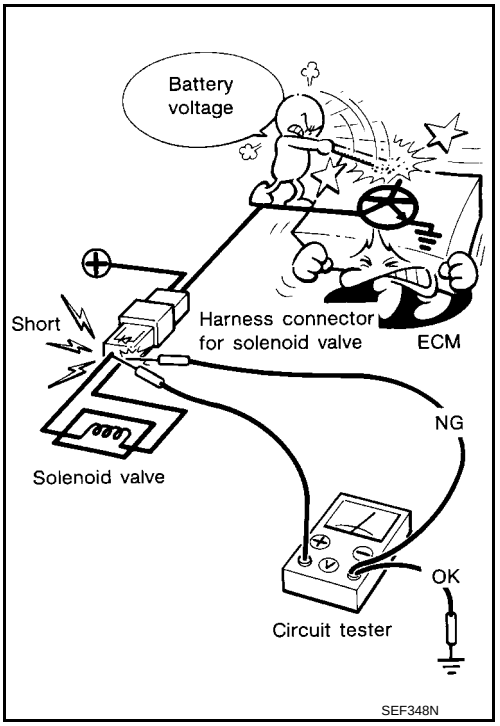




- **After performing each TROUBLE DIAGNOSIS, perform DTC CONFIRMATION PROCEDURE or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.**

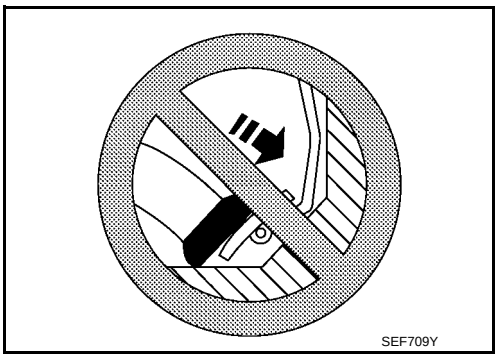


- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

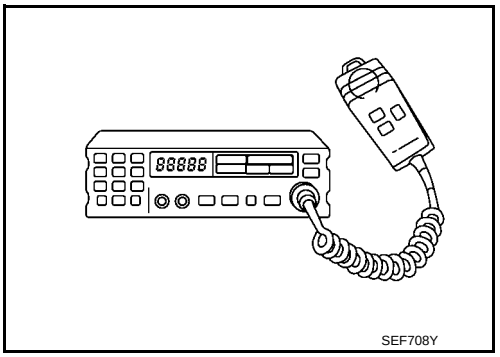


- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

- **Do not depress accelerator pedal when starting.**
- **Immediately after starting, do not rev up engine unnecessarily.**
- **Do not rev up engine just prior to shutdown.**



- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not 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.**



High Voltage Precautions

INFOID:0000000015274528

DANGER:

Since hybrid vehicles and electric vehicles contain a high voltage battery, there is the risk of electric shock, electric leakage, or similar accidents resulting in death or severe injury, if high voltage components and vehicle are mishandled. When performing an inspection or maintenance, be sure to comply with the instructions below to perform correct work procedures.

WARNING:

- **Be sure to remove the service plug in order to disconnect the high voltage circuits before performing inspection or maintenance of high voltage system harnesses and parts.**
- **The removed service plug must always be carried in a pocket of the responsible worker or placed in the tool box during the procedure to prevent the plug from being connected by mistake.**
- **Be sure to wear insulated protective equipment before beginning work on the high voltage system.**
- **Never allow workers other than the responsible person to touch the vehicle containing high voltage parts. To keep others from touching the high voltage parts, these parts must be covered with an insulating sheet except when using them.**

CAUTION:

- **Be sure to install the high voltage harness clips to the original positions to prevent damage to high voltage harness. If the clips are damaged, replace them with new ones before installing the high voltage harness.**
- **To prevent damage to parts, never allow coolant to splash on the high voltage harness connector. If coolant splashes on the high voltage harness connector, immediately remove moisture from the high voltage harness connector by using an air blow gun.**
- **Never bring the vehicle into the READY status with the service plug removed unless otherwise instructed in the Service Manual. A malfunction may occur if this is not observed.**

HIGH VOLTAGE HARNESS AND EQUIPMENT IDENTIFICATION

All the high voltage harnesses and connectors are orange. The Li-ion battery and other high voltage devices include an orange high voltage label. Never touch these harnesses and high voltage parts.

HANDLING OF HIGH VOLTAGE HARNESS AND TERMINALS

Immediately insulate disconnected high voltage connectors and terminals with insulating tape.

GUIDELINES ON WORKERS WITH MEDICAL ELECTRONICS

WARNING:

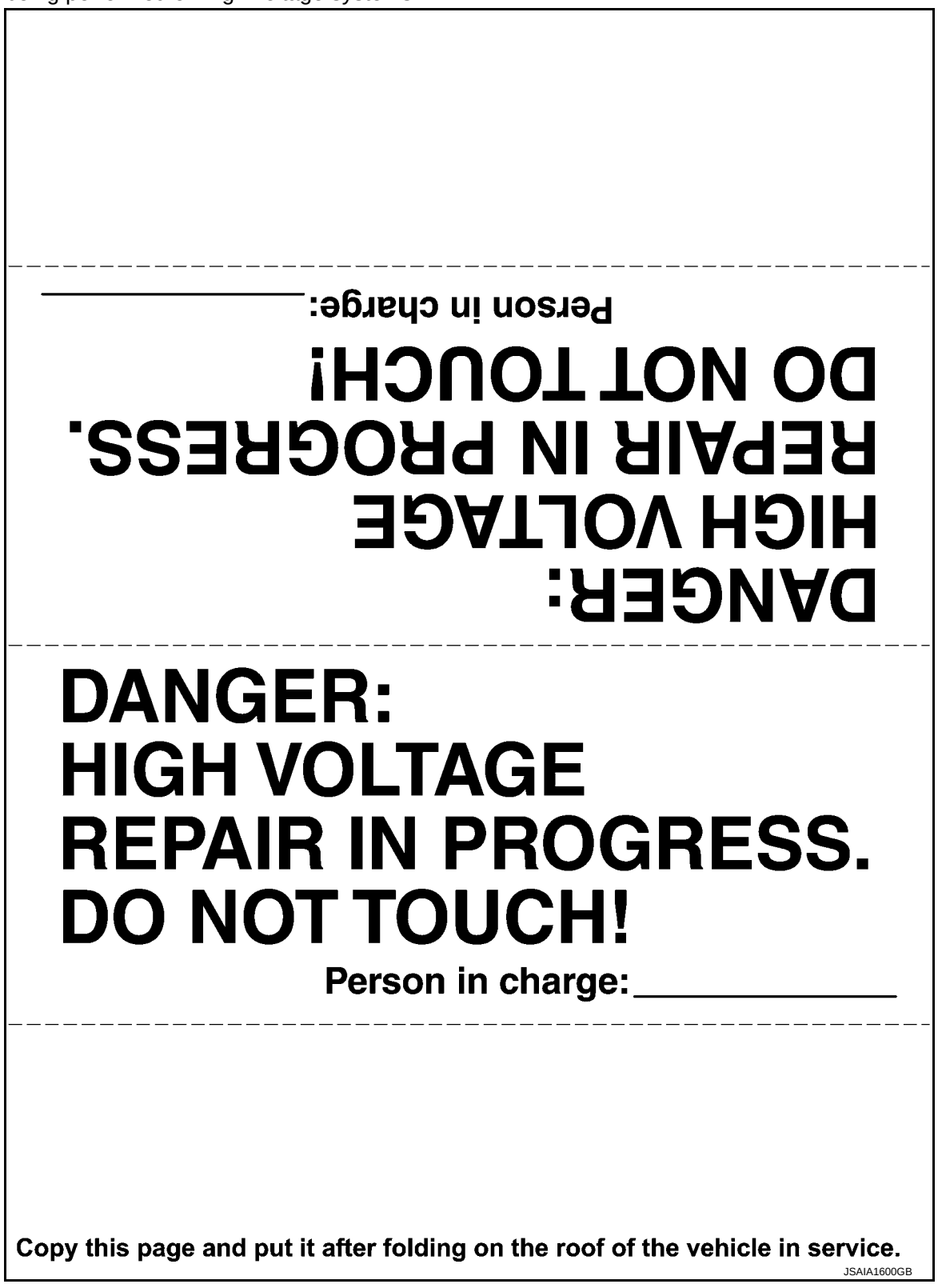
The vehicle contains parts that contain powerful magnets. If a person who is wearing a heart pacemaker or other medical device is close to these parts, the medical device may be affected by the magnets. Such persons must not perform work on the vehicle.

PROHIBITED ITEMS TO CARRY DURING THE WORK

Hybrid vehicles and electric vehicles contain parts with high voltage and intense magnetic force. Never carry metal products and magnetic recording media (e.g. credit card, debit card) to repair/inspect high voltage parts. If this is not observed, the metal products may create a risk of short circuit and the magnetic recording media may lose their magnetic recording.

POST A SIGN OF “DANGER! HIGH VOLTAGE AREA. KEEP OUT”

Call the attention of other workers and indicate "High voltage work in progress." Do not touch vehicles where work is being performed on high voltage systems.



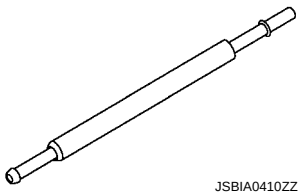
PREPARATION

PREPARATION

Special Service Tools

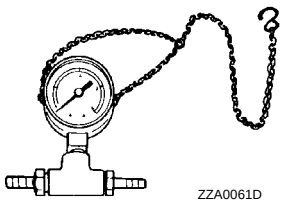
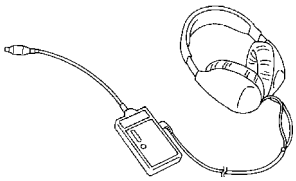
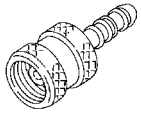
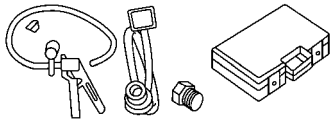
INFOID:0000000014631091

The actual shape of the tools may differ from those illustrated here.

Tool number (TechMate No.) Tool name	Description
KV10120000 (—) Fuel tube adapter  JSBIA0410ZZ	Measures fuel pressure

Commercial Service Tools

INFOID:0000000014631092

Tool name (TechMate No.)	Description
Fuel pressure gauge (—)  ZZA0061D	Measuring fuel pressure
Leak detector i.e.: (J-41416)  S-NT703	Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBD)  S-NT704	Applies positive pressure through EVAP service port
Fuel filler cap adapter i.e.: (J-42909)  ALBIA1353ZZ	Checks fuel tank vacuum relief valve opening pressure

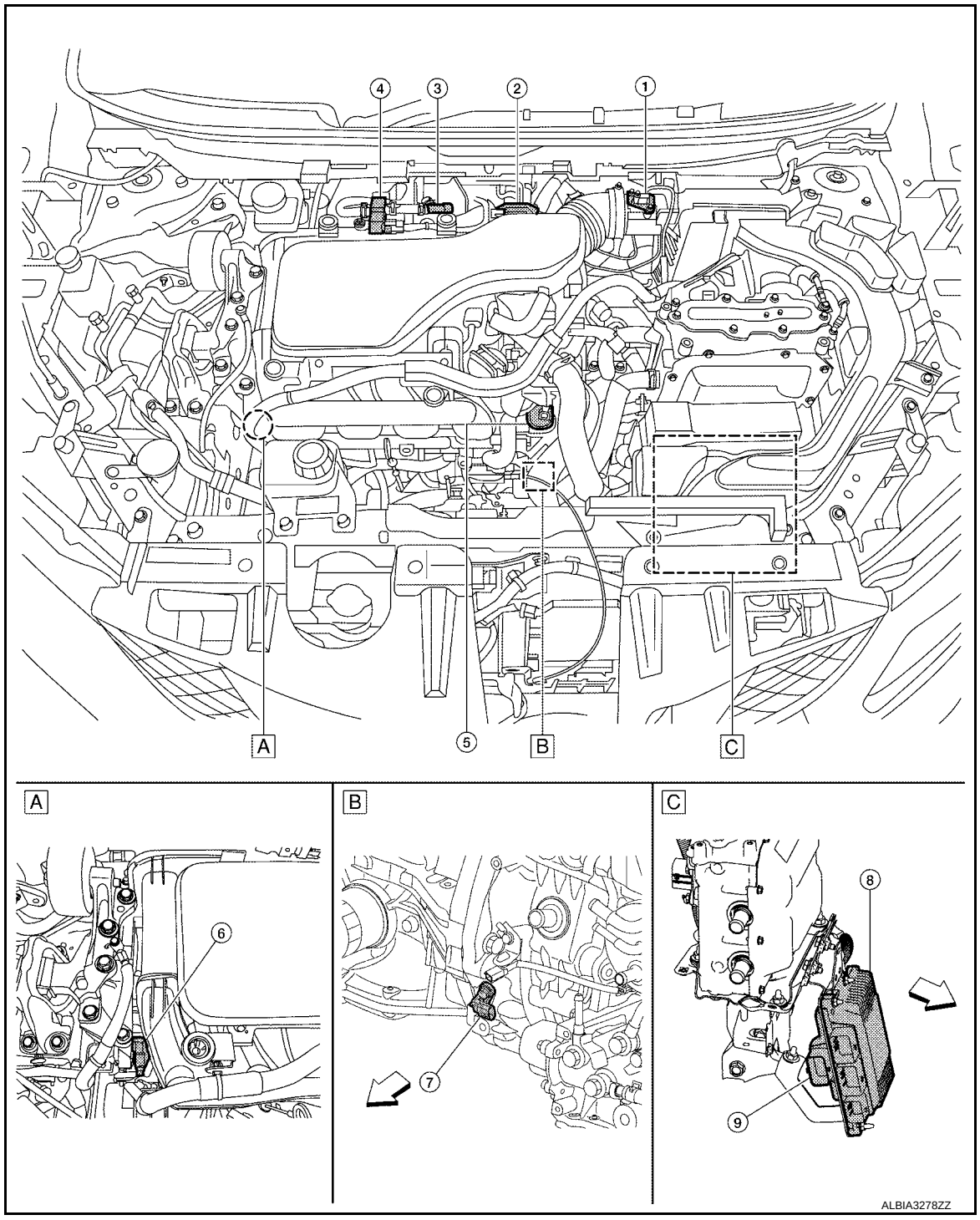
SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

INFOID:0000000014631093

ENGINE ROOM COMPARTMENT



A Engine room, RH

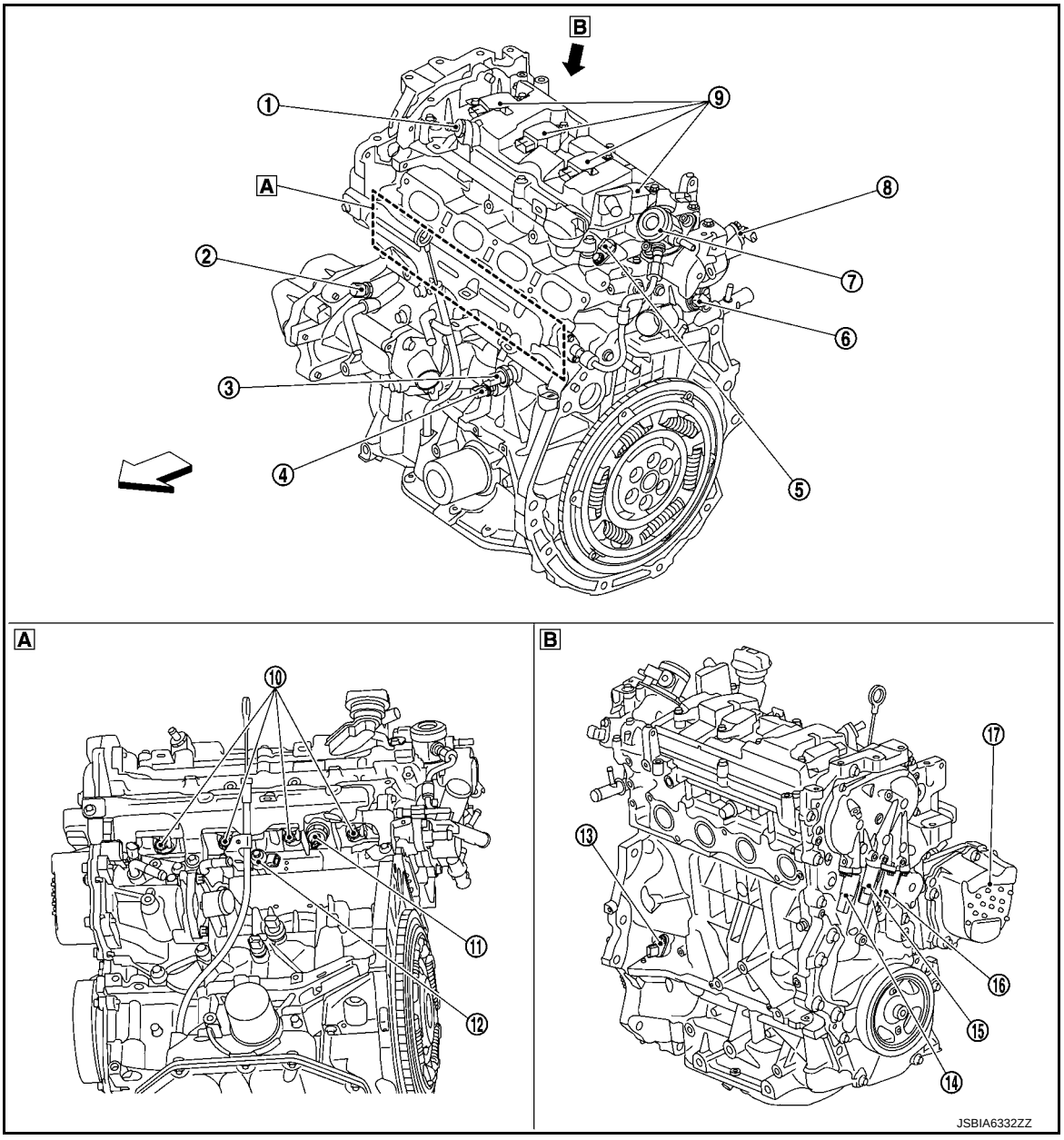
B CVT motor housing

C Engine room, LH

⇦ : Vehicle front

No.	Component	Function
①	Mass air flow sensor (with intake air temperature sensor)	EC-26, "Mass Air Flow Sensor (With Intake Air Temperature Sensor)"
②	Electric throttle control actuator (with built in throttle position sensor and throttle control motor)	EC-23, "Electric Throttle Control Actuator"
③	EVAP service port	—
④	EVAP canister purge volume control solenoid valve	EC-34, "EVAP Canister Purge Volume Control Solenoid Valve"
⑤	Intake manifold runner control valve motor	EC-30, "Intake Manifold Runner Control Valve"
⑥	Intake manifold runner control valve position sensor	EC-30, "Intake Manifold Runner Control Valve"
⑦	Crankshaft position sensor 2	EC-29, "Crankshaft Position Sensor 2"
⑧	ECM (with atmospheric pressure sensor)	EC-23, "ECM"
⑨	TCM	Mainly transmits the following signal to ECM via CAN communication. • CVT fluid temperature signal • Malfunction indicator lamp signal • Shift position signal Refer to TM-15, "CVT CONTROL SYSTEM : Component Parts Location" for detailed installation location.

ENGINE COMPARTMENT



A Vehicle front side

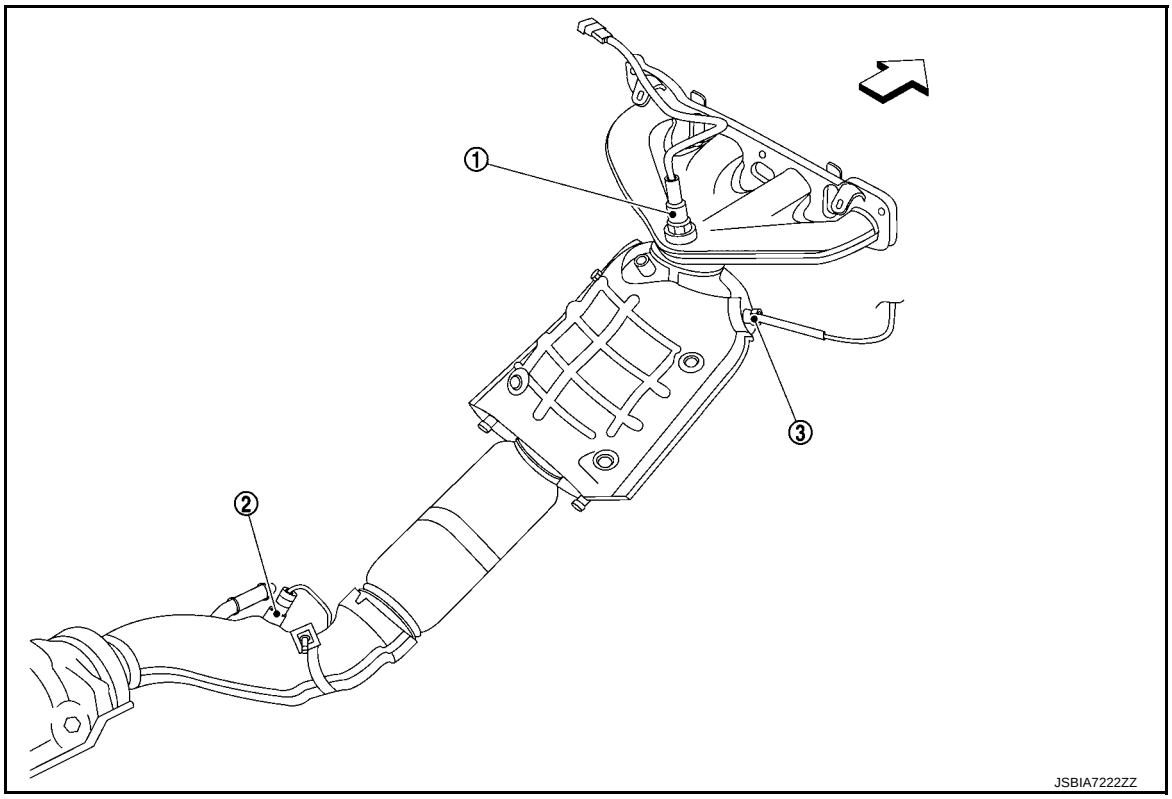
B Vehicle right side

⇦ : Vehicle front

No.	Component	Function
①	PCV valve	EC-36, "Positive Crankcase Ventilation"
②	Engine inlet coolant temperature sensor	EC-28, "Engine Inlet Coolant Temperature Sensor"
③	Engine oil pressure sensor	EC-33, "Engine Oil Pressure Sensor"
④	Engine oil temperature sensor	EC-33, "Engine Oil Temperature Sensor"
⑤	Camshaft position sensor	EC-29, "Camshaft Position Sensor"
⑥	Engine outlet coolant temperature sensor	EC-27, "Engine Outlet Coolant Temperature Sensor"
⑦	High pressure fuel pump	EC-24, "High Pressure Fuel Pump"
⑧	Exhaust valve timing control position sensor	EC-30, "Exhaust Valve Timing Control Position Sensor"

No.	Component	Function
⑨	Ignition coil with power transistor	EC-24, "Ignition Coil With Power Transistor"
⑩	Fuel injector	EC-24, "Fuel Injector"
⑪	Fuel rail pressure sensor	EC-25, "Fuel Rail Pressure Sensor"
⑫	Knock sensor	EC-32, "Knock Sensor"
⑬	Crankshaft position sensor 1	EC-28, "Crankshaft Position Sensor 1"
⑭	Exhaust valve timing control solenoid valve	EC-30, "Exhaust Valve Timing Control Solenoid Valve"
⑮	Intake valve timing intermediate lock control solenoid valve	EC-29, "Intake Valve Timing Intermediate Lock Control Solenoid Valve"
⑯	Intake valve timing control solenoid valve	EC-29, "Intake Valve Timing Control Solenoid Valve"
⑰	Engine cooling electric water pump	EC-28, "Engine Cooling Electric Water Pump"

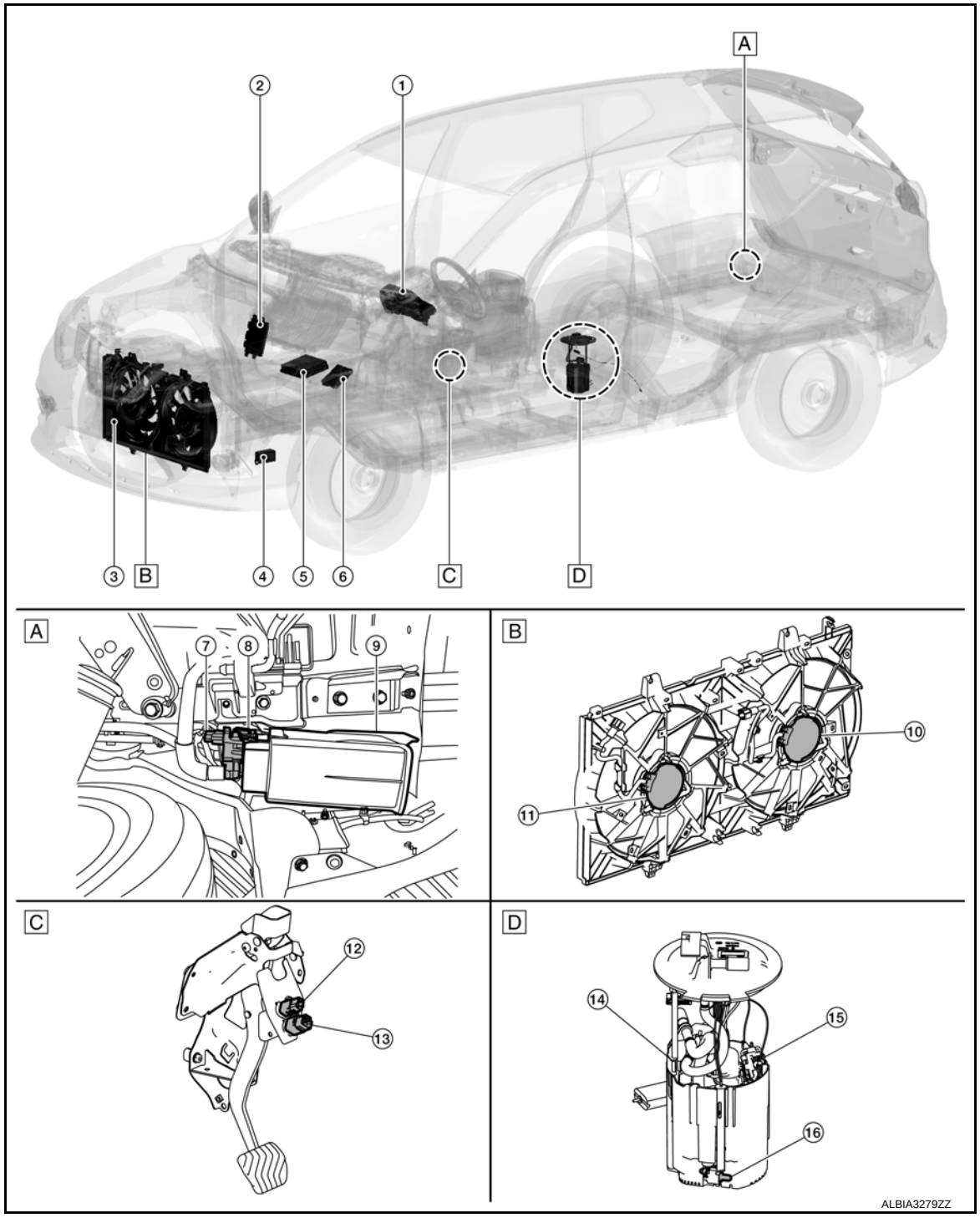
EXHAUST COMPARTMENT



⇦ : Vehicle front

No.	Component	Function
①	Air fuel ratio (A/F) sensor 1	EC-31, "Air Fuel Ratio (A/F) Sensor 1"
②	Heated oxygen sensor 2	EC-31, "Heated Oxygen Sensor 2"
③	Exhaust gas temperature sensor	EC-32, "Exhaust Gas Temperature Sensor"

BODY COMPARTMENT



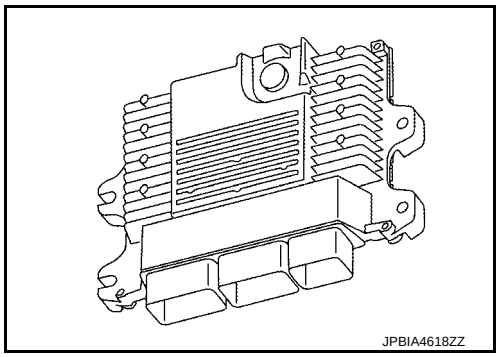
A Right rear undercarriage area
B Behind radiator
C Left side of pedal periphery
D Inside fuel tank periphery

No.	Component		Function
①	Combination meter		Mainly transmits the following signal to ECM via CAN communication. • Vehicle signal Refer to MWI-5, "METER SYSTEM : Component Parts Location" for detailed installation location.
②	HPCM		Mainly transmits the following signal to ECM via CAN communication. • Accelerator pedal position signal • Engine idle request signal • Engine stop command signal • Engine stop notice signal • Malfunction indicator lamp signal • Target engine torque signal Mainly receives the following signal from ECM via CAN communication. • A/C cut request signal • Cooling fan speed request signal • Engine coolant temperature sensor signal • Engine oil pressure warning signal • Engine stop permit signal • Malfunction indicator lamp signal Refer to HBC-12, "Component Parts Location" for detailed installation location.
③	Refrigerant pressure sensor		EC-34, "Refrigerant Pressure Sensor"
④	Relay box	Fuel injector relay	EC-24, "Fuel Injector"
		High pressure fuel pump relay	EC-24, "High Pressure Fuel Pump"
		Engine cooling electric water pump relay	EC-28, "Engine Cooling Electric Water Pump"
⑤	IPDM E/R		• IPDM E/R controls the internal relays and the actuators. Refer to PCS-7, "RELAY CONTROL SYSTEM : System Description". • When CAN communication with ECM is impossible, IPDM E/R performs fail-safe control. Refer to PCS-26, "Fail-safe". • Refer to PCS-6, "Component Parts Location" for detailed installation location.
⑥	A/C auto amp.		Mainly transmits the following signal to ECM via CAN communication. • A/C ON signal • Blower fan ON signal Refer to HAC-8, "Component Part Location" for detailed installation location.
⑦	EVAP canister vent control valve		EC-34, "EVAP Canister Vent Control Valve"
⑧	EVAP control system pressure sensor		EC-34, "EVAP Control System Pressure Sensor"
⑨	EVAP canister		EC-33, "EVAP Canister"
⑩	Cooling fan motor-1		EC-33, "Cooling Fan"
⑪	Cooling fan motor-2		
⑫	Brake pedal position switch		EC-35, "Stop Lamp Switch and Brake pedal position switch"
⑬	Stop lamp switch		
⑭	Low pressure fuel pump		EC-25, "Fuel Level Sensor and Low Pressure Fuel Pump"
⑮	Fuel level sensor (main)		
⑯	Fuel tank temperature sensor		EC-26, "Fuel Tank Temperature Sensor"

ECM

INFOID:0000000014631094

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



ATMOSPHERIC PRESSURE SENSOR

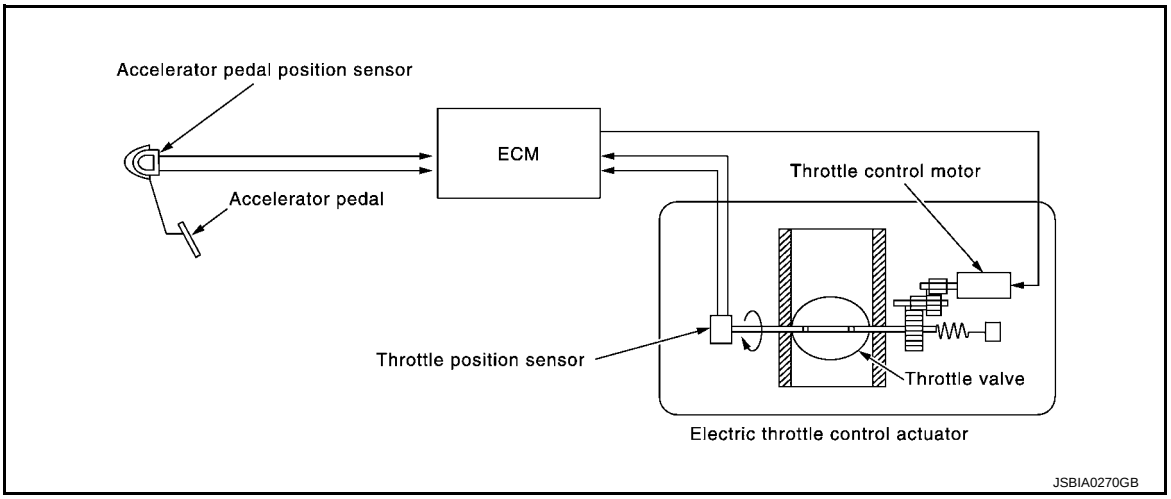
The atmospheric pressure sensor is embedded in ECM. The sensor detects a atmospheric pressure.

Electric Throttle Control Actuator

INFOID:0000000014631095

Description

Electric throttle control actuator consists of throttle body, throttle valve, throttle control motor and throttle position sensor.



THROTTLE CONTROL MOTOR RELAY

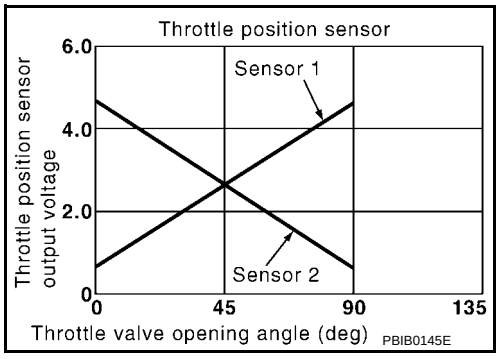
Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is ON/OFF controlled by the ECM. When the ignition switch is turned ON, the ECM sends an ON signal to throttle control motor relay and battery voltage is provided to the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

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

THROTTLE POSITION SENSOR

The throttle position sensor has two sensors. These sensors are a kind of potentiometers which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the throttle valve and feed the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and the ECM controls the throttle control motor to make the throttle valve opening angle properly in response to driving condition.

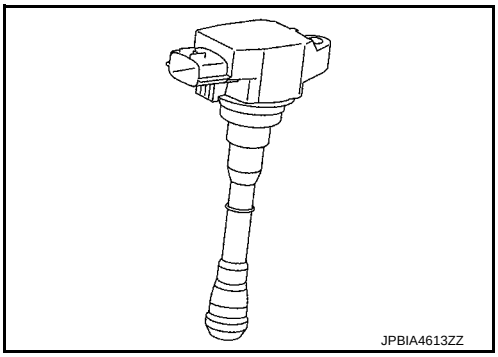


Ignition Coil With Power Transistor

INFOID:0000000014631096

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.

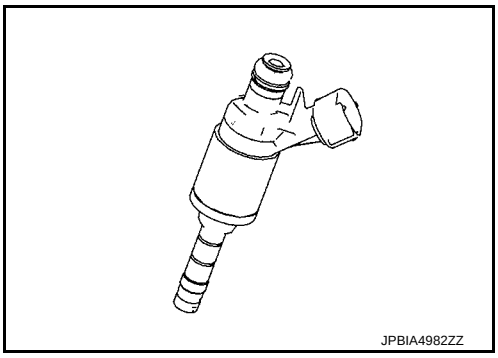


Fuel Injector

INFOID:0000000014631097

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).



FUEL INJECTOR RELAY

The fuel injector relay is controlled by ECM. The relay provides power supply to the fuel injector via ECM.

High Pressure Fuel Pump

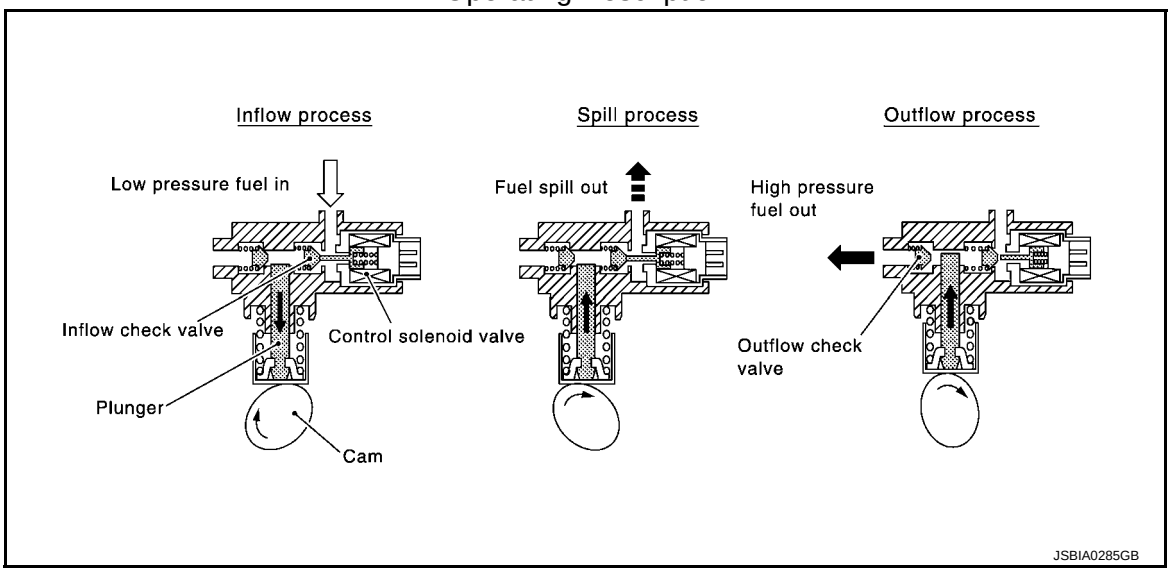
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HIGH PRESSURE FUEL PUMP

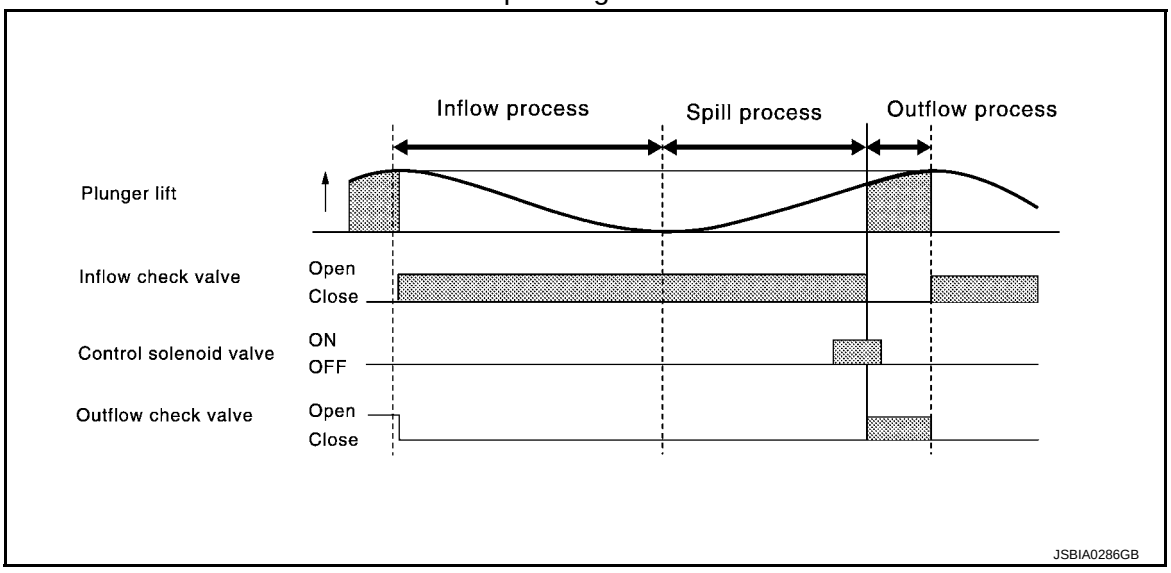
- Balanced flow volume control type single cylinder high pressure fuel pump, which approximately equalize the amount of injection and pump output, is adopted.
- The high pressure fuel pump is activated by the exhaust camshaft. ECM controls the high pressure fuel pump control solenoid valve built into the high pressure fuel pump and adjusts the amount of discharge by changing the suction timing of the low pressure fuel.

- Inflow process: Cam driven lowering plunger let the fuel from low pressure fuel pump induced into high pressure fuel pump.
- Spill process: Although the cam driven plunger start moving upward, inflow check valve still at open position due to the control solenoid valve, so the fuel is not pressurized and spilled out to low pressure fuel pump side. By changing the amount of this spill out volume changes the amount of injection.
- Outflow process: When the control solenoid valve turns ON, the inflow check valve is closed, fuel is pressurized and when the pressure exceeds certain point discharge check valve is pushed open to discharge fuel into fuel rail.

Operating Description



Operating Chart



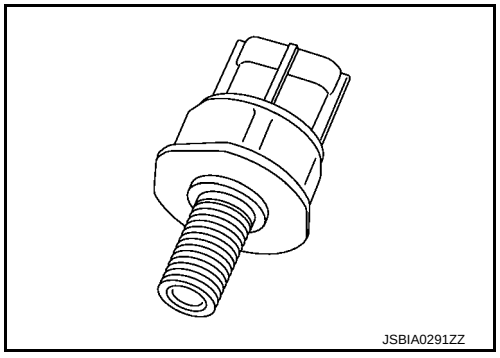
HIGH PRESSURE FUEL PUMP RELAY

The high pressure fuel pump relay is controlled by ECM. The relay provides power supply to the high pressure fuel pump.

Fuel Rail Pressure Sensor

INFOID:0000000014631099

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.

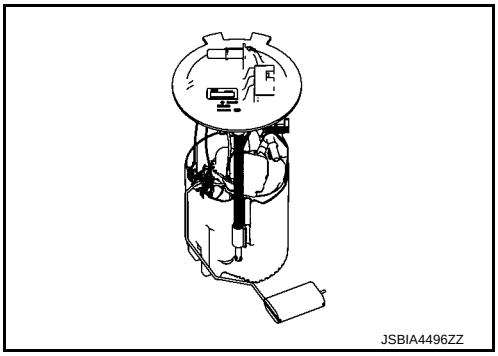


Fuel Level Sensor and Low Pressure Fuel Pump

INFOID:0000000014631100

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.


JSBIA4496ZZ

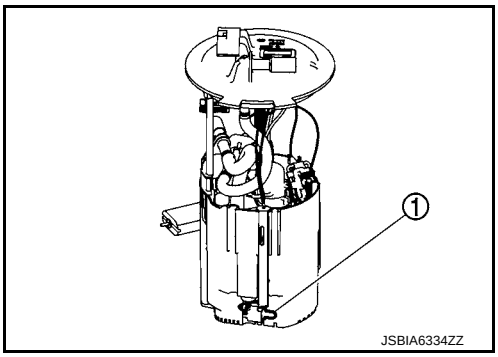
FUEL LEVEL SENSOR

The fuel level sensor is mounted in the low pressure fuel pump.
The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line.
It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

Fuel Tank Temperature Sensor

INFOID:0000000014932422

The fuel tank temperature sensor (FTT sensor) ① 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.

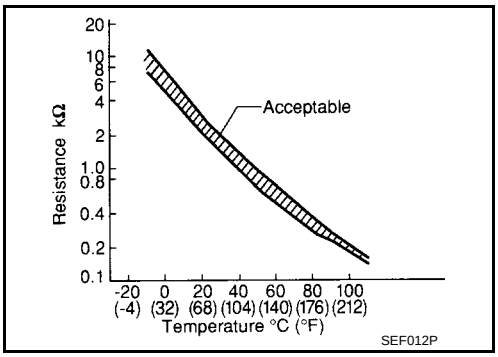


JSBIA6334ZZ

<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 on the diagnosis tool.



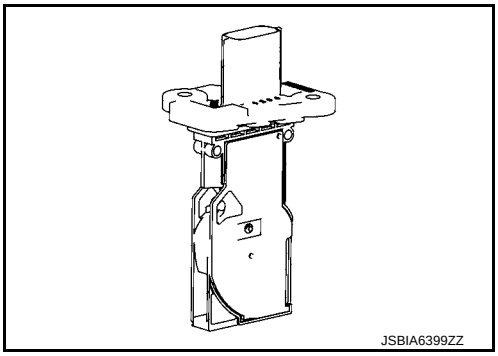
SEF012P

Mass Air Flow Sensor (With Intake Air Temperature Sensor)

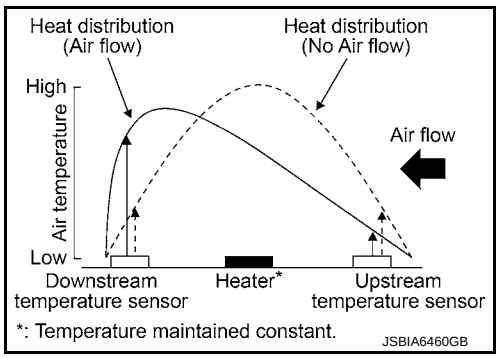
INFOID:0000000014631101

MASS AIR FLOW SENSOR

Mass air flow sensor is installed to the intake air path upstream of throttle and measures air flow rate.
This mass air flow sensor is a backflow-detecting film and silicon element type sensor that can detects air flow rate of both direct flow and backflow. This mass air flow sensor outputs an air flow rate by using frequency signals.


JSBIA6399ZZ

The element part of this mass air flow sensor consists of a heater and temperature sensors installed to both top and bottom of the heater, one to each position. When air flows, the heat distribution around the heater changes and this produces a temperature difference between upstream and downstream. This temperature difference is detected as air flow rate.



INTAKE AIR TEMPERATURE SENSOR

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

The temperature sensing unit uses a thermistor which is sensitive to the change in temperature.

<Reference data>

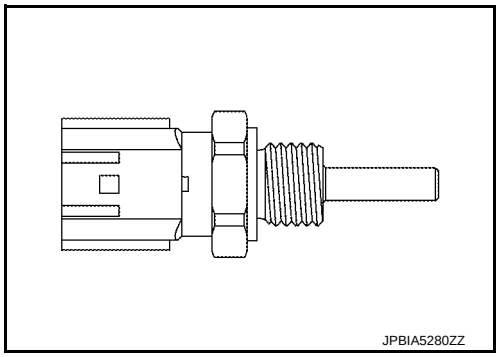
Intake air temperature [°C (°F)]	Voltage* (V)
25 (77)	2.0 – 2.2
80 (176)	3.0 – 3.2

*: These data are reference values on the diagnosis tool.

Engine Outlet Coolant Temperature Sensor

INFOID:0000000014631102

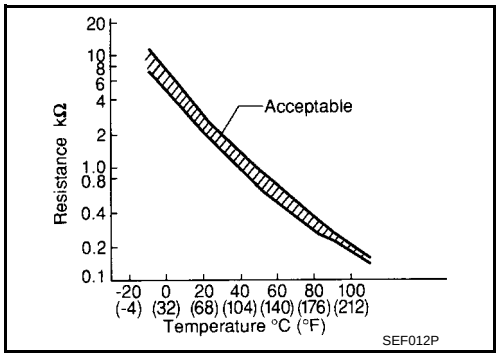
The engine outlet coolant temperature sensor is installed to water outlet of engine and detects a temperature of coolant right after flowing from the engine. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses 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	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

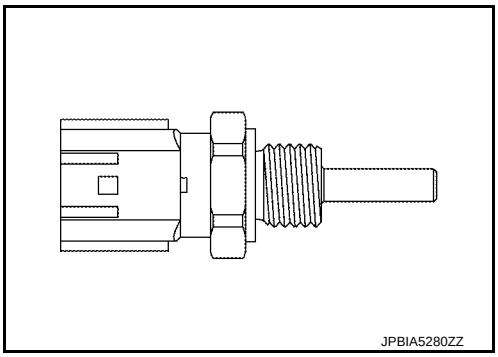
*: These data are reference values and are measured between ECM terminals.



Engine Inlet Coolant Temperature Sensor

INFOID:0000000014631103

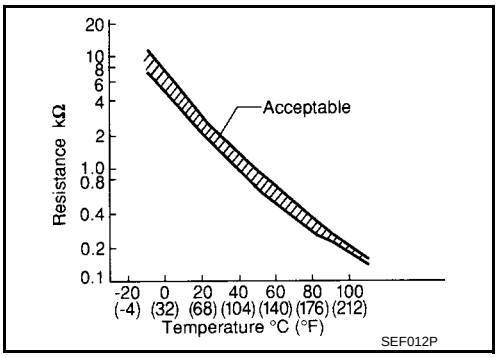
The engine inlet coolant temperature sensor is installed to thermostat housing of engine and detects a temperature of coolant right before flowing into the engine. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.


JPBIA5280ZZ

<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.



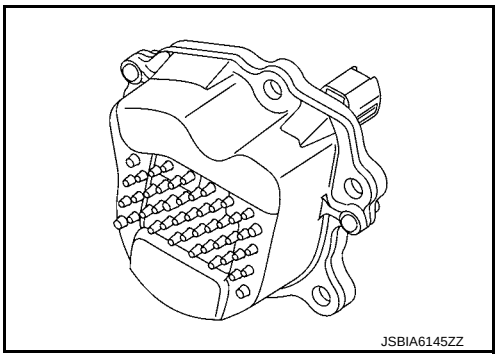
SEF012P

Engine Cooling Electric Water Pump

INFOID:0000000014631104

ENGINE COOLING ELECTRIC WATER PUMP

Engine cooling electric water pump circulates coolant according to a drive duty signal transmitted from ECM. In addition, engine cooling electric water pump transmits a pump speed signal to ECM.


JSBIA6145ZZ

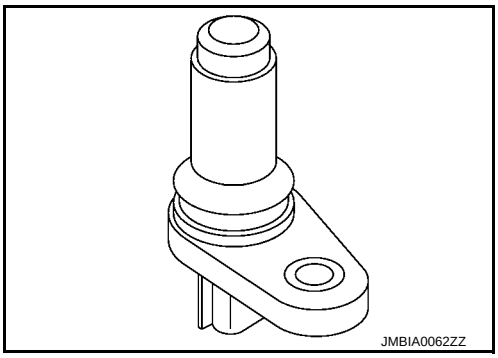
ENGINE COOLING ELECTRIC WATER PUMP RELAY

The engine cooling electric water pump relay is controlled by ECM. The relay provides power supply to the engine cooling water pump.

Crankshaft Position Sensor 1

INFOID:0000000014631105

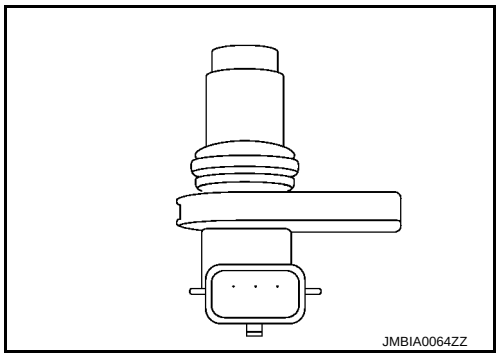
The crankshaft position sensor 1 is installed to the cylinder block rear end. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
The sensor is in the opposed position to the tooth-shape-cut signal plate. When the engine is running, the high and 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.


JMBIA0062ZZ

Crankshaft Position Sensor 2

INFOID:0000000014631106

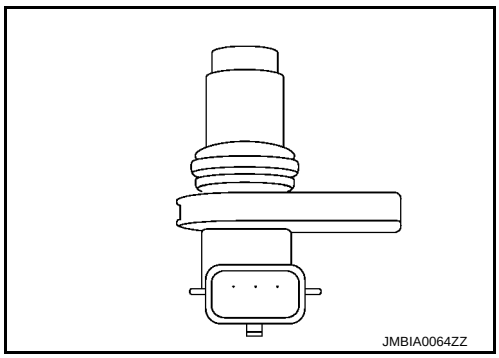
The crankshaft position sensor 2 is installed to the converter housing lower part. It detects the piston position of each cylinder.
The sensor consists of a permanent magnet and Hall IC.
The sensor is in the opposed position to the ring gear of torsional damper. When the engine is running, the gap between torsional damper link gear and position sensor 2 is changed by the gear teeth. This generates a magnetic field around the sensor, changing the sensor output voltage. ECM detects a cylinder being in the process of compression and piston position according to this voltage change and a signal from crank shaft position sensor 1.
Detailed piston position can be detected by reading this because the ring gear of torsional damper includes more teeth than the signal plate detected by crank shaft position sensor 1.


JMBIA0064ZZ

Camshaft Position Sensor

INFOID:0000000014631107

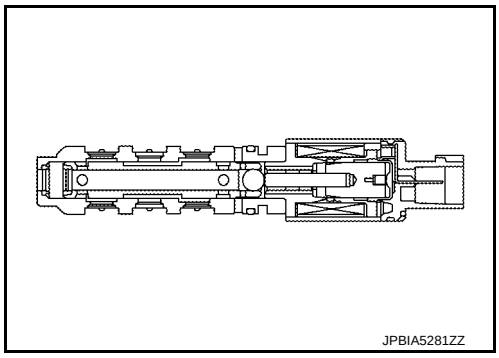
The camshaft position sensor (PHASE) senses the retraction of intake camshaft to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals. The sensor consists of a permanent magnet and Hall IC. When engine is running, the high and low parts of the teeth cause the gap with the sensor to change. The changing gap causes the magnetic field near the sensor to change. Due to the changing magnetic field, the voltage from the sensor changes.


JMBIA0064ZZ

Intake Valve Timing Control Solenoid Valve

INFOID:0000000014631108

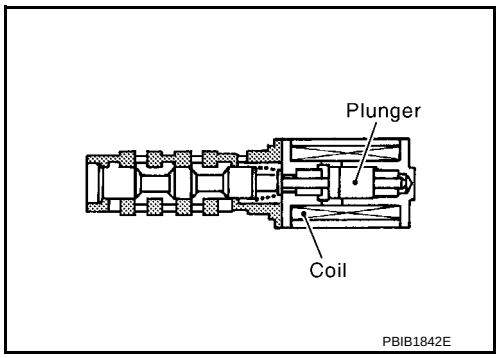
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
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.


JPBIA5281ZZ

Intake Valve Timing Intermediate Lock Control Solenoid Valve

INFOID:0000000015202519

Intake valve timing intermediate lock control solenoid valve is activated by ON/OFF signals from the ECM.
The intake valve timing intermediate lock control solenoid valve opens/closes the path of oil pressure acting on the lock key in the camshaft sprocket (INT).
- When the solenoid valve becomes ON, oil pressure to the lock key is trained to perform intermediate lock.
- When the solenoid valve becomes OFF, oil pressure is acted on the lock key to release the intermediate lock.

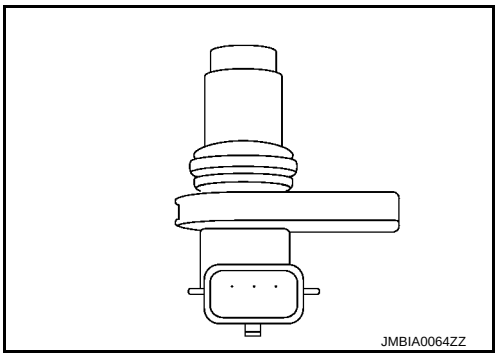


PBIB1842E

Exhaust Valve Timing Control Position Sensor

INFOID:0000000014631109

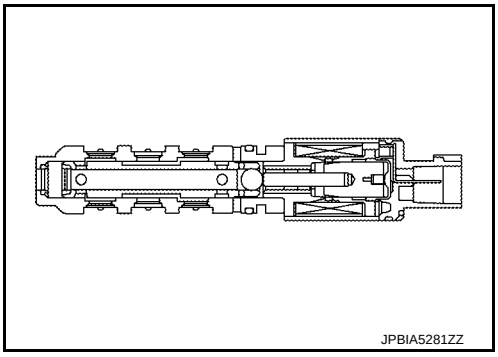
Exhaust valve timing control position sensor detects the protrusion of the signal plate installed to the exhaust camshaft rear end.
This sensor signal is used for sensing a position of the exhaust camshaft.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low 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.


JMBIA0064ZZ

Exhaust Valve Timing Control Solenoid Valve

INFOID:0000000014631110

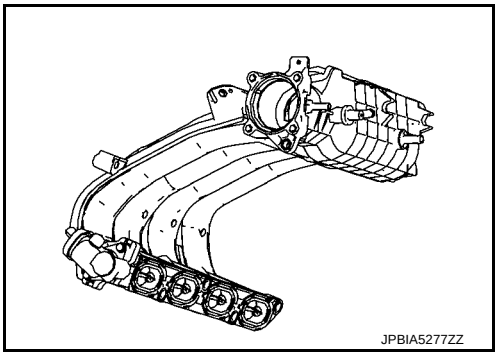
Exhaust valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The exhaust valve timing control solenoid valve changes the oil amount and direction of flow through exhaust valve timing control unit or stops oil flow.
The longer pulse width retards valve angle.
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.


JPBIA5281ZZ

Intake Manifold Runner Control Valve

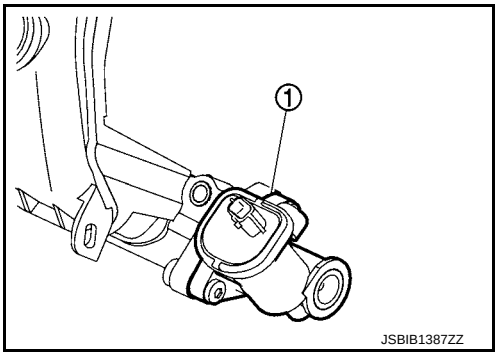
INFOID:0000000014631111

Intake manifold runner control valve is consist of intake manifold runner control valve to open/close the right/left half section installed at each port of intake manifold runner control valve motor to drive open/close the valve.
ECM transmits the open/close signal to intake manifold runner control valve motor according to the driving condition based on the signals of engine speed, coolant temperature etc. ECM stabilizes combustion by causing strong swirl flow (revolving flow) by closing the intake manifold runner control valve.


JPBIA5277ZZ

INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR

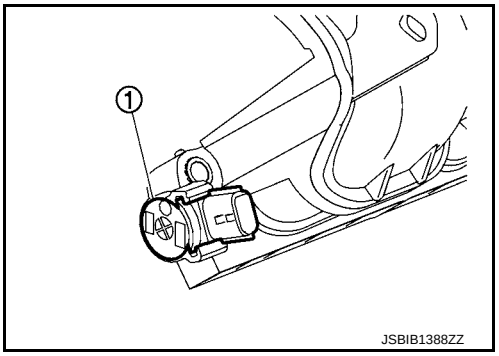
Intake manifold runner control valve motor ① is connected to the rear end of the valve shaft.
The motor opens or closes the valve by the output signal of the ECM.



JSBIB1387ZZ

INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR

Intake manifold runner control valve position sensor ① is connected to the front end of the valve shaft.
The sensor consists of valiable resister. It senses the valve shaft movement and feeds the voltage signals to the ECM.

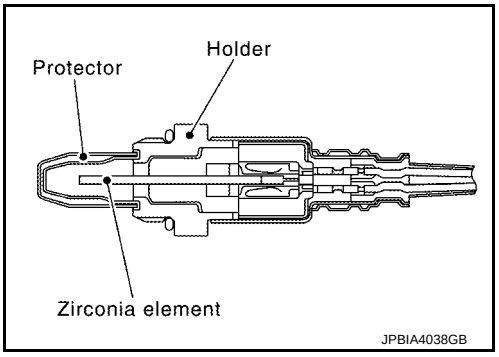


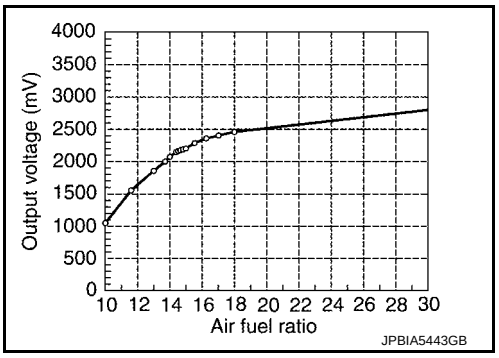
Air Fuel Ratio (A/F) Sensor 1

INFOID:0000000014631112

Description

The A/F sensor 1 is mounted on the exhaust manifold, and transmits the signal of detected oxygen concentration in the exhaust gas to ECM.
While O2 sensor changes output voltage by ON/OFF (rich/lean) mode within a narrow range of the stoichiometric ratio, the A/F sensor changes output voltage between 0 – 4 V for a wide range of air fuel ratio.
ECM judges the state of air fuel ratio with this signal, and precisely controls air fuel ratio to match the stoichiometric ratio. Also, the sensor is equiped with heater for maintaining the activated state.





A/F SENSOR 1 HEATER

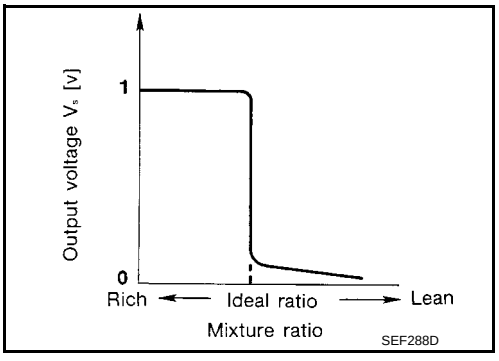
A/F sensor 1 heater is integrated in the sensor.
The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element within the specified range.

Heated Oxygen Sensor 2

INFOID:0000000014631113

DESCRIPTION

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



HEATED OXYGEN SENSOR 2 HEATER

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

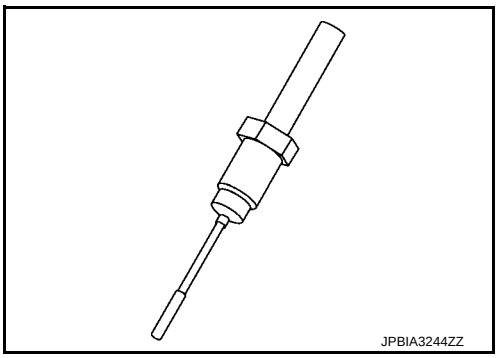
Operation

Engine speed	Heated oxygen sensor 2 heater
Above 3,200 rpm	OFF
Below 3,200 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

Exhaust Gas Temperature Sensor

INFOID:0000000014631114

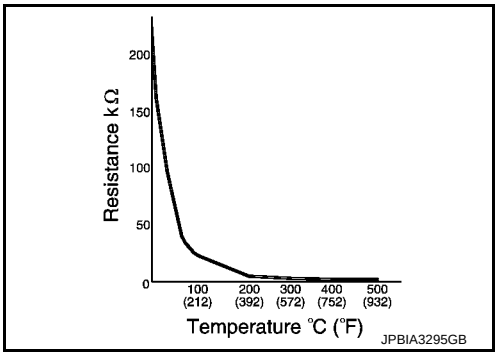
Exhaust gas temperature sensor (EGT sensor) is installed exhaust manifold. The sensor uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rises.



<Reference data>

Exhaust gas temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
100 (212)	4.74	18.25
200 (392)	4.00	4.00
400 (752)	1.97	0.65
600 (1112)	0.86	0.21

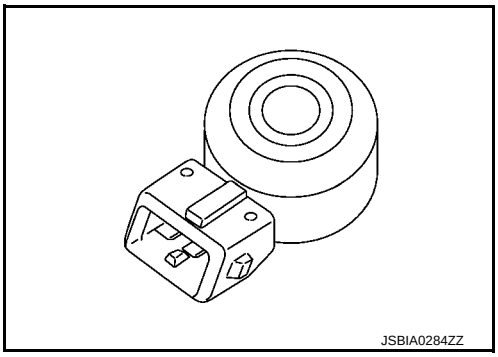
*: These data are reference values on the diagnosis tool.



Knock Sensor

INFOID:0000000014631115

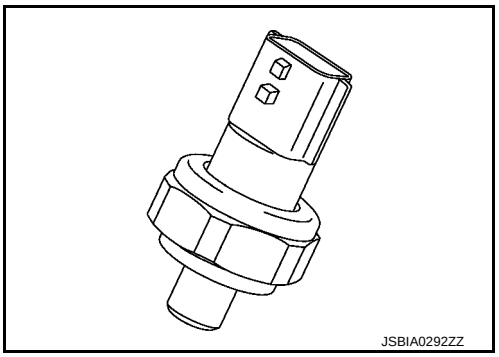
The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



Engine Oil Pressure Sensor

INFOID:0000000014631116

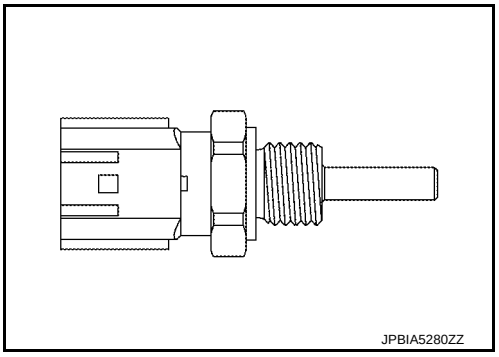
The engine oil pressure (EOP) sensor is detects engine oil pressure and transmits a voltage signal to the ECM.



Engine Oil Temperature Sensor

INFOID:0000000014631117

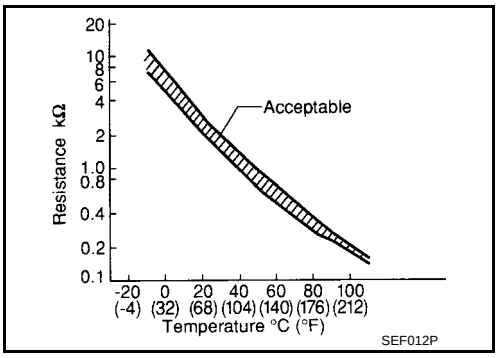
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance 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	2.37 - 2.63
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.



Cooling Fan

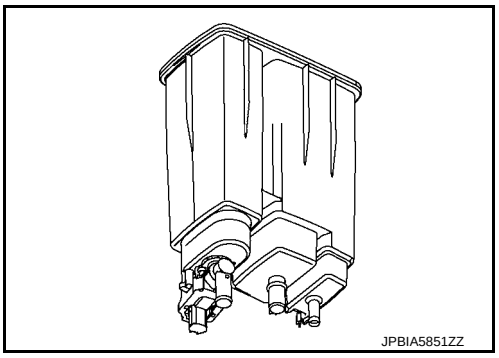
INFOID:0000000014631118

Cooling fan motor receives ON/OFF pulse duty signal from IPDM E/R. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.
For the control of cooling fan, refer to EC-53, "COOLING FAN CONTROL : System Description".

EVAP Canister

INFOID:0000000014631119

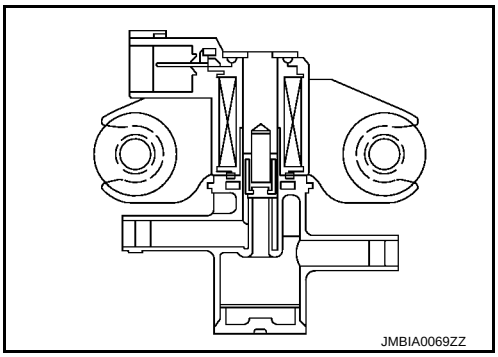
EVAP canister stores the generated fuel vapors in the sealed fuel tank to activated charcoals of EVAP canister when the engine is not operating or when refueling to the fuel tank. For details, refer to EC-63, "EVAPORATIVE EMISSION SYSTEM : System Description".



EVAP Canister Purge Volume Control Solenoid Valve

INFOID:0000000014631120

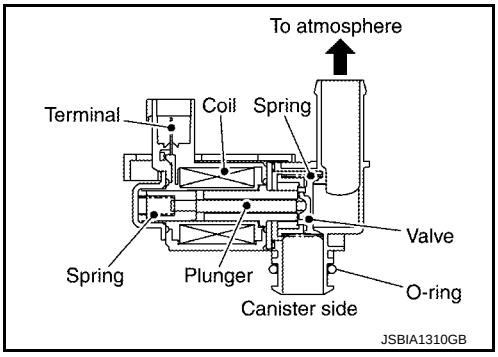
The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through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



EVAP Canister Vent Control Valve

INFOID:0000000014631121

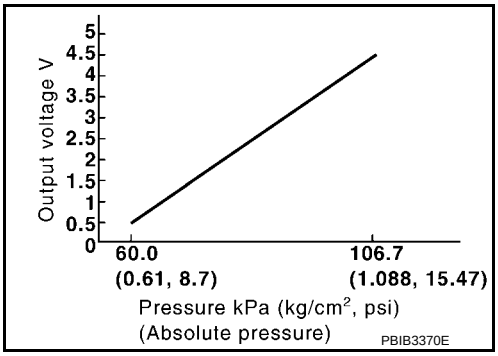
The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows “EVAP Control System” diagnosis.



EVAP Control System Pressure Sensor

INFOID:0000000014631122

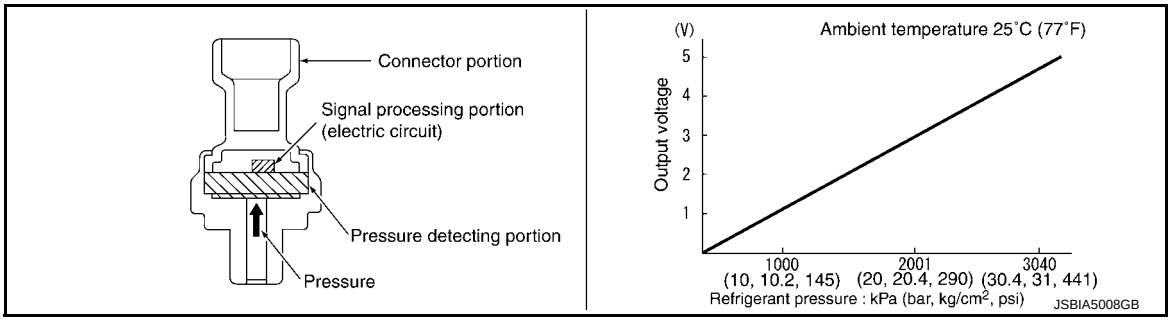
The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



Refrigerant Pressure Sensor

INFOID:0000000014631123

The refrigerant pressure sensor is installed at the liquid tank 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.

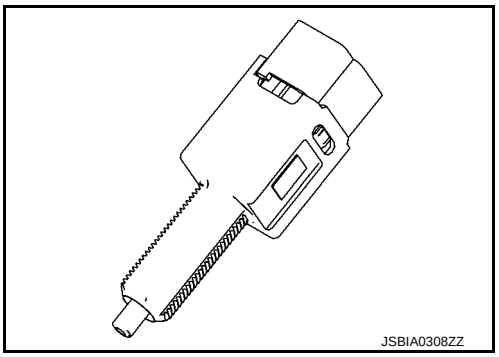


Stop Lamp Switch and Brake pedal position switch

INFOID:0000000014631124

Stop lamp switch and brake pedal position switch are installed to brake pedal bracket.
ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).

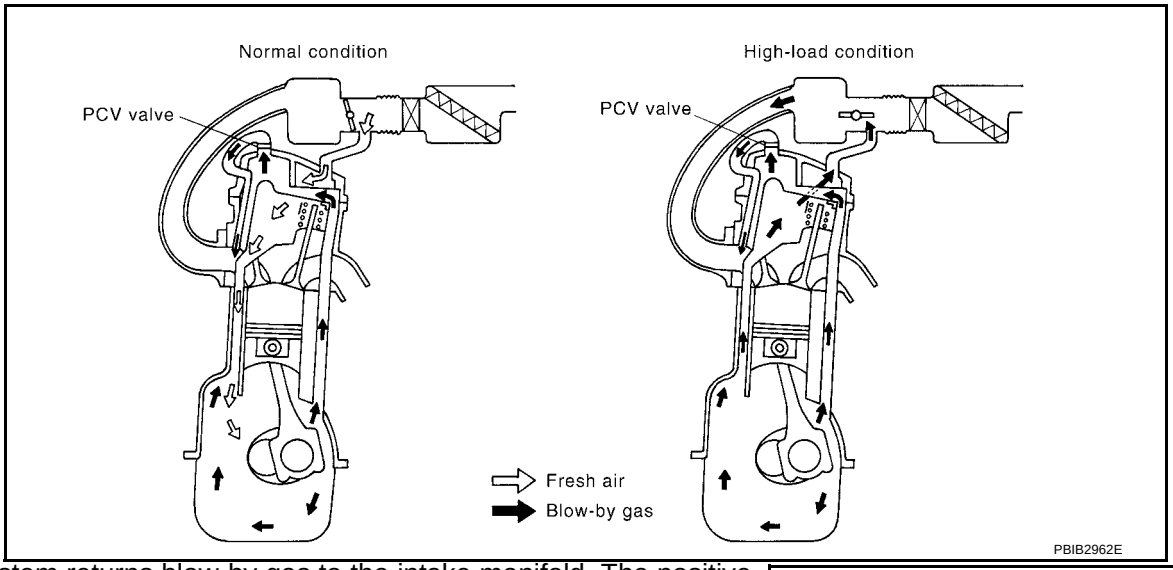
Brake pedal	Brake pedal position switch	Stop lamp switch
Released	ON	OFF
Depressed	OFF	ON



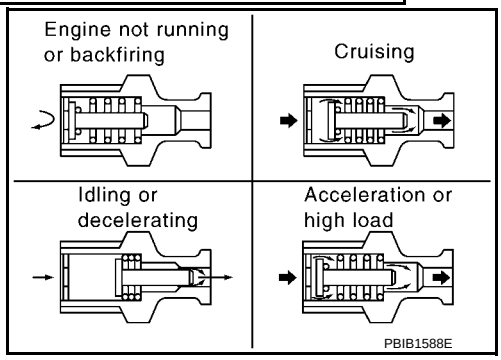
STRUCTURE AND OPERATION

Positive Crankcase Ventilation

INFOID:0000000014631125

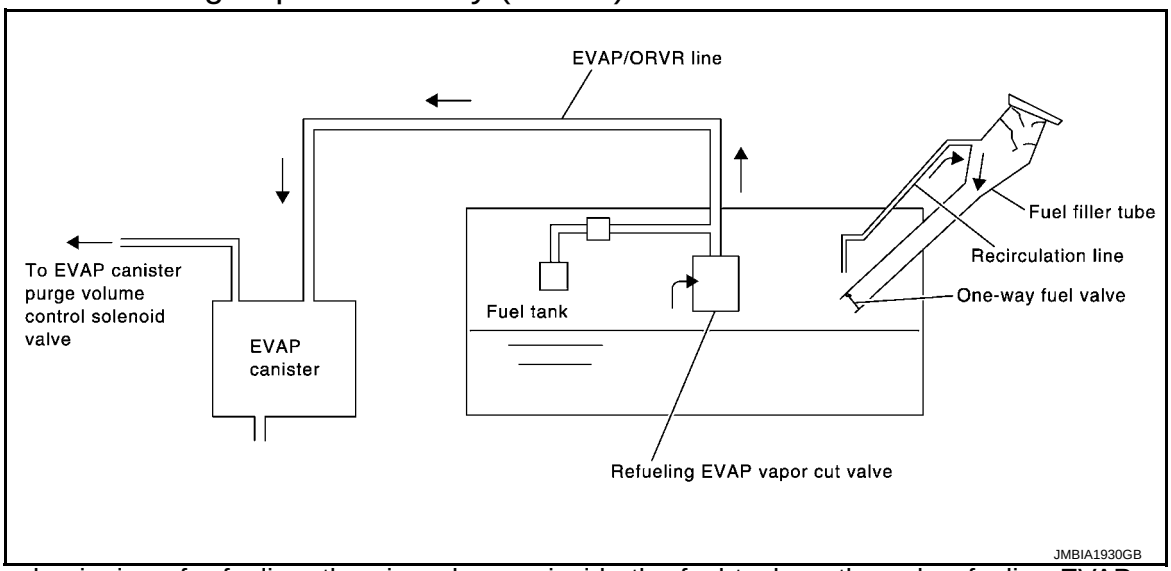


This system returns blow-by gas to the intake manifold. The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity 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 Board Refueling Vapor Recovery (ORVR)

INFOID:0000000014688335



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:

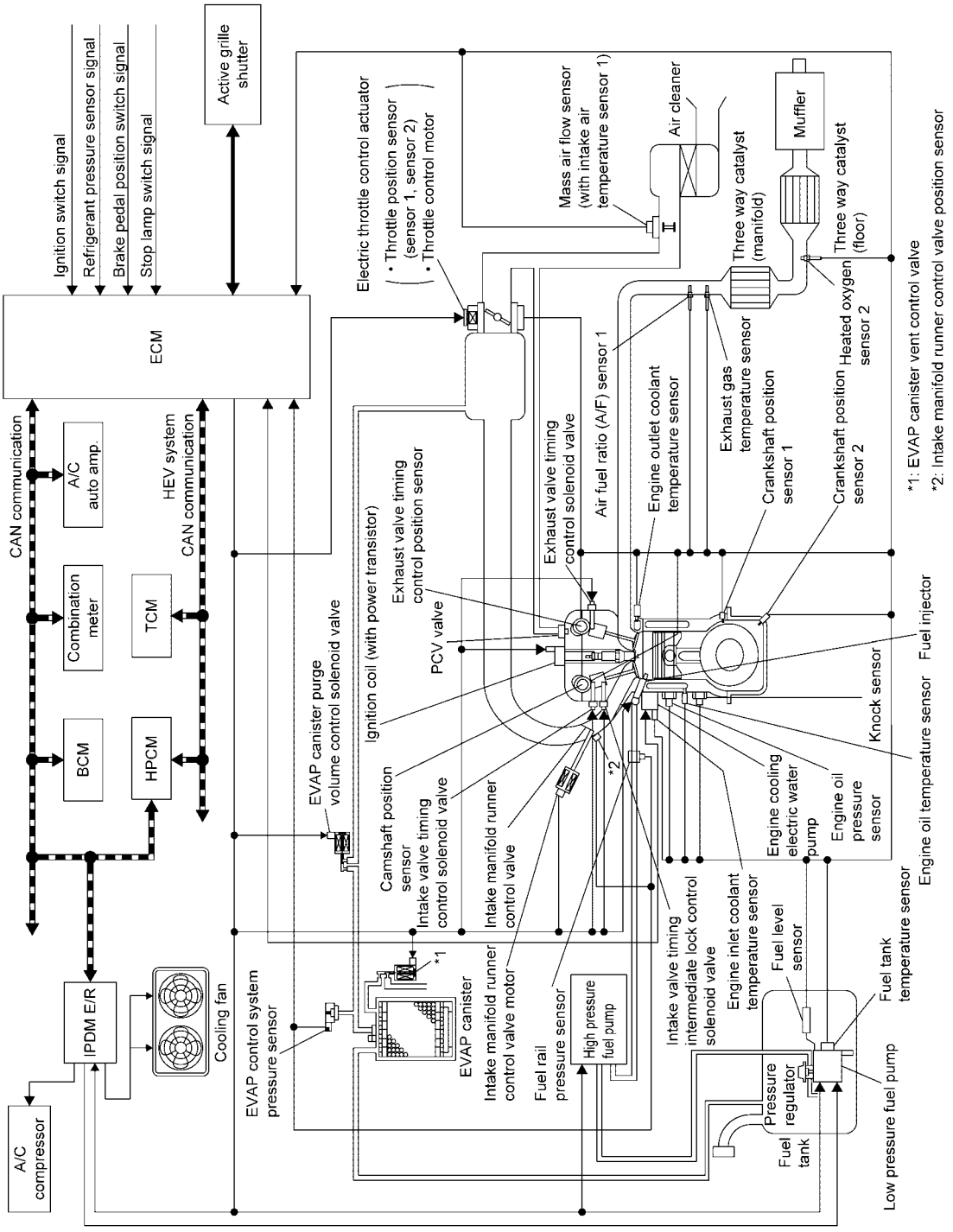
When conducting inspections below, be sure to observe the following:
- **Put a "CAUTION: FLAMMABLE" sign in workshop.**
- **Do not smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Be sure to furnish the workshop with a CO_2 fire extinguisher.**

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-162, "Work Procedure".**
- **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Do not kink or twist hose and tube when they are installed.**
- **Do not tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connection.**
- **Do not attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

SYSTEM
ENGINE CONTROL SYSTEM
ENGINE CONTROL SYSTEM : System Description

INFOID:0000000014631126

SYSTEM DIAGRAM



JSBIB1385GB

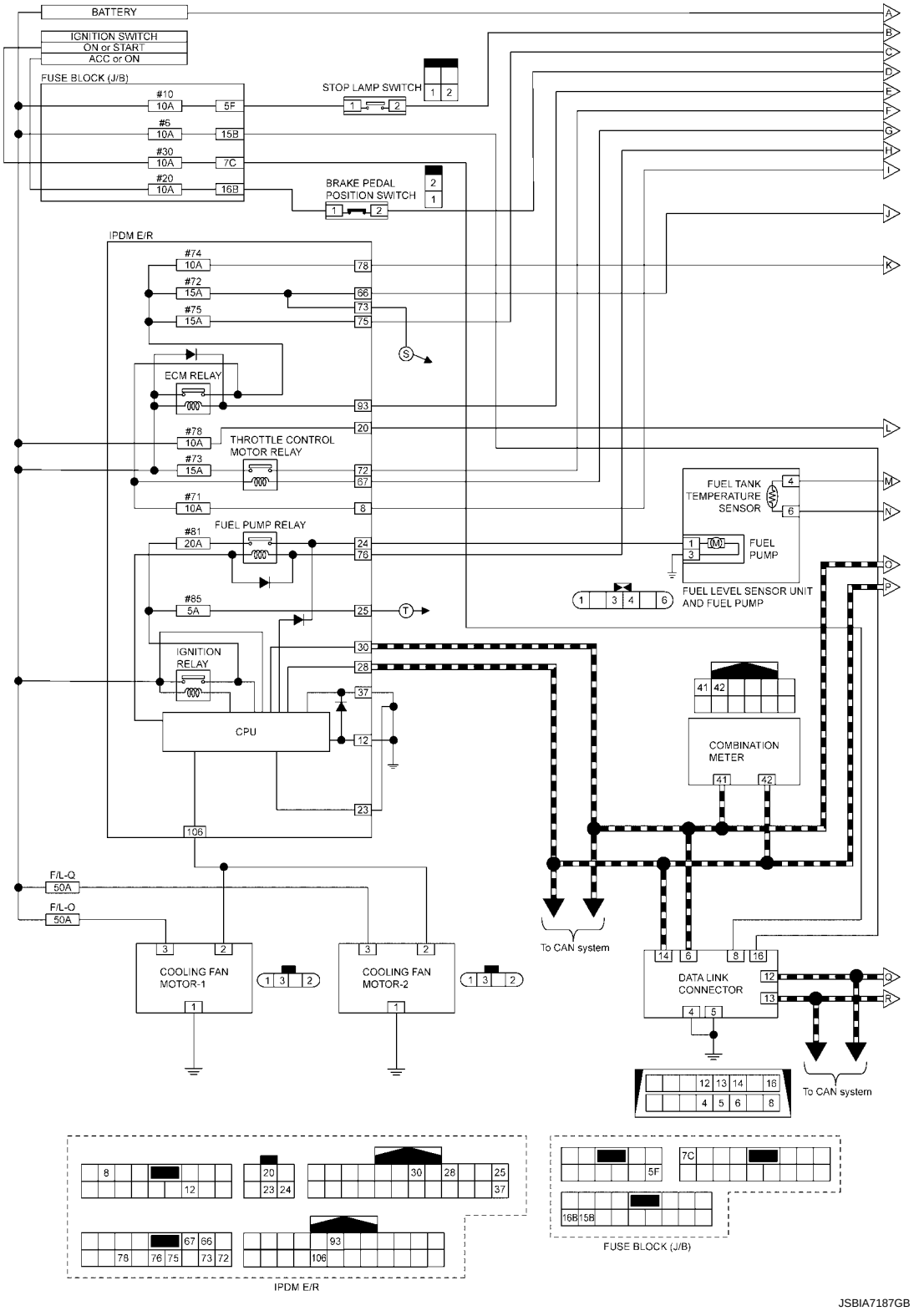
SYSTEM DESCRIPTION

- The adopted system enables comprehensive engine control. ECM (engine control module) performs various controls such as fuel injection control, ignition timing control, EVAP purge control and etc., and this system communicates with control unit such as CVT, ABS, HPCM etc. via CAN communication line.
- The adopted diagnostic system corresponding to OBD (on board diagnostic) system enables various function check and easily malfunction diagnosis in the engine control system.

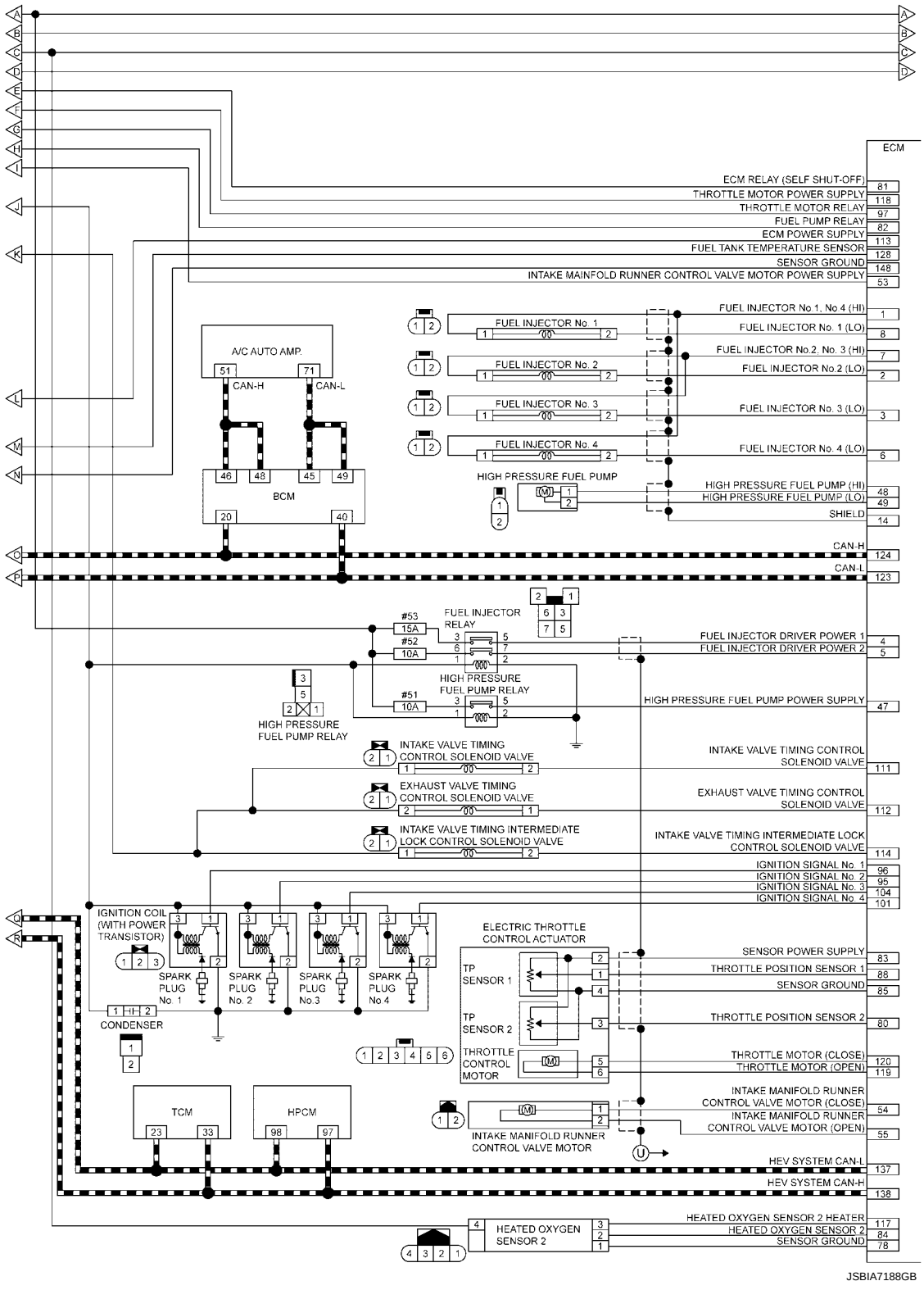
Function	Reference
Fuel injection control	EC-47, "DIG (DIRECT INJECTION GASOLINE) SYSTEM : System Description"
Fuel pressure control	EC-51, "FUEL PRESSURE CONTROL : System Description"
Electric ignition control	EC-52, "ELECTRIC IGNITION SYSTEM : System Description"
Cooling fan control	EC-53, "COOLING FAN CONTROL : System Description"
Intake valve timing control	EC-54, "INTAKE VALVE TIMING CONTROL : System Description"
Exhaust valve timing control	EC-57, "EXHAUST VALVE TIMING CONTROL : System Description"
Intake manifold runner control valve control	EC-59, "INTAKE MANIFOLD RUNNER CONTROL : System Description"
Engine protection control (Low engine oil pressure)	EC-60, "ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE : System Description"
Air conditioning cut control	EC-61, "AIR CONDITIONING CUT CONTROL : System Description"
Engine cooling electric water pump control	EC-62, "ENGINE COOLING ELECTRIC WATER PUMP CONTROL : System Description"
Evaporative emision system	EC-63, "EVAPORATIVE EMISSION SYSTEM : System Description"
Engine stop control	EC-65, "ENGINE STOP CONTROL : System Description"
Active grille shutter	EXT-11, "ACTIVE GRILLE SHUTTER SYSTEM : System Description"
Fuel filler cap warning system	EC-64, "FUEL FILLER CAP WARNING SYSTEM : System Description"
CAN communication	EC-65, "CAN COMMUNICATION : System Description"
Warning/indicator/Chime	EC-68, "WARNING/INDICATOR/CHIME LIST : Warning lamps/Indicator lamps" EC-68, "WARNING/INDICATOR/CHIME LIST : Warning/Indicator (On Information Display)"
Fail-safe function	EC-103, "Fail-safe"
On board diagnostic (OBD) system	EC-69, "Diagnosis Description"

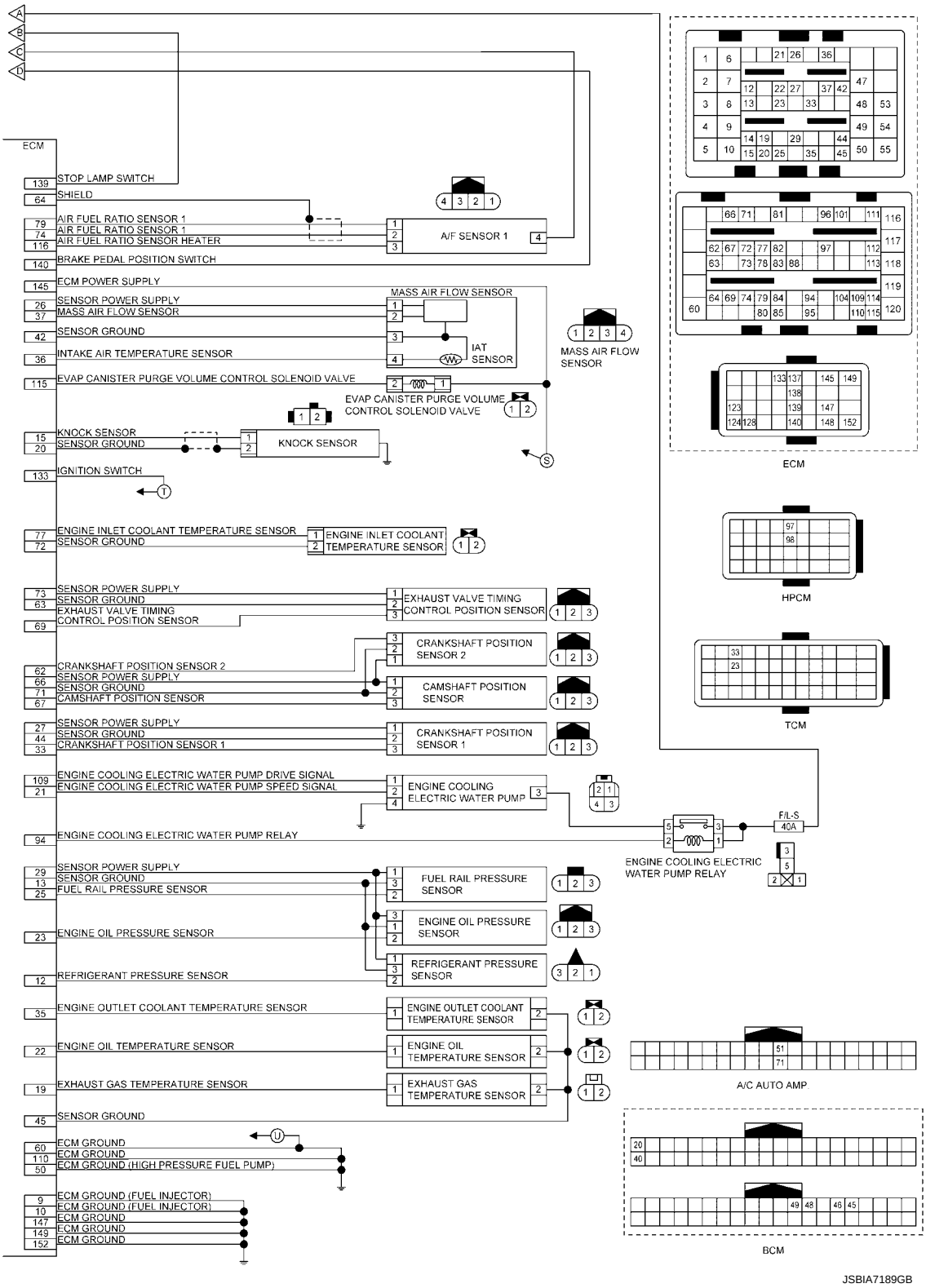
ENGINE CONTROL SYSTEM : Circuit Diagram

INFOID:0000000014631128



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ECM
ECM RELAY (SELF SHUT-OFF) 81
THROTTLE MOTOR POWER SUPPLY 118
THROTTLE MOTOR RELAY 97
FUEL PUMP RELAY 82
ECM POWER SUPPLY 113
FUEL TANK TEMPERATURE SENSOR 128
SENSOR GROUND 148
INTAKE MAINFOLD RUNNER CONTROL VALVE MOTOR POWER SUPPLY 53
A/C AUTO AMP.
51
71
CAN-H
CAN-L
BCM
46
48
45
49
20
40
FUEL INJECTOR No. 1
FUEL INJECTOR No. 2
FUEL INJECTOR No. 3
FUEL INJECTOR No. 4
FUEL INJECTOR No. 1, No. 4 (HI) 1
FUEL INJECTOR No. 1 (LO) 8
FUEL INJECTOR No.2, No. 3 (HI) 7
FUEL INJECTOR No.2 (LO) 2
FUEL INJECTOR No. 3 (LO) 3
FUEL INJECTOR No. 4 (LO) 6
HIGH PRESSURE FUEL PUMP
HIGH PRESSURE FUEL PUMP (HI) 48
HIGH PRESSURE FUEL PUMP (LO) 49
SHIELD 14
CAN-H 124
CAN-L 123
#53 15A
#52 10A
#51 10A
FUEL INJECTOR RELAY
HIGH PRESSURE FUEL PUMP RELAY
FUEL INJECTOR DRIVER POWER 1 4
FUEL INJECTOR DRIVER POWER 2 5
HIGH PRESSURE FUEL PUMP POWER SUPPLY 47
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
INTAKE VALVE TIMING INTERMEDIATE LOCK CONTROL SOLENOID VALVE
INTAKE VALVE TIMING CONTROL SOLENOID VALVE 111
EXHAUST VALVE TIMING CONTROL SOLENOID VALVE 112
INTAKE VALVE TIMING INTERMEDIATE LOCK CONTROL SOLENOID VALVE 114
IGNITION SIGNAL No. 1 96
IGNITION SIGNAL No. 2 95
IGNITION SIGNAL No. 3 104
IGNITION SIGNAL No. 4 101
IGNITION COIL (WITH POWER TRANSISTOR)
SPARK PLUG No. 1
SPARK PLUG No. 2
SPARK PLUG No.3
SPARK PLUG No.4
CONDENSER
ELECTRIC THROTTLE CONTROL ACTUATOR
TP SENSOR 1
TP SENSOR 2
THROTTLE CONTROL MOTOR
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THROTTLE POSITION SENSOR 1 88
SENSOR GROUND 85
THROTTLE POSITION SENSOR 2 80
THROTTLE MOTOR (CLOSE) 120
THROTTLE MOTOR (OPEN) 119
INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR
INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR (CLOSE) 54
INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR (OPEN) 55
TCM
23
33
HPCM
98
97
HEV SYSTEM CAN-L 137
HEV SYSTEM CAN-H 138
HEATED OXYGEN SENSOR 2
HEATED OXYGEN SENSOR 2 HEATER 117
HEATED OXYGEN SENSOR 2 84
SENSOR GROUND 78
JSBIA7188GB



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ENGINE CONTROL SYSTEM : Fail-safe

INFOID:0000000014688848

ENGINE CONTROL SYSTEM

Description

When a DTC is detected, ECM executes a mode (in the Fail-safe mode) applicable to the DTC. The fail-safe mode has the preset traveling control mode (accelerator angle variation and engine output limit), device fix mode and combustion control mode.

Fail safe mode		Vehicle behavior	Fail safe pattern
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.	A
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.	B
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).	C
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).	D
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.	E
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.	
	Ignition timing correction control	Partially controls ignition timing control.	F
	Retardation control	Controls ignition timing delay control in the intermediate water temperature range.	

Fail Safe List

×:Applicable —: Not applicable

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
U0101	CAN communication line	—	—	—	—	—	—	ECM operates active grille shutter to fully-open position.
U0284	Active grille shutter	—	—	—	—	—	—	ECM operates active grille shutter to fully-open position.
U1040 U1044	Engine communication	—	—	—	—	—	—	ECM operates active grille shutter to fully-open position.
P0011	Intake valve timing control	—	—	×	—	—	—	ECM activates the IVT intermediate lock control solenoid valve to bring the cam sprocket into an intermediate lock condition.
P0014	Exhaust valve timing control	—	—	×	—	—	—	—
P0075	Intake valve timing control solenoid valve	—	—	×	—	—	—	—
P0078	Exhaust valve timing control solenoid valve	—	—	×	—	—	—	—
P0087 P0088	FRP control system	×	—	—	×	—	—	—
		×	—	×	×	—	—	
P0090		×	—	×	×	—	—	—

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
P0101	Mass air flow sensor circuit	×	—	—	×	—	—	—
		×	×	×	×	×	×	
P0102 P0103		×	×	×	×	×	×	—
P0117 P0118	Engine coolant temperature sensor circuit	—	—	—	×	×	—	Engine speed will not rise more than 1,800 rpm due to the fuel cut.
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	—	—	×	—	—	—	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor. **NOTE:** If throttle position sensor 1 and 2 malfunction at the same time conducts following control. • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P0171 P0172	Fuel injection system	×	—	—	×	×	—	—
P0190	FRP sensor	×	—	×	×	×	—	—
P0191 P0192 P0193 P119A P119B P119C		×	—	—	×	—	—	—
P0196 P0197 P0198	Engine oil temperature sensor	—	—	—	—	—	—	Intake and exhaust valve timing control does not function.
P0201 P0202 P0203 P0204	Injector	×	—	—	×	—	—	—
P0300 P0301 P0302 P0303 P0304	Misfire	×	—	—	×	×	—	—
P0335	Crankshaft position sensor	—	—	×	—	—	—	—
P0340	Camshaft position sensor	—	—	×	—	—	—	—
P0365	Exhaust valve timing control position sensor	—	—	×	—	—	—	—
P0500	Vehicle speed sensor	×	—	—	×	×	—	—
P0524	Engine oil pressure	—	—	—	—	—	—	• ECM illuminates engine oil pressure warning lamp on the combination meter. • Engine speed will not rise more than 4,000 rpm due to the fuel cut. • Fail-safe is canceled when ignition switch OFF → ON.
P052A P052B	Intake valve timing intermediate lock control	—	—	×	—	—	—	—

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
P0603 P0607	ECM	×*1	×*1	—	—	—	—	—
P0604 P060B		—	—	×	—	—	—	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P0605		—	—	×*1	—	—	—	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.*1
P0606		—	—	×*1	—	—	—	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.*1
P060A		—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
		×	×	×	—	—	—	
P062B		×*1	—	—	×*1	—	—	**NOTE:** Fail-safe mode may not start depending on malfunction type of ECM.
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.
P1197	Out of gas	—	—	×	—	—	—	Engine torque is limited.
P1217	Engine over temperature	—	—	—	—	—	—	Engine speed will not rise more than 1,800 rpm due to the fuel cut.
P161B P162B P162C P261B P261C P261D	Engine cooing electric water pump	×*2	×*2	—	—	—	—	ECM controls engine cooling electric water pump to achieve its maximum driving force. **NOTE:** Engine cooling electric water pump may not be activated.
P1805	Brake switch	—	—	—	—	—	—	ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor. Vehicle condition / Driving condition When engine is idling / Normal When accelerating / Poor acceleration
P2004	Intake manifold runner control valve	×	×	×	×	—	—	—
P2014 P2016 P2017 P2018	Intake manifold runner control valve position sensor	—	—	×	—	—	—	—

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
P2100 P2103	Throttle control motor relay	—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2101	Electric throttle control function	—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2118	Throttle control motor	—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2119	Electric throttle control actuator	×	×	—	—	—	—	—
		—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. **NOTE:** For pattern A and B, refer to A and B of P2119 DTC detection logic. (Refer to EC-521, "DTC Description".) For C of P2119 DTC detection logic ECM behaves as above.

*1: This mode may not be executed.
*2: This mode is executed when engine outlet water temperature, engine inlet water temperature, or CVT fluid temperature rises.

HYBRID CONTROL SYSTEM

ECM transmits a self-diagnosis signal (each fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.
NOTE:
Refer to HBC-67, "Fail-safe", about fail safe mode of HYBRID CONTROL SYSTEM for detail.

DTC No.	Description	Fail-safe mode
U0293, P0606, P2119, P31A5	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	Motor driving
P0122, P0123, P0222, P0223, P0604, P0605, P0606, P060A, P060B, P0643, P2100, P2101, P2103, P2118, P2119, P2135	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Deactivates electric throttle control actuator control • Limiting output control • Limiting accelerator angle variation control • Idling stop is prohibited.
P0087, P0088, P0101, P0171, P0172, P0191, P0192, P0193, P0300, P0301, P0302, P0303, P0304, P0500	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting accelerator angle variation control • Idling stop is prohibited.
P0117, P0118, P0524, P1217	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting engine speed • Limiting accelerator angle variation control • Idling stop is prohibited.
P0090, P0335, P0340, P0365	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting output control • Limiting engine speed • Limiting accelerator angle variation control • Idling stop is prohibited.

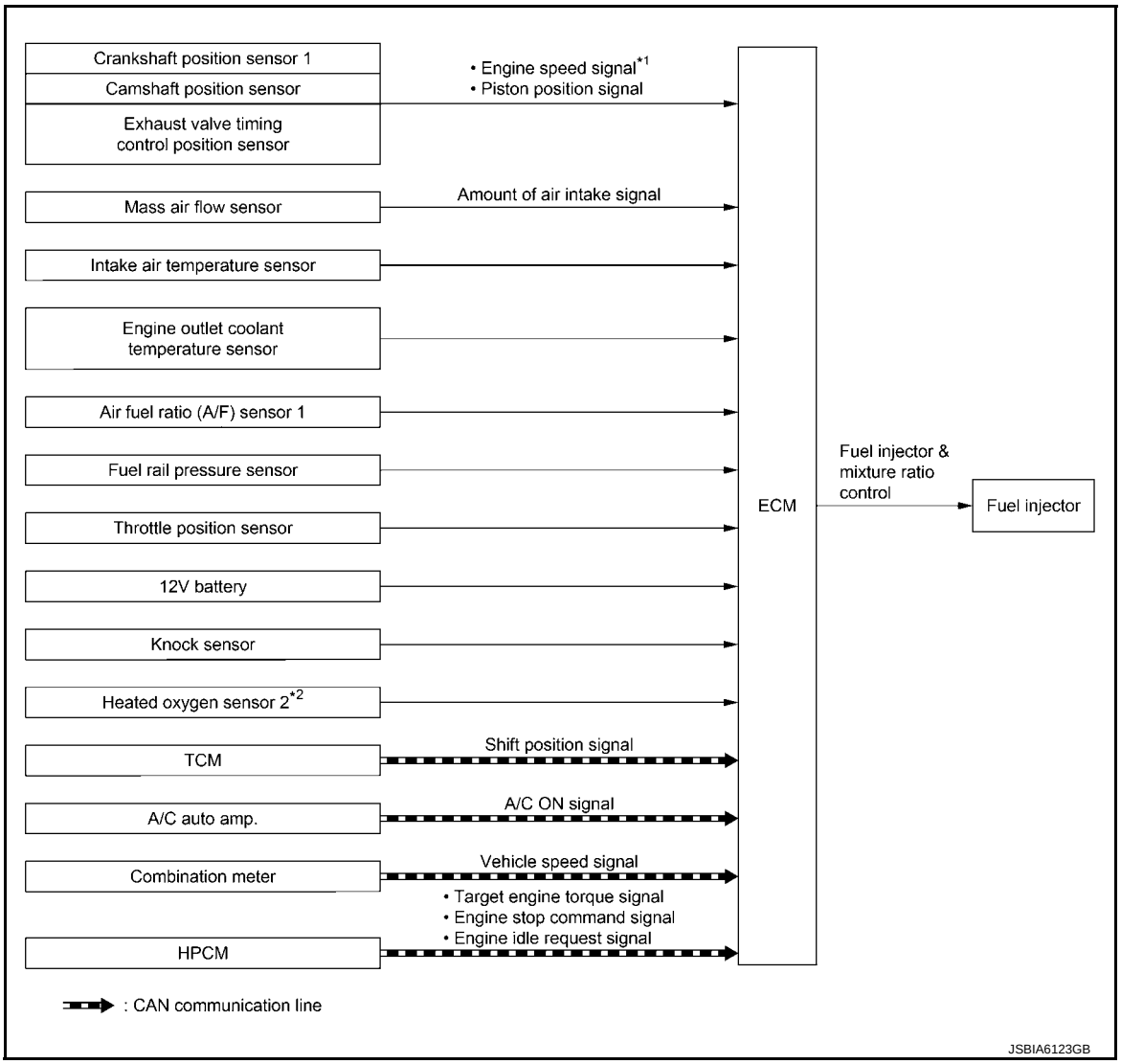
DTC No.	Description	Fail-safe mode
P0011, P0014, P0031, P0032, P0075, P0078, P0087, P0088, P0090, P0101, P0102, P0103, P0112, P0113, P0127, P014C, P014D, P015A, P015B, P0190, P0197, P0198, P0201, P0202, P0203, P0204, P0335, P0340, P0365, P052A, P052B, P0603, P062B, P0607, P1197, P2004, P2119	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting output control • Limiting accelerator angle variation control • Idling stop is prohibited.
P0125, P0441, P0443, P0444, P0447, P0448	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	Idling stop is prohibited.
P0030, P0111, P0196, P0605, P0606, P161B, P2014, P2016, P2017, P2018, P2081, P2184, P2185, P261B, P261C, P261D	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting output control • Limiting accelerator angle variation control
P119A, P119B, P119C	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	Limiting accelerator angle variation control

DIG (DIRECT INJECTION GASOLINE) SYSTEM

DIG (DIRECT INJECTION GASOLINE) SYSTEM : System Description

INFOID:0000000014631129

SYSTEM DIAGRAM



*1: This signal uses crankshaft position sensor 1 only.
*2: This sensor is not used to control the engine system under normal conditions.

SYSTEM DESCRIPTION

The adoption of the direct fuel injection system [DIG (Direct Injection Gasoline)] enables more accurate adjustment of fuel injection quantity by injecting atomized high-pressure fuel directly into the cylinder. This method allows high-powered engine, high torque, low fuel consumption, quietness, 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 1, camshaft position sensor, mass air flow sensor and the fuel rail pressure sensor.

FUEL INJECTION CONTROL

Injection Pattern

ECM conducts sequential injection (1 injection per 2 rotations of engine to each cylinder, suitable injection according to each cylinder's ignition order).

Injection when starting the engine

When starting the engine, ECM determines the amount of fuel injected according to conditions such as engine coolant temperature to make the starting smoother.
Also, conducts the starting control with stratified-charge combustion according to conditions.

Injection when driving normally

Normally, ECM determines the amount of injection to be an optimum air-fuel mixture ratio for homogeneous combustion.

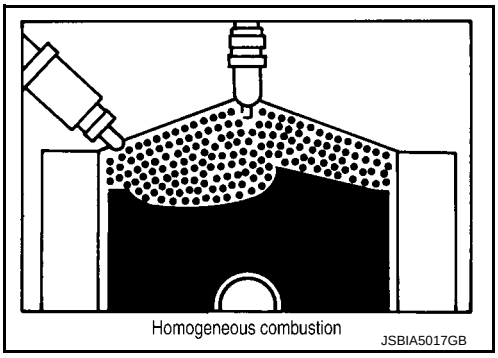
Cut-in injection when acceleration

When accelerating, according to the opening speed of throttle valve, ECM conducts a cut-in injection adding to normal injection and improves accelerating performance.

DIRECT FUEL INJECTION CONTROL

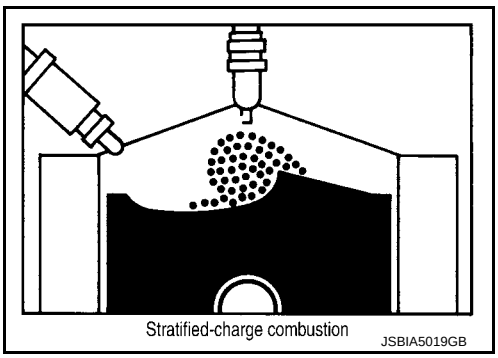
Homogeneous Combustion

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.



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.



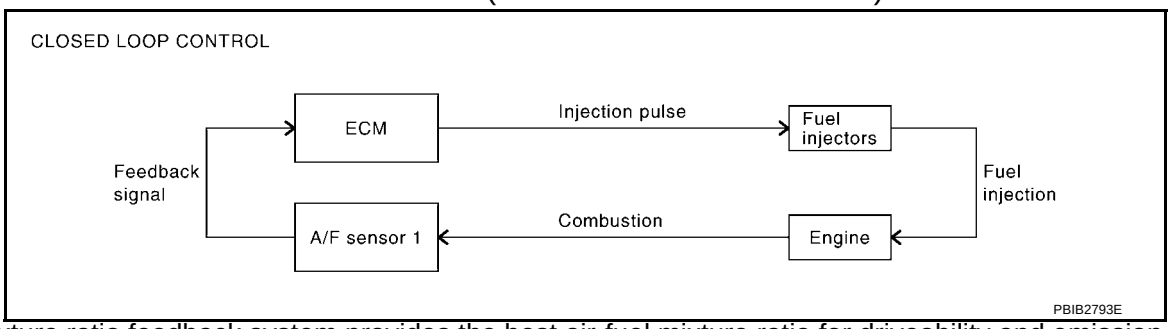
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

The amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

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

<Fuel decrease>
- During deceleration
- During high engine speed operation

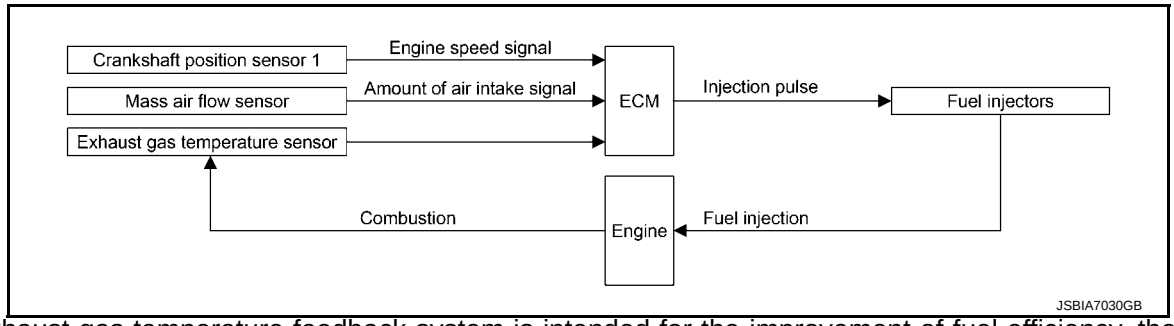
MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for 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. And the correcting factor to control the pulse width is displayed as “A/F CORRECTION”, or “S-FUEL TRM-B1 [%]”. For more information about A/F sensor 1, refer to EC-31, "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 (clamp) 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 position to D position
- When starting the engine

EXHAUST GAS TEMPERATURE FEEDBACK CONTROL



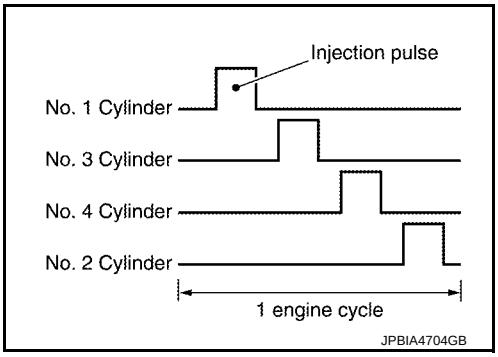
The exhaust gas temperature feedback system is intended for the improvement of fuel efficiency, the reduction in exhaust gas (CO and HC), and the protection of parts. This system monitors the upstream temperature of catalyst by using an exhaust gas temperature sensor and lowers the combustion temperature to prevent damage to the exhaust system related parts by increasing fuel injection when exhaust gas becomes hot.

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen 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 heated oxygen 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 long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING

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 with the engine cold.

FUEL SHUT-OFF

Fuel shut-off during deceleration

Fuel to each cylinder is cut off during deceleration for restraint of HC and improvement of fuel efficiency.
Engine speed at which fuel shut-off and recovery are conducted is programmed in detail according to various factors such as idle judgment, vehicle speed, gear position, engine coolant temperature, etc. for optimizing emission and mileage performance. Also, no fuel shut-off is applied at extreme deceleration.

Fuel shut-off when the engine speed is excessively high

When an engine speed exceeds the specified speed, ECM shuts off the fuel of all cylinders. When the engine speed decreases, ECM recovers the fuel.

Fuel shut-off when the engine speed is excessively high with no load

ECM shuts off fuel to all cylinders when all of the following conditions are satisfied for a certain period: N or P range, engine high speed, and vehicle speed 0 km/h (0 MPH).

Fuel shut-off when the engine is over heating

When output voltage of engine outlet coolant temperature sensor is the value judged as overheating for a certain period consecutively, ECM judges that the engine is in overheated condition and shuts off fuel.
In addition, the malfunction indicator lamp (MIL) illuminates when the engine is judged as overheating.
Once the engine becomes overheated (judged as overheated), the malfunction indicator lamp (MIL) remains illuminated even when engine coolant temperature decreases (becomes normal), and fuel is shut off at approximately 2,000 rpm.
When the ignition switch is turned OFF, fuel is fed and the malfunction indicator lamp (MIL) remains ON. The malfunction indicator lamp (MIL) can be turned OFF by erasing self-diagnosis results.
CAUTION:
Before erasing self-diagnosis results, investigate engine overheating causes.

Fuel shut-off when N → D position is selected

Fuel shut-off is conducted when the engine speed is high and N → D position is selected.

Fuel shut-off when the engine stalls consecutively
To protect CVT, ECM shuts off fuel when engine speed is high for a few minutes consecutively despite extremely low vehicle speeds with the selector lever in a position other than N and P.
This control is not performed during vehicle speed signal error.

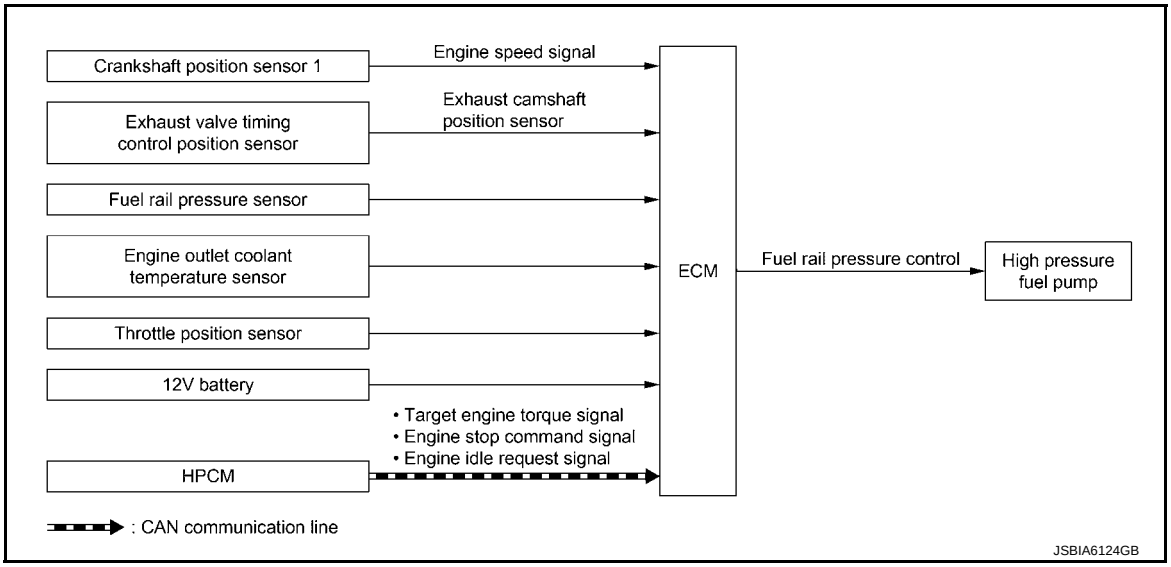
Fuel shut-off when the throttle stuck to closed position
ECM conducts fuel shut-off when the electric throttle is stuck to its closed position.
To maintain heater capability, the engine can be started with the selector lever in N or P position. In this case, engine speed is limited.

FUEL PRESSURE CONTROL

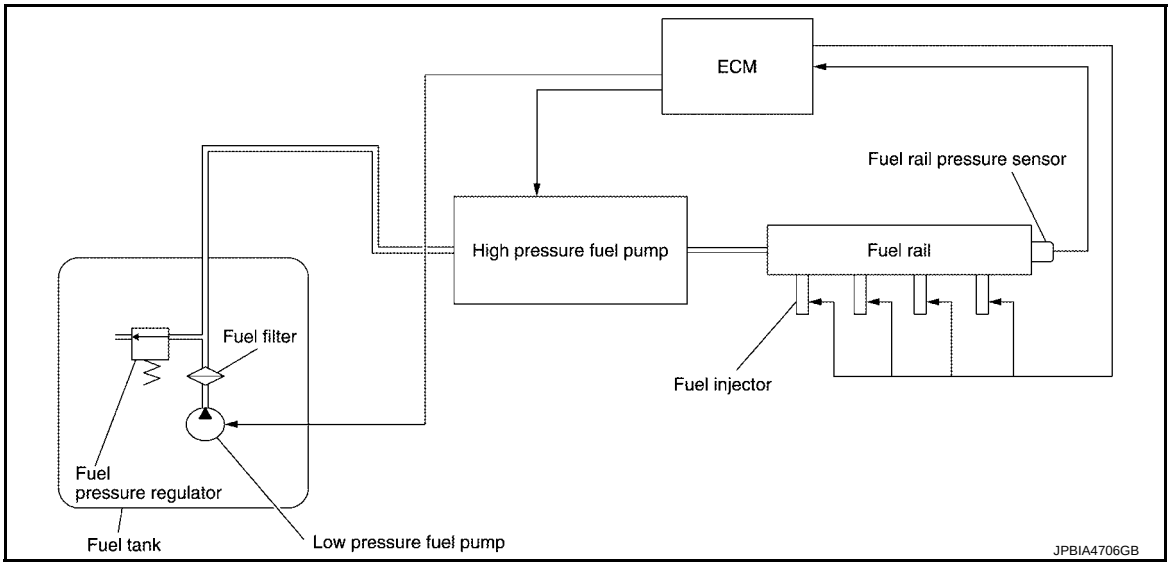
FUEL PRESSURE CONTROL : System Description

INFOID:0000000014631130

SYSTEM DIAGRAM



SYSTEM DESCRIPTION



Low fuel pressure control
- The low fuel pressure pump is controlled by ECM 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.
- Low fuel pressure is adjusted by the fuel pressure regulator.

High fuel pressure control
- The high pressure fuel pump is actuated by the cam of camshaft (EXH).

- 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.

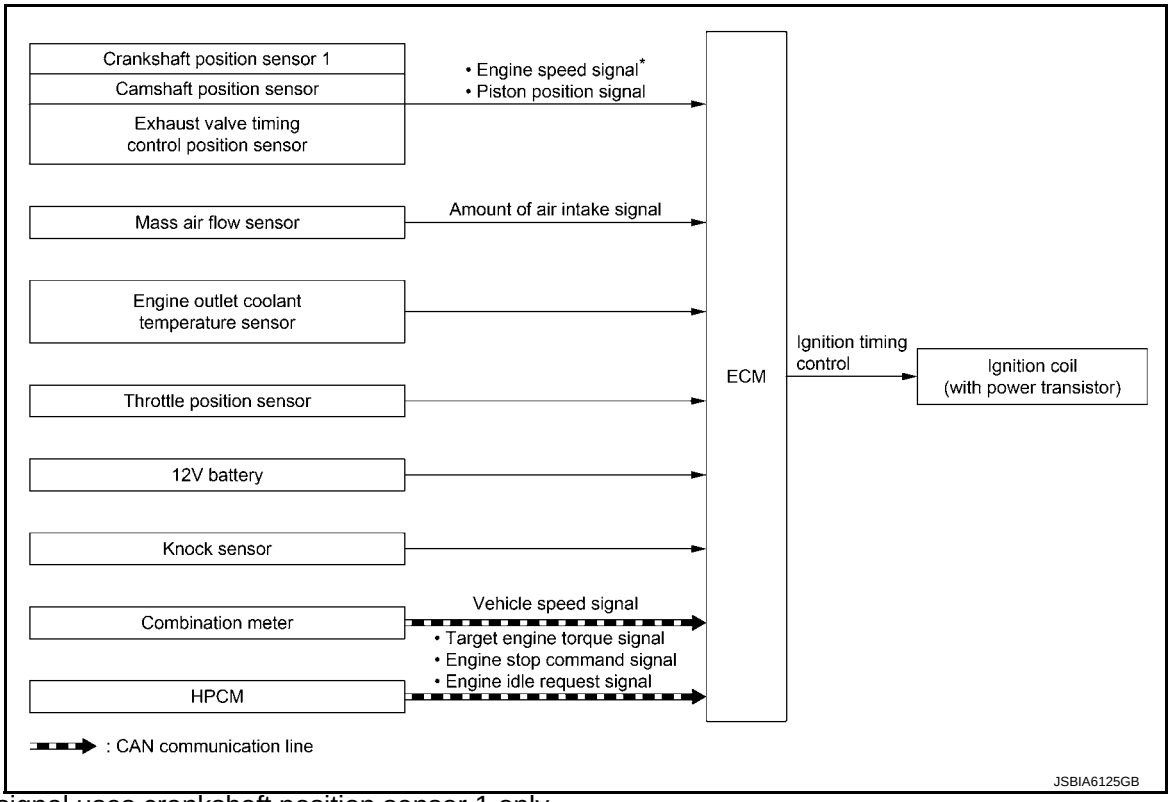
For details about operation, refer to EC-24, "High Pressure Fuel Pump".

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM : System Description

INFOID:0000000014631131

SYSTEM DIAGRAM



*: This signal uses crankshaft position sensor 1 only.

SYSTEM DESCRIPTION

Ignition order: 1 - 3 - 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 basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The knock sensor feedback control 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.

BASIC CONTROL

- When starting, ECM controls ignition timing according to the engine speed and coolant temperature.
- After the engine is started, ECM corrects the ignition timing according to the driving conditions (engine coolant temperature, accelerator pedal position, throttle position, control request from CVT etc.) based on the engine speed and fuel injection pulse width.
- If knocking occurs, ECM retards the ignition timing within the anti-knocking control zone according to the knocking condition.

- When the engine is idling, ECM controls the ignition timing to stabilize idling speed.
- ECM controls the duration of power transmission (power transistor ON time) to ignition coil according to the engine speed and battery voltage.
- When the engine idle speed or the ignition timing deviates from specified value, "Idle Air Volume Learning" is required.

CYLINDER DISTINCTION CONTROL

ECM distinguishes cylinder based on the combination of signals of crankshaft position sensor 1, camshaft position sensor and the exhaust valve timing control position sensor, and if any of sensor malfunctions distinguishes cylinder with normal sensors.

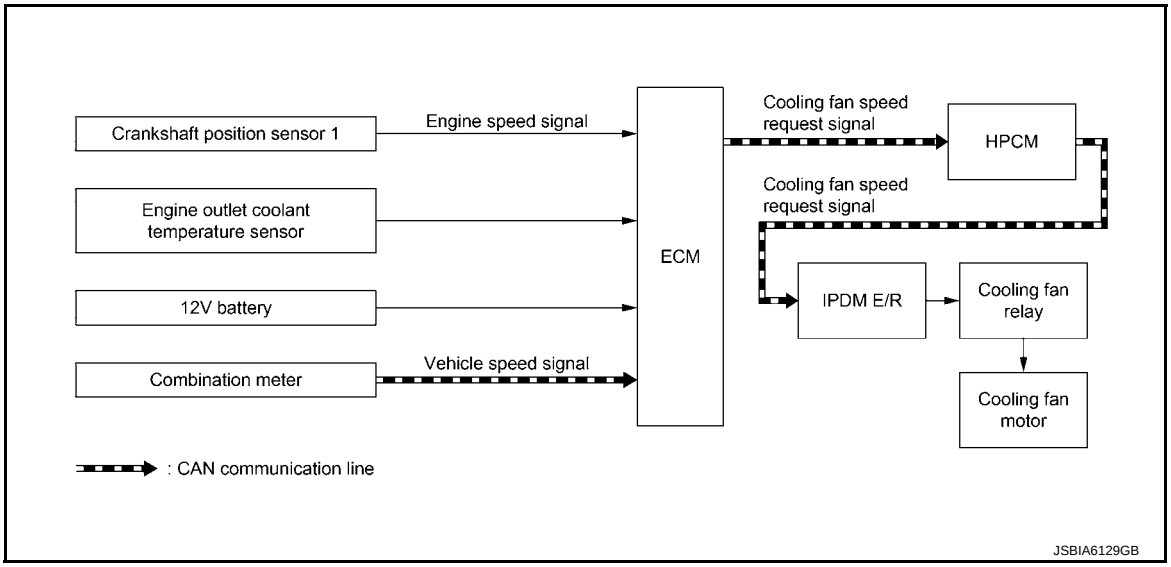
Abnormal point	Sensor to use for cylinder distinction
Crankshaft position sensor 1	Camshaft position sensor
Camshaft position sensor	• Crankshaft position sensor 1 • Exhaust valve timing control position sensor
Exhaust valve timing control position sensor	• Crankshaft position sensor 1 • Camshaft position sensor

COOLING FAN CONTROL

COOLING FAN CONTROL : System Description

INFOID:0000000014631132

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

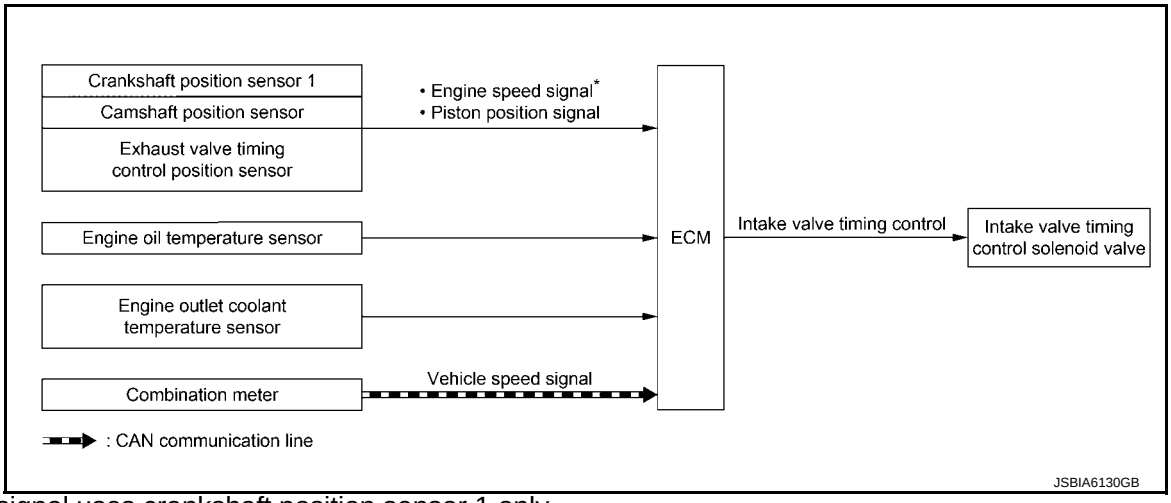
ECM transmits the cooling fan speed request signal to HPCM according to vehicle speed and engine coolant temperature. HPCM transmits the cooling fan speed request signal to IPDM E/R according to the signal from ECM. Based on the signal, IPDM E/R transmits ON/OFF pulse duty signal to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.
For the outline of cooling fan control, refer to HBC-35, "COOLING SYSTEM CONTROL : System Description".

INTAKE VALVE TIMING CONTROL

INTAKE VALVE TIMING CONTROL : System Description

INFOID:0000000014631133

SYSTEM DIAGRAM



*: This signal uses crankshaft position sensor 1 only.

SYSTEM DESCRIPTION

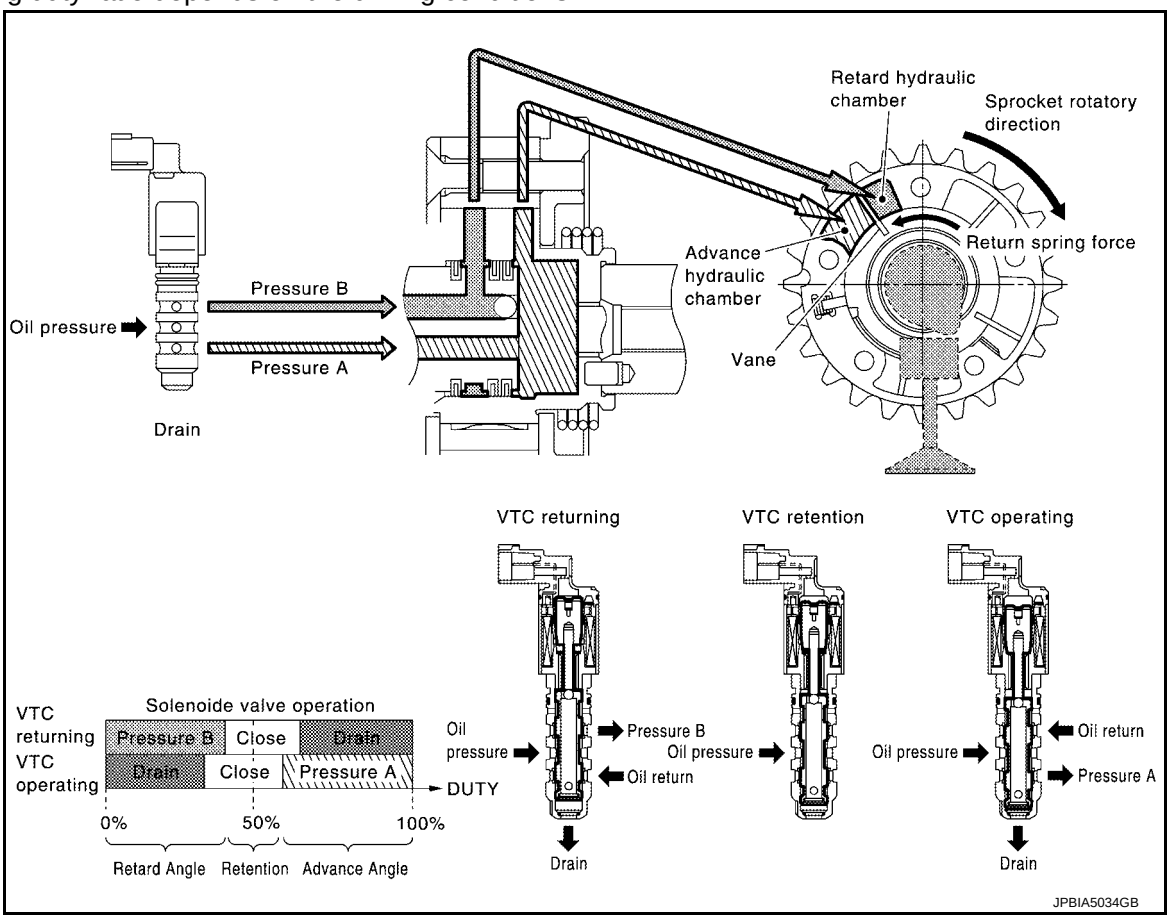
This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

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.

Intake Valve Timing Control Solenoid Valve

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

Intake valve timing control solenoid valve controls the timing of intake valve opening/closing optimally by changing duty ratio depends on the driving conditions.



Status of intake valve timing solenoid valve	Intake valve timing controller activation
Engine OFF	When starting the engine, the controller vane and sprocket are fixed, improving the starting performance of the engine.
Active (Advanced angle)	When the energization rate to the control solenoid valve is increased, the oil pressure from the oil pump is conveyed to the advance angle chamber of the controller. And retard angle chamber oil is drained. Accordingly, the controller vane rotates rightward and the phase of camshaft becomes advance angle. This condition brings about the greater overlap with the exhaust valve, enabling the exhaust gas cleaning by the internal EGR effect and the fuel consumption improvement by the reduction in pumping loss.
Neutral (Maintained)	When it is the target valve timing, the energization rate to the control solenoid valve is adjusted to the intermediate state. The solenoid valve is positioned at the neutral position and the oil path is interrupted to maintain the cam shaft phase.
Return (Retard angle)	When the energization rate to the control solenoid valve is decreased, the oil pressure from the oil pump is conveyed to the retard chamber of the controller. And advanced angle chamber oil is drained. Accordingly, the controller vane rotates leftward and the phase of camshaft becomes retard angle.

Intake Valve Timing Control Feedback Control

Cam Position Detection

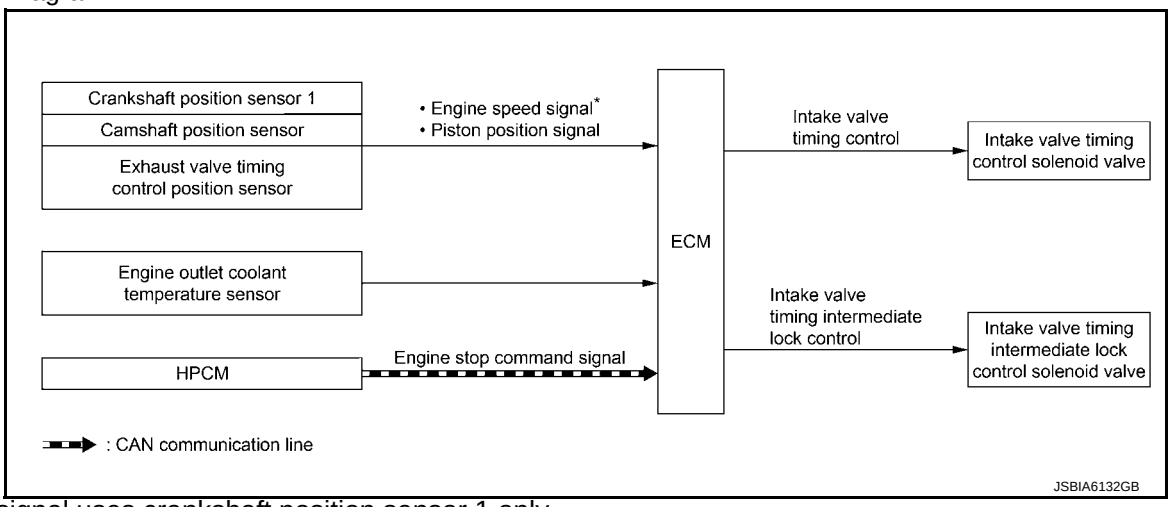
The camshaft position sensor mounted at the rear of the cylinder head detects a cam position, by using the groove on the plate located at the rear of the intake camshaft.

Feedback Control

The camshaft position sensor feeds back an actual cam position signal to ECM. Based on the signal, ECM controls the intake valve timing control solenoid valve to satisfy the optimum target valve opening/closing timing according to a driving condition.

Intake Valve Timing Intermediate Lock Control

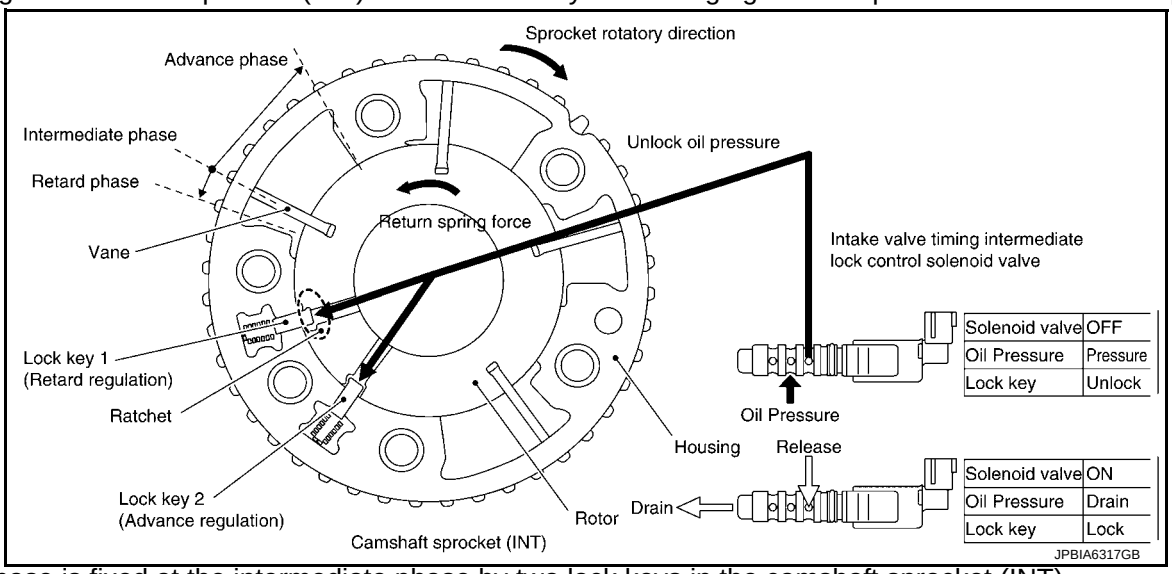
System Diagram



*: This signal uses crankshaft position sensor 1 only.

System Description

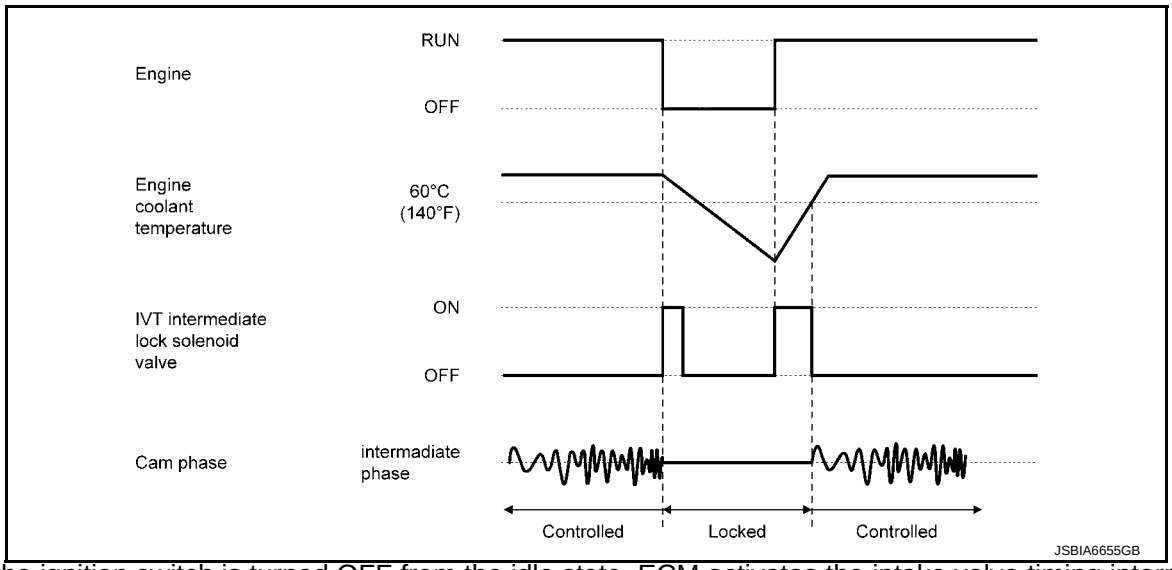
The intake valve timing intermediate lock control improves the cleaning ability of exhaust gas at cold starting by fixing the camshaft sprocket (INT) with two lock keys and bringing the cam phase into intermediate phase.



Cam phase is fixed at the intermediate phase by two lock keys in the camshaft sprocket (INT).

ECM controls the intermediate phase lock by opening/closing the intake valve timing intermediate lock control solenoid valve to control oil pressure acting on the lock key and locking/unlocking the lock key.

Lock/Unlock Activation



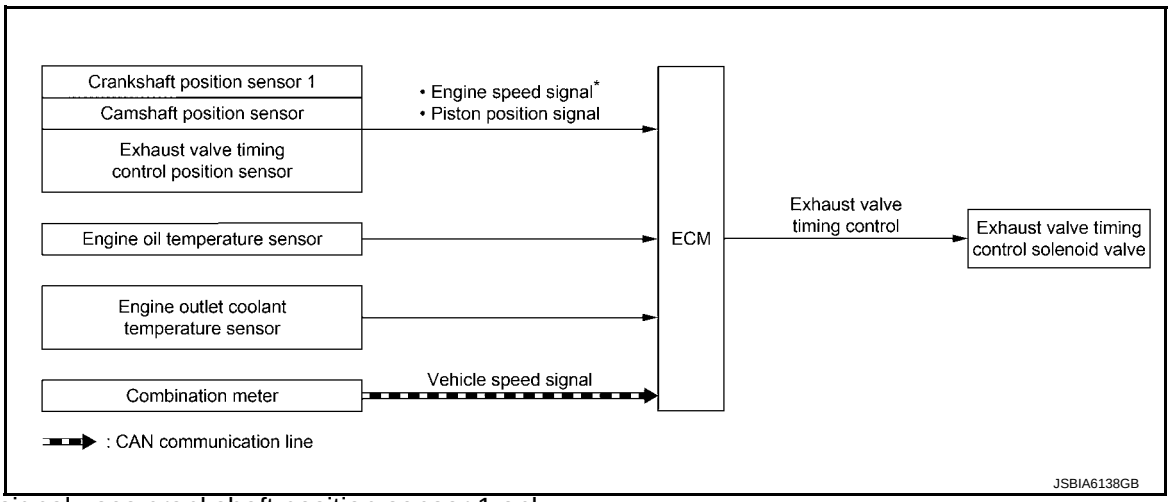
When the ignition switch is turned OFF from the idle state, ECM activates the intake valve timing intermediate lock control solenoid valve to drain oil pressure. Accordingly, the lock key is activated by the spring, and the cam phase is fixed at the intermediate position.
When starting the engine by cold start, ECM activates the solenoid valve to maintain the condition that the cam phase is fixed at the intermediate position.
When the engine coolant temperature exceeds 60°C (140°F), ECM turns OFF the solenoid valve and starts normal intake valve timing control.

EXHAUST VALVE TIMING CONTROL

EXHAUST VALVE TIMING CONTROL : System Description

INFOID:0000000014631134

SYSTEM DIAGRAM



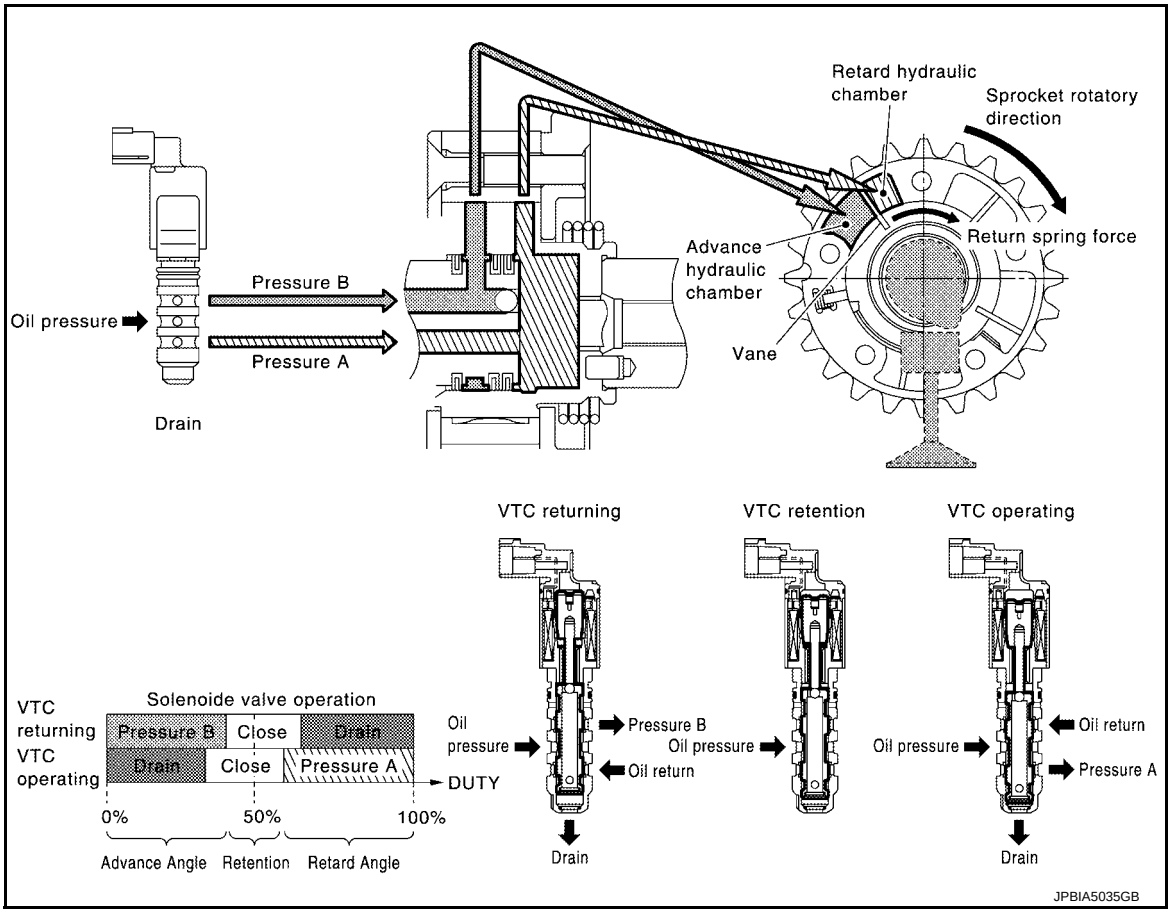
*: This signal uses crankshaft position sensor 1 only.

SYSTEM DESCRIPTION

With the exhaust valve timing controller which controls the phase of exhaust camshaft to optional position continuously, ECM improves both low-middle speed torque and high speed performance, emission and fuel efficiency by optimizing the exhaust valve open/close timing according to driving conditions.
The exhaust valve timing controller is hydraulically controlled by the exhaust valve timing control solenoid valve.
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.

EXHAUST VALVE TIMING CONTROL SOLENOID VALVE CONTROL

The exhaust valve timing control solenoid valve is driven ON-OFF (duty control) by ECM output signal, and controls the open/close timing of the exhaust valve to the optimum by changing its duty ratio according to the vehicle's driving condition.



Exhaust valve timing control solenoid valve condition	Exhaust valve timing controller operation
Engine OFF	When starting the engine, the controller vane and sprocket are fixed in full advanced position by the reaction force of return spring, improving the starting performance of the engine.
Active (Retard angle)	When the energization rate to the control solenoid valve is increased, the oil pressure from the oil pump is conveyed to the retard angle chamber of the controller. And advanced angle chamber oil is drained. Accordingly, the controller vane rotates leftward and the phase of camshaft becomes retard angle. This condition brings about the greater overlap with the intake valve, enabling the exhaust gas cleaning by the internal EGR effect and the fuel consumption improvement by the reduction in pumping loss.
Neutral (Maintained)	When it is the target valve timing, the energization rate to the control solenoid valve is adjusted to the intermediate state. The solenoid valve is positioned at the neutral position and the oil path is interrupted to maintain the cam shaft phase.
Return (Advanced angle)	When the energization rate to the control solenoid valve is decreased, the oil pressure from the oil pump is conveyed to the advanced chamber of the controller. And retard angle chamber oil is drained. Accordingly, the controller vane rotates rightward and the phase of camshaft becomes advanced angle.

EXHAUST VALVE TIMING CONTROL FEEDBACK CONTROL

Cam Position Detection

The camshaft position sensor mounted at the rear of the cylinder head detects a cam position, by using the groove on the plate located at the rear of the exhaust camshaft.

Feedback Control

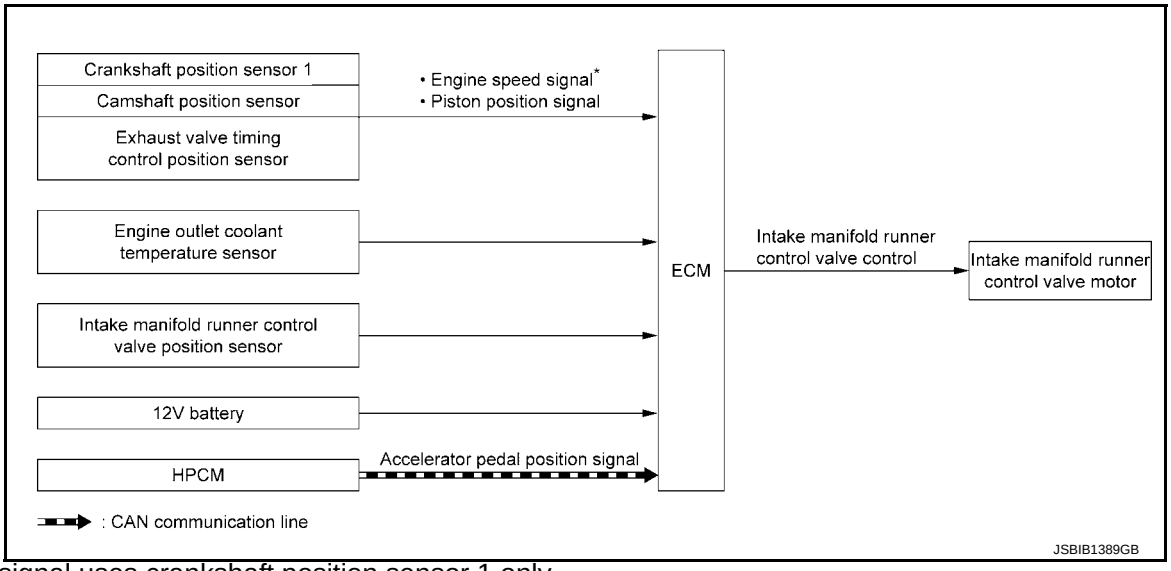
The camshaft position sensor feeds back an actual cam position signal to ECM. Based on the signal, ECM controls the exhaust valve timing control solenoid valve to satisfy the optimum target valve opening/closing timing according to a driving condition.

INTAKE MANIFOLD RUNNER CONTROL

INTAKE MANIFOLD RUNNER CONTROL : System Description

INFOID:0000000014631135

SYSTEM DIAGRAM



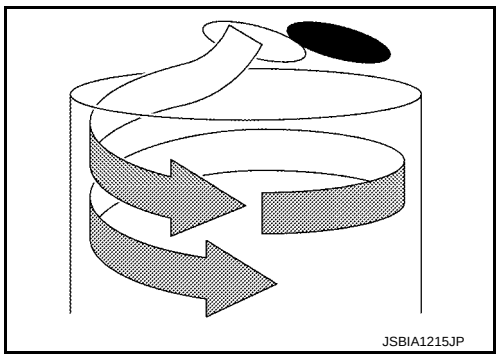
*: This signal uses crankshaft position sensor 1 only.

SYSTEM DESCRIPTION

The intake manifold runner control valve installed at intake manifold generates swirl flow (revolving flow) in combustion chamber, and by that effect air-fuel mixture is homogenized so that stabilizes combustion. The intake manifold runner control valve is driven by DC motor and controlled by ECM.

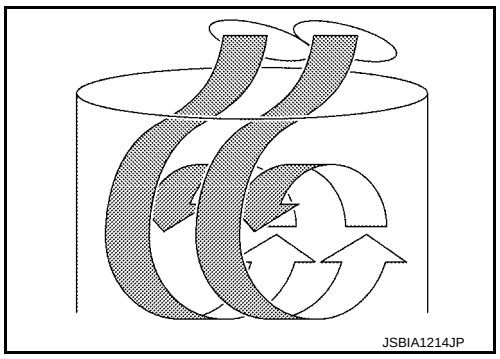
IDLING, LOW SPEED·SMALL LOAD RANGE

With intake manifold runner control valve closed the flowing field of swirl flow (revolving flow) is generated by increased flow speed of gas and improves combustion so that enables stable combustion.



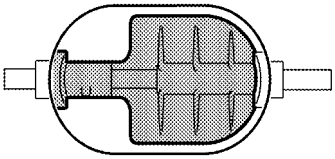
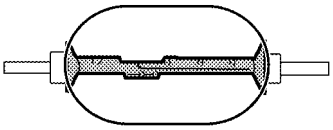
MIDDLE·HIGH SPEED RANGE

- With intake manifold runner control valve opened the flowing field mainly consist of tumble (vertical revolving flow) by atomizer, port shape and shallow piston head is generated.
- Which makes more swirl remained at the latter half of compression process so that improves combustion and enables stable combustion.



OPERATION OF INTAKE MANIFOLD RUNNER CONTROL VALVE

When the engine is idling or running at slow speed the vales are closed and swirl flow is generated. By closing valves the flowing speed of gas is increased and it stabilizes combustion also improves fuel efficiency.

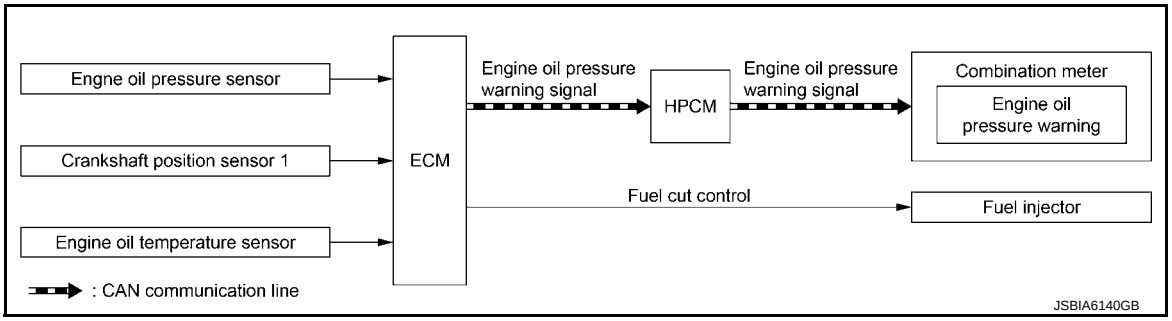
Valve position	operating condition
Valve closed  JSBIA1212JP	Idling, low ·small load range
Valve opened  JSBIA1213JP	Other than above

ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE

ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE : System Description

INFOID:0000000014631136

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

- The engine protection control at low engine oil pressure warns the driver of a decrease in engine oil pressure by the engine oil pressure warning before the engine becomes damaged.
- When detecting a decrease in engine oil pressure at an engine speed less than 1,000 rpm, ECM transmits the engine oil pressure warning signal to HPCM. The HPCM transmits the engine oil pressure warning signal to the combination meter. The combination meter displays the engine oil pressure warning, according to the signal.
- When detecting a decrease in engine oil pressure at an engine speed 1,000 rpm or more, ECM transmits the engine oil pressure warning signal to HPCM. The HPCM transmits the engine oil pressure warning signal to the combination meter. The combination meter displays the engine oil pressure warning, according to the signal. When ECM detects a decrease in engine oil pressure, ECM shuts off the fuel if the engine speed exceeds the specified value. Refer to EC-103, "Fail-safe".

Decrease in engine oil pressure	Engine speed	Combination meter (Information display)	Fuel shut-off
		Engine oil pressure warning	
Detection	Less than 1,000 rpm	ON*	NO
	1,000 rpm or more	ON	YES

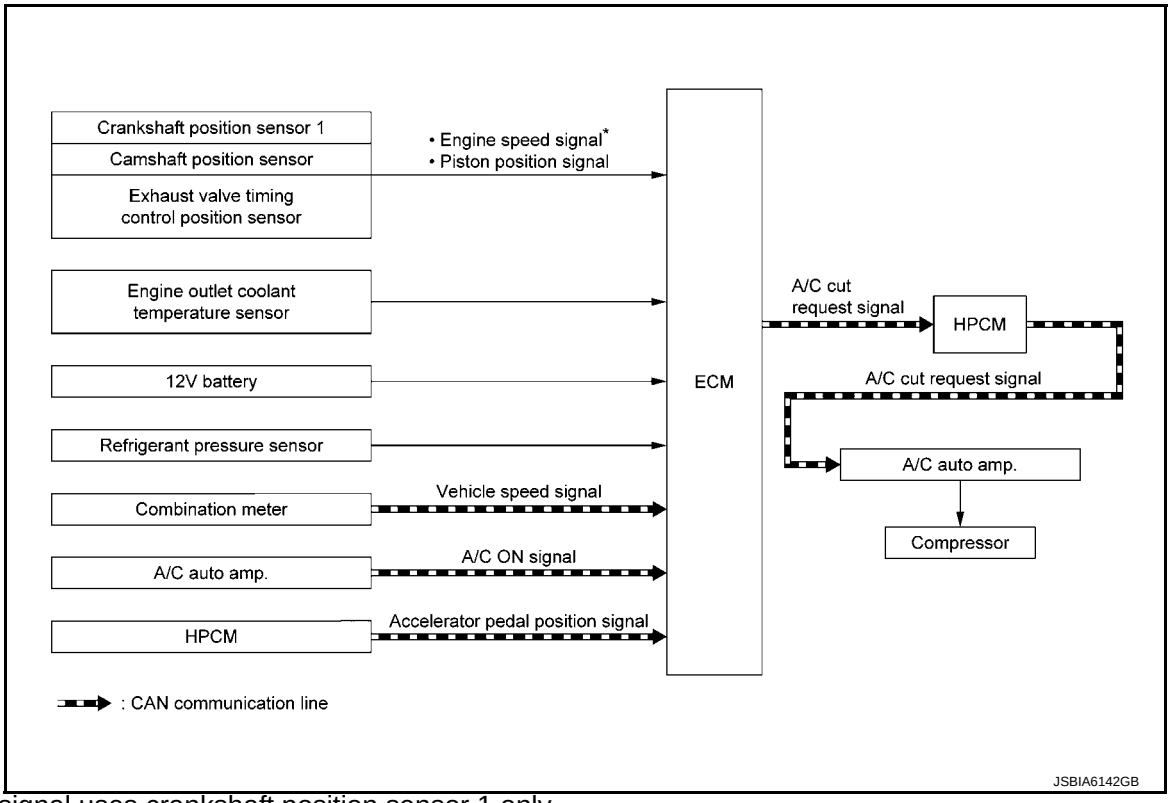
*: When ECM detects a normal engine oil pressure, ECM turns OFF the engine oil pressure warning.

AIR CONDITIONING CUT CONTROL

AIR CONDITIONING CUT CONTROL : System Description

INFOID:0000000014631137

SYSTEM DIAGRAM



*: This signal uses crankshaft position sensor 1 only.

SYSTEM DESCRIPTION

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

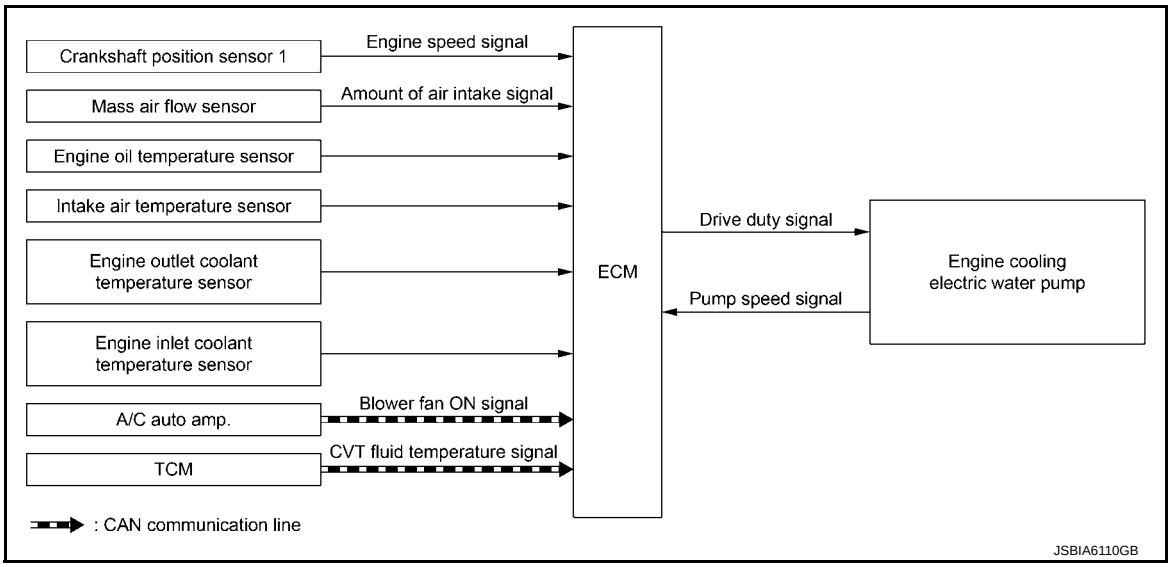
- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

ENGINE COOLING ELECTRIC WATER PUMP CONTROL

ENGINE COOLING ELECTRIC WATER PUMP CONTROL : System Description

INFOID:0000000014631138

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

The abolition of the conventional belt-driven water pump and the introduction of a motor-driven water pump reduce frictions caused by auxiliaries and improve the fuel economy.
ECM constantly monitors vehicle conditions, calculates target speed of engine cooling electric water pump, and transmits a drive duty signal to the engine cooling electric water pump according to the calculated target speed.
Engine cooling electric water pump is activated according to the drive duty signal received from ECM.
ECM monitors actual speed of engine cooling electric water pump, corrects its target speed, and detects malfunctions in it.

WHEN THE ENGINE IS RUNNING

Engine cooling electric water pump is constantly active.
The speed of engine cooling electric water pump increases as the engine output increases, accordingly, the flow rate of coolant increases.
ECM raises the speed of pump to increase the flow rate of coolant when detecting the conditions below and judging that the flow rate of coolant is insufficient.

- Engine outlet water temperature, engine oil temperature, or CVT fluid temperature is high.
- A blower fan ON signal is received from A/C auto amp.

WHEN THE ENGINE IS STOPPED

- When receiving a blower fan ON signal from A/C auto amp. while the engine is stopped, ECM activates engine cooling electric water pump to flow coolant satisfying the air conditioning requirements.
- When detecting high CVT fluid temperatures while driving without using the engine, ECM activates engine cooling electric water pump to flow coolant satisfying the CVT fluid cooling requirements.
- When engine outlet water temperature is high, ECM activates engine cooling electric water pump.

WHEN IGNITION SWITCH IS TURNED OFF

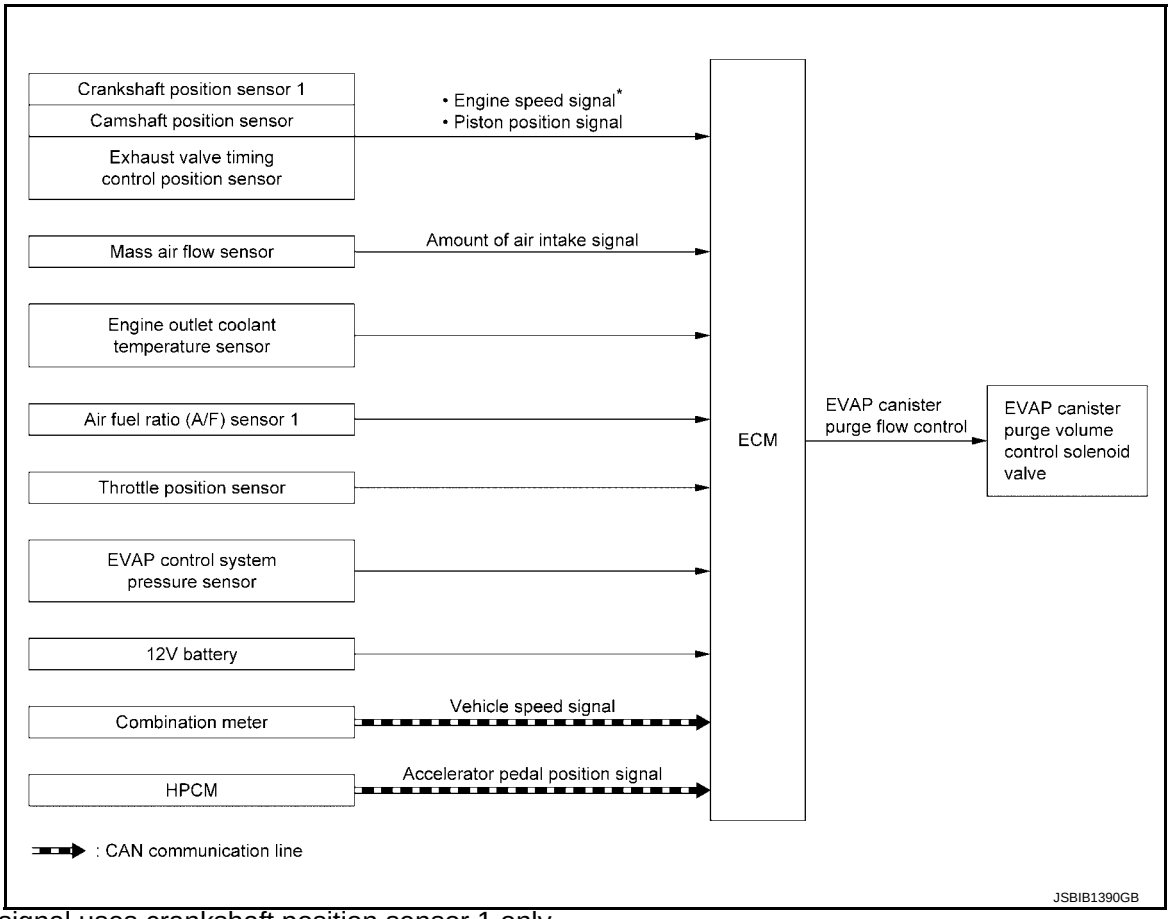
When the ignition switch is turned OFF while coolant temperature is high, ECM activates engine cooling electric water pump and cooling fan for up to 3 minutes and performs the after-cleaning process.

EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM : System Description

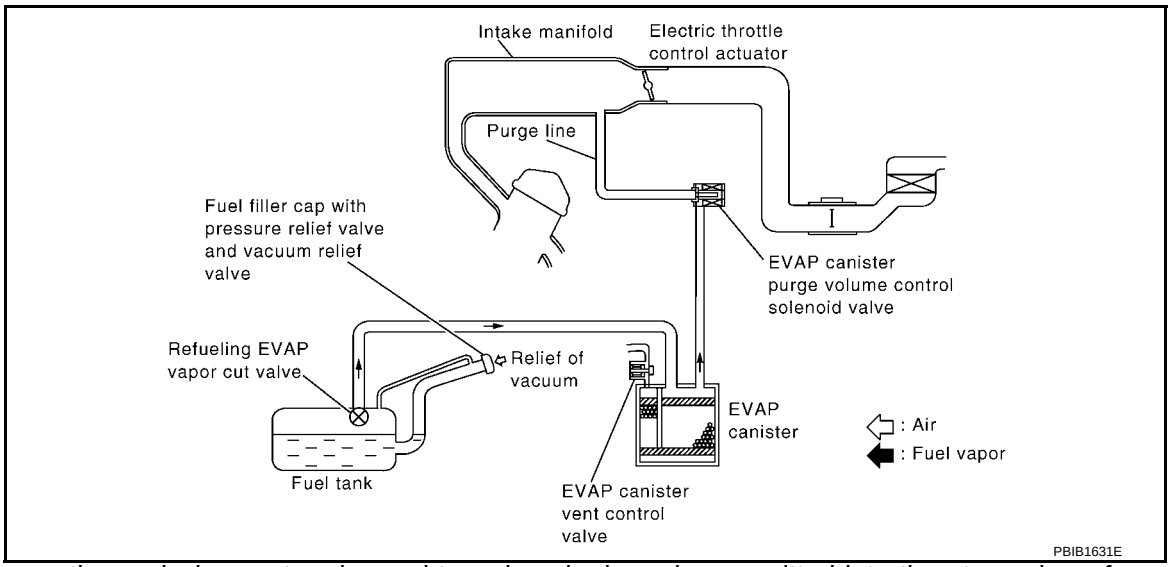
INFOID:0000000014631139

SYSTEM DIAGRAM



*: This signal uses crankshaft position sensor 1 only.

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

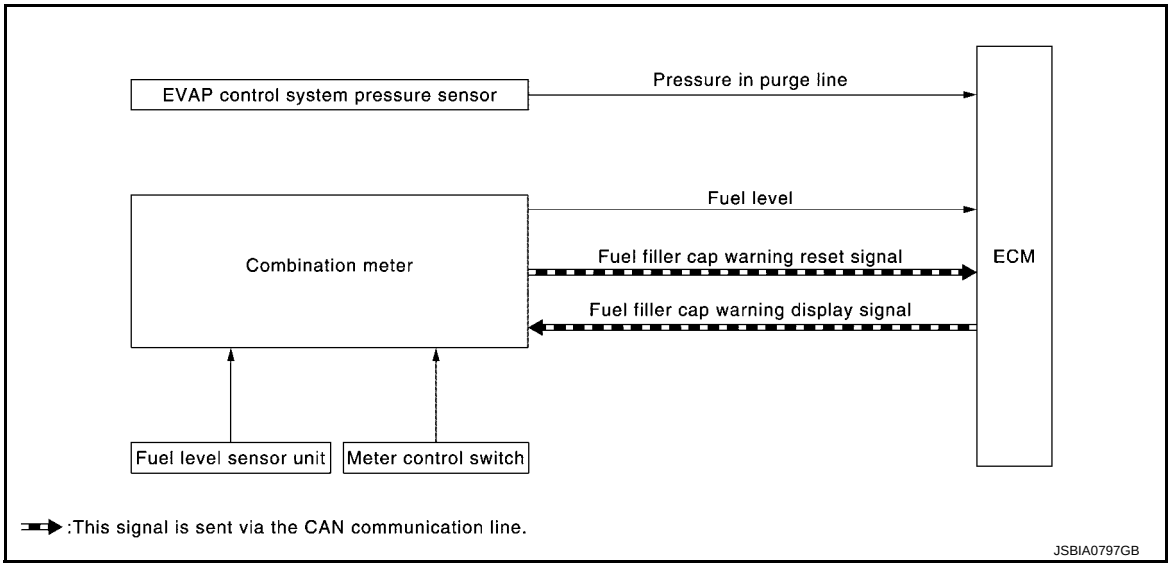
engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

FUEL FILLER CAP WARNING SYSTEM

FUEL FILLER CAP WARNING SYSTEM : System Description

INFOID:0000000014688358

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.
ECM judges a refueled state, based on a fuel level signal transmitted from the combination meter.
When a very small leak is detected through the EVAP leak diagnosis performed after judging the refueled state, ECM transmits a fuel filler cap warning display signal (request for display ON) to the combination meter via CAN communication.
When receiving the signal, the combination meter turns ON the fuel filler cap warning display.

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

Reset Operation

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

- Reset operation is performed by operating the meter control switch on the combination meter. Refer to MWI-18, "Switch Name and Function".
  - When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.
- DTC erased by using CONSULT.

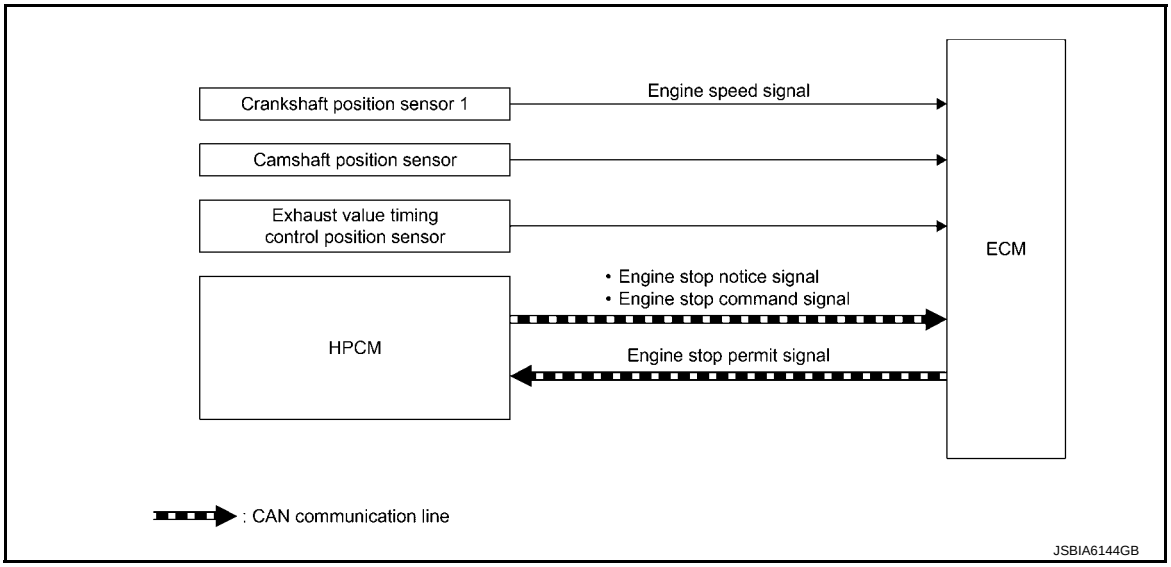
NOTE:
MIL turns ON if a malfunction is detected in leak diagnosis results again at the trip after the fuel filler cap warning display turns ON/OFF.

ENGINE STOP CONTROL

ENGINE STOP CONTROL : System Description

INFOID:0000000014631140

SYSTEM DIAGRAM



SYSTEM DESCRIPTION

- HPCM performs total control of the engine stop function, based on information transmitted from each control unit, sensor, and switch. For details, refer to HBC-21, "HYBRID CONTROL SYSTEM : System Description".
- When receiving an engine stop notice signal from HPCM via CAN communication and judging that it is possible to stop the engine, ECM transmits an engine stop permit signal to HPCM via CAN communication.
- ECM stops the engine when receiving an engine stop command signal from HPCM via CAN communication.

Engine stop permit condition ECM judges

Item	Status
Engine speed	Less than 1,200 rpm
Intake valve timing control solenoid valve position	Full retard angle
Exhaust valve timing control solenoid valve position	Full advance angle

CAN COMMUNICATION

CAN COMMUNICATION : System Description

INFOID:0000000014631141

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.
Refer to LAN-17, "System Description", about CAN communication for detail.

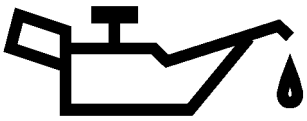
INFORMATION DISPLAY (COMBINATION METER)

INFORMATION DISPLAY (COMBINATION METER) : Engine Oil Pressure Warning

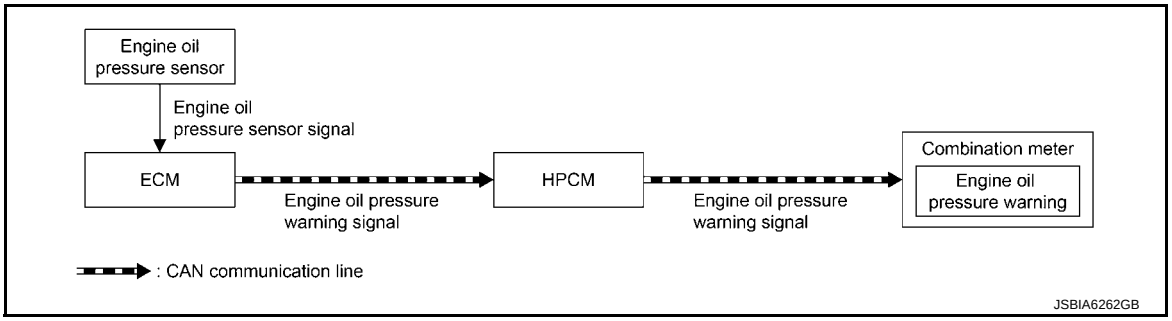
INFOID:0000000014631142

DESIGN/PURPOSE

When engine oil pressure is low, the engine oil pressure warning informs the driver of low oil pressure to prevent damage to the engine.

Symbol	Message
 JPNIA1881ZZ	Low Oil Pressure Stop Vehicle

SYSTEM DIAGRAM



SIGNAL PATH

- ECM reads the resistance value of an engine oil pressure sensor and transmits the engine oil pressure warning signal to HPCM via CAN communication.
- HPCM receives the engine oil pressure warning signal from ECM and transmits the signal to the combination meter via CAN communication.
- Combination meter shows/hides the engine oil pressure warning on the information display according to the signal from HPCM.

LIGHTING CONDITION

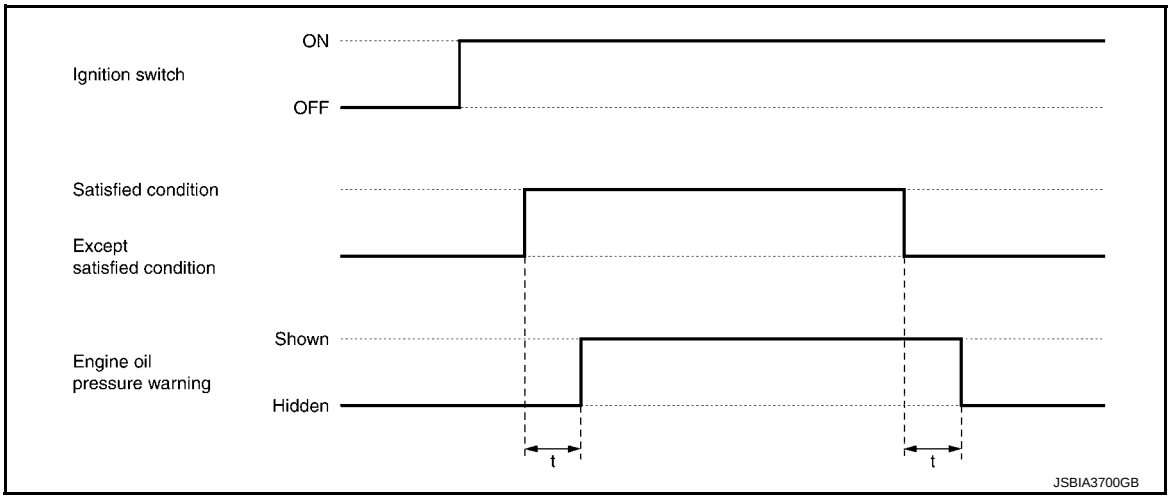
When all of the following conditions are satisfied:

- Ignition switch: ON
- Engine running
- Engine oil pressure is less than the specified value.

SHUTOFF CONDITION

- Ignition switch: OFF
- Engine stop
- Engine oil pressure is the specified value or more.

TIMING CHART



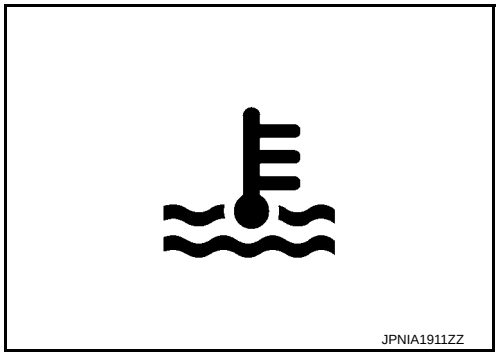
t : 100 ms

INFORMATION DISPLAY (COMBINATION METER) : High Water Temperature Warning

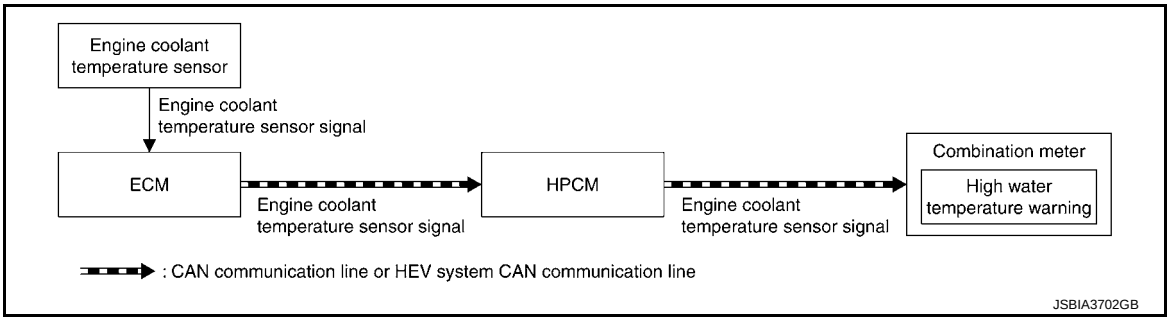
INFOID:0000000014631143

DESIGN/PURPOSE

The state of engine coolant temperature is informed to the driver.
The information display shows high water temperature warning when engine coolant temperature is high (overheat).

Symbol	Message
 JPNIA1911ZZ	High Coolant Temp Stop Vehicle See Owner's Manual

SYSTEM DIAGRAM



SIGNAL PATH

- ECM reads a signal transmitted from the engine outlet coolant temperature sensor and transmits the signal to the HPCM via CAN communication.
- HPCM receives the engine coolant temperature signal from ECM and transmits the signal to the combination meter via CAN communication.

- Combination meter shows/hides the high water temperature warning on the information display according to the signal from HPCM.

LIGHTING CONDITION

When all of the following conditions are satisfied:

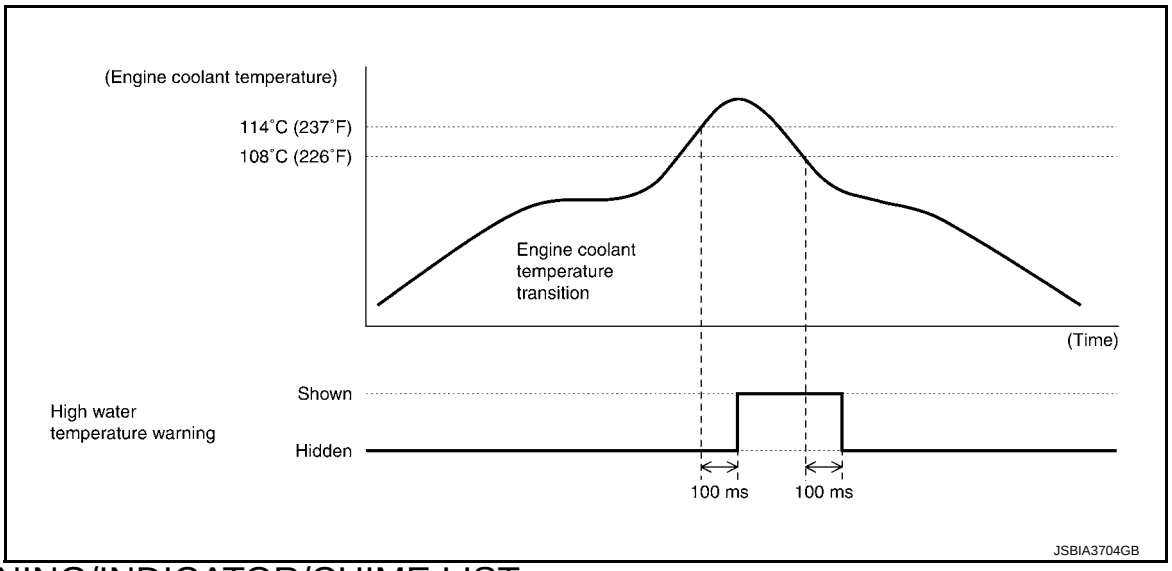
- Ignition switch: ON
- Engine coolant temperature: 114°C (237°F) or more

SHUTOFF CONDITION

When any of the following conditions is satisfied:

- Ignition switch: OFF
- Engine coolant temperature: Below 108°C (226°F)

TIMING CHART



WARNING/INDICATOR/CHIME LIST

WARNING/INDICATOR/CHIME LIST : Warning lamps/Indicator lamps

INFOID:0000000014631144

NOTE:
Regarding the arrangement. Refer to MWI-6, "METER SYSTEM : Design".

Item	Design	Reference
Malfunction indicator lamp (MIL)		Regarding the function. Refer to EC-77, "DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)".

WARNING/INDICATOR/CHIME LIST : Warning/Indicator (On Information Display)

INFOID:0000000014631145

Item	Reference
Engine oil pressure warning	Refer to EC-65, "INFORMATION DISPLAY (COMBINATION METER) : Engine Oil Pressure Warning".
High water temperature warning	Refer to EC-67, "INFORMATION DISPLAY (COMBINATION METER) : High Water Temperature Warning".

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000014631146

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

GST (Generic Scan Tool)

INFOID:0000000014631147

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-62, "Description".

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

DIAGNOSIS SYSTEM (ECM)
DIAGNOSIS DESCRIPTION
DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:0000000014631148

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminated	Blinking	Illuminated				
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0304 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-109, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:0000000014631149

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is saved in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are saved in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-109, "DTC Index". These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.
1st trip DTC is specified in Service $07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to EC-147, "Work Flow". Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT or GST. The 1st trip freeze frame data can only be displayed on the CONSULT screen.

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 – P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items
3	1st trip freeze frame data	

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

DIAGNOSIS DESCRIPTION : Counter System

INFOID:0000000014631150

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

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

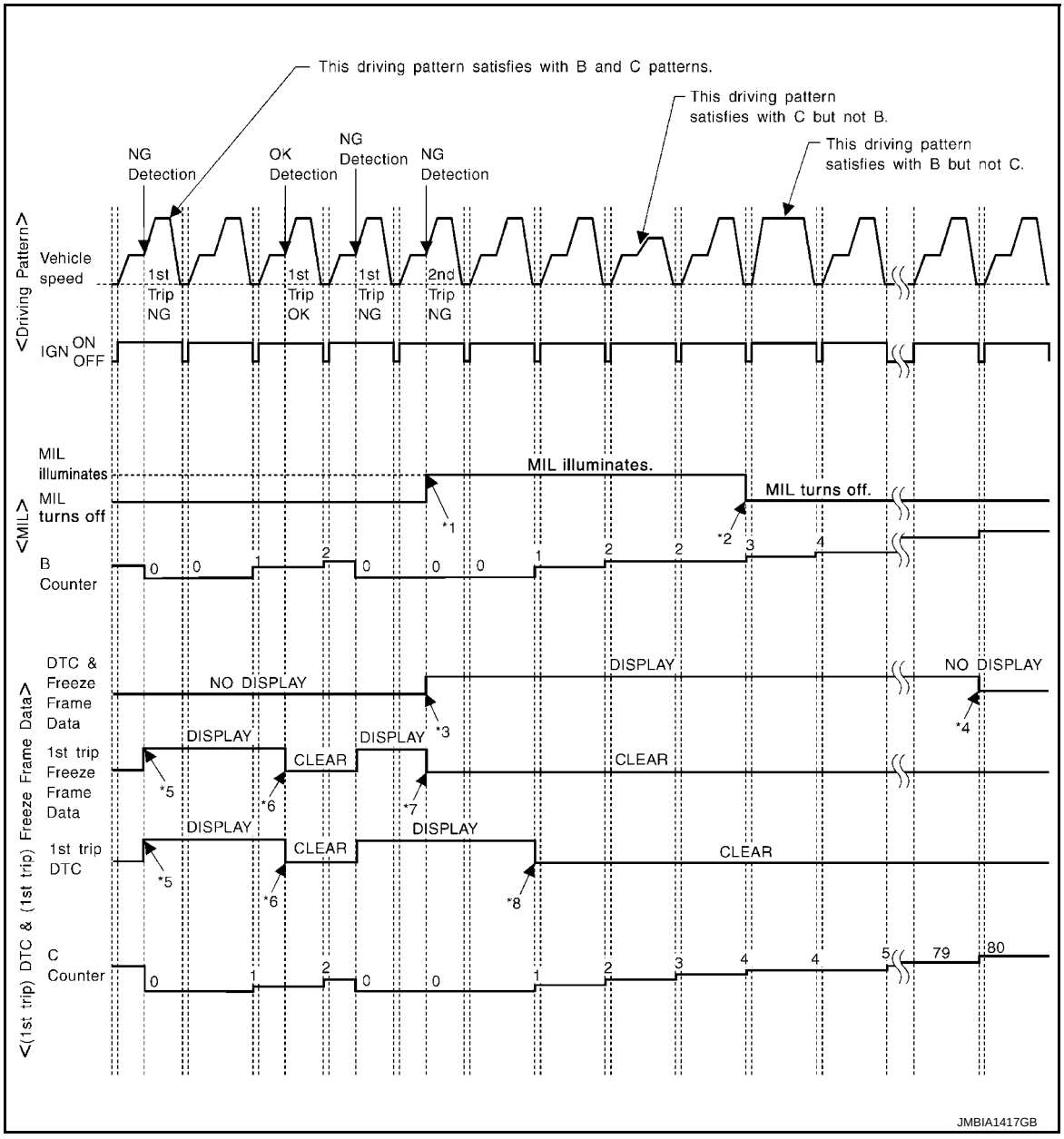
COUNTER SYSTEM CHART

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

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

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

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



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

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

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

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

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

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

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

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

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

Driving Pattern B
Refer to EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern C

Refer to EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Example:

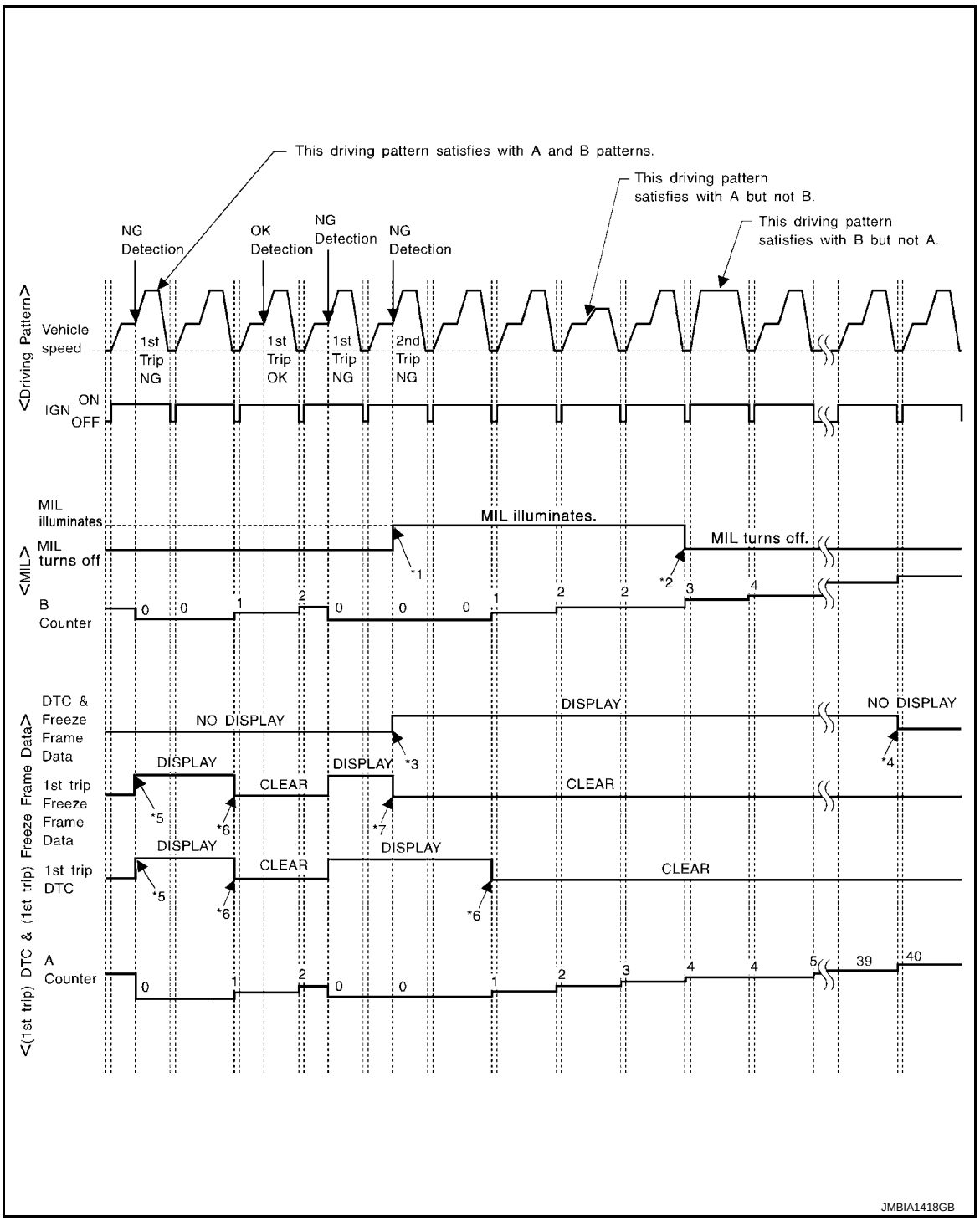
If the stored freeze frame data is as per the following:

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

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

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

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



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

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

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

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 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
Refer to EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern B
Refer to EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:0000000014631151

CAUTION:
Always drive at a safe speed.

DRIVING PATTERN A

Driving pattern A means a trip satisfying the following conditions.
- Engine speed reaches 400 rpm or more.
- Engine coolant temperature rises by 20°C (36°F) or more after starting the engine.
- Engine coolant temperature reaches 70°C (158°F) or more.
- The ignition switch is turned from ON to OFF.

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

DRIVING PATTERN B

Driving pattern B means a trip satisfying the following conditions.
- Engine speed reaches 400 rpm or more.
- Engine coolant temperature reaches 70°C (158°F) or more.
- Vehicle speed of 70 – 120 km/h (44 – 74 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 (6 MPH) or more reaches 10 minutes or more in total.
- A lapse of 22 minutes or more after engine start.

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

DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm

Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature condition:
- When the freeze frame data shows lower than 70°C (158°F), engine coolant temperature should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), engine coolant temperature should be higher than or equal to 70°C (158°F).

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

DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.
- The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total.
- Idle speed lasts 30 seconds or more.
- A lapse of 600 seconds or more after engine start.

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

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:0000000014631152

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.

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

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

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

—: Self-diagnosis is not carried out.

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

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

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

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

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

NOTE:

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

DIAGNOSIS DESCRIPTION : Permanent Diagnostic Trouble Code (Permanent DTC)

INFOID:0000000014933840

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

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

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

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

NOTE:

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

PERMANENT DTC SET TIMING

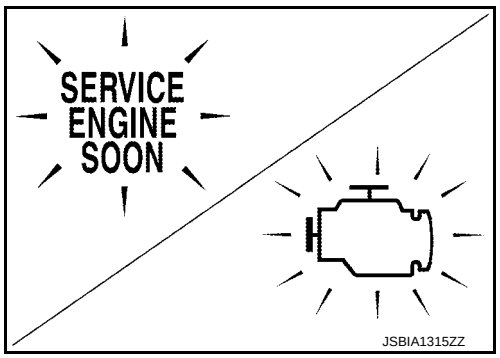
The setting timing of permanent DTC is stored in ECM with the lighting of MIL when a DTC is confirmed.

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:0000000014631153

- If the emission-related control module detects emission-related DTC, illuminating or blinking of the MIL notifies the driver that a malfunction is detected.
- Control module that memorizes DTC for illuminating or blinking of the MIL
  (The control module memorized for each DTC varies.)

- ECM
- TCM
- HPCM



1. The MIL illuminates when ignition switch is turned ON.
   NOTE:
   When the MIL does not illuminate, check the circuit of the MIL. Refer to EC-573, "Component Function Check".
2. The MIL turns off when the ignition switch is set to READY.
   NOTE:
   When the MIL continues to illuminate or blink, emission-related DTC is detected. Perform total self-diagnosis and inspect or repair the unit.

On Board Diagnosis Function

INFOID:0000000014631154

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-155, "Description".
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-156, "Description".
Mixture ratio self-learning value clear	Erase the air-fuel ratio learning value. Refer to EC-158, "Description".

BULB CHECK MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
   If it remains OFF, check MIL circuit. Refer to EC-573, "Diagnosis Procedure".

MALFUNCTION WARNING MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
   If it remains OFF, check MIL circuit. Refer to EC-573, "Diagnosis Procedure".
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

4. 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. (2 trip detection logic diagnoses)
   - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
   - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

CONSULT Function

INFOID:0000000014631155

FUNCTION

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

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.
- DTC (Diagnostic trouble codes)
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item
Regarding items of DTC and 1st trip DTC, refer to EC-109, "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” mode with CONSULT. “TIME” indicates the number of driving the vehicle after the last detection of DTC.
- When ECM has detected a current DTC, “0” is displayed for “TIME”.
- When ECM memorizes a 1st trip DTC, “1t” is displayed for “TIME”.
- If “TIME” is neither “0” nor “1t”, the DTC occurred in the past.

How to Erase 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.

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*1	Description
DIAG TROUBLE CODE [PXXXX]	The engine control component part/control system has a trouble code displayed as PXXXX. (Refer to EC-109, "DTC Index".)
CAL/LD VALUE %]	The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C]	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. • The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
L-FUEL TRM-B2 %]	
S-FUEL TRM-B1 %]	• “Short-term fuel trim” at the moment a malfunction is detected is displayed. • The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
S-FUEL TRM-B2 %]	

Freeze frame data item*1	Description
ENGINE SPEED [rpm]	The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH·P/S [%]	The throttle valve opening angle at the moment a malfunction is detected is displayed.
INJ PULSE [msec]	The basic injection quantity 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. • One of the following mode is displayed. - MODE 2: Open loop due to detected system malfunction - MODE 3: Open loop due to driving conditions (power enrichment, deceleration enleanment) - MODE 4: Closed loop - using oxygen sensor(s) as feedback for fuel control - MODE 5: Open loop - has not yet satisfied condition to go to closed loop
FUEL SYS-B2	
INT MANI PRES [kPa]	• Constant value is displayed. • These items are displayed but are not applicable to this model.
COMBUST CONDITION	
FUEL RAIL PRESSURE [MPa]	The fuel rail pressure at the moment a malfunction is detected is displayed.
TARGET FUEL RAIL PRESSURE [MPa]	The target fuel rail pressure at the moment a malfunction is detected is displayed.
BATTERY VOLTAGE [V]	The battery voltage at the moment a malfunction is detected is displayed.
FUEL LEVEL [%]	The fuel level at the moment a malfunction is detected is displayed.

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

DATA MONITOR MODE

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- For reference values of the following items, refer to EC-87, "Reference Value".

Monitored Item

Monitored item	Unit	Description	Remarks
COOLANT TEMP/S	°C	The engine coolant temperature (determined by the signal voltage of the engine outlet coolant temperature sensor) is displayed.	When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode.The engine coolant temperature determined by the ECM is displayed.
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.	
INT/A TEMP SE	°C or °F	The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
PURG VOL C/V	%	• Indicates the control value of the EVAP canister purge volume control solenoid valve computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
FUEL T/TMP SE	°C or °F	The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
FUEL LEVEL SE	V	The signal voltage of the fuel level sensor is displayed.	
EVAP SYS PRES	V	The signal voltage of EVAP control system pressure sensor is displayed.	
CAL/LD VALUE	%	"Calculated load value" indicates the value of the current air flow divided by peak air flow.	

Monitored item	Unit	Description	Remarks
HO2S2 (B1)	V	The signal voltage of the heated oxygen sensor 2 is displayed.	
ENG OIL TEMP	°C°F	The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed.	
A/F ALPHA-B1	%	The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	• When the engine is stopped, a certain value is indicated. • This data also includes the data for the air-fuel ratio learning control. • When engine is running, normal range is indicated in “SPEC”.
INT/V SOL (B1)	%	• The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. • The advance angle becomes larger as the value increases.	
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.
FUEL INJ TIM	BTDC	Indicates the fuel injection timing computed by ECM according to the input signals.	
A/F S1 HTR (B1)	%	• Indicates the duty ratio of the Air fuel ratio (A/F) sensor 1 heater computed by ECM according to the input signals. • The current flow to the heater becomes larger as the value increases.	
EXH/V TIM B1	°CA	Indicates [°CA] of exhaust camshaft advance angle.	
ENG INLET COOLANT TEMP	°C	The engine coolant temperature (determined by the signal voltage of the engine inlet coolant temperature sensor) is displayed.	
FAN DUTY	%	Indicates a command value for cooling fan. The value is calculated by ECM based on input signals.	
ACCEL PEDAL POSI	%	Displays the accelerator pedal opening sent to HPCM.	
THRTL STK CNT B1	—	**NOTE:** These items are displayed but are not applicable to this model.	
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.
TRVL AFTER MIL	km or mile	Distance traveled while MIL is activated.	
B/FUEL SCHDL	ms	“Base fuel schedule”indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	When engine is running, normal range is indicated in “SPEC”.
MASS AIRFLOW	g/s	Indicates the mass air flow computed by ECM according to the mass air flow sensor signal.	
FUEL PRES SEN	MPa	Indicates the fuel rail pressure computed by ECM according to the input signals.	
TP SEN 1-B1	V	The signal voltage of the throttle position sensor 1 B1 is displayed.	
TP SEN 2-B1	V	The value converted from the signal voltage of the throttle position sensor 2 B1 is displayed.	TP SEN 2-B1 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal.
FUEL INJ B1	msec	ECM-calculated injection pulse width of the fuel injector on the Bank 1 side.	

Monitored item	Unit	Description	Remarks
I/P PULLY SPD	rpm	Indicates the engine speed computed from the input shaft revolution signal.	
VEHICLE SPEED	km/h or mph	The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
TUMBLE POS SEN	V	The intake manifold runner control valve position sensor signal voltage is displayed.	
AC PRESS SEN	V	The signal voltage from the refrigerant pressure sensor is displayed.	
A/F SEN1 (B1)	V	The A/F signal voltage computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed.	
VTC DTY EX B1	%	• The control value of the exhaust valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. • The advance angle becomes larger as the value increases.	
A/F ADJ-B1	—	Indicates the correction of a factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal.	
INT/V TIM (B1)	°CA	Indicates [°CA] of intake camshaft advance angle.	
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.	
EOP SENSOR	mV	The signal voltage of EOP sensor is displayed.	
ECM TEMP 1	°C	Displays a temperature calculated from a signal of ECM temperature sensor 1.	
ECM TEMP 2	°C	Displays a temperature calculated from a signal of ECM temperature sensor 2.	
TARGET ENGINE TORQUE	Nm	Displays an axial torque command value requested from HPCM.	
MASS AIR FLOW SENSOR (HZ)	Hz	The signal frequency of the mass air flow sensor is displayed.	
A/F-S ATMSPHRC CRCT B1	—	Displays a determined value of atmospheric correction factor necessary for correcting an A/F sensor signal input to ECM. The signal used for the correction is an A/F sensor signal transmitted while driving under atmospheric pressure.	
A/F-S ATMSPHRC CRCT UP B1	count	Displays the number of updates of the A/F sensor atmospheric correction factor.	
EXHAUST GAS TEMP SEN 1 B1	V	The signal voltage of exhaust gas temperature sensor is displayed.	
TARGET ENG W/P SPEED	rpm	Displays ECM-calculated target engine cooling electric water pump speed.	
CURRENT ENG W/P SPEED	rpm	Displays current engine cooling electric water pump speed.	

Monitored item	Unit	Description	Remarks
P314D DETECTION CAUSE	—	DTC detected by ECM is displayed where DTC P314D is detected by HPCM.	If DTC is displayed and no DTC is detected by HPCM, this is not a malfunction. In this case, erase Self-diagnostic result of ECM to clear the displayed DTC.
P314E DETECTION CAUSE	—	DTC detected by ECM is displayed where DTC P314E is detected by HPCM.	
P314F DETECTION CAUSE	—	DTC detected by ECM is displayed where DTC P314F is detected by HPCM.	
P3151 DETECTION CAUSE	—	DTC detected by ECM is displayed where DTC P3151 is detected by HPCM.	
P0510 DETECTION CAUSE	—	DTC detected by ECM is displayed where DTC P0510 is detected by HPCM.	
LOAD SIGNAL	On/Off	Indicates [ON/OFF] condition of the electrical load signal. • ON...Rear window defogger switch is ON or lighting switch is in 2nd position. • OFF...Both rear window defogger switch and lighting switch are OFF.	
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	Indicates [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal).	
P/N POSI SW	On/Off	Indicates [ON/OFF] condition from the reverse/neutral position signal.	
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.	
HO2S2 MNTR (B1)	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.
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.	
IDL A/V LEARN	YET/ CMPLT	Displays the condition of Idle Air Volume Learning. • YET...Idle air volume learning has not been performed yet. • DONE...Idle air volume learning has already been performed successfully.	
BRAKE SW	On/Off	Indicates [ON/OFF] condition from the stop lamp switch signal.	
COMBUSTION		**NOTE:** These items are displayed but are not applicable to this model.	
SWRL CONT S/V*	On/Off	The control condition of the intake manifold runner control valve (determined by ECM according to the input signals) is indicated. • ON: Closed • OFF: Open	
FUEL PUMP RLY	On/Off	Indicates the fuel pump relay control condition determined by ECM according to the input signals.	

Monitored item	Unit	Description	Remarks
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)	On/Off	Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
ENG START RQST	YES/NO	Displays the engine start request condition sent from HPCM. • YES: Engine start request received • NO: No engine start request	
IDLE REQUEST	YES/NO	Displays the idle request condition sent from HPCM. • YES: Idle request received • NO: No idle request	
ENG F/C RQST	YES/NO	Displays the engine fuel cut request condition sent from HPCM. • YES: Engine fuel cut request received • NO: No engine fuel cut request	
MIL ON REQUEST	YES/NO	Displays the MIL ON request condition sent from HPCM. • YES: MIL ON request received • NO: No MIL ON request	
ENGINE NO-LOAD	YES/NO	Displays the clutch 1 disengagement/engagement status sent from HPCM. • YES: Clutch 1 disengaged • NO: Clutch 1 engaged	
READY STATE	YES/NO	Displays the current HPCM state sent from HPCM. • YES: READY state • NO: Not in READY state	
ENGINE NO-LOAD REQUEST 2	YES/NO	Displays the clutch 1 disengagement request status sent to HPCM.	This is sent when performing the Idle Air Volume Learning without CONSULT.
ENGINE NO-LOAD REQUEST 1	YES/NO	Displays the clutch 1 disengagement request status sent to HPCM.	This is sent when performing the Idle Air Volume Learning with CONSULT.
IDLE STOP INHIBIT REQUEST	YES/NO	Displays the idle stop prohibit request status sent to HPCM in response to an idle stop request sent from HPCM.	
HO2 S2 DIAG1 (B1)	INCMP/ CMPLT	Indicates DTC P0139 self-diagnosis (delayed response) condition. • INCMP: Self-diagnosis is incomplete. • CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG2 (B1)	INCMP/ CMPLT	Indicates DTC P0139 self-diagnosis (slow response) condition. • INCMP: Self-diagnosis is incomplete. • CMPLT: Self-diagnosis is complete.	
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.	

Monitored item	Unit	Description	Remarks
SYSTEM 1 DIAGNOSIS A B1	INCMP/ CMPLT	Indicates DTC P219A self-diagnosis condition. • INCMP: Self-diagnosis is incomplete. • CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG1 (B1)	INCMP/ CMPLT	• Indicates DTC P015A or P015B self-diagnosis condition. - INCMP: Self-diagnosis is incomplete. - CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG2(B1)	INCMP/ CMPLT	Indicates DTC P014C or P014D self-diagnosis condition. • INCMP: Self-diagnosis is incomplete. • CMPLT: Self-diagnosis is complete.	
SYSTEM 1 DIAGNOSIS B B1	ABSNT/ PRSNT	• Indicates DTC P219A self-diagnosis condition. - ABSNT: Self-diagnosis standby - PRSNT: Under self-diagnosis	
A/F SEN1 DIAG3(B1)	ABSNT/ PRSNT	Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. • ABSNT: The vehicle condition is not within the diagnosis range. • PRSNT: The vehicle condition is within the diagnosis range.	

*: Indicates intake manifold runner control valve.

WORK SUPPORT MODE

Work Item

Work item	Condition	Usage
VIN REGISTRATION	In this mode, VIN is registered in ECM.	When registering VIN in ECM
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 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 will discontinue it and display appropriate instruction. **NOTE:** **When starting engine, CONSULT may display “Battery voltage is low. Charge battery”, even when using a charged battery.**	When detecting EVAP vapor leak in the EVAP system
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
SELF-LEARNING CONT	The coefficient of self-learning control mixture ratio returns to the original coefficient.	When clearing mixture ratio self-learning value.
FUEL PRESSURE RELEASE	• Fuel pump will stop by touching “START” during idling. • Crank a few times after engine stops.	When releasing fuel pressure from fuel line
CLSD THL POS LEARN	Ignition switch ON and engine stopped.	When learning the throttle valve closed position
TARGET IGN TIM ADJ*	Idle condition	When adjusting target ignition timing
SAVING DATA FOR REPLC CPU	In this mode, save data that is in ECM.	When ECM is replaced.
WRITING DATA FOR REPLC CPU	In this mode, write data stored by “SAVE DATA FOR CPU REPLC” in work support mode to ECM.	When ECM is replaced.

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
ENG COOLANT TEMP	Change the engine coolant temperature using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector
FUEL INJECTION	Change the amount of fuel injection using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Air fuel ratio (A/F) sensor 1
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.	Engine speed changes according to the opening percent.	• Harness and connectors • EVAP canister purge volume control solenoid valve
FUEL/T TEMP SEN	Change the fuel tank temperature using CONSULT.		
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch OFF • Selector lever: N (CVT), Neutral (M/T) • Cut off each injector signal one at a time using CONSULT.	Engine runs rough or stops. (Works for accidental fire.)	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil
INT V/T ASSIGN ANGLE	Changes intake valve timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve
EXT V/T ASSIGN ANGLE	Changes exhaust valve timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Exhaust valve timing control solenoid valve
FUEL PUMP RELAY	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay “ON” and “OFF” using CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connectors • Fuel pump relay
VENT CONTROL/V	• Ignition switch: ON (Engine stopped) • Turn EVAP canister vent control valve ON and OFF with the CONSULT and listen to operating sound.	EVAP canister vent control valve makes an operating sound.	• Harness and connectors • EVAP canister vent control valve
FAN DUTY CONTROL*	• Ignition switch: ON • Change duty ratio using CONSULT.	Cooling fan speed changes.	• Harness and connectors • Cooling fan motor • IPDM E/R
TUMBLE CONTROL VALVE	• Ignition switch: ON (Engine stopped) • Turn the intake manifold runner control valve “ON” and “OFF” using CONSULT to open or close.	Touch the intake manifold runner control valve motor and check the operating vibration and sound.	• Harness and connectors • Intake manifold runner control valve • Intake manifold runner control valve motor
IGNITION TIMING	• Timing light: Set • Retard the ignition timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	Perform Idle Air Volume Learning.
ENGINE COOLANT ELECTIC WATER PUMP	• Vehicle condition: READY • Drive the engine cooling electric water pump using CONSULT.	Engine cooling electric water pump drives.	• Harness and connectors • Engine cooling electric water pump
	CAUTION: **Never perform the work procedure under the condition that coolant level is below the specified level.**		

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

DTC WORK SUPPORT MODE

Teat Item

Test mode	Test item	Corresponding DTC No.	Reference page
A/F SEN1	A/F SEN1 (B1) P1276	P0130	EC-264, "DTC Description"
	A/F SENSOR1 (B1) P014C/P014D	—	—
EVAPORATIVE SYSTEM	PURG VOL CN/V P1444	P0443	EC-377, "DTC Description"
	PURG FLOW P0441	P0441	EC-372, "DTC Description"
HO2S2	HO2S2 (B1) P1146	P0138	EC-279, "DTC Description"
	HO2S2 (B1) P1147	P0137	EC-273, "DTC Description"
	HO2S2 (B1) P0139	P0139	EC-287, "DTC Description"

SRT & P-DTC MODE

SRT STATUS Mode

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

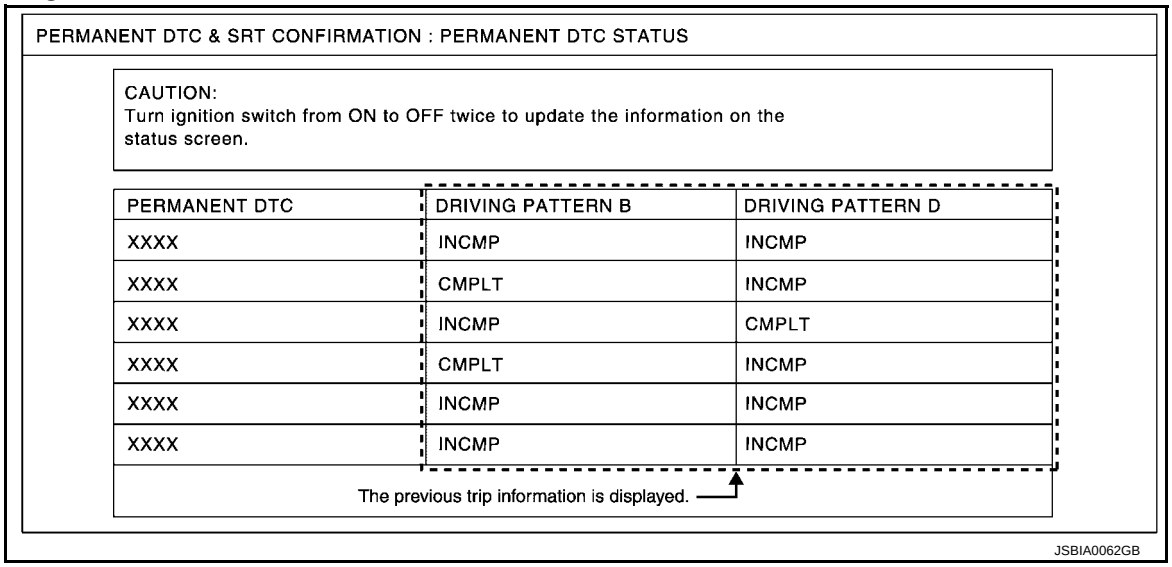
PERMANENT DTC STATUS Mode

How to Display Permanent DTC Status

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

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

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



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

SRT WORK SUPPORT Mode

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

PERMANENT DTC WORK SUPPORT Mode

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

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

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

INFOID:0000000014631156

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- Numerical values in the following table are reference values.
- These values are input/output values that ECM receives/transmits and may differ from actual operations.
  Example: The ignition timing shown by the timing light may differ from the ignition timing displayed on the data monitor.
  This occurs because the timing light shows a value calculated by ECM according to signals received from the camshaft position sensor and other sensors related to ignition timing.
- For outlines of following items, refer to EC-78, "CONSULT Function".

Monitor Item	Condition		Values/Status
COOLANT TEMP/S	Engine: After warming up		More than 70°C (158°F)
VHCL SPEED SE	Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	Ignition switch: ON (Engine stopped)		11 – 14 V
INT/A TEMP SE	Engine: After warming up		Indicates intake air temperature
PURG VOL C/V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle (Accelerator pedal: Not depressed even slightly, after engine starting)	0 %
		Engine speed: 2,000 rpm	1 – 90 %
FUEL T/TMP SE	• Ignition switch: ON		Indicates fuel tank temperature
FUEL LEVEL SE	• Ignition switch: ON		Depending on fuel level of fuel tank
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 – 4.8 V
CAL/LD VALUE	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	5 – 35 %
		Engine speed: 2,500 rpm	5 – 35 %
HO2S1 (B1)	• 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.	Revving engine from idle to 3,000 rpm quickly	0 – 0.3 V ←→ 0.6 – 1.0 V (LEAN ←→ RICH)
ENG OIL TEMP	Engine: After warming up		More than 70 °C (158°F)
A/F ALPHA-B1	See EC-176, "Description".		
INT/V SOL(B1)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0 %
		Revving engine from idle to 2,000 rpm quickly	0 – 90 %
IGN TIMING	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	5 – 15 °BTDC
		Engine speed: 2,000 rpm	30 – 50 °BTDC

Monitor Item	Condition		Values/Status
FUEL INJ TIM	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	Approx. 62 °BTDC
		Engine speed: 2,000 rpm	Approx. 62 °BTDC
A/F S1 HTR (B1)	Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 – 100%
EXH/V TIM B1	• Engine: After warming up • Selector lever: P or N • A/C switch: OFF • No load	Engine speed: Idle	–5 – 5 °CA
		Around 2,500 rpm while the engine speed is rising	0 – 30 °CA
ENG INLET COOLANT TEMP	Engine: After warming up		More than 70°C (158°F)
FUN DUTY	Ignition switch: ON		0 – 100%
ACCEL PEDAL POSI	Ignition switch: ON	Accelerator pedal: Fully released	0 %
		Accelerator pedal: Fully depressed	100 %
THRTL STK CNT B1	**NOTE:** This item is displayed but are not applicable to this model.		—
ENG SPEED	• Connect the tachometer. • Run engine and compare CONSULT value with the tachometer indication.		Almost the same speed as the tachometer indication.
TRVL AFTER MIL	Ignition switch: ON		0 – 65,535 km
B/FUEL SCHDL	See EC-176, "Description".		
MASS AIRFLOW	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	1.0 – 4.0 g/s
		Engine speed: 2,500 rpm	2.0 – 12.0 g/s
FUEL PRES SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	Approx. 2.74 MPa
		Engine speed: 2,000 rpm	Approx. 3.0 MPa
TP SEN 1-B1	• Ignition switch: ON (Engine stopped) • Selector lever: D position	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
TP SEN 2-B1*1	• Ignition switch: ON (Engine stopped) • Selector lever: D position	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
FUEL INJ B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	Approx. 0.8 msec
		Engine speed: 2,000 rpm	Approx. 1.1 msec
I/P PULLY SPD	• Connect the tachometer. • Start the engine and compare CONSULT value with the tachometer indication.	Vehicle speed: More than 20 km/h (12 MPH)	Almost the same speed as the tachometer indication
VEHICLE SPEED	Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as the speedometer indication
TUMBLE POS SEN	Ignition switch: ON		Approx. 4.3 V
	Engine: At cooling	Engine speed: Idle	Approx. 0.8 V
	Engine: After warming up	Engine speed: Idle	Approx. 4.3 V
AC PRESS SEN	• Engine speed: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 – 4.0 V

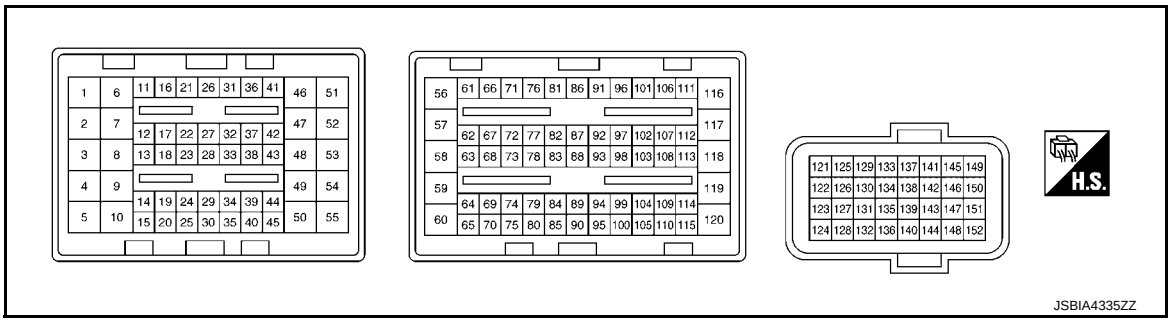
Monitor Item	Condition		Values/Status
A/F SEN1 (B1)	Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
VTC DTY EX B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	0 %
		Revving engine from idle to 2,000 rpm quickly	0 – 90 %
A/F ADJ-B1	Engine speed: Idle		–0.450 – 0.330
INT/V TIM(B1)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	30 – 40 °CA
		Engine speed: 2,000 rpm	0 – 35 °CA
H/P FUEL PUMP DEG	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	255 – 275 deg
		Engine speed: 2,000 rpm	255 – 275 deg
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V
EOP SENSOR	• Engine oil temperature: 80°C (176°F) • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	Approx. 1.450 V
		Engine speed: 2,000 rpm	Approx. 2.850 V
ECM TEMP 1	• Engine: At cooling • Ignition switch: Right after ON		Indicates the ambient temperature.
ECM TEMP 2	• Engine: At cooling • Ignition switch: Right after ON		Indicates the ambient temperature.
TARGET ENGINE TORQUE	Engine: After warming up		Depending on command value from HPCM.
MASS AIR FLOW SENSOR (Hz)	See EC-176, "Description".		
A/F-S ATMSPHRC CRCT B1	Engine: After warming up, idle the engine		Varies depending on vehicle environment.
A/F-S ATMSPHRC CRCT UP B1	Engine: Running		Varies depending on the number of updates.
EXHAUST GAS TEMP SEN 1 B1	Engine: After warming up, idle the engine		1,290 – 2,940 mV Output voltage varies with exhaust gas temperature.
TARGET ENG W/P SPEED	• Engine: After warming up • Selector lever: P or N position • Engine outlet coolant temperature: 90°C (194°F) or less • Blower fan: OFF • Cooling fan: Stopped	Engine speed: Idle	Approx. 1200 rpm
CURRENT ENG W/P SPEED	• Engine: After warming up • Selector lever: P or N position • Engine outlet coolant temperature: 90°C (194°F) or less • Blower fan: OFF • Cooling fan: Stopped	Engine speed: Idle	Approx. 1200 rpm
P314D DETECTION CAUSE	DTC P314D is not detected by HPCM.		NONE*4
P314E DETECTION CAUSE	DTC P314E is not detected by HPCM.		NONE*4
P314F DETECTION CAUSE	DTC P314F is not detected by HPCM.		NONE*4
P3151 DETECTION CAUSE	DTC P3151 is not detected by HPCM.		NONE*4

Monitor Item	Condition		Values/Status
P0510 DETECTION CAUSE	DTC P0510 is not detected by HPCM.		NONE*4
LOAD SIGNAL	Ignition switch: ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	On
		Rear window defogger switch and lighting switch: OFF	Off
AIR COND SIG	• Engine: After warming up • Idle the engine	Air conditioner switch: OFF	Off
		Air conditioner switch: ON (Compressor operates)	On
PW/ST SIGNAL	Engine: After warming up, idle the engine	Steering wheel: Not being turned	Off
		Steering wheel: Being turned	On
P/N POSI SW	Ignition switch: ON	Selector lever: P or N position	On
		Selector lever: Except above position	Off
START SIGNAL	Ignition switch: ON → START → ON		Off → On → Off
CLSD THL POS	Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	On
		Brake pedal: Slightly depressed	Off
HO2S2 MNTR (B1)	• 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.	Revving engine from idle up to 3,000 rpm quickly	LEAN ←→ RICH
IGNITION SW	Ignition switch: ON → OFF → ON		On → Off → On
HEATER FAN SW	Engine: After warming up, idle the engine	A/C fan switch: ON	On
		A/C fan switch: OFF	Off
IDL A/V LEARN	• Engine: After warming up • A/C switch: OFF • No load • Throttle valve closed position learning: Completed	Idle air volume learning has already been performed successfully.	CMPLT
		Idle air volume learning has not been performed yet.	YET
BRAKE SW	Ignition switch: ON	Brake pedal: Fully released OFF	OFF
		Brake pedal: depressed	On
COMBUSTION	**NOTE:** This item is displayed but are not applicable to this model.		—
SWRL CONT S/V*2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	On
		Engine speed: 4,000 rpm	Off
FUEL PUMP RLY	• For 1 seconds after turning ignition switch ON • Engine is running or cranking		On
	Except above		Off
VENT CONT/V	Ignition switch: ON		Off
THRTL RELAY	Ignition switch: ON		On
HO2S1 HTR (B1)	• Engine speed is less than 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
	Engine speed: More than 3,600 rpm		Off

Monitor Item	Condition		Values/Status
ENG START RQST	Engine: After warming up	HPCM: Engine start request	YES
		Other than the above	NO
IDLE REQUEST	Engine: After warming up	HPCM: Idle request	YES
		Other than the above	NO
ENG F/C RQST	Engine: After warming up	HPCM: Fuel cut request	YES
		Other than the above	NO
MIL ON REQUEST	Ignition switch: ON	HPCM: MIL ON request	YES
		Other than the above	NO
ENGINE NO-LOAD	Engine: After warming up	Clutch 1: Disengage	YES
		Clutch 1: Engage	NO
READY STATE	Ignition switch: ON	HPCM: READY state	YES
		Other than the above	NO
ENGINE NO-LOAD REQUEST 2	When performing idle air volume learning (Without CONSULT)		YES
	Other than the above		NO
ENGINE NO-LOAD REQUEST 1	When performing idle air volume learning (With CONSULT)		YES
	Other than the above		NO
IDLE STOP INHIBIT REQUEST	• Engine speed: Above 1,200 rpm • Accelerator pedal: Fully released		NO
	Other than the above		YES
HO2 S2 DIAG1 (B1)	DTC P0139 self-diagnosis (delayed response) is incomplete.		INCMP
	DTC P0139 self-diagnosis (delayed response) is complete.		CMPLT
HO2 S2 DIAG2 (B1)	DTC P0139 self-diagnosis (slow response) is incomplete.		INCMP
	DTC P0139 self-diagnosis (slow response) is complete.		CMPLT
EVAP LEAK DIAG	Ignition switch: ON		Depending on condition of EVAP leak diagnosis
EVAP DIAG READY	Ignition switch: ON		Depending on ready condition of EVAP leak diagnosis
SYSTEM 1 DIAGNOSIS A B1	DTC P219A self-diagnosis is incomplete.		INCMP
	DTC P219A self-diagnosis is complete.		CMPLT
A/F SEN1 DIAG1(B1)	DTC P015A and P015B self-diagnosis incomplete.		INCMP
	DTC P015A and P015B self-diagnosis is complete.		CMPLT
A/F SEN1 DIAG2 (B1)	DTC P014C and P014D self-diagnosis incomplete.		INCMP
	DTC P014C and P014D self-diagnosis is complete.		CMPLT
SYSTEM 1 DIAGNOSIS B B1	DTC P219A self-diagnosis is on standby.		ABSENT
	DTC P219A self-diagnosis is under diagnosis.		PRSENT
A/F SEN1 DIAG3 (B1)	The vehicle condition is not within the diagnosis range of DTC P014C or P014D.		ABSNT
	The vehicle condition is within the diagnosis range of DTC P014C or P014D.		PRSNT

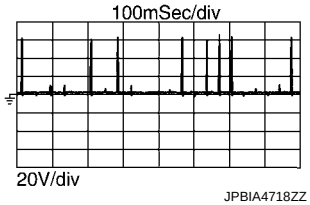
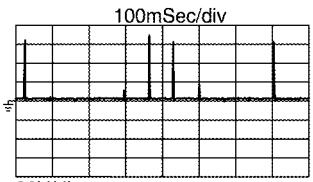
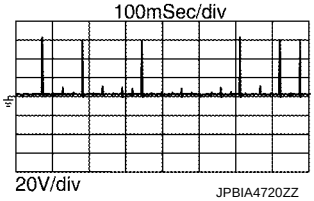
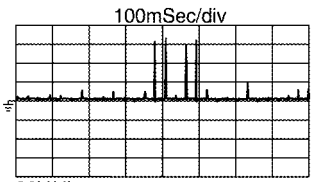
*1: Throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.
*2: Indicates the intake manifold runner control valve.
*3: Varies with the atmospheric pressure changed by whether or elevation as this is an absolute pressure sensor.
*4: If DTC is displayed and no DTC is detected by HPCM, this is not a malfunction. In this case, erase Self diagnostic result of ECM to clear the displayed DTC.

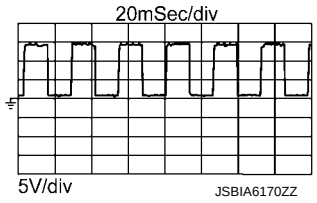
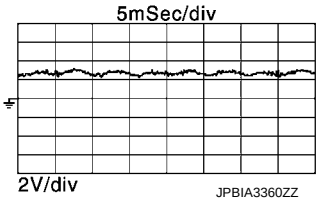
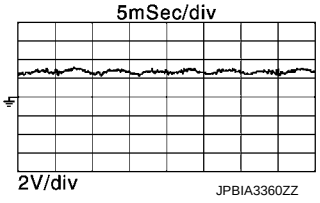
TERMINAL LAYOUT

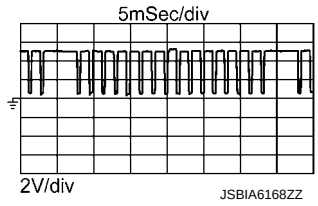
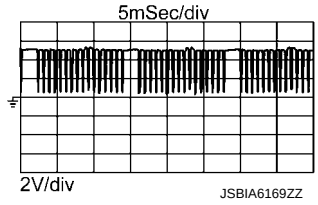


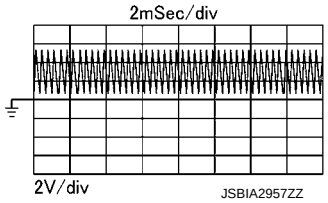
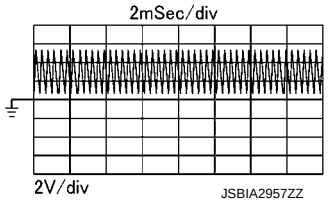
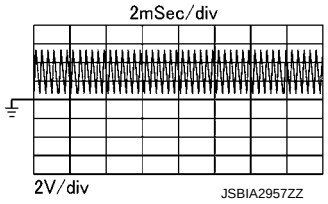
PHYSICAL VALUES

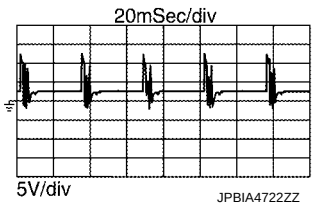
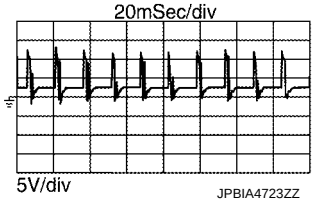
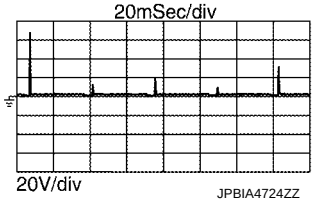
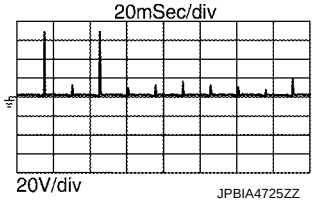
NOTE:
- ECM is located in the engine room left side near battery.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

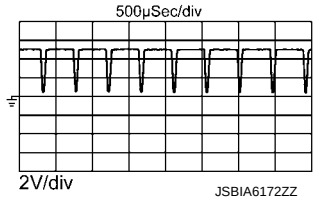
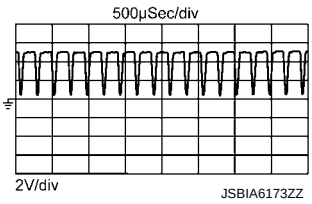
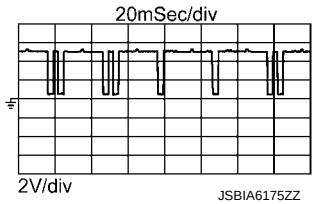
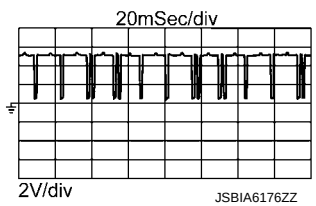
Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (G)	9 (GR)	Fuel injector No. 1, No. 4 (HI)	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	2.7 V ★ 100mSec/div  20V/div JPBIA4718ZZ
7 (W)		Fuel injector No. 2, No. 3 (HI)		[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	2.7 V ★ 100mSec/div  20V/div JPBIA4719ZZ
2 (B)	9 (GR)	Fuel injector No. 2 (LO)	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	2.7 V ★ 100mSec/div  20V/div JPBIA4720ZZ
3 (L)		Fuel injector No. 3 (LO)			
6 (P)		Fuel injector No. 4 (LO)		[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	2.7 V ★ 100mSec/div  20V/div JPBIA4721ZZ
8 (R)		Fuel injector No. 1 (LO)			
4 (P)	9 (GR)	Fuel injector driver power 1	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	Battery voltage (11 – 14 V)

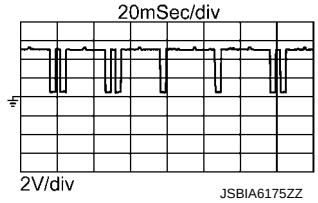
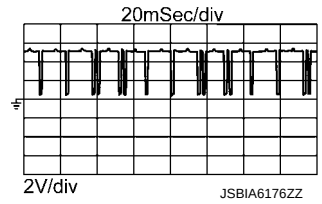
Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
5 (L)	9 (GR)	Fuel injector driver power 2	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	Battery voltage (11 – 14 V)
9 (GR)	—	ECM ground (Fuel injector)	—	—	—
10 (B)	—	ECM ground (Fuel injector)	—	—	—
12 (W)	13 (B)	Refrigerant pressure sensor	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle • A/C switch: ON (Compressor operates)	1.0 – 4.0 V
13 (B)	—	Sensor ground (Fuel rail pressure sensor, Refrigerant pressure sensor, Engine oil pressure sensor)	—	—	—
14 (GR)	—	Shield	—	—	—
15 (W)	20 (—)	Knock sensor	Input	[Engine is running] • Engine speed: Idle	2.5 V
19 (R)	45 (B)	Exhaust gas temperature sensor	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	1.29 – 2.94 V Output voltage varies with exhaust gas temperature.
20 (—)	—	Sensor ground (Knock sensor)	—	—	—
21 (SB)	152 (GR)	Engine cooling electric water pump speed signal	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle • Cooling fan: Stopped	7.5 V ★ 
22 (P)	45 (B)	Engine oil temperature sensor	Input	[Engine is running]	0 – 4.8 V Output voltage varies with engine oil temperature.
23 (G)	13 (B)	Engine oil pressure sensor	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	1.4 V ★ 
				[Engine is running] • Engine speed: 2,000 rpm	1.9 V ★ 

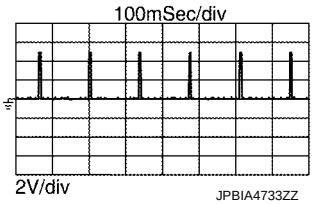
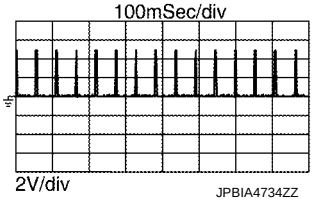
Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
25 (G)	13 (B)	Fuel rail pressure sensor	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
				[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm	0.82 – 2.9 V
26 (B)	42 (R)	Sensor power supply (Mass air flow sensor)	Output	[Ignition switch: ON]	5 V
27 (W)	44 (BR)	Sensor power supply (Crankshaft position sensor 1)	Output	[Ignition switch: ON]	5 V
29 (Y)	13 (B)	Sensor power supply (Fuel rail pressure sensor, Refrigerant pressure sensor, Engine oil pressure sensor)	Output	[Ignition switch: ON]	5 V
30 (W)	43 (BR)	Sensor power supply* (Intake manifold runner control valve position sensor)	Output	[Ignition switch: ON]	5 V
33 (R)	44 (BR)	Crankshaft position sensor 1	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	
35 (BR)	45 (B)	Engine outlet coolant temperature sensor	Input	[Engine is running]	0 – 4.8 V Output voltage varies with engine coolant temperature.
36 (GR)	42 (R)	Intake air temperature sensor	Input	[Engine is running]	0 – 4.8 V Output voltage varies with intake air temperature.

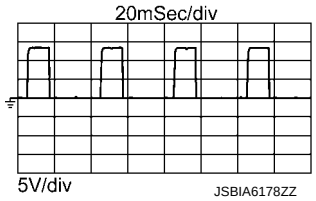
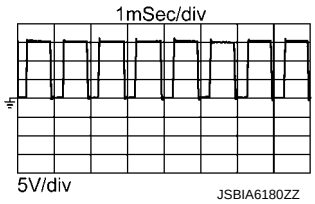
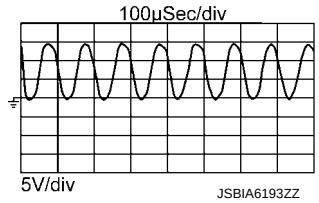
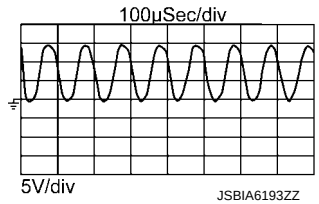
Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
37 (L)	42 (R)	Mass air flow sensor	Input	[Ignition switch: ON] • Engine stopped	3,700 Hz 
				[Engine is running] • Engine warm-up condition • Engine speed: Idle	5,500 Hz 
				[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm	5,500 Hz → 7,000 Hz 
39 (R)	43 (BR)	Intake manifold runner control valve position sensor	Input	[Ignition switch ON]	1 V
				[Engine is running] • Engine cold condition • Engine speed: Idle	0.2 – 1.8 V
				[Engine is running] • Engine warm-up condition • Engine speed: Idle	3.2 – 4.8 V
42 (R)	—	Sensor ground (Mass air flow sensor, Intake air temperature sensor)	—	—	—
43 (BR)	—	Sensor ground* (Intake manifold runner control valve position sensor)	—	—	—
44 (BR)	—	Sensor ground (Crankshaft position sensor 1)	—	—	—
45 (B)	—	Sensor ground (Engine outlet coolant temperature sensor, Engine oil temperature sensor, Exhaust gas temperature sensor)	—	—	—
47 (V)	50 (B)	High pressure fuel pump power supply	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	Battery voltage (11 – 14 V)

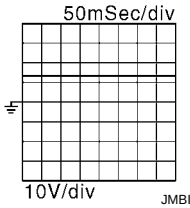
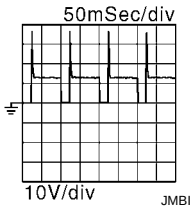
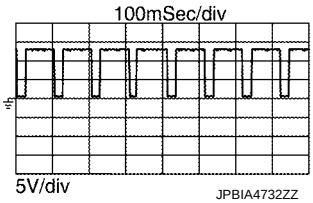
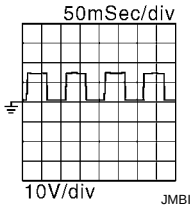
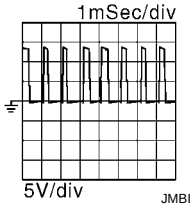
Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
48 (V)	50 (B)	High pressure fuel pump (HI)	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	3.0 V ★ 
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	3.4 V ★ 
49 (LG)	50 (B)	High pressure fuel pump (LO)	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	2.6 V ★ 
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	2.9 V ★ 
50 (B)	—	ECM ground (High pressure fuel pump)	—	—	—
53 (Y)	152 (GR)	Intake manifold runner control valve motor power supply	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle	Battery voltage (11 – 14 V)
54 (G)	152 (GR)	Intake manifold runner control valve motor (CLOSE)	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0 V
				[Engine is running] • Engine warm-up condition • No load • When the engine speed is decreased from 3,000 rpm to idle speed (Accelerator pedal is released)	Generates a voltage for a moment (11 – 14 V)

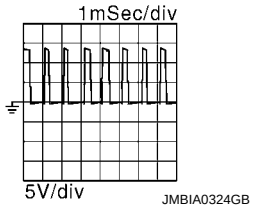
Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
55 (Y)	152 (GR)	Intake manifold runner control valve motor (OPEN)	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0 V
				[Engine is running] • Engine warm-up condition • No load • Revving engine from idle to 3,000 rpm	Generates a voltage for a moment (11 – 14 V)
60 (B)	—	ECM ground	—	—	—
62 (BR)	71 (R)	Crankshaft position sensor 2	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	
63 (W)	—	Sensor ground (Exhaust valve timing control position sensor)	—	—	—
64 (—)	—	Shield	—	—	—
66 (L)	71 (R)	Sensor power supply (Camshaft position sensor, Crankshaft position sensor 2)	Output	[Ignition switch: ON]	5 V
67 (B)	71 (R)	Camshaft position sensor	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	

Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
69 (BR)	63 (W)	Exhaust valve timing position sensor	Input	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	
71 (R)	—	Sensor ground (Camshaft position sensor, Crankshaft position sensor 2)	—	—	—
72 (B)	—	Sensor ground (Engine inlet coolant temperature sensor)	—	—	—
73 (R)	63 (W)	Sensor power supply (Exhaust valve timing position sensor)	Output	[Ignition switch: ON]	5 V
74 (W)	152 (GR)	Air fuel ratio (A/F) sensor 1	Input	[Ignition switch: ON]	2.2 V
77 (BR)	72 (B)	Engine inlet coolant temperature sensor	Input	[Engine is running]	0 – 4.8 V Output voltage varies with engine coolant temperature.
78 (B)	—	Sensor ground (Heated oxygen sensor 2)	—	—	—
79 (B)	152 (GR)	Air fuel ratio (A/F) sensor 1	Input	[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	2.2 V
80 (W)	85 (B)	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D position • Accelerator pedal: Fully released	4.75 V or less
				[Ignition switch: ON] • Engine stopped • Selector lever: D position • Accelerator pedal: Fully depressed	0.36 V or more
81 (P)	152 (GR)	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: ON]	0 – 1.0 V
				[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	Battery voltage (11 – 14 V)

Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
82 (P)	152 (GR)	Fuel pump relay	Output	[Ignition switch: ON] • More that 1 second after turning ignition switch ON [Engine is running]	0 – 1.0 V
				[Ignition switch: ON] • 1 second after turning ignition switch ON	Battery voltage (11 – 14 V)
83 (R)	85 (B)	Sensor power supply (Throttle position sensor 1, 2)	Output	[Ignition switch: ON]	5 V
84 (L)	78 (B)	Heated oxygen sensor 2	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine warm-up condition - Keeping the engine speed at 3,000 rpm for 1 minute and at idle for 1 minute under no load	0 – 1.0 V
85 (B)	—	Sensor ground (Throttle position sensor 1, 2)	—	—	—
86 (B)	—	LIN (Engine communication line)	Input/ Output	—	—
88 (G)	85 (B)	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D position • Accelerator pedal: Fully released	0.36 V or more
				[Ignition switch: ON] • Engine stopped • Selector lever: D position • Accelerator pedal: Fully depressed	4.75 V or less
94 (GR)	152 (GR)	Engine cooling electric water pump relay	Output	[Ignition switch: OFF]	Battery voltage (11 – 14 V)
				[Ignition switch: ON]	0 – 1.0 V
95 (LG)	152 (GR)	Ignition signal No. 2	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle **NOTE:** The pulse cycle changes depending on rpm at idle.	0 – 0.3 V ★ 
96 (P)		Ignition signal No. 1			
101 (SB)		Ignition signal No. 4		[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	0.2 – 0.5 V ★ 
104 (Y)		Ignition signal No. 3			

Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
97 (V)	152 (GR)	Throttle motor relay	Output	[Ignition switch: OFF]	Battery voltage (11 – 14 V)
				[Ignition switch: ON]	0 – 1.0 V
109 (Y)	152 (GR)	Engine cooling electric water pump drive signal	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle • Cooling fan: Stopped	3.8 V ★ 
110 (B)	—	ECM ground	—	—	—
111 (G)	152 (GR)	Intake valve timing control solenoid valve	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle	Battery voltage (11 – 14 V)
				[Engine is running] • Engine warm-up condition • Revving engine from idle to 2,000 rpm quickly	
112 (GR)	152 (GR)	Exhaust valve timing control solenoid valve	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle	
				[Engine is running] • Engine warm-up condition • Engine speed: 2,000 rpm	
113 (R)	152 (GR)	ECM power supply	Input	[Ignition switch: ON]	Battery voltage (11 – 14 V)
114 (P)	152 (GR)	Intake valve timing intermediate lock control solenoid valve	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle	Battery voltage (11 – 14 V)
				[Engine is running] • Engine coolant temperature: 60°C (140°F) or less • Engine speed: Idle	Battery voltage (11 – 14 V)

Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
115 (L)	152 (GR)	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Engine speed: Idle • Accelerator pedal: Not depressed even slightly, after engine starting	Battery voltage (11 – 14 V) ★  JMBIA0327GB
				[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.)	10 V ★  JMBIA0328GB
116 (Y)	152 (GR)	Air fuel ratio (A/F) sensor 1 heater	Output	[Engine is running] • Engine warm-up condition • Engine speed: Idle (More than 140 seconds after starting engine)	2.9 – 11.3 V ★  JPBIA4732ZZ
117 (G)	152 (GR)	Heated oxygen sensor 2 heater	Output	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine warm-up condition - Keeping the engine speed at 3,000 rpm for 1 minute and at idle for 1 minute under no load	10 V ★  JMBIA0325GB
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: 3,600 rpm or more	Battery voltage (11 – 14 V)
118 (W)	152 (GR)	Throttle motor power supply	Input	[Ignition switch: ON]	Battery voltage (11 – 14 V)
119 (P)	152 (GR)	Throttle motor (OPEN)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D position • Accelerator pedal: Fully depressed	1.8 V ★  JMBIA0324GB

Terminal (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
120 (L)	152 (GR)	Throttle motor (CLOSE)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D position • Accelerator pedal: Fully released	0.7 V ★ 
121 (L)	148 (B)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	0.5 – 4.6 V
123 (P)	—	CAN-L	Input/ Output	—	—
124 (L)	—	CAN-H	Input/ Output	—	—
125 (BR)	148 (B)	Sensor power supply (EVAP control system pressure sensor)	Output	[Ignition switch: ON]	5 V
128 (BG)	148 (B)	Fuel tank temperature sensor	Input	[Engine is running]	0 – 4.8 V Output voltage varies with fuel temperature.
133 (LG)	152 (GR)	Ignition switch ON signal	Input	[Ignition switch: OFF]	0 V
				[Ignition switch: ON]	Battery voltage (11 – 14 V)
137 (G)	—	HEV system CAN-L	Input/ Output	—	—
138 (L)	—	HEV system CAN-H	Input/ Output	—	—
139 (Y)	152 (GR)	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	0 V
				[Ignition switch: OFF] • Brake pedal: Slightly depressed	Battery voltage (11 – 14 V)
140 (GR)	152 (GR)	Brake pedal position switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	Battery voltage (11 – 14 V)
				[Ignition switch: OFF] • Brake pedal: Slightly depressed	0 V
141 (R)	152 (GR)	EVAP canister vent control valve	Output	[Ignition switch: ON]	Battery voltage (11 – 14 V)
145 (G)	152 (GR)	ECM power supply	Input	[Ignition switch: ON]	Battery voltage (11 – 14 V)
147 (GR)	—	ECM ground	—	—	—
148 (B)	—	Sensor ground (EVAP control system pressure sensor, Fuel tank temperature sensor)	—	—	—
149 (GR)	—	ECM ground	—	—	—
152 (GR)	—	ECM ground	—	—	—

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

Fail-safe

INFOID:0000000014631157

ENGINE CONTROL SYSTEM

Description

When a DTC is detected, ECM executes a mode (in the Fail-safe mode) applicable to the DTC. The fail-safe mode has the preset traveling control mode (accelerator angle variation and engine output limit), device fix mode and combustion control mode.

Fail safe mode		Vehicle behavior	Fail safe pattern
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.	A
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.	B
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).	C
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).	D
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.	E
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.	
	Ignition timing correction control	Partially controls ignition timing control.	F
	Retardation control	Controls ignition timing delay control in the intermediate water temperature range.	

Fail Safe List

×:Applicable —: Not applicable

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
U0101	CAN communication line	—	—	—	—	—	—	ECM operates active grille shutter to fully-open position.
U0284	Active grille shutter	—	—	—	—	—	—	ECM operates active grille shutter to fully-open position.
U1040 U1044	Engine communication	—	—	—	—	—	—	ECM operates active grille shutter to fully-open position.
P0011	Intake valve timing control	—	—	×	—	—	—	ECM activates the IVT intermediate lock control solenoid valve to bring the cam sprocket into an intermediate lock condition.
P0014	Exhaust valve timing control	—	—	×	—	—	—	—
P0075	Intake valve timing control solenoid valve	—	—	×	—	—	—	—

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
P0078	Exhaust valve timing control solenoid valve	—	—	×	—	—	—	—
P0087 P0088	FRP control system	×	—	—	×	—	—	—
		×	—	×	×	—	—	
P0090		×	—	×	×	—	—	—
P0101	Mass air flow sensor circuit	×	—	—	×	—	—	—
		×	×	×	×	×	×	
P0102 P0103		×	×	×	×	×	×	—
P0117 P0118	Engine coolant temperature sensor circuit	—	—	—	×	×	—	Engine speed will not rise more than 1,800 rpm due to the fuel cut.
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	—	—	×	—	—	—	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor. **NOTE:** If throttle position sensor 1 and 2 malfunction at the same time conducts following control. • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P0171 P0172	Fuel injection system	×	—	—	×	×	—	—
P0190	FRP sensor	×	—	×	×	×	—	—
P0191 P0192 P0193 P119A P119B P119C		×	—	—	×	—	—	—
P0196 P0197 P0198	Engine oil temperature sensor	—	—	—	—	—	—	Intake and exhaust valve timing control does not function.
P0201 P0202 P0203 P0204	Injector	×	—	—	×	—	—	—
P0300 P0301 P0302 P0303 P0304	Misfire	×	—	—	×	×	—	—
P0335	Crankshaft position sensor	—	—	×	—	—	—	—
P0340	Camshaft position sensor	—	—	×	—	—	—	—
P0365	Exhaust valve timing control position sensor	—	—	×	—	—	—	—
P0500	Vehicle speed sensor	×	—	—	×	×	—	—

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
P0524	Engine oil pressure	—	—	—	—	—	—	• ECM illuminates engine oil pressure warning lamp on the combination meter. • Engine speed will not rise more than 4,000 rpm due to the fuel cut. • Fail-safe is canceled when ignition switch OFF → ON.
P052A P052B	Intake valve timing intermediate lock control	—	—	×	—	—	—	—
P0603 P0607	ECM	×*1	×*1	—	—	—	—	—
P0604 P060B		—	—	×	—	—	—	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P0605		—	—	×*1	—	—	—	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.*1
P0606		—	—	×*1	—	—	—	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.*1
P060A		—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
		×	×	×	—	—	—	
P062B		×*1	—	—	×*1	—	—	**NOTE:** Fail-safe mode may not start depending on malfunction type of ECM.
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.
P1197	Out of gas	—	—	×	—	—	—	Engine torque is limited.
P1217	Engine over temperature	—	—	—	—	—	—	Engine speed will not rise more than 1,800 rpm due to the fuel cut.
P161B P162B P162C P261B P261C P261D	Engine cooing electric water pump	×*2	×*2	—	—	—	—	ECM controls engine cooling electric water pump to achieve its maximum driving force. **NOTE:** Engine cooling electric water pump may not be activated.
P1805	Brake switch	—	—	—	—	—	—	ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.

Vehicle condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC No.	Detected items	Vehicle behavior						
		Pattern						Others
		A	B	C	D	E	F	
P2004	Intake manifold runner control valve	×	×	×	×	—	—	—
P2014 P2016 P2017 P2018	Intake manifold runner control valve position sensor	—	—	×	—	—	—	—
P2100 P2103	Throttle control motor relay	—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2101	Electric throttle control function	—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2118	Throttle control motor	—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2119	Electric throttle control actuator	×	×	—	—	—	—	—
		—	—	×	—	—	—	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. **NOTE:** For pattern A and B, refer to A and B of P2119 DTC detection logic. (Refer to EC-521, "DTC Description".) For C of P2119 DTC detection logic ECM behaves as above.

*1: This mode may not be executed.
*2: This mode is executed when engine outlet water temperature, engine inlet water temperature, or CVT fluid temperature rises.

HYBRID CONTROL SYSTEM

ECM transmits a self-diagnosis signal (each fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.
NOTE:
Refer to HBC-67, "Fail-safe", about fail safe mode of HYBRID CONTROL SYSTEM for detail.

DTC No.	Description	Fail-safe mode
U0293, P0606, P2119, P31A5	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	Motor driving
P0122, P0123, P0222, P0223, P0604, P0605, P0606, P060A, P060B, P0643, P2100, P2101, P2103, P2118, P2119, P2135	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Deactivates electric throttle control actuator control • Limiting output control • Limiting accelerator angle variation control • Idling stop is prohibited.
P0087, P0088, P0101, P0171, P0172, P0191, P0192, P0193, P0300, P0301, P0302, P0303, P0304, P0500	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting accelerator angle variation control • Idling stop is prohibited.
P0117, P0118, P0524, P1217	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting engine speed • Limiting accelerator angle variation control • Idling stop is prohibited.

DTC No.	Description	Fail-safe mode
P0090, P0335, P0340, P0365	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting output control • Limiting engine speed • Limiting accelerator angle variation control • Idling stop is prohibited.
P0011, P0014, P0031, P0032, P0075, P0078, P0087, P0088, P0090, P0101, P0102, P0103, P0112, P0113, P0127, P014C, P014D, P015A, P015B, P0190, P0197, P0198, P0201, P0202, P0203, P0204, P0335, P0340, P0365, P052A, P052B, P0603, P062B, P0607, P1197, P2004, P2119	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting output control • Limiting accelerator angle variation control • Idling stop is prohibited.
P0125, P0441, P0443, P0444, P0447, P0448	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	Idling stop is prohibited.
P0030, P0111, P0196, P0605, P0606, P161B, P2014, P2016, P2017, P2018, P2081, P2184, P2185, P261B, P261C, P261D	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	• Limiting output control • Limiting accelerator angle variation control
P119A, P119B, P119C	ECM transmits a self-diagnosis signal (fail safe mode request) to HPCM via CAN communication, when applicable DTC are detected.	Limiting accelerator angle variation control

DTC Inspection Priority Chart

INFOID:0000000014631158

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

Priority	DTC	Detected items
1	U0101, U0293, U1000, P31A5	CAN communication line
	U0284	Active grille shutter
	U1040, U1044	Engine communication line
	P0101, P0102, P0103	Mass air flow sensor
	P0111, P0112, P0113, P0127	Intake air temperature sensor
	P0116, P0117, P0118, P0125	Engine coolant temperature sensor
	P0122, P0123, P0222, P0223, P1225, P1226, P2135	Throttle position sensor
	P0181, P0182, P0183	Fuel tank temperature sensor
	P0190, P0191, P0192, P0193, P119A, P119B, P119C	Fuel rail pressure sensor
	P0196, P0197, P0198	Engine oil temperature sensor
	P0327, P0328	Knock sensor
	P0335	Crankshaft position sensor 1
	P0340	Camshaft position sensor
	P0365	Exhaust valve timing position sensor
	P0385, P0386	Crankshaft position sensor 2
	P0460, P0461, P0462, P0463	Fuel level sensor
	P0500	Vehicle speed sensor
	P0520	Engine oil pressure sensor
	P0544, P0545, P0546, P2080, P2081	Exhaust gas temperature sensor
	P0603, P0604, P0605, P606, P0607, P060A, P060B, P0611, P062B, P062F, P2610	ECM
	P0643	Sensor power supply
	P1197	Out of gas*
	P2014, P2016, P2017, P2018	Intake manifold runner control valve position sensor
	P2183, P2184, P2185	Engine inlet coolant temperature sensor

Priority	DTC	Detected items
2	P0030, P0031, P0032	Air fuel ratio (A/F) sensor 1 heater
	P0037, P0038	Heated oxygen sensor 2 heater
	P0075	Intake valve timing control solenoid valve
	P0078	Exhaust valve timing control solenoid valve
	P0090	High pressure fuel pump
	P0130, P0131, P0132, P014C, P014D, P015A, P015B, P2096, P2097	Air fuel ratio (A/F) sensor 1
	P0137, P0138, P0139	Heated oxygen sensor 2
	P0201, P0202, P0203, P0204	Fuel injector
	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
	P059F, P159F	Active grille shutter
	P1217	Engine over temperature (OVERHEAT)
	P161B, P261C	Engine cooling electric water pump
	P1805	Brake switch
	P2004	Intake manifold runner control valve position sensor
	P2100, P2103	Throttle control motor relay
	P2118	Throttle control motor
3	P0011, P052A, P052B	Intake valve timing control
	P0014	Exhaust valve timing control
	P0087, P0088	Fuel pressure control
	P0128	Thermostat function
	P0171, P0172	Fuel injection system function
	P0300, P0301, P0302, P0303, P0304	Misfire
	P0420	Three way catalyst function
	P0456	EVAP control system
	P0506, P0507	Idle speed control
	P050A, P050B, P050E, P1423, P1424	Cold start control
	P0524	Engine oil pressure
	P1148	Closed loop control
	P162B, P162C, P261B, P261D	Engine cooling electric water pump function
	P2101, P2119	Electric throttle control function
	P219A	Air fuel ratio imbalance
	P261B, P261D	Engine cooling electric water pump function

*: If “P1197”is displayed with other DTC in priority 1, perform trouble diagnosis for “P1197” first.

DTC Index

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×:Applicable —: Not applicable

DTC[*1] CONSULT GST[*2]	Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*3]	Reference page
U0101	LOST COMM (TCM)	—	1	×	B	EC-188
U0284	LOST COMM (A/GRLL SHTTR MDL A)	—	2	×	B	EC-189

DTC[*1] CONSULT GST[*2]	Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*3]	Reference page
U0293	LOST COMM (HV ECU)	—	1	×	B	EC-192
U1000	CAN COMM CIRCUIT	—	2	—	—	EC-194
U1040	ENG COMM CIRCUIT	—	2	—	—	EC-195
U1044	ENG COMM CIRCUIT	—	2	—	—	EC-196
P0000	NO DTC IS DETECTED.	—	—	Blinking[*4]	—	—
P0011	INT/V TIM CONT-B1	×	2	×	B	EC-198
P0014	EXH/V TIM CONT-B1	—	2	×	B	EC-202
P0030	HO2S1 HTR B1	—	2	×	B	EC-206
P0031	A/F SEN1 HTR (B1)	—	2	×	B	EC-206
P0032	A/F SEN1 HTR (B1)	—	2	×	B	EC-206
P0037	HO2S2 HTR (B1)	—	2	×	B	EC-209
P0038	HO2S2 HTR (B1)	—	2	×	B	EC-209
P0075	INT/V TIM V/CIR-B1	—	2	×	B	EC-212
P0078	EX V/T ACT/CIRC-B1	—	2	×	B	EC-215
P0087	LOW FUEL PRES	—	2	×	B	EC-218
P0088	HIGH FUEL PRES	—	2	×	B	EC-223
P0090	FUEL PRESSURE CONTROL FUNCTION	—	2	×	B	EC-226
P0101	MAF SEN/CIRCUIT-B1	—	2	×	B	EC-229
P0102	MAF SEN/CIRCUIT-B1	—	1	×	B	EC-236
P0103	MAF SEN/CIRCUIT-B1	—	1	×	B	EC-236
P0111	IAT SENSOR 1 B1	—	2	×	A	EC-243
P0112	IAT SEN/CIRCUIT-B1	—	2	×	B	EC-245
P0113	IAT SEN/CIRCUIT-B1	—	2	×	B	EC-245
P0116	ECT SEN/CIRC	—	2	×	A	EC-248
P0117	ECT SEN/CIRC	—	1	×	B	EC-250
P0118	ECT SEN/CIRC	—	1	×	B	EC-250
P0122	TP SEN 2/CIRC-B1	—	1	×	B	EC-253
P0123	TP SEN 2/CIRC-B1	—	1	×	B	EC-253
P0125	ECT SENSOR	—	2	×	B	EC-257
P0127	IAT SENSOR-B1	—	2	×	B	EC-259
P0128	THERMSTAT FNCTN	—	2	×	A	EC-261
P0130	A/F SENSOR1 (B1)	—	2	×	A	EC-264
P0131	A/F SENSOR1 (B1)	—	2	×	B	EC-267
P0132	A/F SENSOR1 (B1)	—	2	×	B	EC-270
P0137	HO2S2 (B1)	×	2	×	A	EC-273
P0138	HO2S2 (B1)	×	2	×	A	EC-279
P0139	HO2S2 (B1)	×	2	×	A	EC-287
P014C	A/F SENSOR1 (B1)	×	2	×	A	EC-293
P014D	A/F SENSOR1 (B1)	×	2	×	A	EC-293
P015A	A/F SENSOR1 (B1)	×	2	×	A	EC-293
P015B	A/F SENSOR1 (B1)	×	2	×	A	EC-293
P0171	FUEL SYS-LEAN-B1	—	2	×	B	EC-299

DTC[*1] CONSULT GST[*2]	Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*3]	Reference page
P0172	FUEL SYS-RICH-B1	—	2	×	B	EC-304
P0181	FTT SENSOR	—	2	×	A or B	EC-308
P0182	FTT SEN/CIRCUIT	—	2	×	B	EC-312
P0183	FTT SEN/CIRCUIT	—	2	×	B	EC-312
P0190	FUEL PRES SEN/CIRC	—	1	×	B	EC-314
P0191	FRP SENSOR A	—	2	×	B	EC-319
P0192	FRP SEN/CIRC	—	2	×	B	EC-314
P0193	FRP SEN/CIRC	—	2	×	B	EC-314
P0196	EOT SENSOR	—	2	—	A or B	EC-323
P0197	EOT SEN/CIRC	—	2	×	B	EC-327
P0198	EOT SEN/CIRC	—	2	×	B	EC-327
P0201	INJECTOR CIRC-CYL1	—	2	×	B	EC-330
P0202	INJECTOR CIRC-CYL2	—	2	×	B	EC-330
P0203	INJECTOR CIRC-CYL3	—	2	×	B	EC-330
P0204	INJECTOR CIRC-CYL4	—	2	×	B	EC-330
P0222	TP SEN 1/CIRC-B1	—	1	×	B	EC-332
P0223	TP SEN 1/CIRC-B1	—	1	×	B	EC-332
P0300	MULTI CYL MISFIRE	—	1 or 2	× or flashing	B	EC-336
P0301	CYL 1 MISFIRE	—	1 or 2	× or flashing	B	EC-336
P0302	CYL 2 MISFIRE	—	1 or 2	× or flashing	B	EC-336
P0303	CYL 3 MISFIRE	—	1 or 2	× or flashing	B	EC-336
P0304	CYL 4 MISFIRE	—	1 or 2	× or flashing	B	EC-336
P0327	KNOCK SEN/CIRC-B1	—	2	—	—	EC-343
P0328	KNOCK SEN/CIRC-B1	—	2	—	—	EC-343
P0335	CKP SEN/CIRCUIT	—	2	×	B	EC-345
P0340	CMP SEN/CIRC-B1	—	2	×	B	EC-350
P0365	CMP SEN/CIRC-B1	—	2	×	B	EC-354
P0385	CKP SENSOR B	—	2	—	B	EC-359
P0386	CKP SENSOR B	—	2	—	B	EC-363
P0420	TW CATALYST SYS-B1	×	2	×	A	EC-367
P0441	EVAP PURG FLOW/MON	×	2	×	A	EC-372
P0443	PURG VOLUME CONT/V	—	2	×	A	EC-377
P0444	PURG VOLUME CONT/V	—	2	×	B	EC-382
P0445	PURG VOLUME CONT/V	—	2	×	B	EC-382
P0447	VENT CONTROL VALVE	—	2	×	B	EC-385
P0448	VENT CONTROL VALVE	—	2	×	A	EC-389
P0451	EVAP SYS PRES SEN	—	2	×	A	EC-393
P0452	EVAP SYS PRES SEN	—	2	×	B	EC-397
P0453	EVAP SYS PRES SEN	—	2	×	B	EC-400
P0456	EVAP VERY SML LEAK	×[*5]	2	×	A	EC-404
P0460	FUEL LEV SEN SLOSH	—	2	×	B	EC-410
P0461	FUEL LEVEL SENSOR	—	2	×	A	EC-412

DTC[*1] CONSULT GST[*2]	Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*3]	Reference page
P0462	FUEL LEVL SEN/CIRC	—	2	×	B	EC-414
P0463	FUEL LEVL SEN/CIRC	—	2	×	B	EC-414
P0500	VEHICLE SPEED SENSOR A[*6]	—	2	×	B	EC-416
P0506	ISC SYSTEM	—	2	×	B	EC-419
P0507	ISC SYSTEM	—	2	×	B	EC-421
P050A	COLD START CONTROL	—	2	×	A	EC-423
P050B	COLD START CONTROL	—	2	×	A	EC-423
P050E	COLD START CONTROL	—	2	×	A	EC-423
P0520	EOP SENSOR/SWITCH	—	2	—	—	EC-425
P0524	ENGINE OIL PRESSURE	—	1	—	—	EC-429
P052A	CAMSHAFT POSITION TIMING B1	—	2	×	B	EC-432
P052B	CAMSHAFT POSITION TIMING B1	—	2	×	B	EC-432
P0544	EXHAUST GAS TEMP SENSOR 1 B1	—	2	×	B	EC-438
P0545	EXHAUST GAS TEMP SENSOR 1 B1	—	2	×	B	EC-441
P0546	EXHAUST GAS TEMP SENSOR 1 B1	—	2	×	B	EC-441
P059F	ACTIVE GRILLE AIR SHUTTER A	—	2	×	B	EC-444
P0603	ECM BACK UP/CIRCUIT	—	2	×	B	EC-448
P0604	ECM	—	1	×	B	EC-451
P0605	ECM	—	1 or 2	× or —	B	EC-453
P0606	CONTROL MODULE	—	1	×	B	EC-455
P0607	ECM	—	1 or 2	× or —	B	EC-457
P060A	CONTROL MODULE	—	1	×	B	EC-459
P060B	CONTROL MODULE	—	1	×	B	EC-461
P0611	FIC MODULE	—	2	—	B	EC-463
P062B	ECM	—	2	×	B	EC-464
P062F	CONTROL MODULE	—	1	×	B	EC-448
P0643	SENSOR POWER/CIRC	—	1	×	B	EC-466
P1148	CLOSED LOOP-B1	—	1	×	B	EC-468
P1197	FUEL RUN OUT	—	2	—	—	EC-469
P119A	FUEL PRESSURE SENSOR	—	2	×	A	EC-471
P119B	FUEL PRESSURE SENSOR	—	2	×	A	EC-471
P119C	FUEL PRESSURE SENSOR	—	2	×	B	EC-476
P1217	ENG OVER TEMP	—	1	×	B	EC-480
P1225	CTP LEARNING-B1	—	2	—	—	EC-483
P1226	CTP LEARNING-B1	—	2	—	—	EC-484
P1423	COLD START CONTROL	—	2	×	A or B	EC-485
P1424	COLD START CONTROL	—	2	×	A or B	EC-485
P1425	COLD START CONTROL	—	2	×	A	EC-487
P159F	ACTIVE GRILLE AIR SHUTTER A	—	2	—	—	EC-489
P161B	ENG COOLANT ELEC WATER PUMP	—	1	×	B	EC-491
P1805	BRAKE SW/CIRCUIT	—	2	—	—	EC-493
P2004	SWIRL CONT/V (B1)	—	2	×	B	EC-496

DTC*1 / CONSULT GST*2	Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*3	Reference page
P2014	SWIRL CONT SEN/SW	—	2	×	B	EC-500
P2016	IN/MANIFOLD RUNNER POS SEN B1	—	2	×	B	EC-500
P2017	IN/MANIFOLD RUNNER POS SEN B1	—	2	×	B	EC-500
P2018	IN/MANIFOLD RUNNER POS SEN B1	—	2	×	B	EC-500
P2080	EXHAUST GAS TEMP SENSOR 1 B1	—	2	×	B	EC-503
P2081	EXHAUST GAS TEMP SENSOR 1 B1	—	2	×	B	EC-506
P2096	POST CATALYST FUEL TRIM SYS B1	—	2	×	A	EC-509
P2097	POST CATALYST FUEL TRIM SYS B1	—	2	×	A	EC-509
P2100	ETC MOT PWR-B1	—	1	×	B	EC-513
P2101	ETC FNCTN/CIRC-B1	—	1	×	B	EC-516
P2103	ETC MOT PWR-B1	—	1	×	B	EC-513
P2118	ETC MOT-B1	—	1	×	B	EC-519
P2119	ETC ACTR-B1	—	1	×	B	EC-521
P2135	TP SENSOR-B1	—	1	×	B	EC-523
P2183	ENG COOLANT TEMP SENSOR 2	—	2	×	B	EC-526
P2184	ENG COOLANT TEMP SENSOR 2	—	2	×	B	EC-528
P2185	ENG COOLANT TEMP SENSOR 2	—	2	×	B	EC-528
P219A	AIR FUEL RATIO IMBALANCE B1	×	2	×	A	EC-531
P2610	ECM/PCM INTERNAL ENG OFF TIMER	—	2	×	B	EC-536
P261B	COOLANT PUMP B	—	1	×	B	EC-538
P261C	COOLANT PUMP B	—	1	×	B	EC-540
P261D	COOLANT PUMP B	—	1	×	B	EC-544
P31A5	COMMUNICATION ERROR	—	1	×	B	EC-546

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

*2: This number is prescribed by SAE J1979/ ISO 15031-5.

*3: Refer to EC-170, "Description".

*4: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to EC-77, "On Board Diagnosis Function".

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

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

Index of HPCM-detected DTC

INFOID:0000000014631160

When a DTC in the following table is detected by ECM, HPCM also detects a DTC.

NOTE:

- The following table includes information inapplicable to this vehicle.
- If DTC is not displayed in Self-diagnostic result of ECM, refer to EC-114, "How to Check ECM-detected DTC to HPCM-detected Engine-related DTC".

DTC	DTC of HPCM
P0122, P0123, P0222, P0223, P0604, P0605, P0606, P060A, P060B, P0643, P2100, P2101, P2103, P2118, P2119, P2135	P0510
U0293, P0201, P0202, P0203, P0204, P0606, P31A5	P314D
P0117, P0118, P0335, P0340, P0524, P1217	P314E
P2119	P314F
P0300, P0301, P0302, P0303, P0304	P3151

How to Check ECM-detected DTC to HPCM-detected Engine-related DTC

INFOID:0000000014631161

When engine related DTC is detected by HPCM, ECM-detected DTC can be checked according to the following instructions.

WORK PROCEDURE

With CONSULT

1. Check DTC of “EV/HEV”.
2. On CONSULT screen, select “DATA MONITOR” of “ENGINE”.
3. Select an item appropriate to DTC detected by HPCM.

DTC (HPCM)	Monitor item
P0510	P0510 DETECTION CAUSE
P314D	P314D DETECTION CAUSE
P314E	P314E DETECTION CAUSE
P314F	P314F DETECTION CAUSE
P3151	P3151 DETECTION CAUSE

4. Perform the diagnosis of the displayed DTC. Refer to HBC-71, "DTC Index".

Test Value and Test Limit

INFOID:0000000014948867

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

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

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

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

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

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
O2 SENSOR HEATER	41H	A/F sensor 1 heater (Bank 1)	Low Input: P0031 High Input: P0032	81H	0BH	Converted value of heater electric current to voltage
			P0030	83H	0BH	A/F sensor heater circuit malfunction
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage
			P0141	81H	14H	Rear O2 sensor internal impedance
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage
			P0050	83H	0BH	A/F sensor heater circuit malfunction
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage
			P0161	81H	14CH	Rear O2 sensor internal impedance
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage
SECONDARY AIR	71H	Secondary air system	P0411	80H	01H	Secondary air injection system incorrect flow detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary air injection system insufficient flow
			P2445	82H	01H	Secondary air injection system pump stuck off
			P2448	83H	01H	Secondary air injection system high airflow
			Bank1: P2440 Bank2: P2442	84H	01H	Secondary air injection system switching valve stuck open
			P2440	85H	01H	Secondary air injection system switching valve stuck open
			P2444	86H	01H	Secondary air injection system pump stuck on

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

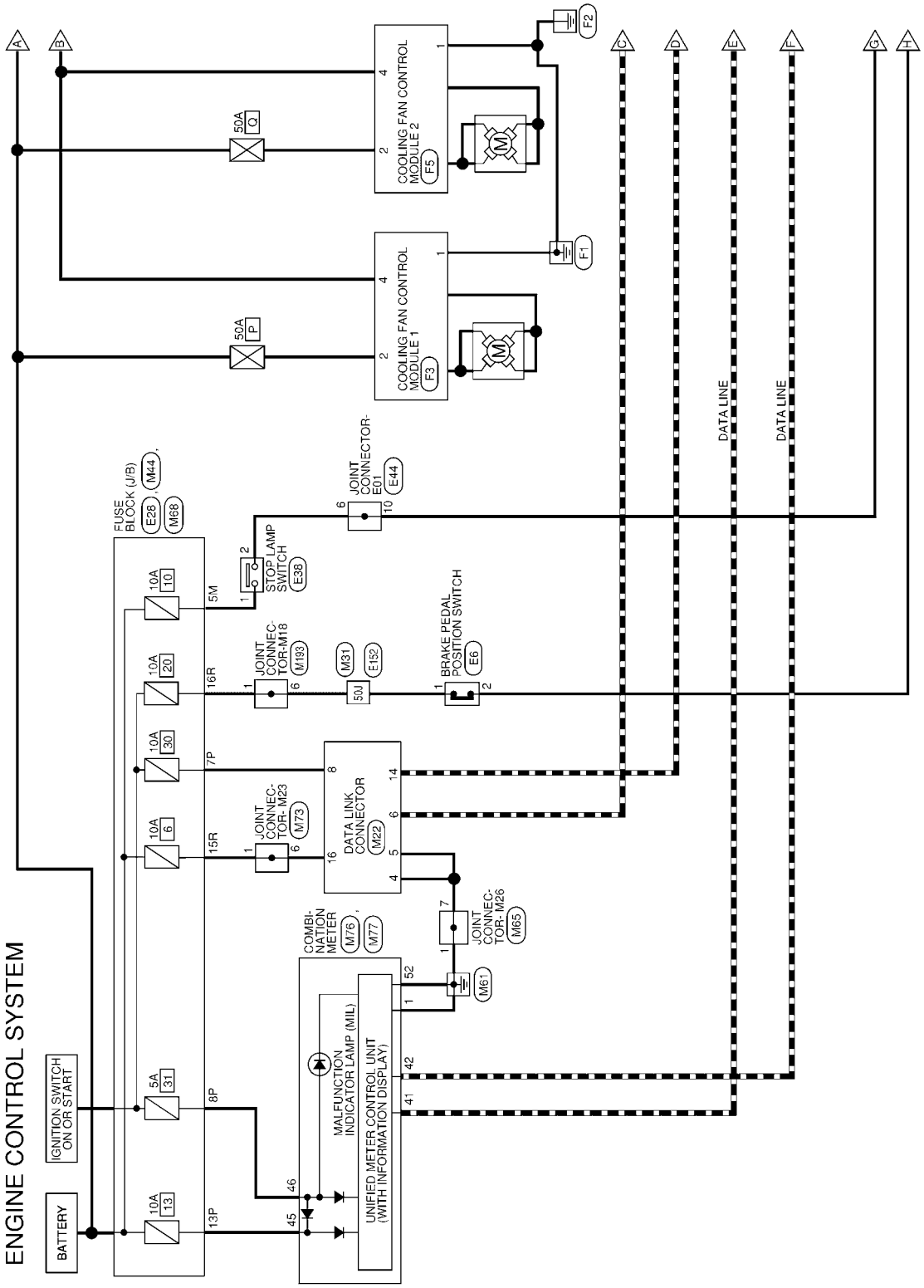
Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A2H	No. 1 cylinder misfire	P0301	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current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

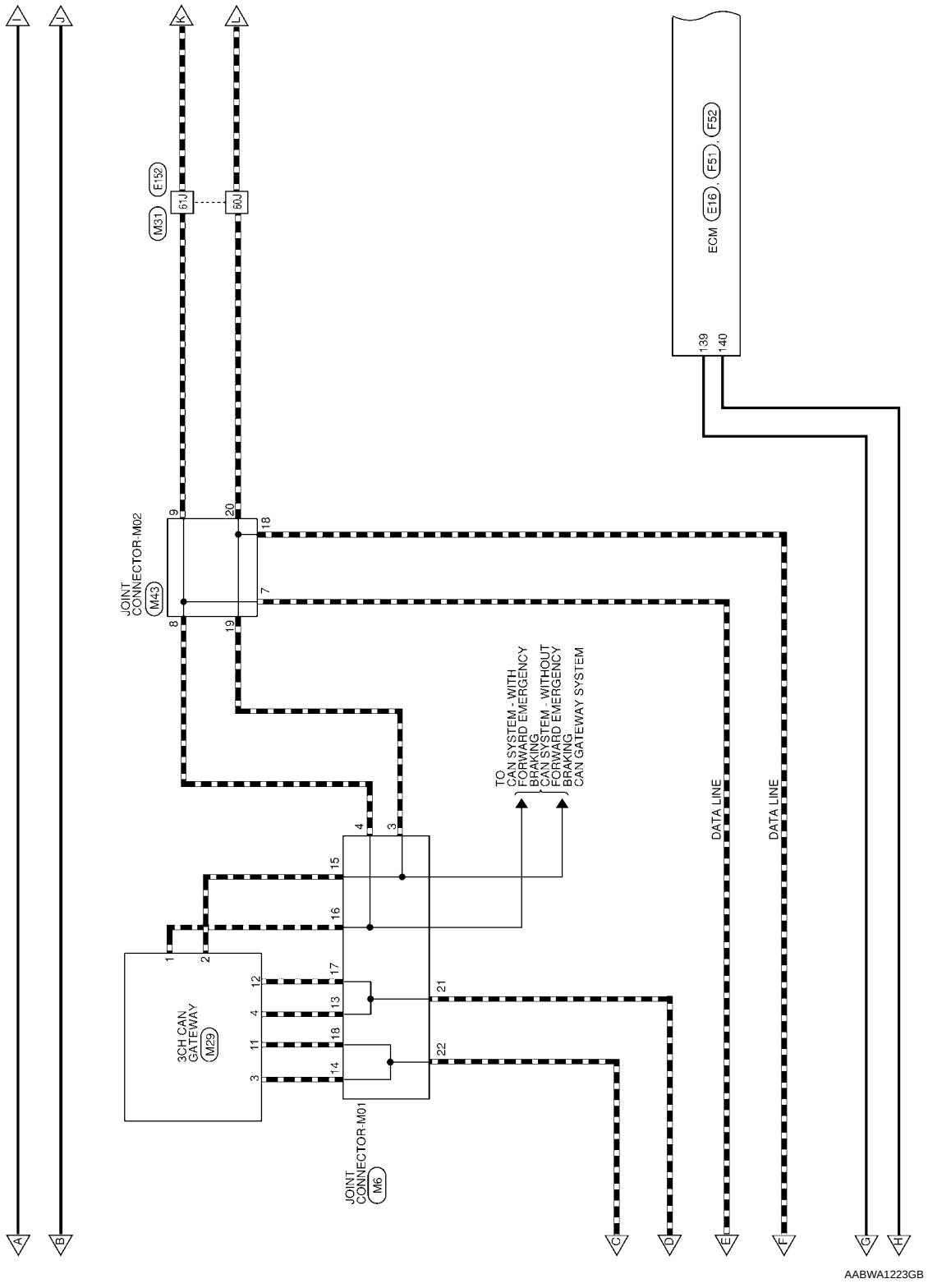
WIRING DIAGRAM

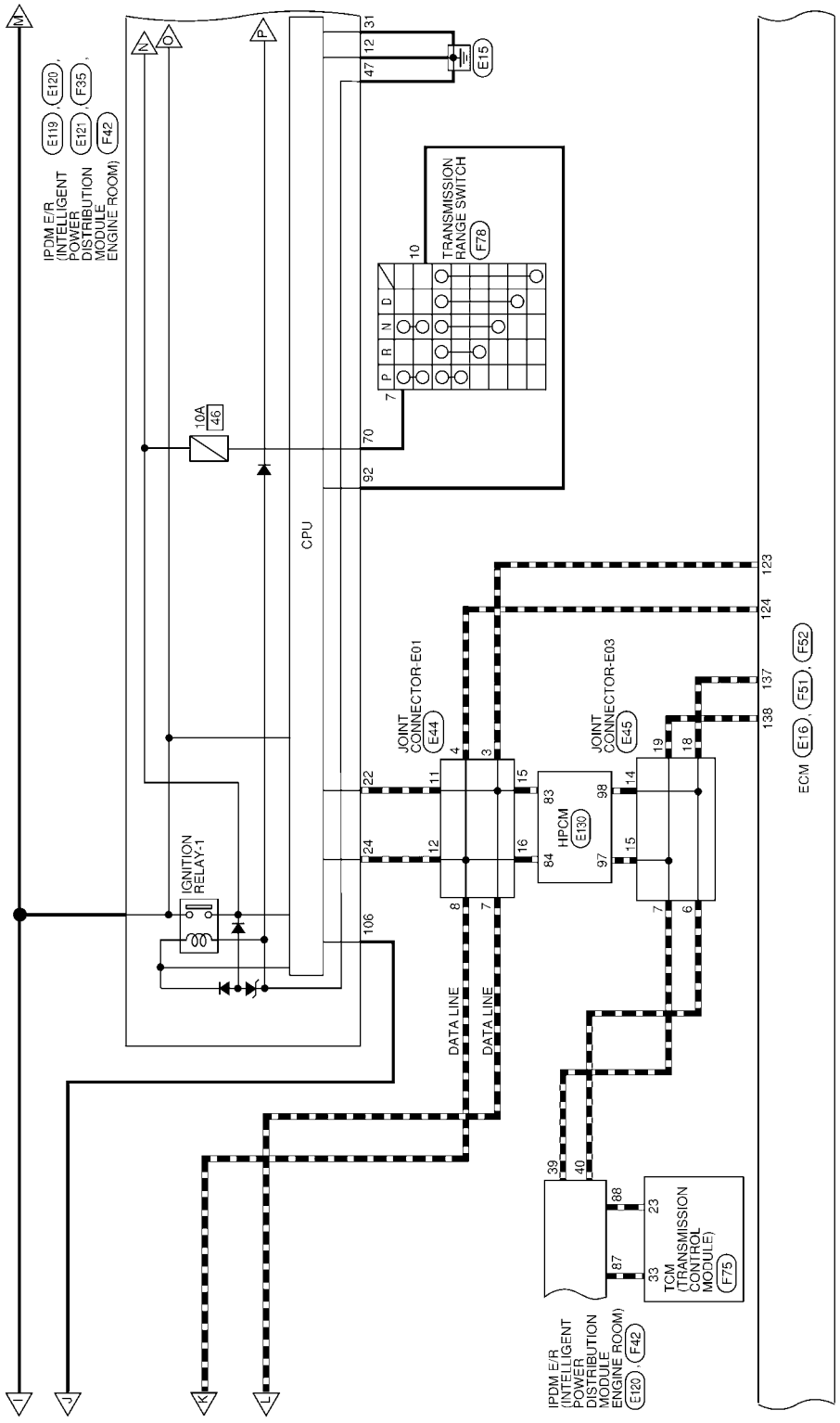
ENGINE CONTROL SYSTEM

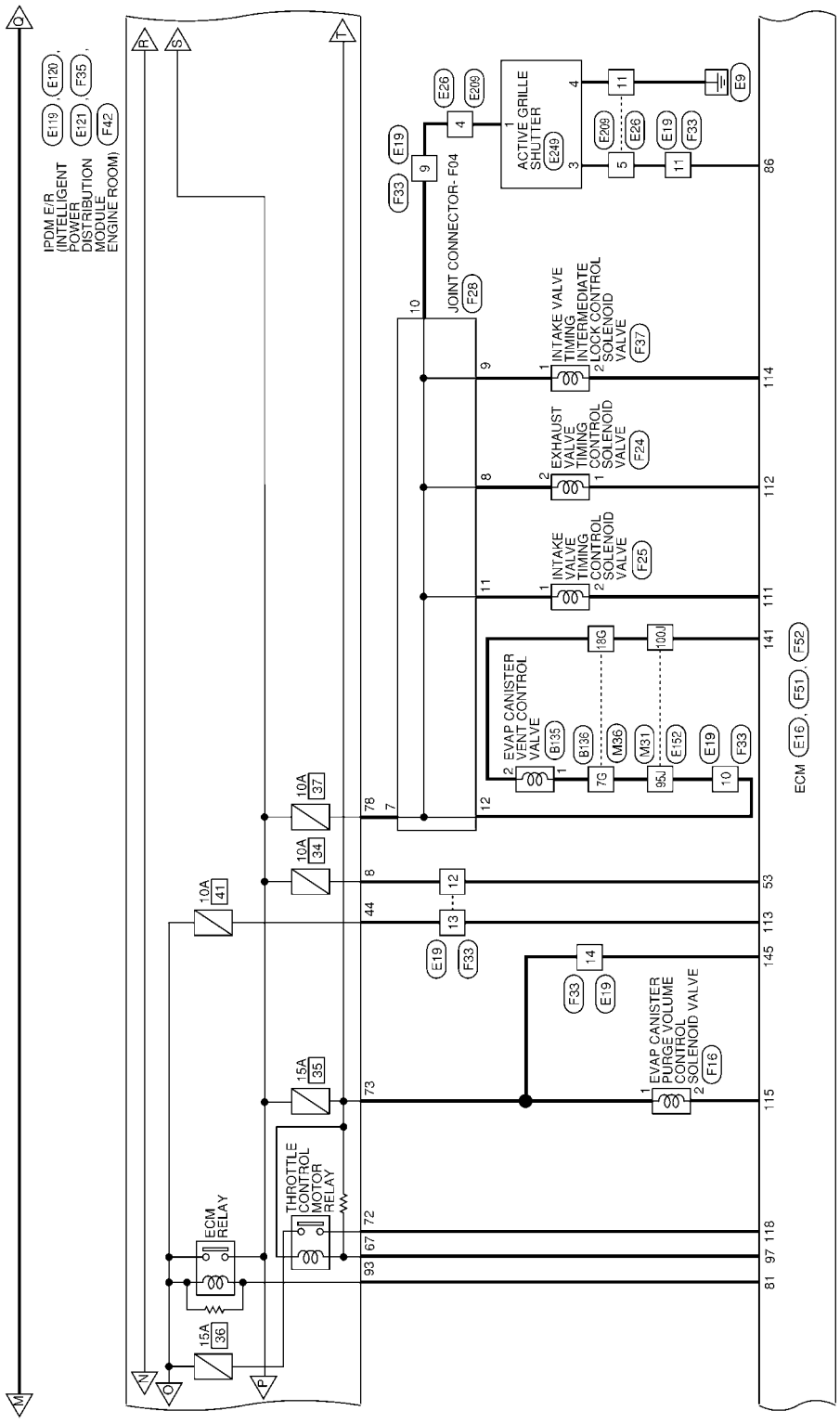
Wiring Diagram

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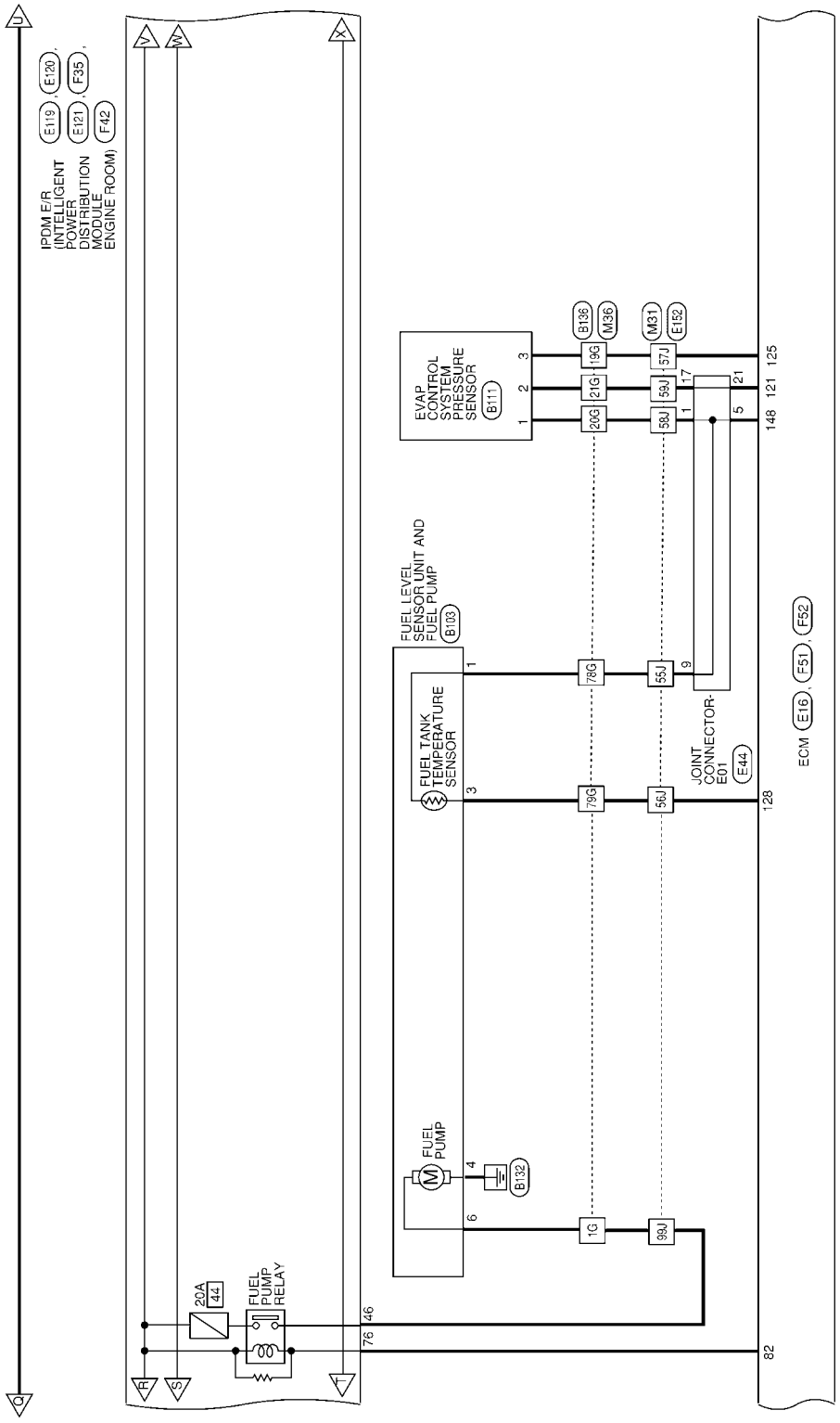


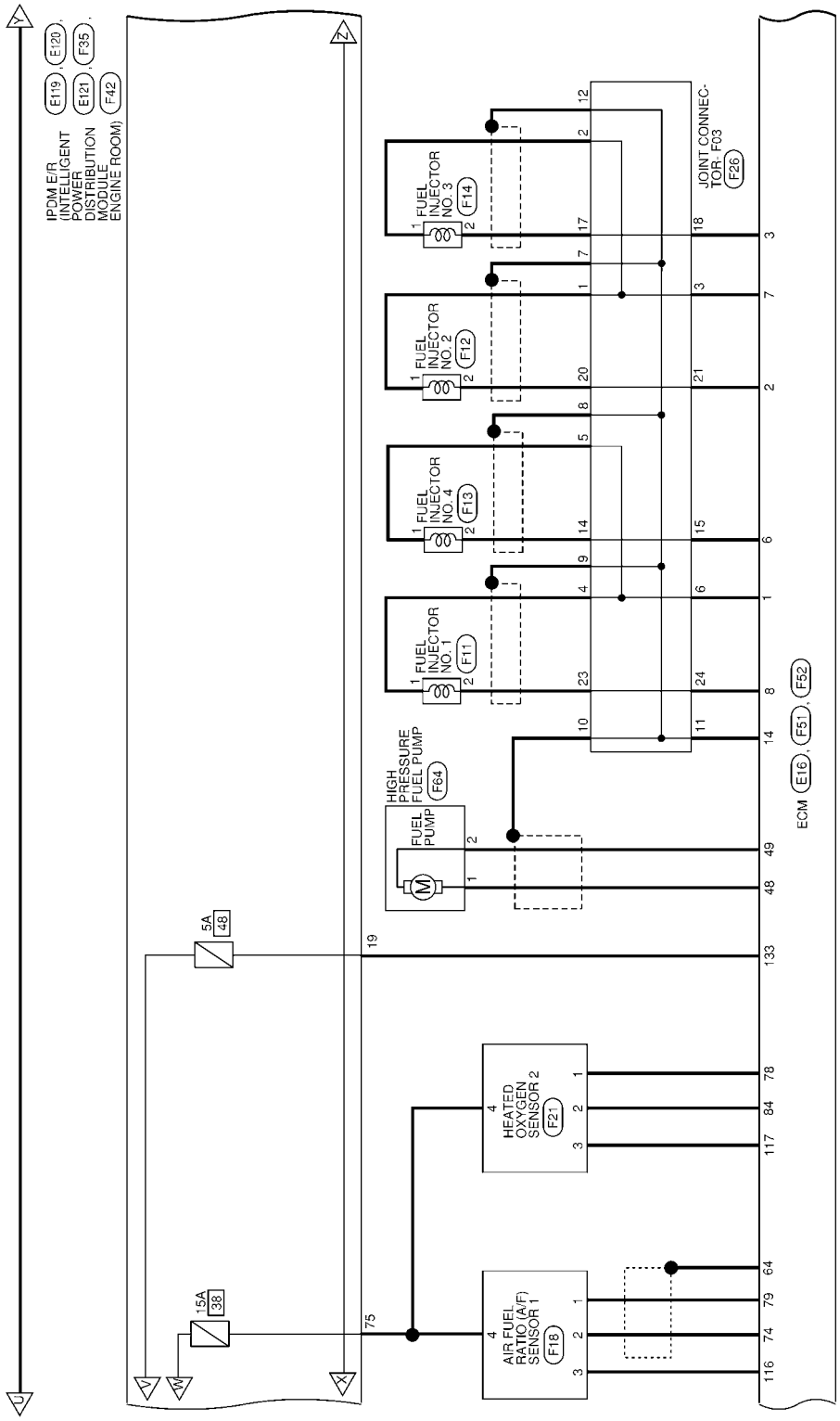

A
B
K
L
ECM E16, F51, F52
139
140
E152
M31
61J
60J
JOINT CONNECTOR-M02
M43
9
20
18
7
8
19
TO
CAN SYSTEM - WITH FORWARD EMERGENCY BRAKING
CAN SYSTEM - WITHOUT FORWARD EMERGENCY BRAKING
CAN GATEWAY SYSTEM
DATA LINE
DATA LINE
4
3
15
16
1
2
17
12
13
4
18
11
14
3
21
22
3CH CAN GATEWAY
M29
JOINT CONNECTOR-M01
M6
C
D
E
F
G
H
AABWA1223GB


IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
E119, E120, E121, F35, F42
CPU
10A 46
IGNITION RELAY-1
TRANSMISSION RANGE SWITCH F78
P R N D
E15
JOINT CONNECTOR-E01 E44
JOINT CONNECTOR-E03 E45
HPCM E130
ECM E16, E51, F52
DATA LINE
DATA LINE
TCM (TRANSMISSION CONTROL MODULE) F75
IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM) E120, F42
AABWA1224GB

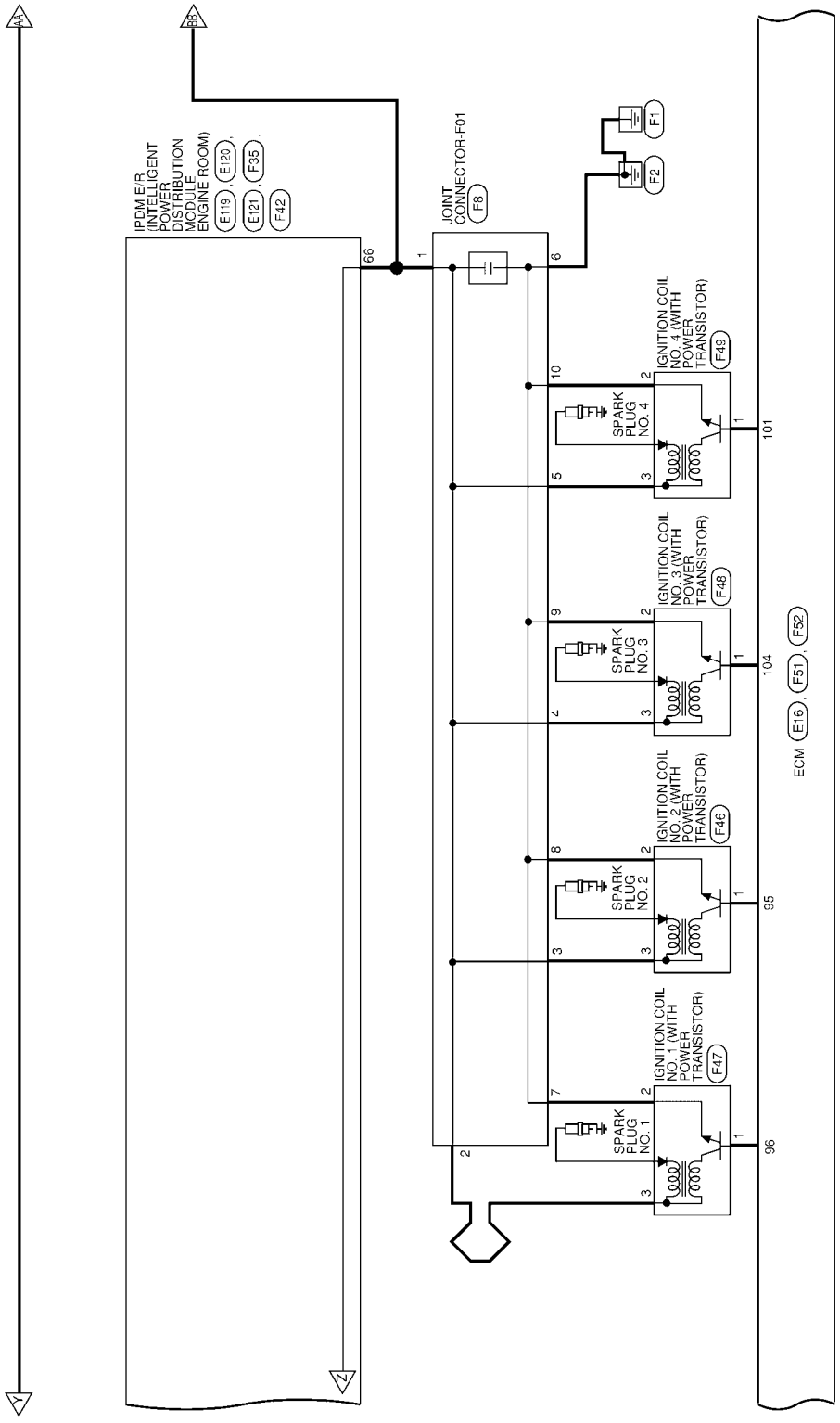


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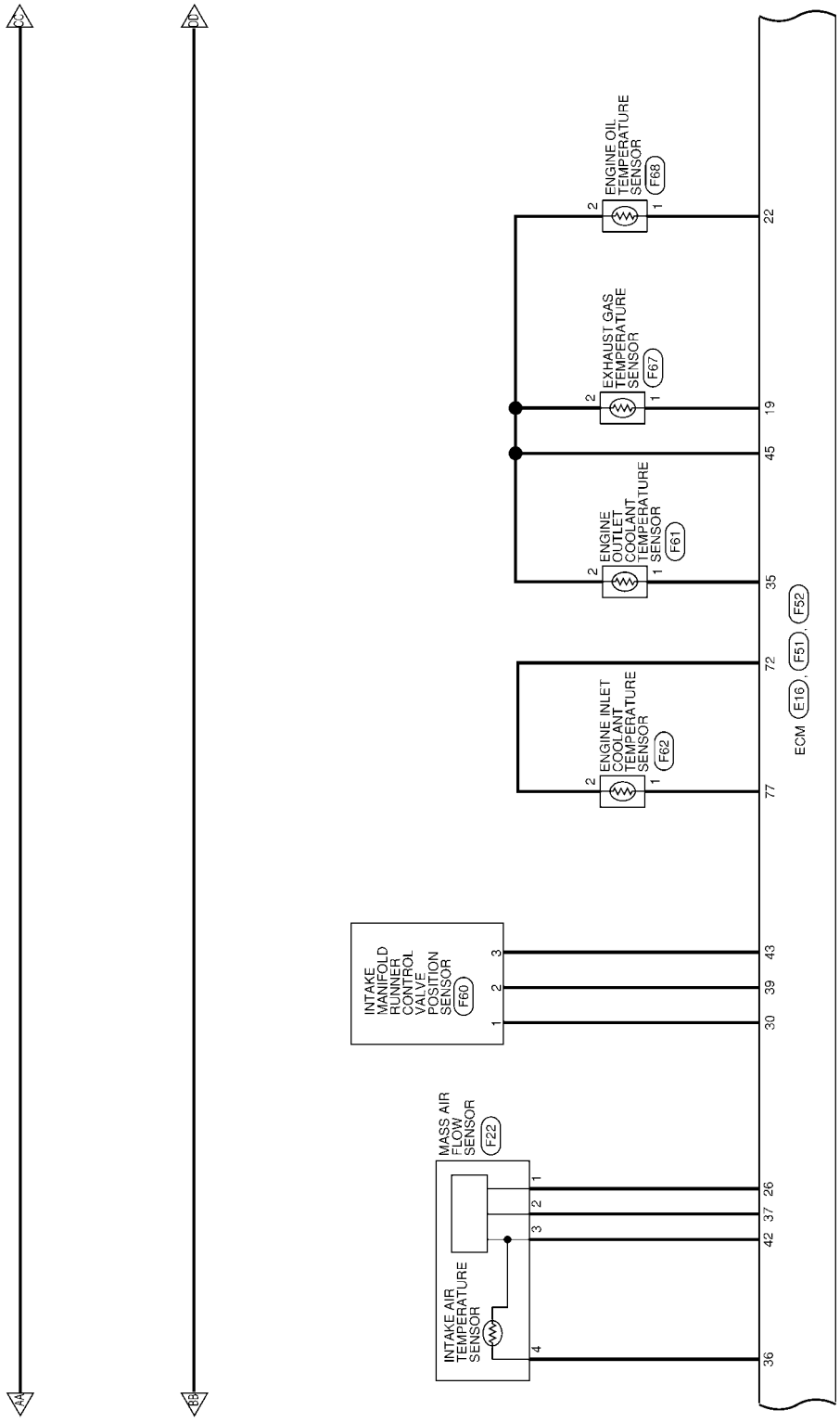

IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
E119, E120, E121, F35, F42
EVAP CONTROL SYSTEM PRESSURE SENSOR B111
FUEL LEVEL SENSOR UNIT AND FUEL PUMP B103
FUEL TANK TEMPERATURE SENSOR
FUEL PUMP
B132
20A 44
FUEL PUMP RELAY
JOINT CONNECTOR-E01 E44
ECM E16, F51, F52
B136 M36 19G 21G 20G
M31 E152 57J 59J 58J
78G 79G 1G
55J 56J 99J
125 121 148 128 82 46 76
17 21 5 9 1 3 4 6
AABWA1226GB



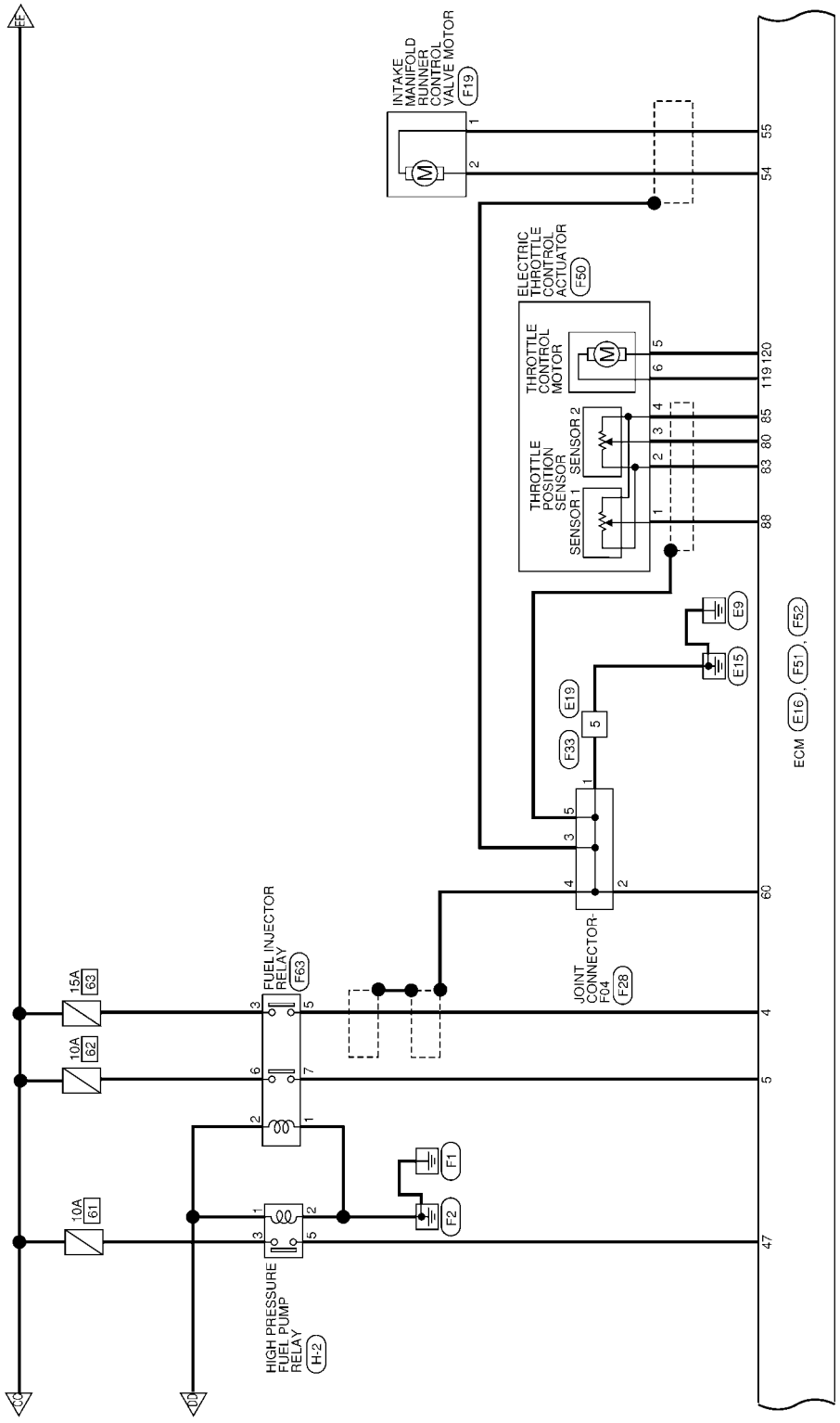
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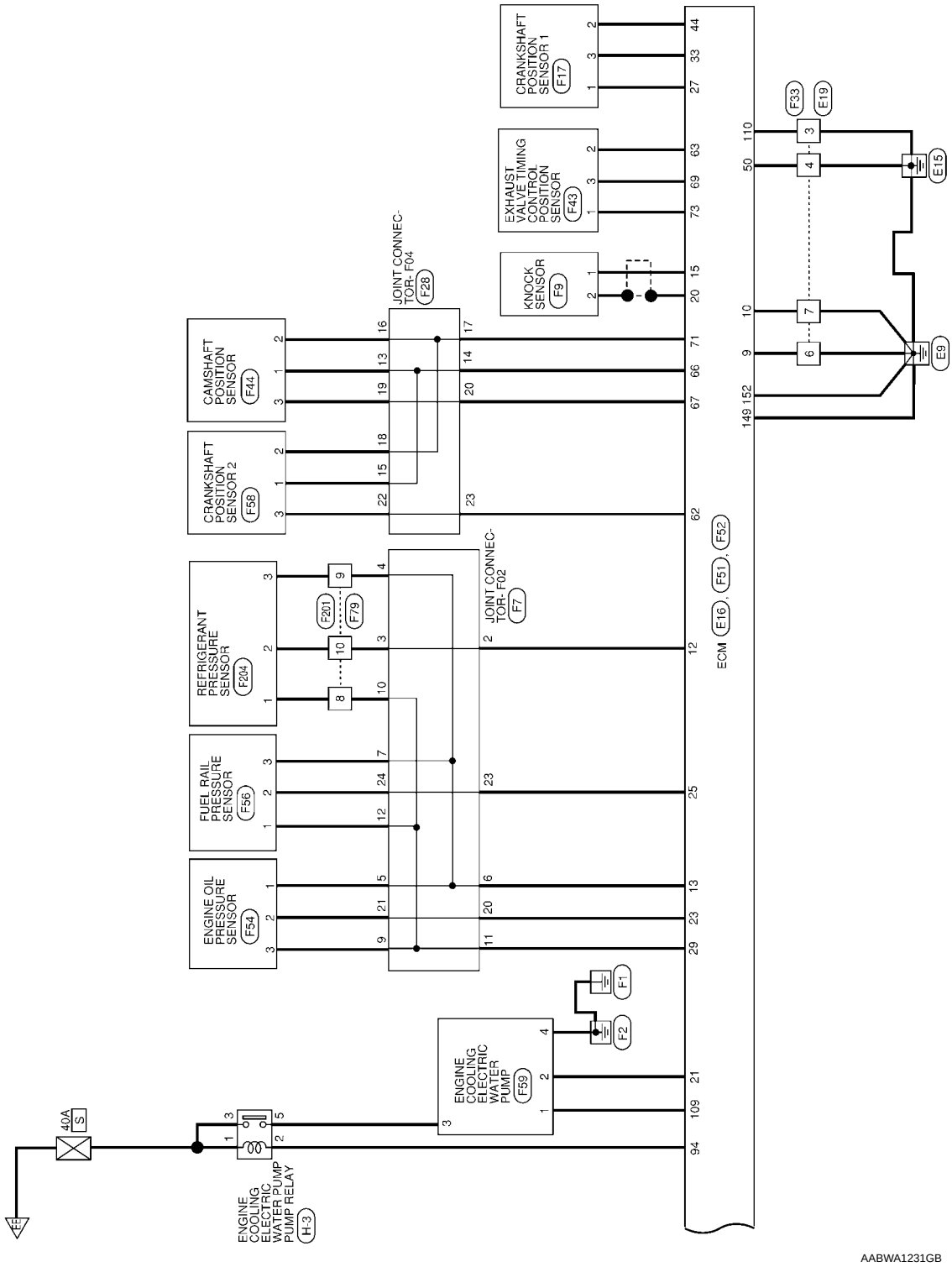
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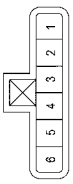
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CRANKSHAFT POSITION SENSOR 1 F17
EXHAUST VALVE TIMING CONTROL POSITION SENSOR F43
KNOCK SENSOR F9
JOINT CONNEC-TOR- F04 F28
CAMSHAFT POSITION SENSOR F44
CRANKSHAFT POSITION SENSOR 2 F58
REFRIGERANT PRESSURE SENSOR F204
JOINT CONNEC-TOR- F02 F7
FUEL RAIL PRESSURE SENSOR F56
ENGINE OIL PRESSURE SENSOR F54
ENGINE COOLING ELECTRIC WATER PUMP F59
F201 F79
F33 E19
E15
E9
F1
F2
ECM E16, F51, F52
40A S
E6
ENGINE COOLING ELECTRIC WATER PUMP PUMP RELAY H-3
AABWA1231GB

ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	B103
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN)
Connector Type	E06FGY-RS
Connector Color	GRAY

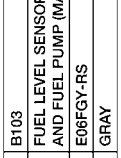
H.S.



Terminal No.	Color of Wire	Signal Name
1	LA/R	SENSOR GROUND
2	LA/B	FUEL SENSOR GND
3	LA/V	FUEL TANK TEMPERATURE SENSOR
4	LA/B	FUEL PUMP (-)
5	LA/L	FUEL SENSOR
6	LA/GR	FUEL PUMP (+)

Connector No.	B111
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Type	E03FGY-RS
Connector Color	GRAY

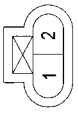
H.S.



Terminal No.	Color of Wire	Signal Name
1	W	SENSOR GROUND
2	P	EVAP CONTROL SYSTEM PRESSURE SENSOR
3	R	SENSOR POWER SUPPLY

Connector No.	B135
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Type	E02FB-RS
Connector Color	BLACK

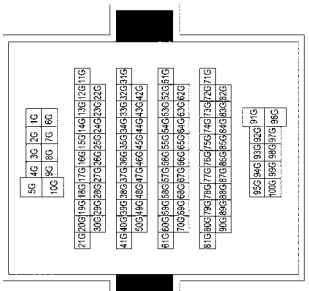
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Terminal No.	Color of Wire	Signal Name
1	BR	IGNITION
2	R	EVAP CANISTER VENT CONTROL VALVE

Connector No.	B136
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4
Connector Color	WHITE

H.S.



Terminal No.	Color of Wire	Signal Name
1G	LA/GR	TO MAIN HARNESS
2G	LA/P	TO MAIN HARNESS
3G	Y	TO MAIN HARNESS
4G	L	TO MAIN HARNESS
5G	G	TO MAIN HARNESS
6G	LA/BR	TO MAIN HARNESS
7G	BR	TO MAIN HARNESS
8G	LA/L	TO MAIN HARNESS
9G	LA/R	TO MAIN HARNESS
10G	R	TO MAIN HARNESS
11G	G	TO MAIN HARNESS
12G	Y	TO MAIN HARNESS
13G	–	TO MAIN HARNESS
14G	–	TO MAIN HARNESS
15G	Y	TO MAIN HARNESS
16G	–	TO MAIN HARNESS
17G	–	TO MAIN HARNESS
18G	R	TO MAIN HARNESS
19G	R	TO MAIN HARNESS
20G	W	TO MAIN HARNESS
21G	P	TO MAIN HARNESS
22G	P	TO MAIN HARNESS
23G	L	TO MAIN HARNESS
24G	W	TO MAIN HARNESS
25G	L	TO MAIN HARNESS
26G	–	TO MAIN HARNESS
27G	–	TO MAIN HARNESS
28G	–	TO MAIN HARNESS
29G	SB	TO MAIN HARNESS
30G	–	TO MAIN HARNESS
31G	–	TO MAIN HARNESS
32G	–	TO MAIN HARNESS
33G	–	TO MAIN HARNESS
34G	V	TO MAIN HARNESS
35G	BR	TO MAIN HARNESS
36G	SHIELD	TO MAIN HARNESS
37G	LG	TO MAIN HARNESS
38G	V	TO MAIN HARNESS
39G	SHIELD	TO MAIN HARNESS
40G	G	TO MAIN HARNESS
41G	R	TO MAIN HARNESS
42G	–	TO MAIN HARNESS
43G	–	TO MAIN HARNESS
44G	BG	TO MAIN HARNESS
45G	SHIELD	TO MAIN HARNESS
46G	W	TO MAIN HARNESS
47G	R	TO MAIN HARNESS
48G	SHIELD	TO MAIN HARNESS
49G	L	TO MAIN HARNESS
50G	Y	TO MAIN HARNESS
51G	–	TO MAIN HARNESS
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57G	–	TO MAIN HARNESS
58G	–	TO MAIN HARNESS
59G	–	TO MAIN HARNESS
60G	GR	TO MAIN HARNESS
61G	V	TO MAIN HARNESS
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76G	–	TO MAIN HARNESS
77G	–	TO MAIN HARNESS
78G	LA/R	TO MAIN HARNESS
79G	LA/V	TO MAIN HARNESS
80G	LA/B	TO MAIN HARNESS
81G	LA/L	TO MAIN HARNESS
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84G	–	TO MAIN HARNESS
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86G	–	TO MAIN HARNESS
87G	–	TO MAIN HARNESS
88G	–	TO MAIN HARNESS
89G	–	TO MAIN HARNESS
90G	–	TO MAIN HARNESS
91G	R	TO MAIN HARNESS
92G	BR	TO MAIN HARNESS
93G	W	TO MAIN HARNESS
94G	LA/V	TO MAIN HARNESS
95G	V	TO MAIN HARNESS
96G	G	TO MAIN HARNESS
97G	P	TO MAIN HARNESS
98G	GR	TO MAIN HARNESS
99G	LA/Y	TO MAIN HARNESS
100G	Y	TO MAIN HARNESS

AABIA2252GB

ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	E6
Connector Name	BRAKE PEDAL POSITION SWITCH
Connector Type	M02FBR-LC
Connector Color	BROWN

H.S.

Terminal No.	Color of Wire	Signal Name
1	P	IGNITION
2	GR	SWITCH OUTPUT

Connector No.	E16
Connector Name	ECM
Connector Type	RH24FB-RZ8-L-LH
Connector Color	BLACK

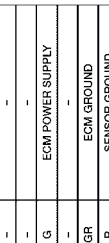
H.S.

Terminal No.	Color of Wire	Signal Name
121	L	EVAP CONTROL SYSTEM PRESSURE SENSOR
122	–	–
123	P	CAN-L
124	L	CAN-H
125	R	SENSOR POWER SUPPLY
126	–	–
127	–	–
128	BG	FUEL TANK TEMPERATURE SENSOR
129	–	–
130	–	–
131	–	–
132	–	–
133	LG	IGNITION SWITCH
134	–	–
135	–	–
136	–	–
137	G	HEV CAN-L
138	L	HEV CAN-H
139	Y	STOP LAMP SWITCH

140	GR	BRAKE PEDAL POSITION SWITCH
141	Y	EVAP CANISTER VENT CONTROL VALVE
142	–	–
143	–	–
144	–	–
145	G	ECM POWER SUPPLY
146	–	–
147	GR	ECM GROUND
148	B	SENSOR GROUND
149	GR	ECM GROUND
150	–	–
151	–	–
152	GR	ECM GROUND

Connector No.	E19
Connector Name	WIRE TO WIRE
Connector Type	NS16MBR-CS
Connector Color	BROWN

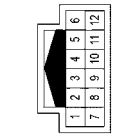
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	TO ENGINE CONTROL HARNESS
2	BG	TO ENGINE CONTROL HARNESS
3	B	TO ENGINE CONTROL HARNESS
4	B	TO ENGINE CONTROL HARNESS
5	B	TO ENGINE CONTROL HARNESS
6	B	TO ENGINE CONTROL HARNESS
7	B	TO ENGINE CONTROL HARNESS
8	W	TO ENGINE CONTROL HARNESS
9	BR	TO ENGINE CONTROL HARNESS
10	BR	TO ENGINE CONTROL HARNESS
11	L	TO ENGINE CONTROL HARNESS
12	W	TO ENGINE CONTROL HARNESS
13	R	TO ENGINE CONTROL HARNESS
14	G	TO ENGINE CONTROL HARNESS
15	W	TO ENGINE CONTROL HARNESS
16	W	TO ENGINE CONTROL HARNESS

Connector No.	E26
Connector Name	WIRE TO WIRE
Connector Type	TH12MW-NH
Connector Color	WHITE

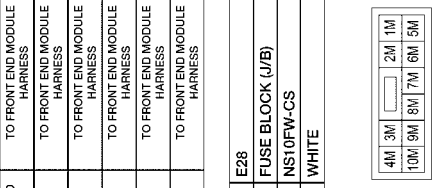
H.S.



Terminal No.	Color of Wire	Signal Name
1	V	TO FRONT END MODULE HARNESS
2	L	TO FRONT END MODULE HARNESS
3	W	TO FRONT END MODULE HARNESS
4	BR	TO FRONT END MODULE HARNESS
5	L	TO FRONT END MODULE HARNESS
6	GR	TO FRONT END MODULE HARNESS
7	SHIELD	TO FRONT END MODULE HARNESS
8	LG	TO FRONT END MODULE HARNESS
9	–	TO FRONT END MODULE HARNESS
10	–	TO FRONT END MODULE HARNESS
11	B	TO FRONT END MODULE HARNESS
12	GR	TO FRONT END MODULE HARNESS

Connector No.	E28
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS10FW-CS
Connector Color	WHITE

H.S.



Terminal No.	Color of Wire	Signal Name
1M	–	–
2M	–	–
3M	–	–
4M	–	–
5M	V	BATTERY
6M	Y	O LIGHT POSITION REAR LH
7M	–	–
8M	–	–
9M	–	–
10M	–	–

Connector No.	E38
Connector Name	STOP LAMP SWITCH
Connector Type	M04FW-LC
Connector Color	WHITE

H.S.



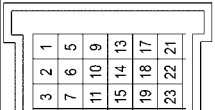
Terminal No.	Color of Wire	Signal Name
1	V	BATTERY
2	LG	STOP LAMP SWITCH OUTPUT
3	L	IGNITION
4	W	STOP LAMP SWITCH OUTPUT

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	E44
Connector Name	JOINT CONNECTOR-E01
Connector Type	NH24FG-J
Connector Color	GREEN

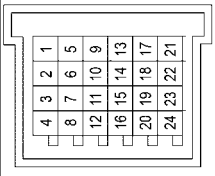
H.S.



Terminal No.	Color of Wire	Signal Name
1	V	SENSOR GROUND
2	LG	I BRAKE SW2
3	P	CAN-L
4	L	CAN-H
5	B	SENSOR GROUND
6	LG	STOP LAMP SWITCH OUTPUT
7	P	CAN-L
8	L	CAN-H
9	W	SENSOR GROUND
10	Y	STOP LAMP SWITCH OUTPUT
11	P	CAN-L
12	L	CAN-H
13	–	–
14	R	STOP LAMP SWITCH OUTPUT
15	P	CAN-L
16	L	CAN-H
17	BR	EVAP CONTROL SYSTEM PRESSURE SENSOR
18	–	–
19	P	CAN-L
20	L	CAN-H
21	L	EVAP CONTROL SYSTEM PRESSURE SENSOR
22	–	–
23	–	–
24	–	–

Connector No.	E45
Connector Name	JOINT CONNECTOR-E03
Connector Type	NH24FW-J
Connector Color	WHITE

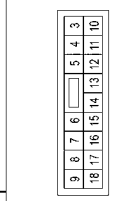
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	GROUND
2	G	CAN-L
3	L	CAN-H
4	–	–
5	B	GROUND
6	G	HEV CAN-L
7	L	HEV CAN-H
8	–	–
9	B	GROUND
10	G	CAN-L
11	L	CAN-H
12	–	–
13	SHIELD	SHIELD
14	G	CAN-L
15	L	CAN-H
16	–	–
17	B	GROUND
18	G	HEV CAN-L
19	L	HEV CAN-H
20	–	–
21	B	GROUND
22	–	–
23	–	–
24	–	–

Connector No.	E119
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS16FGY-CS
Connector Color	GRAY

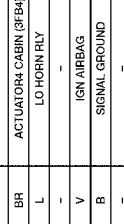
H.S.



Terminal No.	Color of Wire	Signal Name
3	P	IGN NOT COLUMN LOCK
4	Y	LIGHT POSITION REAR LH
5	–	–
6	–	–
7	–	–
8	BR	ACTUATOR4 CABIN (3FB4)
9	L	LO HORN RLY
10	–	–
11	V	IGN AIRBAG
12	B	SIGNAL GROUND
13	–	–
14	–	–
15	–	–
16	G	LIGHT REVERSE LAMP
17	W	LIGHT POSITION REAR RH
18	–	–

Connector No.	E120
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH24FGY-NH
Connector Color	GRAY

H.S.

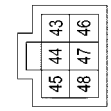


Terminal No.	Color of Wire	Signal Name
19	LG	IGN ECM
20	–	–
21	–	–

22	P	CAN-L
23	–	–
24	L	CAN-H
25	–	–
26	–	–
27	SB	CABIN MOTOR 5
28	R	CABIN MOTOR 6
29	LG	CABIN MOTOR 7
30	Y	CABIN MOTOR 8
31	B	2ND SIGNAL GROUND
32	R	LI PUSH SW
33	BR	AUTO STOP WIPER
34	–	–
35	–	–
36	–	–
37	–	–
38	–	–
39	L	CABIN MOTOR 1
40	G	CABIN MOTOR 2
41	W	CABIN MOTOR 3
42	R	CABIN MOTOR 4

Connector No.	E121
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	243405408R
Connector Color	RED

H.S.



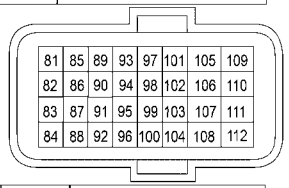
Terminal No.	Color of Wire	Signal Name
43	–	–
44	R	BAT ABS VALVE
45	V	FR WIPER HI
46	W	FUEL PUMP
47	B	POWER GROUND
48	Y	FR WIPER LO

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	E130
Connector Name	HPCM
Connector Type	RH24FB-RZ8-L-RH
Connector Color	BLACK

H.S.

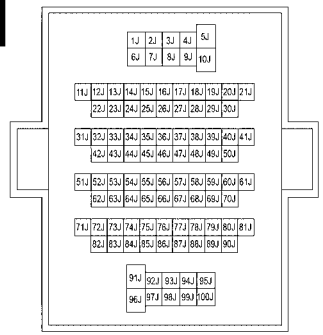


Terminal No.	Color of Wire	Signal Name
81	R	BATTERY VOLTAGE
82	–	–
83	P	CAN-L
84	L	CAN-H
85	–	–
86	–	–
87	–	–
88	B	DC/DC CONVERTER VOLTAGE STABILIZER SIGNAL
89	–	–
90	–	–
91	–	–
92	–	–
93	Y	IGNITION SIGNAL
94	G	ASCD STEERING SWITCH
95	V	SENSOR GROUND
96	–	–
97	L	HEV CAN-H
98	G	HEV CAN-L
99	R	STOP LAMP SWITCH
100	W	BRAKE PEDAL POSITION SWITCH
101	–	–
102	SB	SENSOR POWER SUPPLY
103	BR	ACCELERATOR PEDAL POSITION SENSOR 2
104	LG	SENSOR GROUND
105	BR	POWER SUPPLY FOR HPCM
106	V	SENSOR POWER SUPPLY
107	–	–
108	B	HPCM GND
109	–	–
110	GR	ACCELERATOR PEDAL POSITION SENSOR 1
111	R	SENSOR GROUND
112	GR	HPCM GND

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Connector No.	E152
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4
Connector Color	WHITE

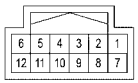
H.S.



Terminal No.	Color of Wire	Signal Name
1J	–	TO MAIN HARNESS
2J	Y	TO MAIN HARNESS
3J	–	TO MAIN HARNESS
4J	–	TO MAIN HARNESS
5J	–	TO MAIN HARNESS
6J	–	TO MAIN HARNESS
7J	–	TO MAIN HARNESS
8J	–	TO MAIN HARNESS
9J	BR	TO MAIN HARNESS
10J	–	TO MAIN HARNESS
11J	–	TO MAIN HARNESS
12J	–	TO MAIN HARNESS
13J	–	TO MAIN HARNESS
14J	–	TO MAIN HARNESS
15J	–	TO MAIN HARNESS
16J	–	TO MAIN HARNESS
17J	–	TO MAIN HARNESS
18J	–	TO MAIN HARNESS
19J	–	TO MAIN HARNESS
20J	–	TO MAIN HARNESS
21J	GR	TO MAIN HARNESS
22J	SHIELD	TO MAIN HARNESS
23J	LG	TO MAIN HARNESS
24J	V	TO MAIN HARNESS
25J	L	TO MAIN HARNESS
26J	BR	TO MAIN HARNESS
27J	G	TO MAIN HARNESS
28J	R	TO MAIN HARNESS
29J	–	TO MAIN HARNESS
30J	V	TO MAIN HARNESS
31J	–	TO MAIN HARNESS
32J	–	TO MAIN HARNESS
33J	R	TO MAIN HARNESS
34J	L	TO MAIN HARNESS
35J	BG	TO MAIN HARNESS
36J	LG	TO MAIN HARNESS
37J	GR	TO MAIN HARNESS
38J	BR	TO MAIN HARNESS
39J	–	TO MAIN HARNESS
40J	–	TO MAIN HARNESS
41J	G	TO MAIN HARNESS
42J	W	TO MAIN HARNESS
43J	L	TO MAIN HARNESS
44J	B	TO MAIN HARNESS
45J	SB	TO MAIN HARNESS
46J	BR	TO MAIN HARNESS
47J	W	TO MAIN HARNESS
48J	W	TO MAIN HARNESS
49J	L	TO MAIN HARNESS
50J	P	TO MAIN HARNESS
51J	W	TO MAIN HARNESS
52J	R	TO MAIN HARNESS
53J	SB	TO MAIN HARNESS
54J	LG	TO MAIN HARNESS
55J	W	TO MAIN HARNESS
56J	BG	TO MAIN HARNESS
57J	R	TO MAIN HARNESS
58J	V	TO MAIN HARNESS
59J	BR	TO MAIN HARNESS
60J	P	TO MAIN HARNESS
61J	L	TO MAIN HARNESS
62J	P	TO MAIN HARNESS
63J	L	TO MAIN HARNESS
64J	R	TO MAIN HARNESS
65J	L	TO MAIN HARNESS
66J	BG	TO MAIN HARNESS
67J	–	TO MAIN HARNESS
68J	–	TO MAIN HARNESS
69J	G	TO MAIN HARNESS
70J	L	TO MAIN HARNESS
71J	–	TO MAIN HARNESS
72J	–	TO MAIN HARNESS
73J	–	TO MAIN HARNESS
74J	–	TO MAIN HARNESS
75J	–	TO MAIN HARNESS
76J	–	TO MAIN HARNESS
77J	–	TO MAIN HARNESS
78J	–	TO MAIN HARNESS
79J	SHIELD	TO MAIN HARNESS
80J	B	TO MAIN HARNESS
81J	W	TO MAIN HARNESS
82J	–	TO MAIN HARNESS
83J	–	TO MAIN HARNESS
84J	–	TO MAIN HARNESS
85J	–	TO MAIN HARNESS
86J	–	TO MAIN HARNESS
87J	–	TO MAIN HARNESS
88J	–	TO MAIN HARNESS
89J	–	TO MAIN HARNESS
90J	–	TO MAIN HARNESS
91J	–	TO MAIN HARNESS
92J	LG	TO MAIN HARNESS
93J	L	TO MAIN HARNESS
94J	L	TO MAIN HARNESS
95J	BR	TO MAIN HARNESS
96J	–	TO MAIN HARNESS
97J	GR	TO MAIN HARNESS
98J	P	TO MAIN HARNESS
99J	W	TO MAIN HARNESS
100J	Y	TO MAIN HARNESS

Connector No.	E209
Connector Name	WIRE TO WIRE
Connector Type	TH12FW-NH
Connector Color	WHITE

H.S.

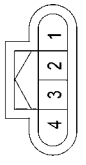


Terminal No.	Color of Wire	Signal Name
1	V	TO ENGINE ROOM HARNESS
2	L	TO ENGINE ROOM HARNESS
3	W	TO ENGINE ROOM HARNESS
4	BG	TO ENGINE ROOM HARNESS
5	L	TO ENGINE ROOM HARNESS
6	GR	TO ENGINE ROOM HARNESS
7	SHIELD	TO ENGINE ROOM HARNESS
8	LG	TO ENGINE ROOM HARNESS
9	–	TO ENGINE ROOM HARNESS
10	–	TO ENGINE ROOM HARNESS
11	B	TO ENGINE ROOM HARNESS
12	GR	TO ENGINE ROOM HARNESS

ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	E249
Connector Name	ACTIVE GRILLE SHUTTER
Connector Type	RH04FB
Connector Color	BLACK

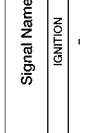
H.S.



Terminal No.	Color of Wire	Signal Name
1	BG	IGNITION
2	–	–
3	L	ENGINE COMMUNICATION LINE
4	B	GROUND

Connector No.	F3
Connector Name	COOLING FAN CONTROL MODULE 1
Connector Type	FHB04FB
Connector Color	BLACK

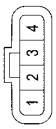
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	GND
2	B	PWM POWER
3	–	–
4	BR	PWM SIG

Connector No.	F5
Connector Name	COOLING FAN CONTROL MODULE 2
Connector Type	FHB04FB
Connector Color	BLACK

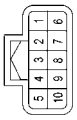
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	GND
2	B	PWM POWER
3	–	–
4	BR	PWM SIG

Connector No.	F8
Connector Name	JOINT CONNECTOR-F01
Connector Type	RH10FB
Connector Color	BLACK

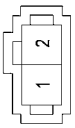
H.S.



Terminal No.	Color of Wire	Signal Name
1	W	IGNITION
2	W	IGNITION
3	W	IGNITION
4	W	IGNITION
5	W	IGNITION
6	B	GROUND
7	B	GROUND
8	B	GROUND
9	B	GROUND
10	B	GROUND

Connector No.	F9
Connector Name	KNOCK SENSOR
Connector Type	BS02FGY-B-AHY
Connector Color	GRAY

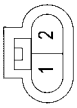
H.S.



Terminal No.	Color of Wire	Signal Name
1	W	KNOCK SENSOR
2	SHIELD	SHIELD

Connector No.	F11
Connector Name	FUEL INJECTOR NO.1
Connector Type	HS02FGY
Connector Color	GRAY

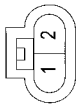
H.S.



Terminal No.	Color of Wire	Signal Name
1	G	FUEL INJECTOR NO. 1, 4 (HI)
2	R	FUEL INJECTOR NO. 1 (LO)

Connector No.	F12
Connector Name	FUEL INJECTOR NO.2
Connector Type	HS02FGY
Connector Color	GRAY

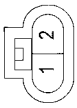
H.S.



Terminal No.	Color of Wire	Signal Name
1	W	FUEL INJECTOR NO. 2, 3 (HI)
2	B	FUEL INJECTOR NO. 2 (LO)

Connector No.	F13
Connector Name	FUEL INJECTOR NO.4
Connector Type	HS02FGY
Connector Color	GRAY

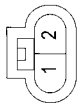
H.S.



Terminal No.	Color of Wire	Signal Name
1	L	FUEL INJECTOR NO. 1, 4 (HI)
2	P	FUEL INJECTOR NO. 4 (LO)

Connector No.	F14
Connector Name	FUEL INJECTOR NO.3
Connector Type	HS02FGY
Connector Color	GRAY

H.S.



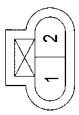
Terminal No.	Color of Wire	Signal Name
1	P	FUEL INJECTOR NO. 2, 3 (HI)
2	L	FUEL INJECTOR NO. 3 (LO)

AABIA2256GB

ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F16
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	E02FL-RS-LGY
Connector Color	BLUE

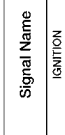
H.S.



Terminal No.	Color of Wire	Signal Name
1	G	IGNITION
2	L	EVAPEVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE*

Connector No.	F17
Connector Name	CRANKSHAFT POSITION SENSOR 1
Connector Type	RH03FB
Connector Color	BLACK

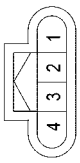
H.S.



Terminal No.	Color of Wire	Signal Name
1	W	SENSOR POWER SUPPLY
2	BR	SENSOR GROUND
3	R	CRANKSHAFT POSITION SENSOR 1

Connector No.	F18
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1
Connector Type	RH04FDGY-P
Connector Color	GRAY

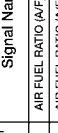
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	AIR FUEL RATIO (A/F) SENSOR 1
2	W	AIR FUEL RATIO (A/F) SENSOR 1
3	Y	AIR FUEL RATIO (A/F) SENSOR 1 HEATER
4	R	IGNITION

Connector No.	F19
Connector Name	INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR
Connector Type	RH02FB
Connector Color	BLACK

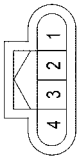
H.S.



Terminal No.	Color of Wire	Signal Name
1	Y	INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR (OPEN)
2	G	INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR (CLOSE)

Connector No.	F21
Connector Name	HEATED OXYGEN SENSOR 2
Connector Type	RH04FDGY-P
Connector Color	GRAY

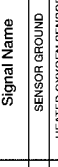
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	SENSOR GROUND
2	L	HEATED OXYGEN SENSOR 2
3	G	HEATED OXYGEN SENSOR 2 HEATER
4	BR	IGNITION

Connector No.	F22
Connector Name	MASS AIR FLOW SENSOR
Connector Type	RH04FB
Connector Color	BLACK

H.S.



Terminal No.	Color of Wire	Signal Name
1	B	SENSOR POWER SUPPLY
2	L	MASS AIR FLOW SENSOR
3	R	SENSOR GROUND
4	GR	INTAKE AIR TEMPERATURE SENSOR

Connector No.	F24
Connector Name	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
Connector Type	E02FG-RS-LGY
Connector Color	GRAY

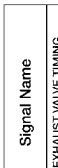
H.S.



Terminal No.	Color of Wire	Signal Name
1	GR	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
2	L	IGNITION

Connector No.	F25
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE
Connector Type	E02FBR-RS-GY
Connector Color	BROWN

H.S.



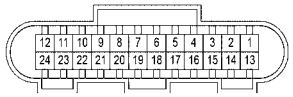
Terminal No.	Color of Wire	Signal Name
1	BR	IGNITION
2	G	INTAKE VALVE TIMING CONTROL SOLENOID VALVE

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F26
Connector Name	JOINT CONNECTOR-F03
Connector Type	SAA24FB-J
Connector Color	BLACK

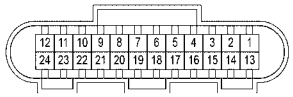
H.S.



Terminal No.	Color of Wire	Signal Name
1	W	FUEL INJECTOR NO. 2, 3 (HI)
2	P	FUEL INJECTOR NO. 2, 3 (HI)
3	W	FUEL INJECTOR NO. 2, 3 (HI)
4	G	FUEL INJECTOR NO. 1, 4 (HI)
5	L	FUEL INJECTOR NO. 1, 4 (HI)
6	G	FUEL INJECTOR NO. 1, 4 (HI)
7	SHIELD	SHIELD
8	SHIELD	SHIELD
9	SHIELD	SHIELD
10	SHIELD	SHIELD
11	GR	SHIELD
12	SHIELD	SHIELD
13	–	–
14	P	FUEL INJECTOR NO. 4 (LO)
15	P	FUEL INJECTOR NO. 4 (LO)
16	–	–
17	L	FUEL INJECTOR NO. 3 (LO)
18	L	FUEL INJECTOR NO. 3 (LO)
19	–	–
20	B	FUEL INJECTOR NO. 2 (LO)
21	B	FUEL INJECTOR NO. 2 (LO)
22	–	–
23	R	FUEL INJECTOR NO. 1 (LO)
24	R	FUEL INJECTOR NO. 1 (LO)

Connector No.	F28
Connector Name	JOINT CONNECTOR-F04
Connector Type	SAA24FB-J
Connector Color	BLACK

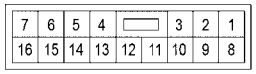
H.S.



Terminal No.	Color of Wire	Signal Name
1	B	GROUND
2	B	GROUND
3	SHIELD	SHIELD
4	SHIELD	SHIELD
5	SHIELD	SHIELD
6	–	–
7	BR	IGNITION
8	L	IGNITION
9	Y	IGNITION
10	BR	IGNITION
11	BR	IGNITION
12	BR	IGNITION
13	L	SENSOR POWER SUPPLY
14	L	SENSOR POWER SUPPLY
15	L	SENSOR POWER SUPPLY
16	R	SENSOR GROUND
17	R	SENSOR GROUND
18	R	SENSOR GROUND
19	B	SENSOR GROUND
20	B	SENSOR GROUND
21	–	–
22	B	RING POSITION SENSOR
23	BR	RING POSITION SENSOR
24	–	–

Connector No.	F33
Connector Name	WIRE TO WIRE
Connector Type	NS16FBR-CS
Connector Color	BROWN

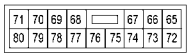
H.S.



Terminal No.	Color of Wire	Signal Name
1	R	TO ENGINE ROOM HARNESS
2	BG	TO ENGINE ROOM HARNESS
3	B	TO ENGINE ROOM HARNESS
4	B	TO ENGINE ROOM HARNESS
5	B	TO ENGINE ROOM HARNESS
6	B	TO ENGINE ROOM HARNESS
7	B	TO ENGINE ROOM HARNESS
8	W	TO ENGINE ROOM HARNESS
9	BR	TO ENGINE ROOM HARNESS
10	BR	TO ENGINE ROOM HARNESS
11	L	TO ENGINE ROOM HARNESS
12	GR	TO ENGINE ROOM HARNESS
13	R	TO ENGINE ROOM HARNESS
14	G	TO ENGINE ROOM HARNESS
15	W	TO ENGINE ROOM HARNESS
16	W	TO ENGINE ROOM HARNESS

Connector No.	F35
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS16FW-CS
Connector Color	WHITE

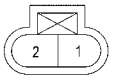
H.S.



Terminal No.	Color of Wire	Signal Name
65	–	–
66	W	ACTUATOR1 1 (3FBI)
67	V	LI ECM ACT5 DRIVER
68	–	–
69	–	–
70	R	IGN AT LPG
71	Y	IGN REVERSE SW AC VALVE
72	LG	ACTUATOR5 (3FBA)
73	G	ACTUATOR1 2 (3FB)
74	–	–
75	R	ACTUATOR3 (3FB3)
76	P	LI FUEL PUMP DRIVER
77	–	–
78	BR	ACTUATOR2 (3FB2)
79	G	LI LIGHT REVERSE SW
80	–	–

Connector No.	F37
Connector Name	INTAKE VALVE TIMING INTERMEDIATE LOCK CONTROL SOLENOID VALVE
Connector Type	E02FBR-RS-GY
Connector Color	BROWN

H.S.



Terminal No.	Color of Wire	Signal Name
1	Y	IGNITION
2	P	INTAKE VALVE TIMING INTERMEDIATE LOCK CONTROL SOLENOID VALVE

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F42
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH24FB-NH
Connector Color	BLACK

H.S.

98	97	96	95	94	93	92	91	90	89	88	87
110	109	108	107	106	105	104	103	102	101	100	99

Terminal No.	Color of Wire	Signal Name
87	L	MOTOR CABIN 1
88	G	MOTOR CABIN 2
89	W	MOTOR CABIN 3
90	R	MOTOR CABIN 4
91	–	–
92	GR	LI NP SW
93	W	LI ECM DRIVER
94	–	–
95	–	–
96	–	–
97	–	–
98	–	–
99	GR	MOTOR CABIN 5
100	GR	MOTOR CABIN 6
101	LG	MOTOR CABIN 7
102	Y	MOTOR CABIN 8
103	W	LI HOOD SW2
104	–	–
105	–	–
106	BR	LO FAN RELAY2(PWM)
107	–	–
108	–	–
109	–	–
110	–	–

Connector No.	F43
Connector Name	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
Connector Type	RH03FB
Connector Color	BLACK

H.S.

Terminal No.	Color of Wire	Signal Name
1	R	SENSOR POWER SUPPLY
2	W	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
3	BR	SENSOR GROUND

Connector No.	F44
Connector Name	CAMSHAFT POSITION SENSOR
Connector Type	RH03FB
Connector Color	BLACK

H.S.

Terminal No.	Color of Wire	Signal Name
1	L	SENSOR POWER SUPPLY
2	R	SENSOR GROUND
3	B	CAMSHAFT POSITION SENSOR

Connector No.	F46
Connector Name	IGNITION COIL NO.2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS
Connector Color	GRAY

H.S.

Terminal No.	Color of Wire	Signal Name
1	LG	IGNITION SIGNAL NO. 2
2	B	GROUND
3	W	IGNITION

Connector No.	F47
Connector Name	IGNITION COIL NO.1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS
Connector Color	GRAY

H.S.

Terminal No.	Color of Wire	Signal Name
1	P	IGNITION SIGNAL NO. 1
2	B	GROUND
3	W	IGNITION

Connector No.	F48
Connector Name	IGNITION COIL NO.3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS
Connector Color	GRAY

H.S.

Terminal No.	Color of Wire	Signal Name
1	Y	IGNITION SIGNAL NO. 3
2	B	GROUND
3	W	IGNITION

Connector No.	F49
Connector Name	IGNITION COIL NO.4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS
Connector Color	GRAY

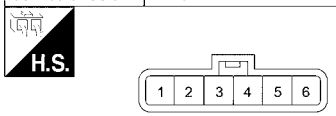
H.S.

Terminal No.	Color of Wire	Signal Name
1	SB	IGNITION SIGNAL NO. 4
2	B	GROUND
3	W	IGNITION

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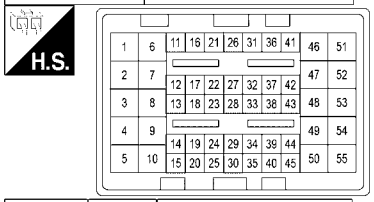
ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F50
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Type	HS06FB
Connector Color	BLACK



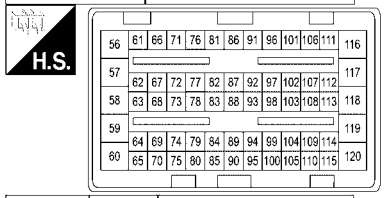
Terminal No.	Color of Wire	Signal Name
1	G	THROTTLE POSITION SENSOR 1
2	R	SENSOR POWER SUPPLY
3	W	THROTTLE POSITION SENSOR 2
4	B	SENSOR GROUND
5	L	THROTTLE CONTROL MOTOR (CLOSE)
6	P	THROTTLE CONTROL MOTOR (OPEN)

Connector No.	F51
Connector Name	ECM
Connector Type	MAB35FB-MEB20-LH
Connector Color	BLACK



Terminal No.	Color of Wire	Signal Name
1	G	FUEL INJECTOR NO. 1, 4 (HI)
2	B	FUEL INJECTOR NO. 2 (LO)
3	L	FUEL INJECTOR NO. 3 (LO)
4	P	FUEL INJECTOR DRIVER POWER SUPPLY-1
5	L	FUEL INJECTOR DRIVER POWER SUPPLY-2
6	P	FUEL INJECTOR NO. 4 (LO)
7	W	FUEL INJECTOR NO. 2, 3 (HI)
8	R	FUEL INJECTOR NO. 1 (LO)
9	GR	ECM GROUND
10	B	ECM GROUND
11	–	–
12	W	REFRIGERANT PRESSURE SENSOR
13	B	SENSOR GROUND
14	GR	SHIELD
15	W	KNOCK SENSOR
16	–	–
17	–	–
18	–	–
19	R	EXHAUST GAS TEMPERATURE SENSOR
20	SHIELD	SHIELD
21	SB	ENGINE COOLING ELECTRIC WATER PUMP SPEED SIGNAL
22	P	ENGINE OIL TEMPERATURE SENSOR
23	G	ENGINE OIL PRESSURE SENSOR
24	–	–
25	G	FUEL RAIL PRESSURE SENSOR
26	B	SENSOR POWER SUPPLY
27	W	SENSOR POWER SUPPLY
28	–	–
29	Y	SENSOR POWER SUPPLY
30	W	SENSOR POWER SUPPLY
31	–	–
32	–	–
33	R	CRANKSHAFT POSITION SENSOR 1
34	–	–
35	BR	ENGINE OUTLET COOLANT TEMPERATURE SENSOR
36	GR	INTAKE AIR TEMPERATURE SENSOR
37	L	MASS AIR FLOW SENSOR
38	–	–
39	R	INTAKE MANIFOLD RUNNER VALVE POSITION SENSOR
40	–	–
41	–	–
42	R	SENSOR GROUND
43	BR	SENSOR GROUND
44	BR	SENSOR GROUND
45	B	SENSOR GROUND
46	–	–
47	V	HIGH PRESSURE FUEL PUMP SUPPLY
48	V	HIGH PRESSURE FUEL PUMP HIGH
49	LG	HIGH PRESSURE FUEL PUMP LOW
50	B	ECM GROUND
51	–	–
52	–	–
53	Y	INTAKE MANIFOLD RUNNER VALVE MOTOR POWER SUPPLY
54	G	INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR (CLOSE)
55	Y	INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR (OPEN)

Connector No.	F52
Connector Name	ECM
Connector Type	MAB55FB-MEB10-LH
Connector Color	BLACK



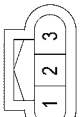
Terminal No.	Color of Wire	Signal Name
56	–	–
57	–	–
58	–	–
59	–	–
60	B	ECM GROUND
61	–	–
62	BR	CRANKSHAFT POSITION SENSOR 2
63	W	SENSOR GROUND
64	SHIELD	SHIELD
65	–	–
66	L	SENSOR POWER SUPPLY
67	B	CAMSHAFT POSITION SENSOR
68	–	–
69	BR	EXHAUST VALVE TIMING CONTROL POSITION SENSOR
70	–	–
71	R	SENSOR GROUND
72	B	SENSOR GROUND
73	R	SENSOR POWER SUPPLY
74	W	AIR FUEL RATIO (A/F) SENSOR 1
75	–	–
76	–	–
77	BR	ENGINE INLET COOLANT TEMPERATURE SENSOR
78	B	SENSOR GROUND
79	B	AIR FUEL RATIO (A/F) SENSOR 1
80	W	THROTTLE POSITION SENSOR 2
81	P	ECM RELAY (SELF SHUT-OFF)
82	P	FUEL PUMP RELAY
83	R	SENSOR POWER SUPPLY
84	L	HEATED OXYGEN SENSOR 2
85	B	SENSOR GROUND
86	L	ENGINE COMMUNICATION LINE
87	–	–
88	G	THROTTLE POSITION SENSOR 1
89	–	–
90	–	–
91	–	–
92	–	–
93	–	–
94	GR	ENGINE COOLING ELECTRIC WATER PUMP RELAY
95	LG	IGNITION SIGNAL NO. 2
96	P	IGNITION SIGNAL NO. 1
97	V	THROTTLE CONTROL MOTOR RELAY
98	–	–
99	–	–
100	–	–
101	SB	IGNITION SIGNAL NO. 4
102	–	–
103	–	–
104	Y	IGNITION SIGNAL NO. 3
105	–	–
106	–	–
107	–	–
108	–	–
109	Y	ENGINE COOLING ELECTRIC WATER PUMP DRIVE SIGNAL
110	B	ECM GROUND
111	G	INTAKE VALVE TIMING CONTROL SOLENOID VALVE
112	GR	EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
113	R	POWER SUPPLY FOR ECM (BACK-UP)
114	P	INTAKE VALVE TIMING INTERMEDIATE LOCK CONTROL SOLENOID VALVE
115	L	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
116	Y	AIR FUEL RATIO (A/F) SENSOR 1 HEATER
117	G	HEATED OXYGEN SENSOR 2 HEATER
118	LG	THROTTLE CONTROL MOTOR POWER SUPPLY
119	P	THROTTLE CONTROL MOTOR (OPEN)
120	L	THROTTLE CONTROL MOTOR (CLOSE)

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F54
Connector Name	ENGINE OIL PRESSURE SENSOR
Connector Type	RH03FB
Connector Color	BLACK

H.S.



Terminal No.	Color of Wire	Signal Name
1	B	SENSOR GROUND
2	G	ENGINE OIL PRESSURE SENSOR
3	Y	SENSOR POWER SUPPLY

Connector No.	F56
Connector Name	FUEL RAIL PRESSURE SENSOR
Connector Type	AFZ03FB
Connector Color	BLACK

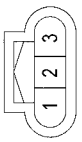
H.S.



Terminal No.	Color of Wire	Signal Name
1	Y	SENSOR POWER SUPPLY
2	G	FUEL RAIL PRESSURE SENSOR
3	B	SENSOR GROUND

Connector No.	F58
Connector Name	CRANKSHAFT POSITION SENSOR 2
Connector Type	RH03FGY
Connector Color	GRAY

H.S.



Terminal No.	Color of Wire	Signal Name
1	L	SENSOR POWER SUPPLY
2	R	SENSOR GROUND
3	B	CRANKSHAFT POSITION SENSOR 2

Connector No.	F59
Connector Name	ENGINE COOLING ELECTRIC WATER PUMP
Connector Type	HS02FGY-SJZ2
Connector Color	GRAY

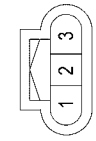
H.S.



Terminal No.	Color of Wire	Signal Name
1	Y	ENGINE COOLING ELECTRIC WATER PUMP DRIVE SIGNAL
2	SB	ENGINE COOLING ELECTRIC WATER PUMP SPEED SIGNAL
3	BR	RELAY OUTPUT
4	B	GROUND

Connector No.	F60
Connector Name	INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR
Connector Type	RH03FB
Connector Color	BLACK

H.S.



Terminal No.	Color of Wire	Signal Name
1	W	SENSOR POWER SUPPLY
2	R	INTAKE MANIFOLD RUNNER VALVE POSITION SENSOR
3	BR	SENSOR GROUND

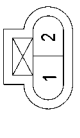
Connector No.	F61
Connector Name	ENGINE OUTLET COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS
Connector Color	GRAY

H.S.

Terminal No.	Color of Wire	Signal Name
1	BR	ENGINE OUTLET COOLANT TEMPERATURE SENSOR
2	B	SENSOR GROUND

Connector No.	F62
Connector Name	ENGINE INLET COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS
Connector Color	GRAY

H.S.



Terminal No.	Color of Wire	Signal Name
1	BR	ENGINE INLET COOLANT TEMPERATURE SENSOR
2	B	SENSOR GROUND

Connector No.	F63
Connector Name	FUEL INJECTOR RELAY
Connector Type	M06FBR-R-LC
Connector Color	BROWN

H.S.



Terminal No.	Color of Wire	Signal Name
1	B	GROUND
2	W	IGNITION
3	V	BATTERY
5	P	FUEL INJECTOR POWER SUPPLY-1
6	LG	BATTERY
7	L	FUEL INJECTOR POWER SUPPLY-2

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F64
Connector Name	HIGH PRESSURE FUEL PUMP
Connector Type	HS02FLGY-VR
Connector Color	GRAY

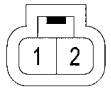
H.S.



Terminal No.	Color of Wire	Signal Name
1	V	HIGH PRESSURE FUEL PUMP HIGH
2	LG	HIGH PRESSURE FUEL PUMP LOW

Connector No.	F67
Connector Name	EXHAUST GAS TEMPERATURE SENSOR
Connector Type	HS02MW-1V
Connector Color	WHITE

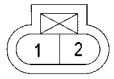
H.S.



Terminal No.	Color of Wire	Signal Name
1	R	EXHAUST GAS TEMPERATURE SENSOR
2	B	SENSOR GROUND

Connector No.	F68
Connector Name	ENGINE OIL TEMPERATURE SENSOR
Connector Type	E02FGY-RS
Connector Color	GRAY

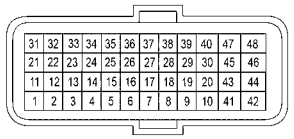
H.S.



Terminal No.	Color of Wire	Signal Name
1	P	ENGINE OIL TEMPERATURE SENSOR
2	B	SENSOR GROUND

Connector No.	F75
Connector Name	TCM (TRANSMISSION CONTROL MODULE)
Connector Type	RH40FB-RZ8-L-LH
Connector Color	BLACK

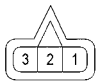
H.S.



Terminal No.	Color of Wire	Signal Name
1	–	–
2	SB	L RANGE SW
3	LG	CLUTCH 2 TEMP SENSOR
4	Y	D RANGE SW
5	R	N RANGE SW
6	G	R RANGE SW
7	V	P RANGE SW
8	–	–
9	–	–
10	–	–
11	W	SENSOR GND
12	LG	CVT FLUID TEMP SENS
13	–	–
14	–	–
15	B	SENSOR GND
16	R	SEC PRESS SENS
17	L	PRI PRESS SENS
18	–	–
19	–	–
20	–	–
21	–	–
22	–	–
23	G	HEV CAN–L
24	LG	INPUT SPEED SENS
25	W	EOP SIG
26	P	SENS PWR SUPPLY
27	–	–
28	–	–
29	–	–
30	BR	LINE PRESS SOL VALVE
31	–	–
32	P	EOP STATE
33	L	HEV CAN–H
34	R	OUTPUT SPEED SENS
35	LG	PRI SPEED SENS
36	–	–
37	BG	SELECT SOL VALVE
38	GR	TCC SOL VALVE
39	SB	SEC PRESS SOL VALVE
40	V	PRI PRESS SOL VALVE
41	B	GND
42	B	GND
43	–	–
44	–	–
45	LG	BATT
46	LG	BATT
47	R	VIGN
48	R	VIGN

Connector No.	F77
Connector Name	OUTPUT SPEED SENSOR
Connector Type	RK03FB
Connector Color	BLACK

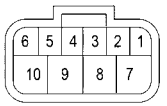
H.S.



Terminal No.	Color of Wire	Signal Name
1	LG	GROUND
2	R	OUTPUT SPEED SENS
3	Y	VIGN

Connector No.	F78
Connector Name	TRANSMISSION RANGE SWITCH
Connector Type	YDX06FB-HS4
Connector Color	BLACK

H.S.



Terminal No.	Color of Wire	Signal Name
1	–	–
2	Y	D RANGE SW
3	–	–
4	R	IGNITION
5	V	P RANGE SW
6	SB	L RANGE SW
7	Y	IGNITION
8	G	R RANGE SW
9	R	N RANGE SW
10	BG	NP SW

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	F79
Connector Name	WIRE TO WIRE
Connector Type	RH10FB
Connector Color	BLACK

H.S.

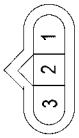


Terminal No.	Color of Wire	Signal Name
1	–	TO ENGINE CONTROL SUB HARNESS
2	R	TO ENGINE CONTROL SUB HARNESS
3	W	TO ENGINE CONTROL SUB HARNESS
4	BG	TO ENGINE CONTROL SUB HARNESS
5	B	TO ENGINE CONTROL SUB HARNESS
6	GR	TO ENGINE CONTROL SUB HARNESS
7	LG	TO ENGINE CONTROL SUB HARNESS
8	Y	TO ENGINE CONTROL SUB HARNESS
9	B	TO ENGINE CONTROL SUB HARNESS
10	W	TO ENGINE CONTROL SUB HARNESS

7	LG	TO ENGINE CONTROL HARNESS
8	Y	TO ENGINE CONTROL HARNESS
9	B	TO ENGINE CONTROL HARNESS
10	W	TO ENGINE CONTROL HARNESS

Connector No.	F204
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB
Connector Color	BLACK

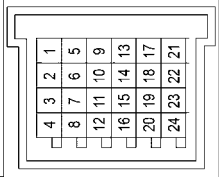
H.S.



Terminal No.	Color of Wire	Signal Name
1	Y	SENSOR POWER SUPPLY
2	W	REFRIGERANT PRESSURE SENSOR
3	B	SENSOR GROUND

Connector No.	M6
Connector Name	JOINT CONNECTOR-M01
Connector Type	NH24FGY-J
Connector Color	GRAY

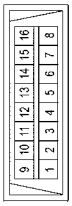
H.S.



Terminal No.	Color of Wire	Signal Name
1	GR	–
2	R	–
3	P	CAN-L
4	L	CAN-H
5	–	–
6	–	–
7	P	CAN-L
8	L	CAN-H
9	GR	–
10	R	–
11	P	CAN-L
12	L	CAN-H
13	P	CAN-L
14	L	CAN-H
15	P	CAN-L
16	L	CAN-H
17	P	CAN-L
18	L	CAN-H
19	P	CAN-L
20	L	CAN-H
21	P	CAN-L
22	L	CAN-H
23	P	CAN-L
24	L	CAN-H

Connector No.	M22
Connector Name	DATA LINK CONNECTOR
Connector Type	BD16FW
Connector Color	WHITE

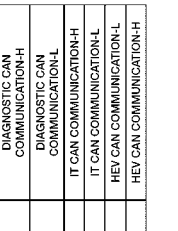
H.S.



Terminal No.	Color of Wire	Signal Name
1	–	–
2	–	–
3	–	–
4	B	GROUND
5	B	GROUND
6	L	CAN-H
7	GR	K-LINE
8	Y	IGNITION
9	–	–
10	–	–
11	–	–
12	–	–
13	–	–
14	P	CAN-L
15	–	–
16	W	BATTERY

Connector No.	M29
Connector Name	3CH CAN GATEWAY
Connector Type	TH16FW-NH
Connector Color	WHITE

H.S.



Terminal No.	Color of Wire	Signal Name
1	L	VEHICLE CAN COMMUNICATION 1-H
2	P	VEHICLE CAN COMMUNICATION 1-L
3	L	DIAGNOSTIC CAN COMMUNICATION-H
4	P	DIAGNOSTIC CAN COMMUNICATION-L
5	Y	IGNITION POWER SUPPLY
6	B	GROUND
7	B	GROUND
8	W	BATTERY POWER SUPPLY
9	L	IT CAN COMMUNICATION-H
10	V	IT CAN COMMUNICATION-L
11	L	DIAGNOSTIC CAN COMMUNICATION-H
12	P	DIAGNOSTIC CAN COMMUNICATION-L
13	L	IT CAN COMMUNICATION-H
14	V	IT CAN COMMUNICATION-L
15	L	HEV CAN COMMUNICATION-L
16	G	HEV CAN COMMUNICATION-H

Connector No.	F201
Connector Name	WIRE TO WIRE
Connector Type	RH10MB
Connector Color	BLACK

H.S.



Terminal No.	Color of Wire	Signal Name
1	–	TO ENGINE CONTROL HARNESS
2	R	TO ENGINE CONTROL HARNESS
3	W	TO ENGINE CONTROL HARNESS
4	BG	TO ENGINE CONTROL HARNESS
5	B	TO ENGINE CONTROL HARNESS
6	Y	TO ENGINE CONTROL HARNESS

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	M31
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4
Connector Color	WHITE

H.S.

Terminal No.	Color of Wire	Signal Name
1J	–	TO ENGINE ROOM HARNESS
2J	R	TO ENGINE ROOM HARNESS
3J	–	TO ENGINE ROOM HARNESS
4J	–	TO ENGINE ROOM HARNESS
5J	–	TO ENGINE ROOM HARNESS
6J	–	TO ENGINE ROOM HARNESS
7J	–	TO ENGINE ROOM HARNESS
8J	–	TO ENGINE ROOM HARNESS
9J	W	TO ENGINE ROOM HARNESS
10J	–	TO ENGINE ROOM HARNESS
11J	–	TO ENGINE ROOM HARNESS
12J	–	TO ENGINE ROOM HARNESS
13J	–	TO ENGINE ROOM HARNESS
14J	–	TO ENGINE ROOM HARNESS
15J	–	TO ENGINE ROOM HARNESS
16J	–	TO ENGINE ROOM HARNESS
17J	–	TO ENGINE ROOM HARNESS
18J	–	TO ENGINE ROOM HARNESS
19J	–	TO ENGINE ROOM HARNESS
20J	–	TO ENGINE ROOM HARNESS
21J	LA/L	TO ENGINE ROOM HARNESS
22J	SHIELD	TO ENGINE ROOM HARNESS
23J	LG	TO ENGINE ROOM HARNESS
24J	V	TO ENGINE ROOM HARNESS
25J	L	TO ENGINE ROOM HARNESS
26J	BR	TO ENGINE ROOM HARNESS
27J	G	TO ENGINE ROOM HARNESS
28J	Y	TO ENGINE ROOM HARNESS
29J	L	TO ENGINE ROOM HARNESS
30J	V	TO ENGINE ROOM HARNESS
31J	–	TO ENGINE ROOM HARNESS
32J	–	TO ENGINE ROOM HARNESS
33J	R	TO ENGINE ROOM HARNESS
33J	Y	TO ENGINE ROOM HARNESS - (WITH DRIVER ASSISTNACE SYSTEM)
34J	L	TO ENGINE ROOM HARNESS
35J	BG	TO ENGINE ROOM HARNESS
36J	GR	TO ENGINE ROOM HARNESS
37J	Y	TO ENGINE ROOM HARNESS
38J	LA/BR	TO ENGINE ROOM HARNESS
39J	–	TO ENGINE ROOM HARNESS
40J	–	TO ENGINE ROOM HARNESS
41J	LA/R	TO ENGINE ROOM HARNESS
42J	W	TO ENGINE ROOM HARNESS
43J	L	TO ENGINE ROOM HARNESS
44J	B	TO ENGINE ROOM HARNESS
45J	SB	TO ENGINE ROOM HARNESS
46J	BR	TO ENGINE ROOM HARNESS
47J	W	TO ENGINE ROOM HARNESS
48J	R	TO ENGINE ROOM HARNESS
49J	SB	TO ENGINE ROOM HARNESS
50J	GR	TO ENGINE ROOM HARNESS
51J	W	TO ENGINE ROOM HARNESS
52J	R	TO ENGINE ROOM HARNESS
53J	BR	TO ENGINE ROOM HARNESS
54J	LG	TO ENGINE ROOM HARNESS
55J	LA/Y	TO ENGINE ROOM HARNESS
56J	LA/V	TO ENGINE ROOM HARNESS
57J	LA/R	TO ENGINE ROOM HARNESS
58J	W	TO ENGINE ROOM HARNESS
59J	BR	TO ENGINE ROOM HARNESS
60J	P	TO ENGINE ROOM HARNESS
61J	L	TO ENGINE ROOM HARNESS
62J	R	TO ENGINE ROOM HARNESS
63J	L	TO ENGINE ROOM HARNESS
64J	R	TO ENGINE ROOM HARNESS
65J	L	TO ENGINE ROOM HARNESS
66J	BG	TO ENGINE ROOM HARNESS
67J	–	TO ENGINE ROOM HARNESS
68J	–	TO ENGINE ROOM HARNESS
69J	G	TO ENGINE ROOM HARNESS
70J	L	TO ENGINE ROOM HARNESS
71J	–	TO ENGINE ROOM HARNESS
72J	–	TO ENGINE ROOM HARNESS
73J	–	TO ENGINE ROOM HARNESS
74J	–	TO ENGINE ROOM HARNESS
75J	–	TO ENGINE ROOM HARNESS
76J	–	TO ENGINE ROOM HARNESS
77J	–	TO ENGINE ROOM HARNESS
78J	–	TO ENGINE ROOM HARNESS
79J	SHIELD	TO ENGINE ROOM HARNESS
80J	B	TO ENGINE ROOM HARNESS
81J	W	TO ENGINE ROOM HARNESS
82J	–	TO ENGINE ROOM HARNESS
83J	–	TO ENGINE ROOM HARNESS
84J	–	TO ENGINE ROOM HARNESS
85J	–	TO ENGINE ROOM HARNESS
86J	–	TO ENGINE ROOM HARNESS
87J	–	TO ENGINE ROOM HARNESS
88J	–	TO ENGINE ROOM HARNESS
89J	–	TO ENGINE ROOM HARNESS
90J	–	TO ENGINE ROOM HARNESS
91J	–	TO ENGINE ROOM HARNESS
92J	Y	TO ENGINE ROOM HARNESS
93J	G	TO ENGINE ROOM HARNESS
94J	L	TO ENGINE ROOM HARNESS
95J	P	TO ENGINE ROOM HARNESS
96J	–	TO ENGINE ROOM HARNESS
97J	SB	TO ENGINE ROOM HARNESS
98J	P	TO ENGINE ROOM HARNESS
99J	LA/R	TO ENGINE ROOM HARNESS
100J	R	TO ENGINE ROOM HARNESS

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ENGINE CONTROL SYSTEM CONNECTORS

Connector No.	M36
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4
Connector Color	WHITE

H.S.

Terminal No.	Color of Wire	Signal Name
1G	LA/R	TO BODY NO. 2 HARNESS
2G	W	TO BODY NO. 2 HARNESS
3G	Y	TO BODY NO. 2 HARNESS
4G	BG	TO BODY NO. 2 HARNESS
5G	G	TO BODY NO. 2 HARNESS
6G	SB	TO BODY NO. 2 HARNESS
7G	P	TO BODY NO. 2 HARNESS
8G	LA/Y	TO BODY NO. 2 HARNESS
9G	LA/W	TO BODY NO. 2 HARNESS
10G	R	TO BODY NO. 2 HARNESS
11G	G	TO BODY NO. 2 HARNESS
12G	L	TO BODY NO. 2 HARNESS
13G	–	TO BODY NO. 2 HARNESS
14G	–	TO BODY NO. 2 HARNESS
15G	Y	TO BODY NO. 2 HARNESS
16G	–	TO BODY NO. 2 HARNESS
17G	–	TO BODY NO. 2 HARNESS
18G	R	TO BODY NO. 2 HARNESS
19G	LA/R	TO BODY NO. 2 HARNESS
20G	W	TO BODY NO. 2 HARNESS
21G	BR	TO BODY NO. 2 HARNESS
22G	P	TO BODY NO. 2 HARNESS
23G	L	TO BODY NO. 2 HARNESS
24G	W	TO BODY NO. 2 HARNESS
25G	L	TO BODY NO. 2 HARNESS
26G	–	TO BODY NO. 2 HARNESS
27G	–	TO BODY NO. 2 HARNESS
28G	–	TO BODY NO. 2 HARNESS
29G	–	TO BODY NO. 2 HARNESS
30G	–	TO BODY NO. 2 HARNESS
31G	–	TO BODY NO. 2 HARNESS
32G	–	TO BODY NO. 2 HARNESS
33G	–	TO BODY NO. 2 HARNESS
34G	V	TO BODY NO. 2 HARNESS
35G	BR	TO BODY NO. 2 HARNESS
36G	SHIELD	TO BODY NO. 2 HARNESS
37G	LG	TO BODY NO. 2 HARNESS
38G	V	TO BODY NO. 2 HARNESS
39G	SHIELD	TO BODY NO. 2 HARNESS
40G	G	TO BODY NO. 2 HARNESS
41G	R	TO BODY NO. 2 HARNESS
42G	–	TO BODY NO. 2 HARNESS
43G	–	TO BODY NO. 2 HARNESS
44G	BG	TO BODY NO. 2 HARNESS
45G	SHIELD	TO BODY NO. 2 HARNESS
46G	L	TO BODY NO. 2 HARNESS
47G	Y	TO BODY NO. 2 HARNESS
48G	SHIELD	TO BODY NO. 2 HARNESS
49G	W	TO BODY NO. 2 HARNESS
50G	R	TO BODY NO. 2 HARNESS
51G	–	TO BODY NO. 2 HARNESS
52G	–	TO BODY NO. 2 HARNESS
53G	–	TO BODY NO. 2 HARNESS
54G	–	TO BODY NO. 2 HARNESS
55G	–	TO BODY NO. 2 HARNESS
56G	–	TO BODY NO. 2 HARNESS
57G	–	TO BODY NO. 2 HARNESS
58G	–	TO BODY NO. 2 HARNESS
59G	–	TO BODY NO. 2 HARNESS
60G	GR	TO BODY NO. 2 HARNESS
61G	BR	TO BODY NO. 2 HARNESS
62G	–	TO BODY NO. 2 HARNESS
63G	–	TO BODY NO. 2 HARNESS
64G	–	TO BODY NO. 2 HARNESS
65G	–	TO BODY NO. 2 HARNESS
66G	–	TO BODY NO. 2 HARNESS
67G	–	TO BODY NO. 2 HARNESS
68G	–	TO BODY NO. 2 HARNESS
69G	–	TO BODY NO. 2 HARNESS
70G	–	TO BODY NO. 2 HARNESS
71G	–	TO BODY NO. 2 HARNESS
72G	–	TO BODY NO. 2 HARNESS
73G	–	TO BODY NO. 2 HARNESS
74G	–	TO BODY NO. 2 HARNESS
76G	–	TO BODY NO. 2 HARNESS
77G	–	TO BODY NO. 2 HARNESS
78G	LA/Y	TO BODY NO. 2 HARNESS
79G	LA/V	TO BODY NO. 2 HARNESS
80G	LA/B	TO BODY NO. 2 HARNESS
81G	LA/L	TO BODY NO. 2 HARNESS
82G	–	TO BODY NO. 2 HARNESS
83G	–	TO BODY NO. 2 HARNESS
84G	–	TO BODY NO. 2 HARNESS
85G	–	TO BODY NO. 2 HARNESS
86G	–	TO BODY NO. 2 HARNESS
87G	–	TO BODY NO. 2 HARNESS
88G	–	TO BODY NO. 2 HARNESS
89G	–	TO BODY NO. 2 HARNESS
90G	–	TO BODY NO. 2 HARNESS
91G	R	TO BODY NO. 2 HARNESS
92G	LA/L	TO BODY NO. 2 HARNESS
93G	W	TO BODY NO. 2 HARNESS
94G	LG	TO BODY NO. 2 HARNESS
95G	GR	TO BODY NO. 2 HARNESS
96G	SB	TO BODY NO. 2 HARNESS
97G	LA/BR	TO BODY NO. 2 HARNESS
98G	GR	TO BODY NO. 2 HARNESS
99G	Y	TO BODY NO. 2 HARNESS
100G	V	TO BODY NO. 2 HARNESS

Connector No.	M43
Connector Name	JOINT CONNECTOR-M02
Connector Type	NH20FG-DC
Connector Color	GREEN

H.S.

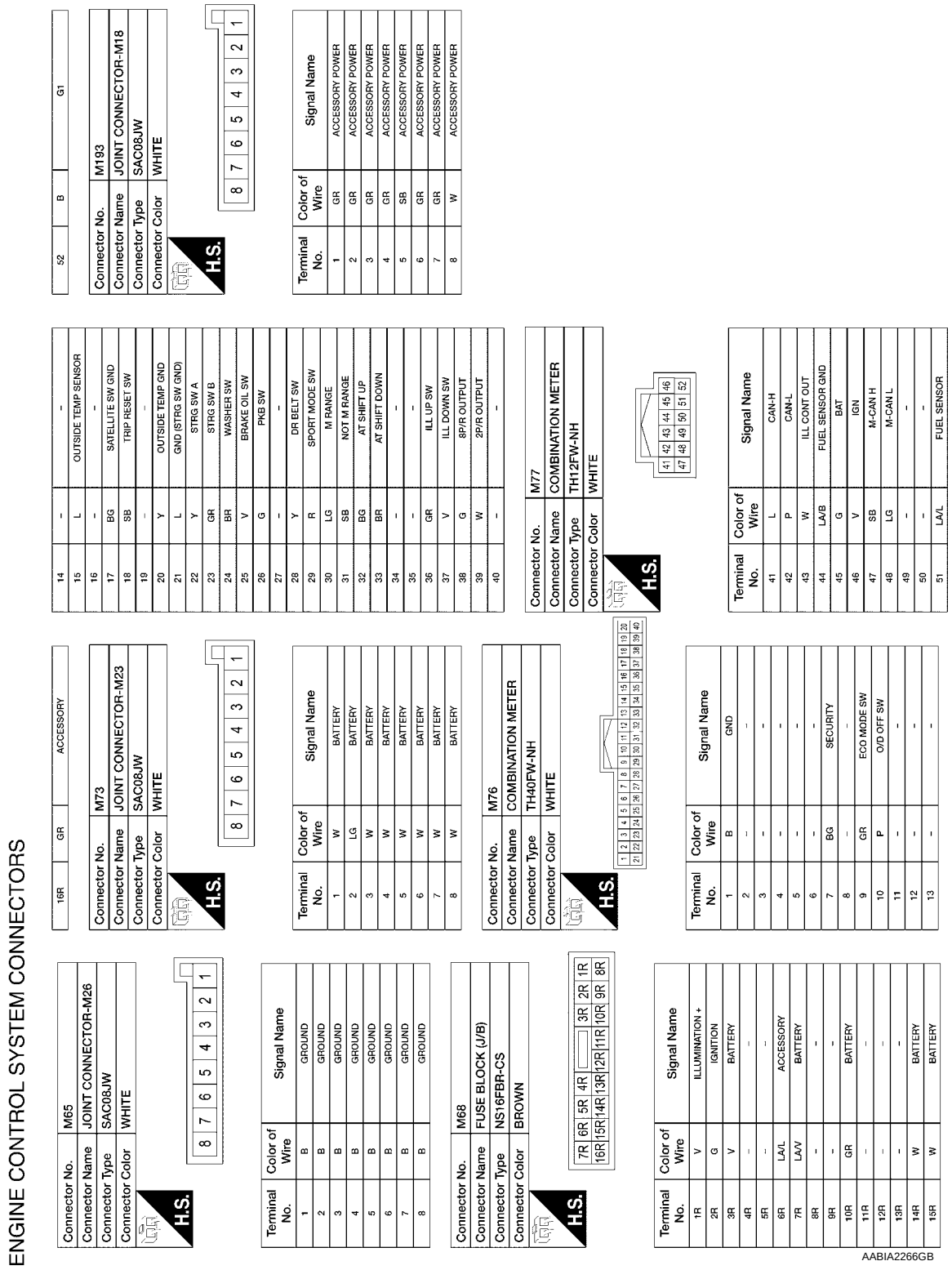
Terminal No.	Color of Wire	Signal Name
1	–	–
2	–	–
3	L	CAN-H
4	L	CAN-H
5	L	CAN-H
6	–	–
7	L	CAN-H
8	L	CAN-H
9	L	CAN-H
10	–	–
11	–	–
12	–	–
13	–	–
14	G	CAN-L
15	G	CAN-L
16	G	CAN-L
17	–	–
18	P	CAN-L
19	P	CAN-L
20	P	CAN-L

Connector No.	M44
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS
Connector Color	WHITE

H.S.

Terminal No.	Color of Wire	Signal Name
1P	R	IGNITION
2P	G	IGNITION
3P	Y	IGNITION RELAY-2 CONTROL
4P	LG	IGNITION
5P	GR	IGNITION
6P	LA/R	REAR WINDOW DEFOGGER RELAY CONTROL
7P	Y	IGNITION
8P	BR	IGNITION
9P	L	BATTERY
10P	LG	IGNITION
11P	–	–
12P	–	–
13P	G	BATTERY
14P	SB	BATTERY
15P	L	BATTERY
16P	LA/W	FRONT BLOWER MOTOR RELAY CONTROL

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ENGINE CONTROL SYSTEM CONNECTORS
Connector No. M65
Connector Name JOINT CONNECTOR-M26
Connector Type SAC08JW
Connector Color WHITE
H.S.
8 7 6 5 4 3 2 1
Terminal No. Color of Wire Signal Name
1 B GROUND
2 B GROUND
3 B GROUND
4 B GROUND
5 B GROUND
6 B GROUND
7 B GROUND
8 B GROUND
Connector No. M68
Connector Name FUSE BLOCK (J/B)
Connector Type NS16FBR-CS
Connector Color BROWN
H.S.
7R 6R 5R 4R 3R 2R 1R
16R 15R 14R 13R 12R 11R 10R 9R 8R
Terminal No. Color of Wire Signal Name
1R V ILLUMINATION +
2R G IGNITION
3R V BATTERY
4R – –
5R – –
6R LA/L ACCESSORY
7R LA/V BATTERY
8R – –
9R – –
10R GR BATTERY
11R – –
12R – –
13R – –
14R W BATTERY
15R W BATTERY
16R GR ACCESSORY
Connector No. M73
Connector Name JOINT CONNECTOR-M23
Connector Type SAC08JW
Connector Color WHITE
H.S.
8 7 6 5 4 3 2 1
Terminal No. Color of Wire Signal Name
1 W BATTERY
2 LG BATTERY
3 W BATTERY
4 W BATTERY
5 W BATTERY
6 W BATTERY
7 W BATTERY
8 W BATTERY
Connector No. M76
Connector Name COMBINATION METER
Connector Type TH40FW-NH
Connector Color WHITE
H.S.
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20
21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40
Terminal No. Color of Wire Signal Name
1 B GND
2 – –
3 – –
4 – –
5 – –
6 – –
7 BG SECURITY
8 – –
9 GR ECO MODE SW
10 P O/D OFF SW
11 – –
12 – –
13 – –
14 – –
15 L OUTSIDE TEMP SENSOR
16 – –
17 BG SATELLITE SW GND
18 SB TRIP RESET SW
19 – –
20 Y OUTSIDE TEMP GND
21 L GND (STRG SW GND)
22 Y STRG SW A
23 GR STRG SW B
24 BR WASHER SW
25 V BRAKE OIL SW
26 G PKB SW
27 – –
28 Y DR BELT SW
29 R SPORT MODE SW
30 LG M RANGE
31 SB NOT M RANGE
32 BG AT SHIFT UP
33 BR AT SHIFT DOWN
34 – –
35 – –
36 GR ILL UP SW
37 V ILL DOWN SW
38 G 8P/R OUTPUT
39 W 2P/R OUTPUT
40 – –
Connector No. M77
Connector Name COMBINATION METER
Connector Type TH12FW-NH
Connector Color WHITE
H.S.
41 42 43 44 45 46
47 48 49 50 51 52
Terminal No. Color of Wire Signal Name
41 L CAN-H
42 P CAN-L
43 W ILL CONT OUT
44 LA/B FUEL SENSOR GND
45 G BAT
46 V IGN
47 SB M-CAN H
48 LG M-CAN L
49 – –
50 – –
51 LA/L FUEL SENSOR
52 B G1
Connector No. M193
Connector Name JOINT CONNECTOR-M18
Connector Type SAC08JW
Connector Color WHITE
H.S.
8 7 6 5 4 3 2 1
Terminal No. Color of Wire Signal Name
1 GR ACCESSORY POWER
2 GR ACCESSORY POWER
3 GR ACCESSORY POWER
4 GR ACCESSORY POWER
5 SB ACCESSORY POWER
6 GR ACCESSORY POWER
7 GR ACCESSORY POWER
8 W ACCESSORY POWER
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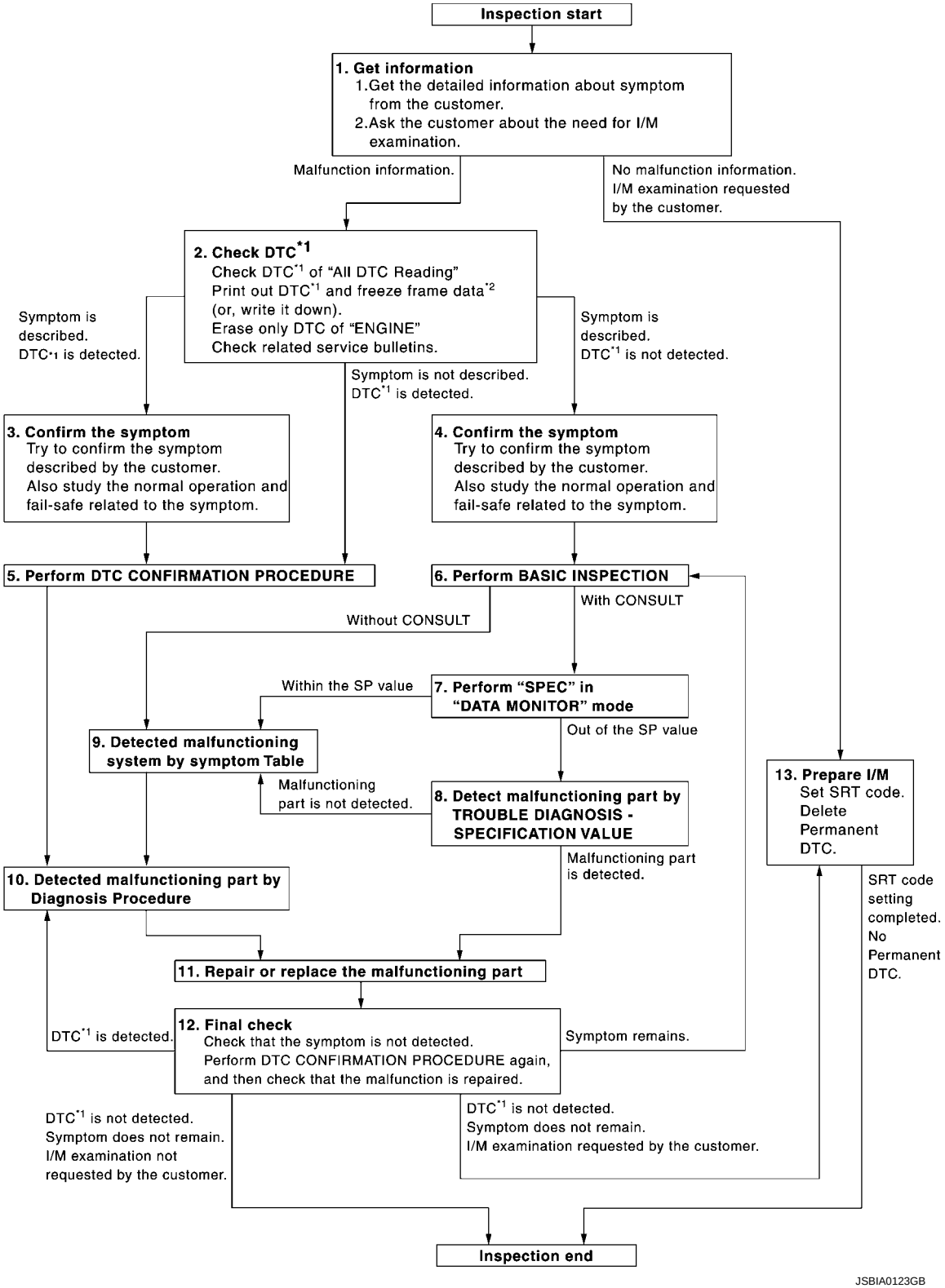
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000014631164

OVERALL SEQUENCE



JSBIA0123GB

*1: Include 1st trip DTC.
*2: Include 1st trip freeze frame data.

DETAILED FLOW

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-150, "Diagnostic Work Sheet".)

Malfunction information, obtained>>GO TO 2.

2.CHECK DTC

1. Check DTC of “ALL DTC Reading”.
2. Perform the following procedure if DTC is displayed.

- Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
- Erase only DTC of “ENGINE”.
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-583, "Symptom Table".)

3. Check related service bulletins for information.

Is any symptom described and is any DTC 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-588, "Description" and EC-103, "Fail-safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail-safe related to the symptom. Refer to Refer to EC-588, "Description" and EC-103, "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 EC-107, "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 CONFIRMATION PROCEDURE.

Is DTC detected?

YES >> GO TO 10.
NO >> Check according to GI-54, "Intermittent Incident".

6.PERFORM BASIC INSPECTION

Perform EC-159, "Work Procedure".

Do you have CONSULT?

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

7. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT
Check that “MASS AIR FLOW SENSOR (Hz)”, “B/FUEL SCHDL”, and “A/F ALPHA-B1” are within the SP value using “SPEC” in “DATA MONITOR” mode with CONSULT. Refer to EC-176, "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-177, "Diagnosis Procedure".

Is a malfunctioning part detected?

YES >> GO TO 11.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to EC-583, "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-56, "Circuit Inspection".

Is a malfunctioning part detected?

YES >> GO TO 11.
NO >> Monitor input data from related sensors or check voltage of related ECM terminals using CONSULT. Refer to EC-87, "Reference Value".

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

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

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

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.
YES-2 >> Symptom remains: GO TO 6.
NO-1 >> Before returning the vehicle to the customer, make sure to erase unnecessary DTC in ECM. (Refer to “How to Erase DTC and 1st Trip DTC” in EC-78, "CONSULT Function".)
NO-2 >> I/M examination, requested from the customer: GO TO 13.

13. PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to EC-164, "Description".

2. Erase permanent DTCs. Refer to EC-170, "Description".

>> INSPECTION END.

Diagnostic Work Sheet

INFOID:0000000014631165

DESCRIPTION

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

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

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

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

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

KEY POINTS

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

SEF907L

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.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid °F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

MTBL0017

ADDITIONAL SERVICE WHEN REPLACING ECM

Description

INFOID:0000000014631166

When replacing ECM, the following procedure must be performed. (For details, refer to EC-152, "Work Procedure".)

PROGRAMMING OPERATION

NOTE:

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

Work Procedure

INFOID:0000000014631167

1.SAVE ECM DATA

With CONSULT

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

NOTE:

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

>> GO TO 2.

2.CHECK ECM PART NUMBER

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

NOTE:

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

Is the ECM a blank ECM?

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

3.SAVE ECM PART NUMBER

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

NOTE:

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

>> GO TO 4.

4.PERFORM ECM PROGRAMMING

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

NOTE:

- Refer to EC-595, "Removal and Installation" for replacement of ECM.
- During programming, maintain the following conditions:

- Ignition switch: ON
- Electric load: OFF
- Brake pedal: Not depressed
- Battery voltage: 12 – 13.5 V (Be sure to check the value of battery voltage by selecting “BATTERY VOLT” in “Data monitor” of CONSULT.)

>> GO TO 6.

5.REPLACE ECM

Replace ECM. Refer to EC-595, "Removal and Installation".

>> GO TO 6.

6. CHECK ECM DATA STATUS

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

Is the data saved successfully?

YES >> GO TO 7.
NO >> GO TO 8.

7. WRITE ECM DATA

With CONSULT
1. Select “WRITING DATA FOR REPLC CPU” in “WORK SUPPORT” mode of “ENGINE” using CONSULT.
2. Follow the instruction of CONSULT display.

NOTE:
The data saved by “SAVING DATA FOR REPLC CPU” is written to ECM.

>> GO TO 9.

8. PERFORM VIN REGISTRATION

Refer to EC-154, "Description".

>> GO TO 9.

9. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-155, "Description".

>> GO TO 10.

10. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-156, "Description".

>> END

VIN REGISTRATION

Description

INFOID:0000000014631168

VIN Registration is an operation to registering VIN in ECM. (For details, refer to EC-154, "Work Procedure".)
It must be performed each time ECM is replaced.

Work Procedure

INFOID:0000000014631169

1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to GI-44, "Identification Number".

>> GO TO 2.

2.PERFORM VIN REGISTRATION

With CONSULT

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

>> END

THROTTLE VALVE CLOSED POSITION LEARNING

Description

INFOID:0000000014631170

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. (For details, refer to EC-155, "Work Procedure".) It must be performed each time the harness connector of the electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned.

Work Procedure

INFOID:0000000014631171

1.START

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

Without CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
   NOTE:
   Coolant temperature is less than 25°C (77°F) before engine starts.
3. Warm up the engine.
   NOTE:
   Raise engine coolant temperature until it reaches 65°C (149°F) or more.
4. Turn ignition switch OFF and wait at least 10 seconds.
   NOTE:
   Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

>> END

IDLE AIR VOLUME LEARNING

Description

INFOID:0000000014631172

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within the specific range. (For details, refer to EC-156, "Work Procedure".)
It must be performed under the following conditions:
- Each time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of specification.

Work Procedure

INFOID:0000000014631173

1.START

CAUTION:
Note that the engine starts automatically when starting the Idle Air Volume Learning during engine stop control.

>> GO TO 2.

2.PRECONDITIONING-1

With CONSULT
1. Turn ignition switch ON.
2. Select “HV BATTERY LEVEL” in “DATA MONITOR” mode of “EV/HEV”.
3. Check “HV BATTERY LEVEL” data monitor item indication.

Is the “HV BATTERY LEVEL” indicating 50% or more?

YES >> GO TO 3.
NO >> 1. Charge the Li-ion battery.
2. GO TO 3.

3.PRECONDITIONING-2

With CONSULT
1. Select “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Check “COOLANT TEMP/S” data monitor item indication.

Is the “COOLANT TEMP/S” indicating a temperature between 70°C (158°F) and 100°C (212°F)?

YES >> GO TO 4.
NO >> 1. Adjust Engine coolant temperature between 70°C (158°F) and 100°C (212°F).
NOTE:
When warm engine up to normal operating temperature, perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Turn ignition switch OFF.
3. GO TO 4.

4.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".

>> GO TO 5.

5.PERFORM IDLE AIR VOLUME LEARNING

With CONSULT
1. Set the vehicle to READY.
2. Make sure that all of the following conditions are satisfied.

- Li-ion battery charging status: 50% or more
- Engine coolant temperature: 70 – 100°C (158 – 212°F)
- Battery voltage: More than 12.9 V (At idle)
- Selector lever: P or N
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
- Steering wheel: Neutral (Straight-ahead position)

- Vehicle speed: Stopped
- Transmission: Warmed-up (Drive vehicle for 10 minutes.)

3. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode of “ENGINE” using CONSULT.
4. Touch “START”.
   NOTE:
   The engine starts automatically.
5. Wait 20 seconds at idle.

Is “CMPLT” displayed on CONSULT screen?

YES >> GO TO 6.
NO >> GO TO 7.

6. DETECT MALFUNCTIONING PART-1

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7. DETECT MALFUNCTIONING PART-2

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.
It is useful to perform “TROUBLE DIAGNOSIS - SPECIFICATION VALUE”. Refer to EC-176, "Description".
If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:
- Engine stalls.
- Erroneous idle.

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description

INFOID:0000000014631174

This describes how to erase the mixture ratio self-learning value. (For details, refer to EC-158, "Work Procedure".)
For the actual procedure, follow the instructions in “Diagnosis Procedure”.

Work Procedure

INFOID:0000000014631175

1.START

With CONSULT
1. Perform INSPECTION END 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT.
4. Clear mixture ratio self-learning value by touching “CLEAR”.

>> END

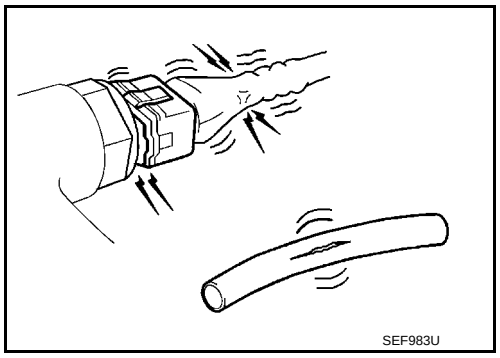
BASIC INSPECTION

Work Procedure

INFOID:0000000014631176

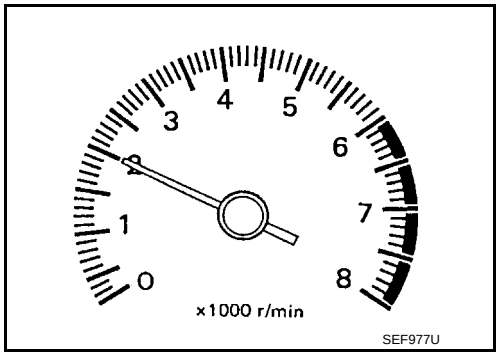
1.INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket
3. Confirm that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
4. Perform INSPECTION MODE 1. Refer to HBC-113, "Description".
5. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge. Ensure engine stays below 1,000 rpm.
6. Run engine at about 2,000 rpm for about 2 minutes under no load.
7. Make sure that no DTC is displayed with CONSULT or Diagnostic Test Mode II (self-diagnostic results).


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Is any DTC detected?

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



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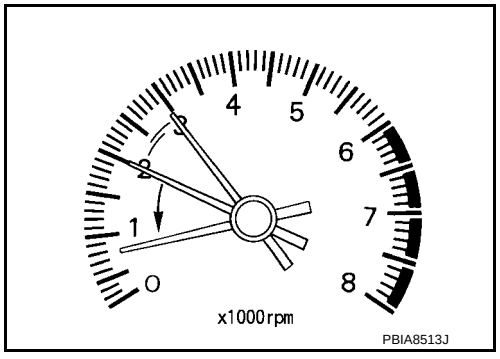
2.REPAIR OR REPLACE

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

>> GO TO 3.

3.CHECK TARGET IDLE SPEED

1. Run engine at about 2,000 rpm for about 2 minutes under no load.
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.
3. Check idle speed.
For procedure, refer to EC-589, "Inspection".
For specification, refer to EC-596, "Idle Speed".



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Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 4.

4.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".

>> GO TO 5.

5.PERFORM IDLE AIR VOLUME LEARNING

Perform Idle Air Volume Learning. Refer to EC-156, "Description".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 6.
NO >> Follow the instruction of IDLE AIR VOLUME LEARNING. Then GO TO 4.

6. CHECK TARGET IDLE SPEED AGAIN

1. Perform INSPECTION MODE 1. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Check idle speed.
   For procedure, refer to EC-589, "Inspection".
   For specification, refer to EC-596, "Idle Speed".

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor and circuit. Refer to EC-350, "DTC Description".
- Check exhaust valve timing control position sensor and circuit. Refer to EC-354, "DTC Description".
- Check crankshaft position sensor 1 and circuit. Refer to EC-345, "DTC Description".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace. Then GO TO 4.

8. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)

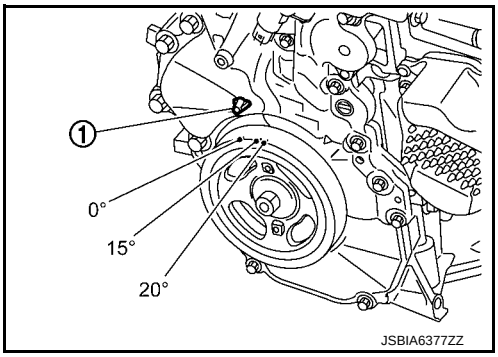
>> GO TO 4.

9. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.

① : Timing indicator

For procedure, refer to EC-590, "Inspection".
For specification, refer to EC-596, "Ignition Timing".



Is the inspection result normal?

YES >> GO TO 17.
NO >> GO TO 10.

10. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".

>> GO TO 11.

11. PERFORM IDLE AIR VOLUME LEARNING

Perform Idle Air Volume Learning. Refer to EC-156, "Description".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 12.
NO >> Follow the instruction of IDLE AIR VOLUME LEARNING. Then GO TO 4.

12. CHECK TARGET IDLE SPEED AGAIN

1. Perform INSPECTION MODE 1. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.

3. Check idle speed.
For procedure, refer to EC-589, "Inspection".
For specification, refer to EC-596, "Idle Speed".

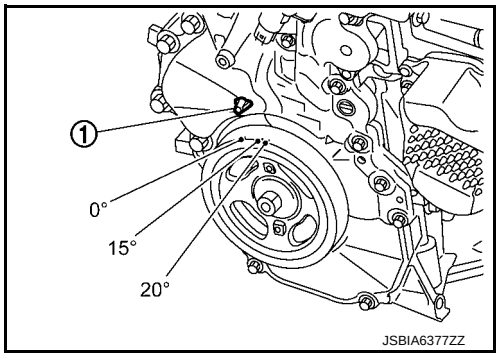
Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 15.

13. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.

① : Timing indicator



For procedure, refer to EC-590, "Inspection".
For specification, refer to EC-596, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 17.
NO >> GO TO 14.

14. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-66, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair the timing chain installation. Then GO TO 4.

15. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor and circuit. Refer to EC-350, "DTC Description".
- Check exhaust valve timing control position sensor and circuit. Refer to EC-354, "DTC Description".
- Check crankshaft position sensor 1 and circuit. Refer to EC-345, "DTC Description".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Repair or replace. Then GO TO 4.

16. CHECK ECM FUNCTION

Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)

>> GO TO 4.

17. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, perform EC-152, "Work Procedure".

>> INSPECTION END

FUEL PRESSURE CHECK

Work Procedure

INFOID:0000000014631177

FUEL PRESSURE RELEASE

1.FUEL PRESSURE RELEASE

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode of “ENGINE” using CONSULT.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.

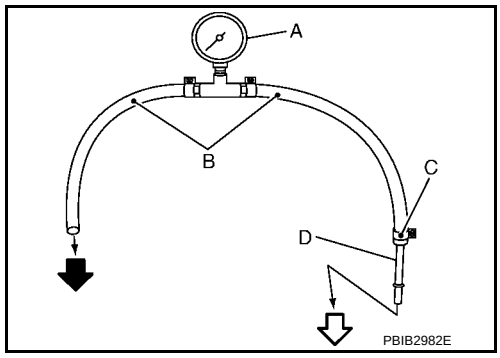
Without CONSULT
1. Remove fuel pump fuse located in IPDM E/R.
- Refer to EC-122, "Wiring Diagram" for the fuse number.
- Refer to PG-118, "IPDM E/R Terminal Arrangement" for the fuse arrangement.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Reinstall fuel pump fuse after servicing fuel system.

>> INSPECTION END

FUEL PRESSURE CHECK

1.FUEL PRESSURE CHECK

1. Release fuel pressure.
2. Connect fuel hose for fuel pressure check (B) to fuel pressure gauge (A). Then, connect fuel hose for fuel pressure check to fuel tube adapter (SST: KV10120000) (D) with hose clamp (C).



: To high pressure fuel pump

: To quick connector

CAUTION:
- **Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose)**
- **To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.**
- **Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.**
- **Apply proper amount of gasoline on the hose insertion part.**
- **Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 N4710)**
- **Install hose clamp to the hose end position within 1 – 2 mm (0.04 – 0.08 in) and tighten hose clamp to the specified torque.**

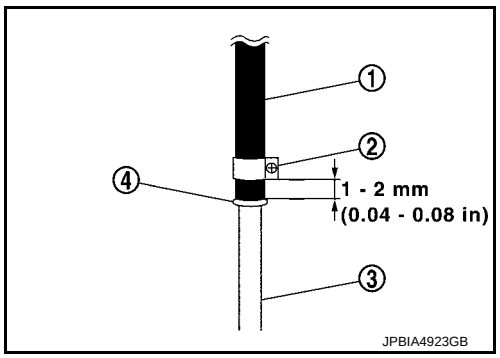
Tightening torque: 1.3 N·m (0.13 kg–m, 12 in-lb)

3. Disconnect quick connector and disconnect fuel feed hose from high pressure fuel pump. Refer to EM-49, "Exploded View".

CAUTION:
- **Make sure to release fuel pressure before removal of fuel line.**
- **Do the following procedure in the place where ventilation is good without the combustible.**

NOTE:
- Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because this models do not have fuel return system.
- Use fuel tube adapter (SST: KV10120000) and fuel pressure gauge (Commercial service tool) to check fuel pressure.

4. Install fuel hose for fuel pressure check ① to high pressure fuel pump with hose clamp ②.

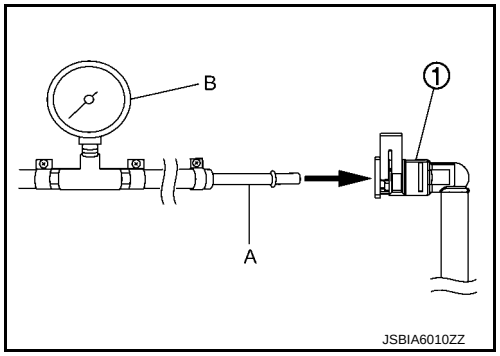


CAUTION:
- **Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.**
- **Apply proper amount of gasoline on the hose insertion part.**
- **Insert fuel hose for fuel pressure check until it touches the spool ④ on high pressure fuel pump ③.**
- **Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).**
- **Install hose clamp to the hose end position within 1 – 2 mm (0.04 – 0.08 in) and tighten hose clamp to the specified torque.**

Tightening torque: 1.3 N·m (0.13 kg–m, 12 in-lb)

- **After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 100 N (approximately 10 kg, 22 lb) to confirm fuel sub tube does not come off.**

5. Install fuel tube adapter (SST: KV10120000) (A) to quick connector ① of fuel feed hose.



B : Fuel pressure gauge

6. Turn ignition switch ON and check for fuel leakage.
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Start engine and check for fuel leakage.
9. Read the indication of fuel pressure gauge.

At idling : Approximately 500 kPa (5.1 kg/cm^2, 72.5 psi)

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK FUEL HOSE

Check fuel hose for clogging.

Is the inspection result normal?

YES >> Repair or replace the malfunctioning part.
NO >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".

HOW TO SET SRT CODE

Description

INFOID:0000000014720840

OUTLINE

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

SRT ITEM

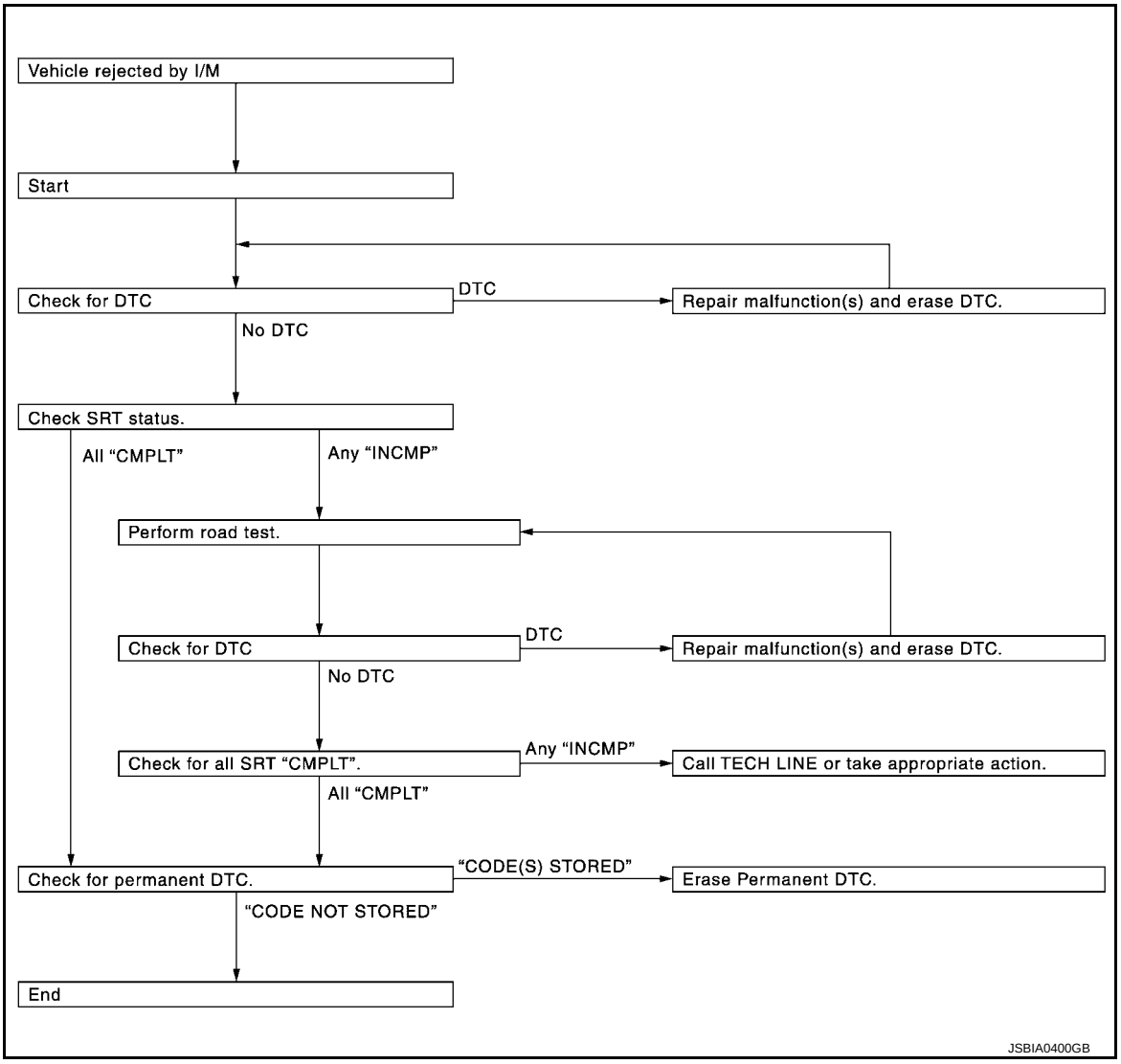
The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item*1 (CONSULT indication)	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	Three way catalyst function	P0420
EVAP SYSTEM	EVAP control system purge flow monitoring	P0441
	EVAP control system	P0456
HO2S	Air fuel ratio (A/F) sensor 1	P014C, P014D, P015A, P015B
	Heated oxygen sensor 2	P0137
	Heated oxygen sensor 2	P0138
	Heated oxygen sensor 2	P0139
EGR/VVT SYSTEM	Intake value timing control function	P0011, P052A, P052B

*1: Though displayed on the CONSULT 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, referring to the following flowchart.

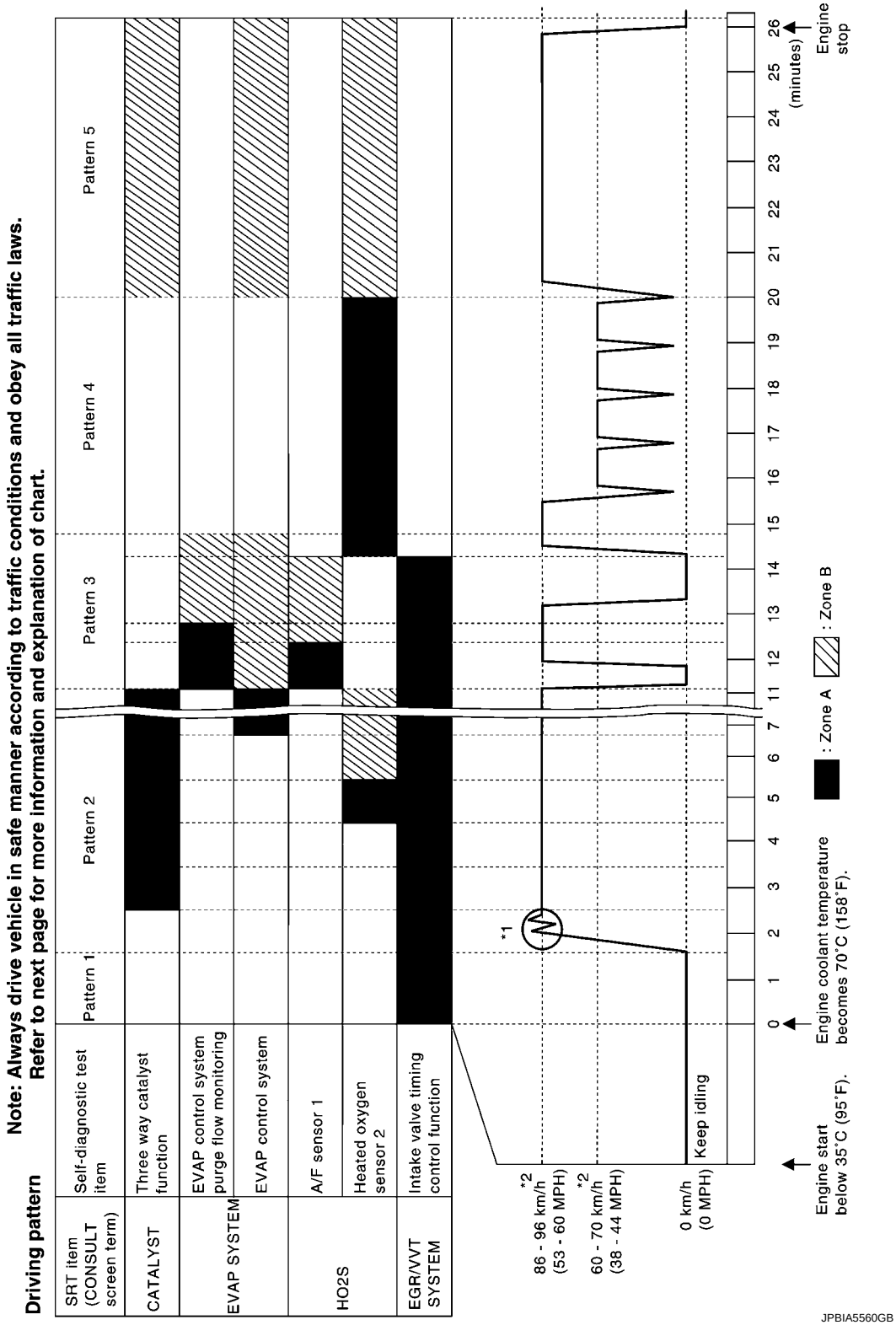


SRT Set Driving Pattern

INFOID:0000000014720841

CAUTION:

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



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

*2: Checking the vehicle speed with GST is advised.

- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
- “Zone A” is the fastest time where required for the diagnosis under normal conditions*. If the diagnosis is not completed within “Zone A”, the diagnosis can still be performed within “Zone B”.

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

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

Work Procedure

INFOID:0000000014720842

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.CHECK SRT STATUS

With CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode with CONSULT.
Without CONSULT
Perform “SRT status” mode with EC-77, "On Board Diagnosis Function".
With GST
Select Service $01 with GST.

Is SRT code(s) set?

YES >> GO TO 11.
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> Without CONSULT: GO TO 4.

3.DTC CONFIRMATION PROCEDURE

1. Select “SRT WORK SUPPORT” in “DTC & SRT CONFIRMATION” mode with CONSULT.
2. For SRT(s) that is not set, perform the corresponding “DTC CONFIRMATION PROCEDURE” according to the “Performance Priority” in the “SRT ITEM” table. Refer to EC-164, "Description".
3. Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 10.

4.PERFORM ROAD TEST

- Check the “Performance Priority” in the “SRT ITEM” table. Refer to EC-164, "Description".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to EC-165, "SRT Set Driving Pattern".
  In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

1. Check the vehicle condition;
- Engine coolant temperature is –10 to 35°C (14 to 95°F).
- Fuel tank temperature is more than 0°C (32°F).
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start the engine.
4. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:
ECM terminal voltage is follows (Refer to EC-87, "Reference Value");
- Engine coolant temperature
- –10 to 35°C (14 to 95°F): 3.0 – 4.3 V
- 70°(158°F): Less than 4.1 V
- Fuel tank temperature: Less than 1.4 V

>> GO TO 6.

6.PATTERN 2

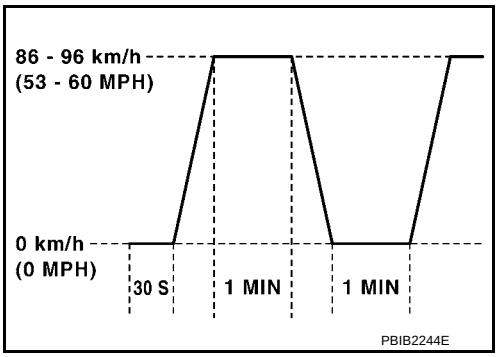
1. Drive the vehicle. And depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds.
2. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

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

>> GO TO 7.

7.PATTERN 3

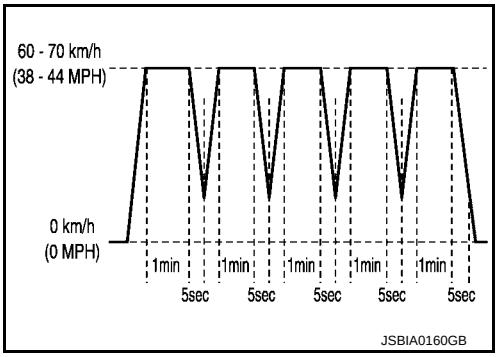
- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).



>> GO TO 8.

8.PATTERN 4

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



>> GO TO 9.

9.PATTERN 5

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

>> GO TO 10.

10.CHECK SRT STATUS

With CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode using CONSULT.
Without CONSULT
Perform “SRT status” mode with EC-77, "On Board Diagnosis Function".
With GST
Select Service $01 with GST.

Is SRT(s) set?

YES >> GO TO 11.
NO >> Call TECH LINE or take appropriate action.

11.CHECK PERMANENT DTC

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

With CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode using CONSULT.

With GST
Select Service $0A with GST.

Is permanent DTC(s) detected?

YES >> Proceed to EC-170, "Description".
NO >> END

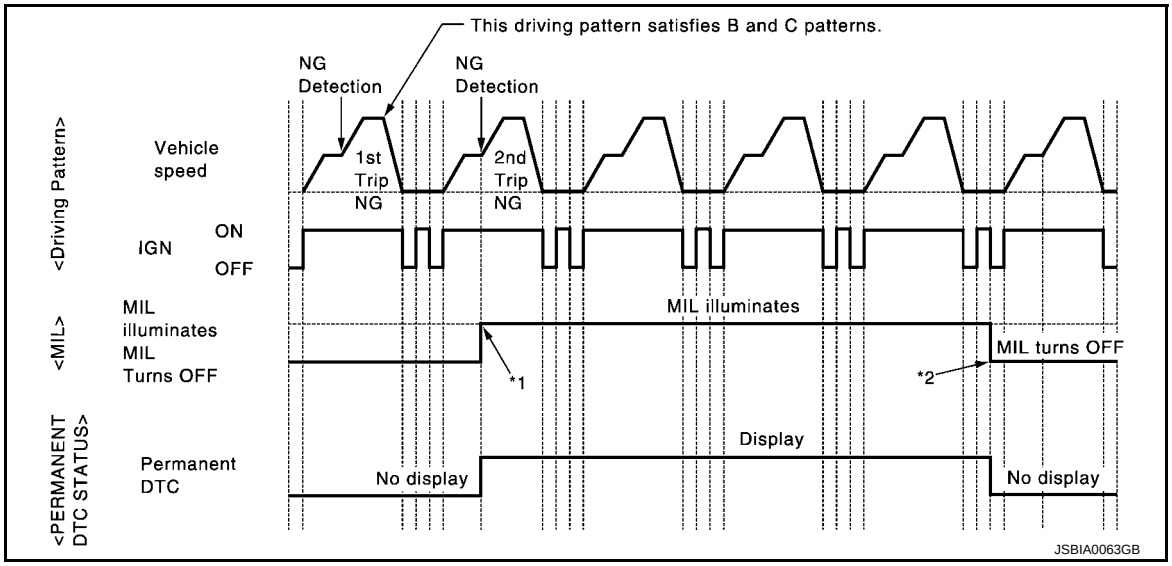
HOW TO ERASE PERMANENT DTC

Description

INFOID:0000000014720843

OUTLINE

When a DTC is stored in control module
When a DTC is stored in control module 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.

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

When a DTC is not stored in control module
The erasing method depends on a permanent DTC stored in control module. Refer to the following table.
NOTE:
If the applicable permanent DTC includes multiple groups, perform the procedure of Group B first. If the permanent DTC is not erased, perform the procedure of Group A.

×: Applicable —: Not applicable

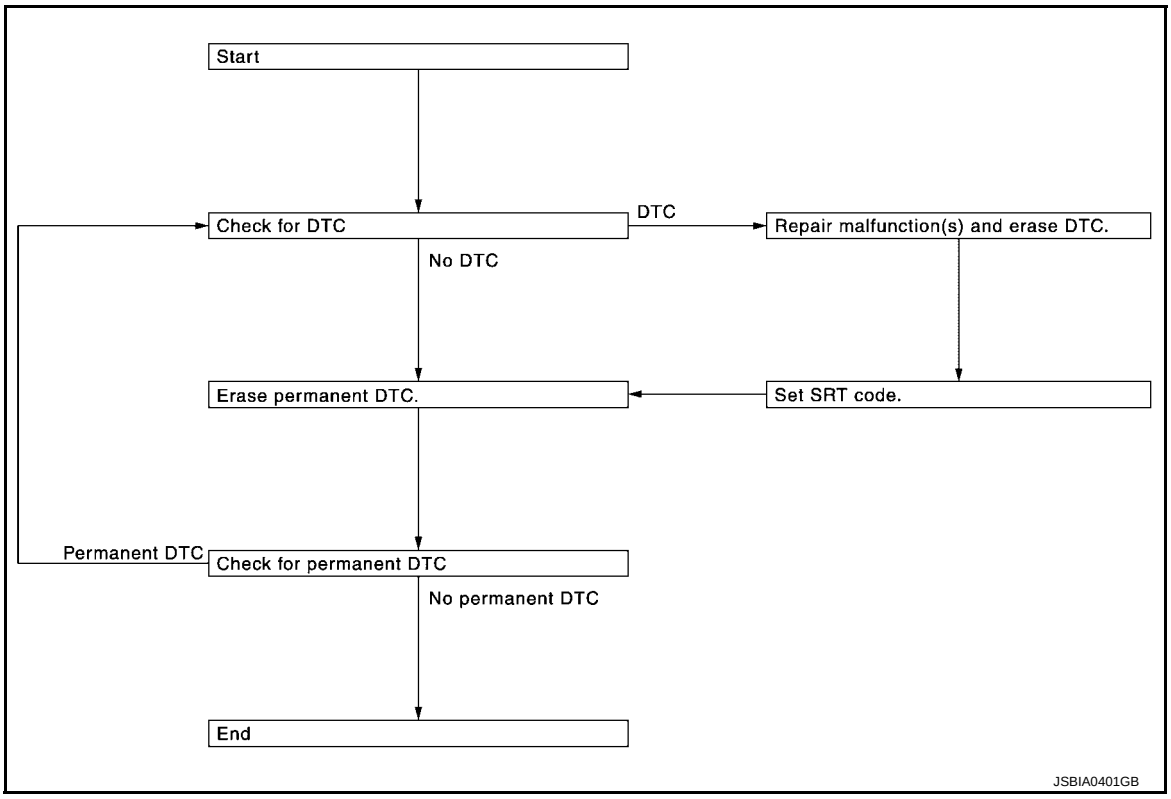
Group*	Perform “DTC CONFIRMATION PROCEDURE” for applicable DTCs.	Driving pattern		Reference
		B	D	
A	×	—	—	EC-171, "Work Procedure (Group A)"
B	—	×	×	EC-173, "Work Procedure (Group B)"

*: For group, refer to “DTC Index” of each control module.

PERMANENT DTC ITEM

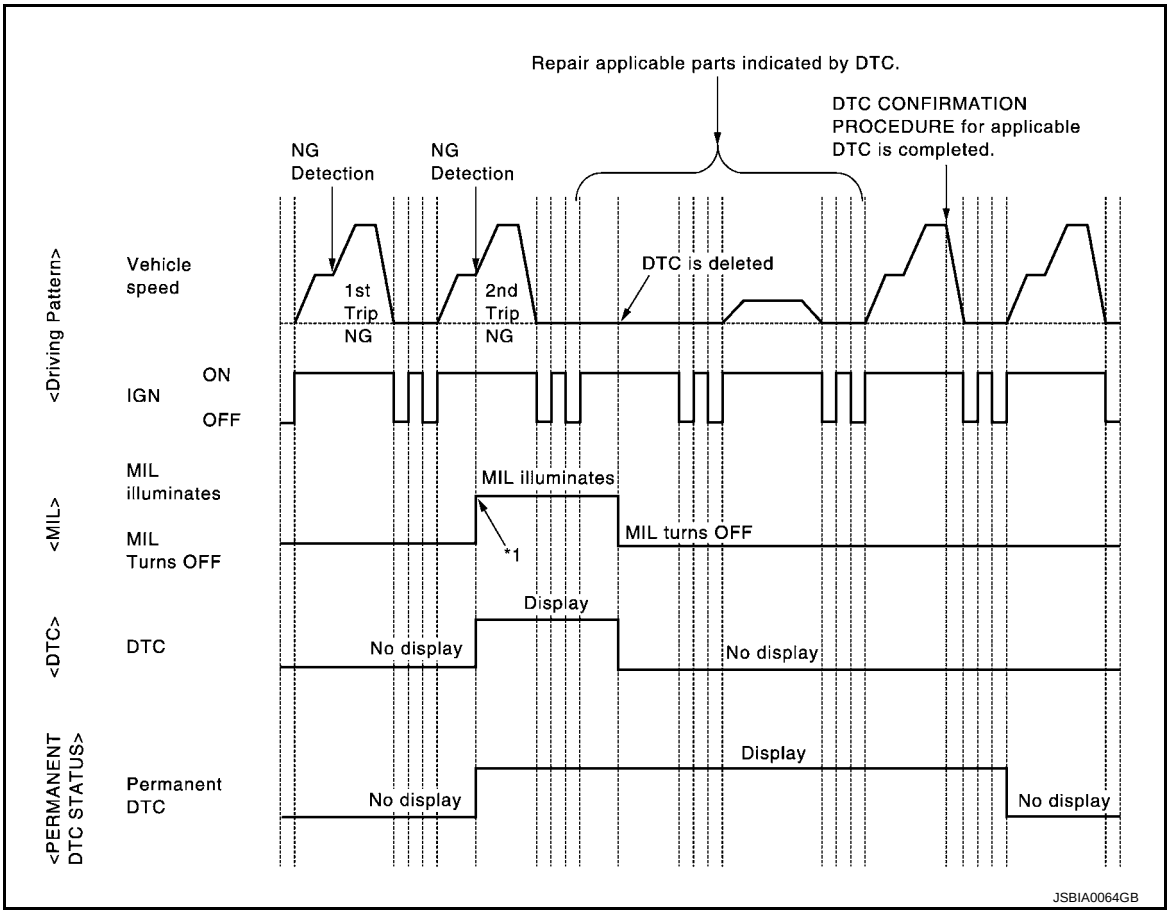
For permanent DTC items, MIL turns ON. Refer to “DTC Index” of each control module.

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:0000000014720844



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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to “DTC Index” of each control module.
NO >> GO TO 2.

2.CHECK PERMANENT DTC

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

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

Is any permanent DTC detected?

YES >> GO TO 3.
NO >> END

3.PERFORM DTC CONFIRMATION PROCEDURE

Perform “DTC CONFIRMATION PROCEDURE” for DTCs which are the same as permanent DTCs stored in control module.

>> GO TO 4.

4.CHECK PERMANENT DTC

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

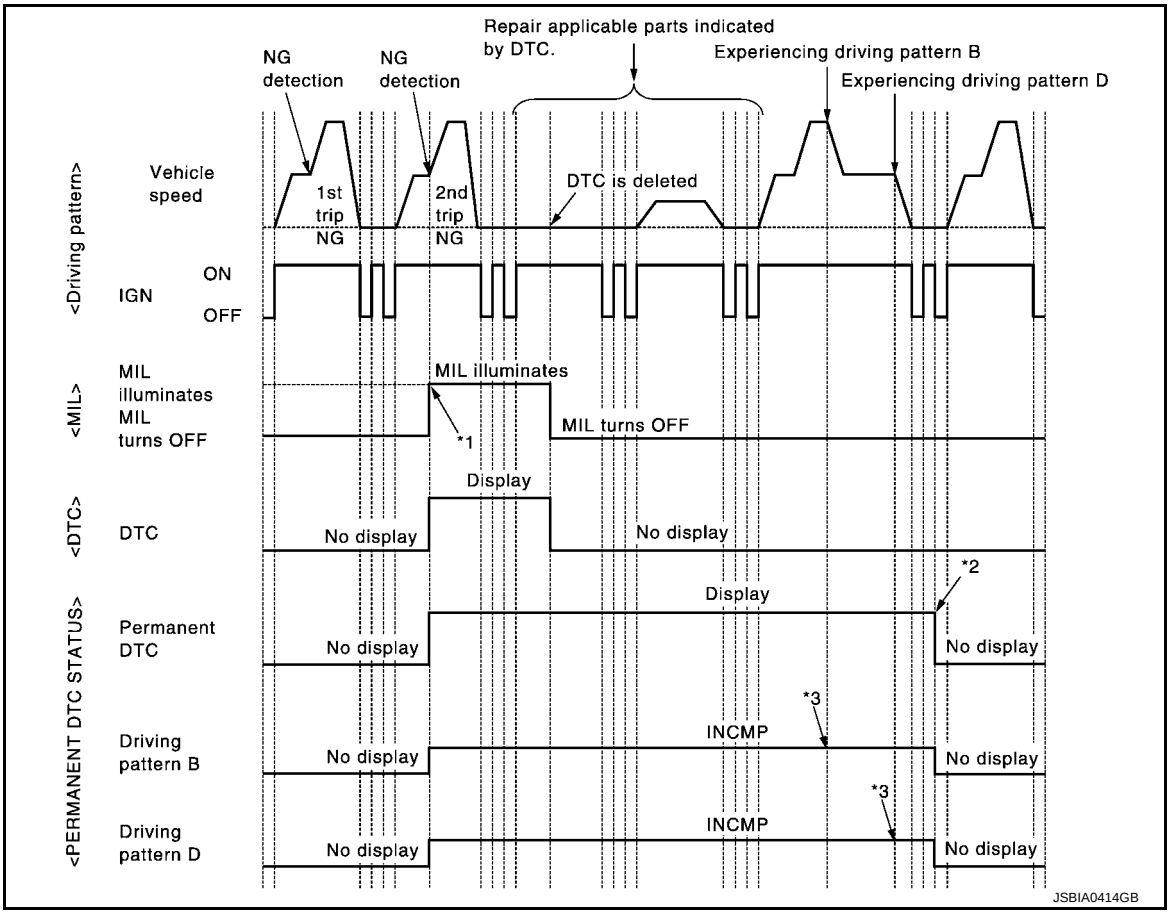
With GST
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select Service $0A with GST.

Is any permanent DTC detected?

YES >> GO TO 1.
NO >> END

Work Procedure (Group B)

INFOID:0000000014720845



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

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

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

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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC.
NO >> GO TO 2.

2.CHECK PERMANENT DTC

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

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

5. Select Service $0A with GST.

Is any permanent DTC detected?

YES >> GO TO 3.
NO >> END

3. DRIVE DRIVING PATTERN B

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

With CONSULT
1. Turn ignition switch ON.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Use “PERMANENT DTC WORK SUPPORT” mode with CONSULT to drive the vehicle according to driving pattern B. Refer to EC-78, "CONSULT Function", EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

With GST
1. Turn ignition switch ON.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Drive the vehicle according to driving pattern B. Refer to EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

>> GO TO 4.

4. CHECK PERMANENT DTC

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

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

Is any permanent DTC detected?

YES >> GO TO 5.
NO >> END

5. DRIVE DRIVING PATTERN D

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

1. Drive the vehicle according to driving pattern D. Refer to EC-74, "DIAGNOSIS DESCRIPTION : Driving Pattern".

>> GO TO 6.

6. CHECK PERMANENT DTC

With CONSULT
1. Turn ignition switch OFF and wait at least 10 seconds.

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

With GST

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

Is any permanent DTC detected?

YES >> GO TO 1.
NO >> END

DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000014631178

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” of “DATA MONITOR” mode of CONSULT during normal operation of the Engine Control System. When the value in “SPEC” of “DATA MONITOR” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “SPEC” of “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 light 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 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MASS AIR FLOW SENSOR (Hz)

Component Function Check

INFOID:0000000014631179

1. START

Make sure that all of the following conditions are satisfied.
- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Atmospheric pressure: 98.3 – 104.3 kPa (1.003 – 1.063 kg/cm^2, 14.26 – 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 SEN” (CVT fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied*
- Engine speed: Idle

*: Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.

>> GO TO 2.

2. PERFORM “SPEC” OF “DATA MONITOR” MODE

With CONSULT
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform EC-159, "Work Procedure".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MASS AIR FLOW SENSOR (Hz)” in “SPEC” of “DATA MONITOR” mode with CONSULT.
3. Make sure that monitor items are within the SP value.

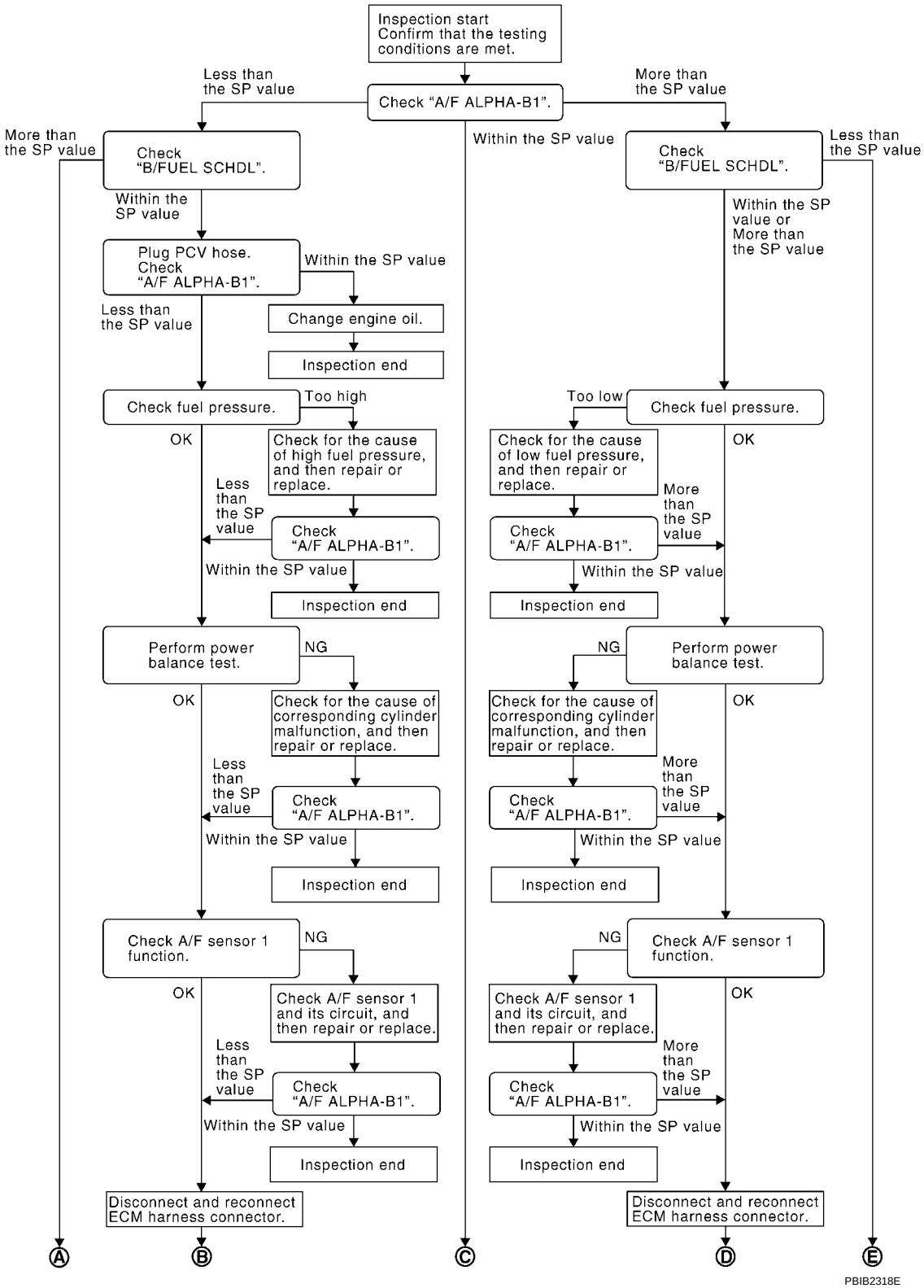
Is the inspection result normal?

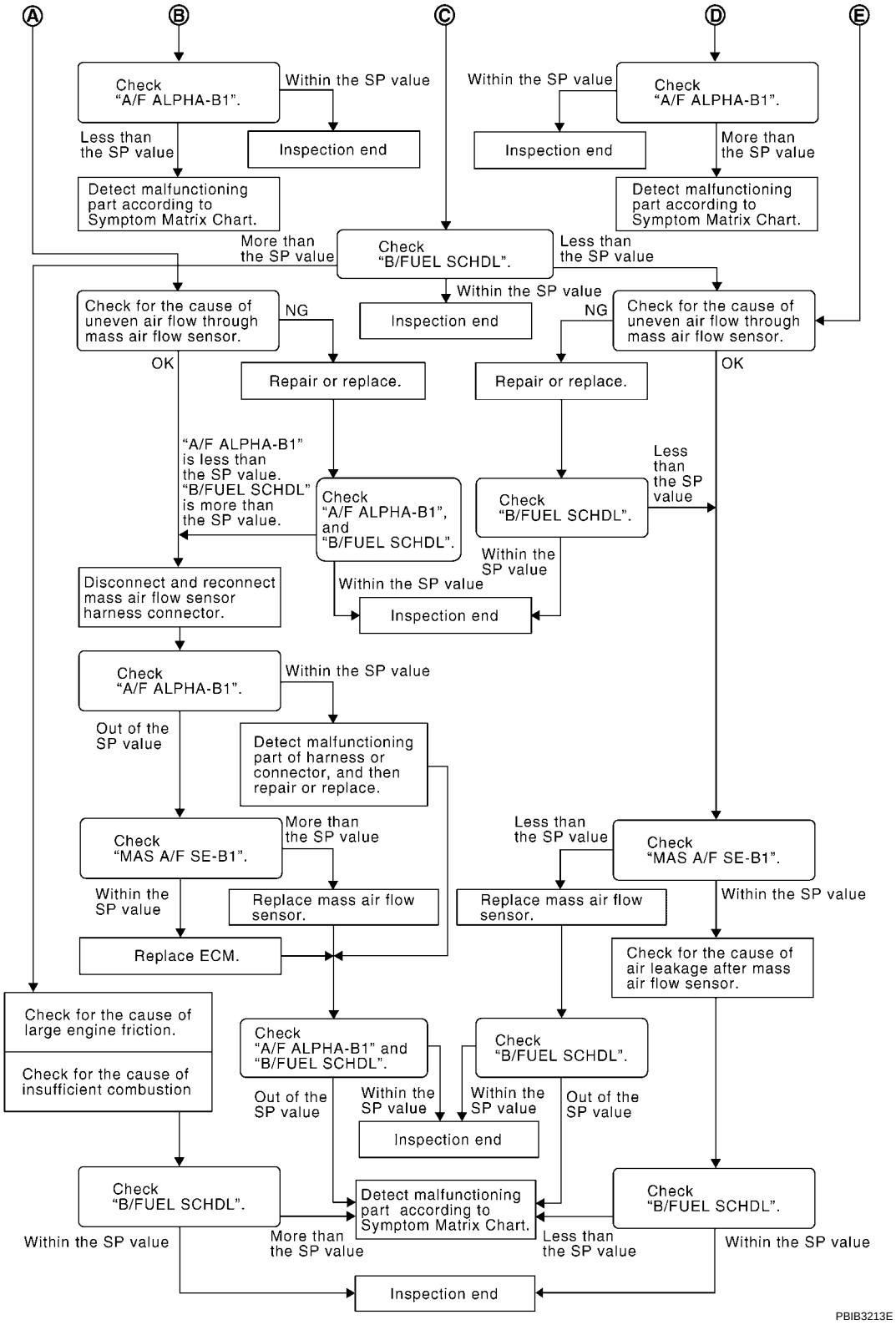
YES >> END
NO >> Proceed to EC-177, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631180

OVERALL SEQUENCE





DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1"

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Confirm that the testing conditions are met. Refer to EC-176, "Component Function Check".
4. Select "DATA MONITOR" mode of "ENGINE" with "CONSULT".

5. Select “Reference” and change “DISPLAY TYPE” to “Line Graph”.
6. Select “A/F ALPHA-B1” and make sure that the each indication is within the SP value.

NOTE:
Check “A/F ALPHA-B1” 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” at “Reference” 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” at “Reference” 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”

1. Stop the engine.
2. Disconnect PCV hose, and then plug it.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine.
5. Select “A/F ALPHA-B1” at “Reference” 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 5.
NO >> GO TO 6.

5. CHANGE ENGINE OIL

1. Stop the engine.
2. Change engine oil.

NOTE:
This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving condition.

>> **INSPECTION END**

6. CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-162, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> Fuel pressure is too high: Replace fuel filter and fuel pump assembly (Refer to FL-7, "Removal and Installation".) and then GO TO 8.
NO-2 >> Fuel pressure is too low: GO TO 7.

7. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging

Is the inspection result normal?

YES >> Replace fuel filter and fuel pump assembly (Refer to FL-7, "Removal and Installation".) and then GO TO 8.
NO >> Repair or replace and then GO TO 8.

8. CHECK “A/F ALPHA-B1”

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “A/F ALPHA-B1” at “Reference” 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 >> GO TO 9.

9. PERFORM POWER BALANCE TEST

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Make sure that the each cylinder produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
1. Ignition coil and its circuit (Refer to EC-564, "Component Function Check".)
2. Fuel injector and its circuit (Refer to EC-555, "Component Function Check".)
3. Intake air leakage
4. Low compression pressure (Refer to EC-162, "Work Procedure".)

Is the inspection result normal?

YES >> Replace fuel injector (Refer to EM-54, "Removal and Installation".) and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.

11. CHECK “A/F ALPHA-B1”

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “A/F ALPHA-B1” at “Reference” 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 >> GO TO 12.

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.
- For DTC P0130, refer to EC-264, "DTC Description".
- For DTC P0131, refer to EC-267, "DTC Description".
- For DTC P0132, refer to EC-270, "DTC Description".
- For DTC P014C, P014D, P015A, P015B, P2096, P2097 refer to EC-293, "DTC Description".
- For DTC P2096, P2097 refer to EC-509, "DTC Description".

Is any DTC detected?

YES >> GO TO 15.
NO >> GO TO 13.

13. CHECK A/F SENSOR 1 CIRCUIT

Perform DIAGNOSTIC PROCEDURE according to corresponding DTC.

>> GO TO 14.

14. CHECK “A/F ALPHA-B1”

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

3. Select “A/F ALPHA-B1” at “Reference” of “DATA MONITOR” mode, and make sure that the each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> GO TO 15.

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect ECM harness connector. Check pin terminal and connector for damage, and then reconnect it.

>> GO TO 16.

16. CHECK “A/F ALPHA-B1”

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “A/F ALPHA-B1” at “Reference” 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 >> Detect malfunctioning part according to EC-583, "Symptom Table".

17. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” at “Reference” 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

1. Check for the cause of large engine friction. Refer to the following.

- Engine oil level is too high
- Engine oil viscosity
- Belt tension of power steering, alternator, A/C compressor, etc. is excessive
- Noise from engine
- Noise from transmission, etc.

2. Check for the cause of insufficient combustion. Refer to the following.

- Valve clearance malfunction
- Intake valve timing control function malfunction
- Camshaft sprocket installation malfunction, etc.

>> Repair or replace malfunctioning part, and then GO TO 30.

19. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

Is the inspection result normal?

YES >> GO TO 21.
NO >> Repair or replace malfunctioning part, and then GO TO 20.

20. CHECK “A/F ALPHA-B1”, AND “B/FUEL SCHDL”

Select “A/F ALPHA-B1” and “B/FUEL SCHDL” at “Reference” of “DATA MONITOR” mode, and make sure that the 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” is less than the SP value: GO TO 21.

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

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

>> GO TO 22.

22. CHECK “A/F ALPHA-B1”

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “A/F ALPHA-B1” at “Reference” of “DATA MONITOR” mode, and make sure that the 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-236, "DTC Description". Then GO TO 29.
NO >> GO TO 23.

23. CHECK “MASS AIR FLOW SENSOR (HZ)”

Select “MASS AIR FLOW SENSOR (Hz)” at “Reference” 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 mass air flow sensor (Refer to EM-29, "Exploded View".) and then GO TO 29.

24. REPLACE ECM

Replace ECM. Refer to EC-595, "Removal and Installation".

>> GO TO 29.

25. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of 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” at “Reference” 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 “MASS AIR FLOW SENSOR (HZ)”

Select “MASS AIR FLOW SENSOR (Hz)” at “Reference” 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 28.
NO >> Less than the SP value: Replace mass air flow sensor (Refer to EM-29, "Exploded View".) 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 of PCV valve
- Disconnection or cracks of EVAP purge hose, open stuck of EVAP canister purge volume control solenoid valve
- Malfunctioning seal of rocker cover gasket
- Disconnection, looseness, or cracks of hoses, such as vacuum hose, connecting to intake air system parts
- Malfunctioning seal of intake air system, etc.

>> GO TO 30.

29. CHECK “A/F ALPHA-B1” AND “B/FUEL SCHDL”

Select “A/F ALPHA-B1” and “B/FUEL SCHDL” at “Reference” 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 >> Detect malfunctioning part according to EC-583, "Symptom Table".

30. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” at “Reference” of “DATA MONITOR” mode, and then make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-583, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000014631181

1.CHECK FUSE

1. Turn ignition switch OFF.
2. Check that the following fuse is not blowing.

Location	Fuse No.	Capacity
IPDM E/R	#35	15 A
	#41	10 A
	#48	5 A

Is the fuse blown (open)?

YES >> Replace the fuse after repairing the applicable circuit.
NO >> GO TO 2.

2.CHECK GROUND CONNECTION

Check ground connection E9 and E15. Refer to GI-56, "Circuit Inspection".

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.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK IGNITION SWITCH SIGNAL

Check the voltage between ECM harness connector terminals as follows.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
E16	133	152	Ignition switch: ON	Battery voltage
			Ignition switch: OFF	0 V

Is the inspection result normal?

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

5. CHECK IGNITION SWITCH SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E16	133	E120	19	Existed

5. Also check harness for short to power.

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

6. CHECK ECM POWER SUPPLY

Check the voltage between ECM harness connector terminals.

ECM			Condition	Voltage (Approx.)
Connector	+	–		
	Terminal			
E16	145	152	Ignition switch ON → OFF	After turning ignition switch OFF, battery voltage will exist for a few seconds and drop to approximately 0 V.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 7.

7. CHECK ECM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E16	145	F35	73	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8. CHECK ECM RELAY CONTROL SIGNAL

1. Reconnect ECM harness connector.
2. Reconnect IPDM E/R harness connector.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Check the voltage between ECM harness connector terminals as per the following.

ECM				Condition	Voltage (Approx.)
+		–			
Connector	Terminal	Connector	Terminal		
F52	81	E16	152	A few seconds after turning ignition switch OFF	0 – 1.0 V
				More than a few seconds after turning ignition switch OFF	Battery voltage

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9. CHECK ECM RELAY CONTROL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	81	F42	93	Existed

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

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-46, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

10. CHECK IPDM E/R POWER SUPPLY CIRCUIT

Perform trouble diagnosis for IPDM E/R power supply circuit. Refer to PCS-45, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-46, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

11. CHECK ECM BACK-UP POWER SUPPLY

Check the voltage between ECM harness connector terminals.

ECM				Voltage (Approx.)
+		–		
Connector	Terminal	Connector	Terminal	
F52	113	E16	152	Battery voltage

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> GO TO 12.

12. CHECK ECM BACK-UP POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	113	E121	44	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply.
NO >> Repair or replace malfunctioning part.

U0101 CAN COMM CIRCUIT

DTC Description

INFOID:0000000014631182

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
U0101	LOST COMM (TCM) (Lost communication with TCM)	When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) for 2 seconds or more.

POSSIBLE CAUSE

Harness or connectors (CAN communication line is open or shorted.)

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	ECM operates active grille shutter to fully-open position.

Hybrid Control System
Not applicable

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-188, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631183

Perform the trouble diagnosis for CAN communication system. Refer to LAN-26, "Trouble Diagnosis Flow Chart".

U0284 ACTIVE GRILLE SHUTTER

DTC Description

INFOID:0000000014679777

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
U0284	LOST COMM (A/GRLL SHTTR MDL A) (Lost communication with active grille air shutter module A)	ECM cannot receive the engine communication signal from active grille shutter.

POSSIBLE CAUSE

- Harness and connectors (Engine communication line is open or circuit shorted.)
- Active grille shutter

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	ECM operates active grille shutter to fully-open position.

Hybrid Control System
Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC U0284 is displayed with another DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If another DTC Confirmation Procedure is conducted just before this procedure, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more with ignition switch ON.

>> GO TO 3.

3.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-189, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679778

1.CHECK DTC PRIORITY

If DTC U0284 is displayed with another DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.CHECK ACTIVE GRILLE SHUTTER POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect active grille shutter harness connector.
3. Check the voltage between active grille shutter harness connector and ground as follows.

+		−	Condition	Voltage (Approx.)
Active grille shutter				
Connector	Terminal			
E249	1	Ground	Ignition switch: ON	Battery voltage
			Ignition switch: OFF	0 V

Is the inspection result normal?

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

3.CHECK ACTIVE GRILLE SHUTTER POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between active grille shutter harness connector and IPDM E/R harness connector.

Active grille shutter		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E249	1	F35	78	Existed

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace the error-detected parts.

4.CHECK ACTIVE GRILLE SHUTTER GROUND CIRCUIT

1. Turn ignition switch OFF
2. Check the continuity between active grille shutter harness connector and ground.

Active grille shutter		—	Continuity
Connector	Terminal		
E249	4	Ground	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 ACTIVE GRILLE SHUTTER INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and active grille shutter harness connector.

ECM		Active grille shutter		Continuity
Connector	Terminal	Connector	Terminal	
F52	86	E249	3	Existed

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace the error-detected parts.

6.CHECK ACTIVE GRILLE SHUTTER

Check active grille shutter. Refer to EC-191, "Component Inspection (Active Grille Shutter)".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace active grille shutter. Refer to EXT-35, "Removal and Installation".

Component Inspection (Active Grille Shutter)

INFOID:0000000014679779

1. CHECK ACTIVE GRILLE SHUTTER

With CONSULT

1. Start the engine.
2. Select “ACTIVE GRILLE SHUTTER” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
3. Touch “CALIBRTN”.
4. After the calibration completes, check the operation of active grille shutter as follows.

Condition	Active grille shutter
Select “CLOSE”	Close → Open
Select “OPEN”	Open → Close

Without CONSULT

1. Turn ignition switch OFF.
2. Operate shutter by hands to close position.
3. Check the operation of active grille shutter as follows.

Condition	Active grille shutter
Ignition switch: ON	Close → Open

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace active grille shutter. Refer to EXT-35, "Removal and Installation".

U0293 HYBRID POWERTRAIN CONTROL MODULE

DTC Description

INFOID:0000000014631184

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
U0293	LOST COMM (HV ECU) (Lost communication with HPCM)	ECM cannot receive a CAN communication signal from HPCM for 2 seconds or more in a row.
		ECM cannot receive a CAN communication signal from HPCM for a short period of less than 2 seconds.

POSSIBLE CAUSE

- Harness or connectors (CAN communication line is open or shorted.)
- Harness or connectors (Intermittent malfunction in the CAN communication circuit)

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Motor driving

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Perform “INSPECTION MODE 5”. Refer to HBC-113, "Description".
2. Start engine and wait at least 5 seconds.
3. Perform “All DTC Reading”.
4. Check DTC of “MOTOR CONTROL”.

Is the DTC U0100, U0101, U0111 or U0293 detected?

YES >> GO TO 3.
NO-1 (DTC U0100, U0101, U0111 or U0293 is stored in “Motor Control” at the time of receiving.)>>GO TO 3.
NO-2 >> Confirmation after repair: INSPECTION END

3.PERFORM CAN DIAGNOSIS

With CONSULT

1. Perform “CAN Diagnosis”.
2. Check diagnosis results.

>> Go to EC-192, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631185

CAUTION:

- **To perform diagnosis, observe LAN-16, "Precautions for Trouble Diagnosis".**
- **To repair harness, observe LAN-16, "Precautions for Harness Repair".**

1.INSPECTION START

Confirm the detected malfunction (result of “CAN Diagnosis”).

Is there any malfunction at present or a malfunction history?

YES >> Go to LAN-26, "Trouble Diagnosis Flow Chart".
NO >> GO TO 2.

2.DETECT THE ROOT CAUSE

With CONSULT
Check DTC of “MOTOR CONTROL”.

Detected DTC	Root cause
DTC U0100, U0101, U0111 and U0293	• CAN communication system (Short circuit, traction motor inverter branch line*1, or HPCM branch line) • ECM • HPCM • TCM • Li-ion battery controller • Traction motor inverter
DTC U0100	• ECM branch line*2 • ECM
DTC U0101	• TCM branch line • TCM
DTC U0111	• Li-ion battery controller branch line • Li-ion battery controller
DTC U0293	• HPCM branch line • HPCM*3

NOTE:
*1: If “EV/HEV” detects DTC U0110, check the traction motor inverter branch line first.
*2: If “ENGINE” detects DTC U0293, check the ECM branch line first.
*3: When replacing HPCM, replace Li-ion battery assembly together with HPCM.

>> Because of intermittent malfunction, check malfunction parts, based on the intermittent incident. Refer to GI-54, "Intermittent Incident".

U1000 CAN COMM CIRCUIT

DTC Description

INFOID:0000000014631186

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
U1000	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.

POSSIBLE CAUSE

Harness and connectors (CAN communication line is open or shorted.)

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-194, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631187

Refer to LAN-26, "Trouble Diagnosis Flow Chart".

U1040 ENG COMM CIRCUIT

DTC Description

INFOID:0000000014679793

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
U1040	ENG COMM CIRCUIT (Engine communication circuit)	ECM unable to transmit engine communication signal.

POSSIBLE CAUSE

- Harness and connectors (Engine communication line is open or shorted.)
- ECM

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	ECM operates active grille shutter to fully-open position.

Hybrid Control System
Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If another DTC Confirmation Procedure is conducted just before this procedure, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> 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-195, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679794

1.CHECK ACTIVE GRILLE SHUTTER SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect active grille shutter harness connector.
4. Check the continuity between ECM harness connector and active grille shutter harness connector.

+		–		Continuity
ECM		Active grille shutter		
Connector	Terminal	Connector	Terminal	
F52	86	E249	3	Existed

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace error-detected parts.

U1044 ENG COMM CIRCUIT

DTC Description

INFOID:0000000014679795

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
U1044	ENG COMM CIRCUIT (Engine communication circuit)	A signal voltage of LIN communication between ECM and active grille shutter is excessively low or excessively high.

POSSIBLE CAUSE

- Harness or connectors (LIN communication circuit is open or shorted.)
- Active grille shutter

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	ECM operates active grille shutter to fully-open position.

Hybrid Control System
Not applicable

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 ON and wait at least 10 seconds.
2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-196, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679796

1.CHECK ACTIVE GRILLE SHUTTER SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect active grille shutter harness connector.
4. Check the continuity between ECM harness connector and active grille shutter harness connector.

+		–		Continuity
ECM		Active grille shutter		
Connector	Terminal	Connector	Terminal	
F52	86	E249	3	Existed

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace error-detected parts.

P0011 IVT CONTROL

DTC Description

INFOID:0000000014631190

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0011	INT/V TIM CONT-B1 (“A” Camshaft position - timing over-advanced or system performance bank 1)	There is a gap between angle of target and phase-control angle degree.

POSSIBLE CAUSE

- Crankshaft position sensor 1
- Camshaft position sensor
- Intake valve timing control solenoid valve
- Accumulation of debris to the signal plate of the camshaft
- Timing chain installation
- Foreign matter caught in the oil groove for intake valve timing control

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Other	ECM activates the IVT intermediate lock control solenoid valve to bring the cam sprocket into an intermediate lock condition.

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0011 is displayed with DTC P0075, first perform the trouble diagnosis for DTC P0075.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-212, "DTC Description".
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-1

Start the inspection.

NOTE:

- Use component function check to check the overall function of the intake valve timing control. During this check, a 1st trip DTC might not be confirmed.
- If the cause is a temporal jamming of debris, it may be back to normal during the following procedure.

Will CONSULT be used?

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

3.PERFORM COMPONENT FUNCTION CHECK-2

Ⓔ WITH CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Start engine and check that “INT/V TIM (B1)” immediately after starting displays a value within 35± 13°CA.

Perform the following procedure when the value is more than 48°CA.
- Start engine and warm it up to the normal operating temperature.
- Start engine and keep the engine speed at 1,000 rpm for at least 10 seconds.
- Turn ignition switch OFF and wait at least 10 seconds and restart engine.
- Check step 3 again.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Proceed to EC-200, "Diagnosis Procedure".

4. PERFORM COMPONENT FUNCTION CHECK-3

1. Select “INT V/T ASSIGN ANGLE” in “ACTIVE TEST” mode of “ENGINE ”using CONSULT.
2. Touch “START” with the engine speed is maintained at approximately 2,500 rpm.
3. “Up” and “Down” and check if it makes change of the value in “IN VTC S/V B1”.

NOTE:
Intake valve timing angle is limited and not up or down over that.

Is the inspection result normal?

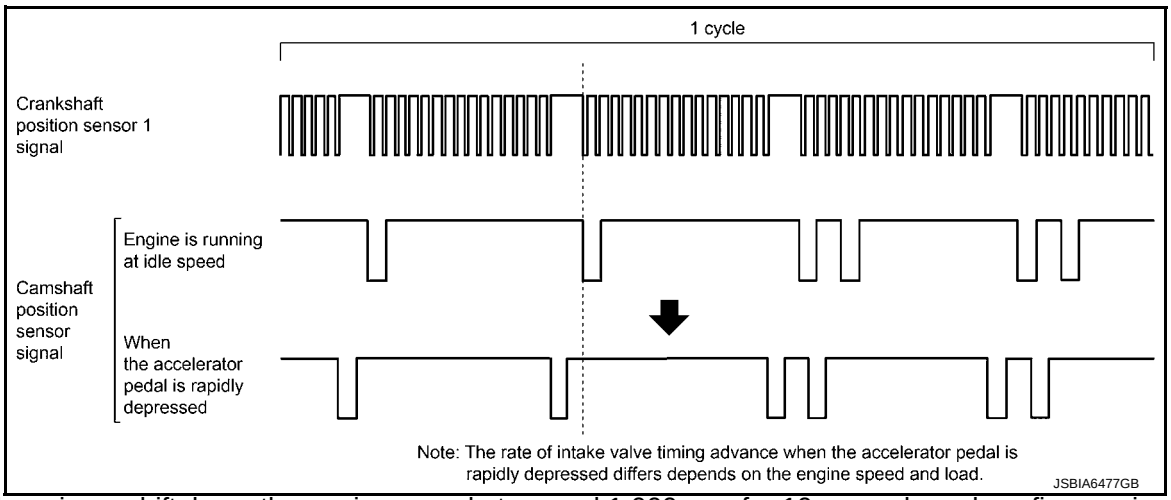
YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-200, "Diagnosis Procedure".

5. PERFORM COMPONENT FUNCTION CHECK-4

WITHOUT CONSULT
1. Check service records for any recent repairs that may cause timing chain misalignment. If there are, check timing chain installation first.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Set the oscilloscope probe between ECM harness connector terminals.

ECM			Signal name
Connector	+	–	
	Terminal		
F51	33	44	Crankshaft position sensor 1
F52	67	71	Camshaft position sensor

5. Record the wave pattern of the Crankshaft position sensor 1 signal and the camshaft position sensor signal at idling.
6. Record the wave pattern of the Crankshaft position sensor 1 signal and the camshaft position sensor signal when the accelerator pedal is depressed quickly.
7. Compare both wave patterns and confirm that the camshaft position sensor signal is shifted to the advance side.



If there is no shift, keep the engine speed at around 1,000 rpm for 10 seconds and confirm again.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-200, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631191

1.CHECK DTC PRIORITY

If DTC P0011 is displayed with DTC P0075, first perform the trouble diagnosis for DTC P0075.

Is applicable DTC detected?

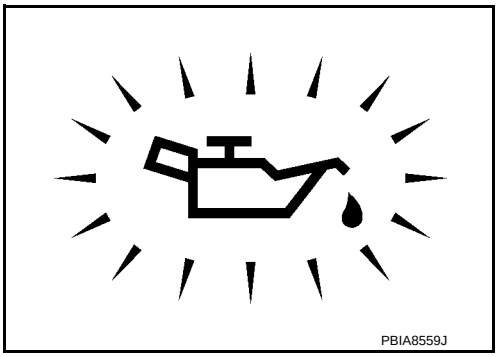
YES >> Perform diagnosis of applicable. Refer to EC-212, "DTC Description".
NO >> GO TO 2.

2.CHECK ENGINE OIL PRESSURE WARNING

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Check engine oil pressure warning and confirm it is not displayed.

Is engine oil pressure warning displayed?

YES >> Check the engine oil level. Refer to LU-10, "Inspection".
NO >> GO TO 3.


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3.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-201, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace intake valve timing control solenoid valve. Refer to EM-65, "Exploded View".

4.CHECK CRANKSHAFT POSITION SENSOR 1

Refer to EC-348, "Component Inspection (CKP Sensor 1)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace crankshaft position sensor 1. Refer to EM-116, "Exploded View".

5.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-353, "Component Inspection (CMP Sensor)".

Is the inspection result normal?

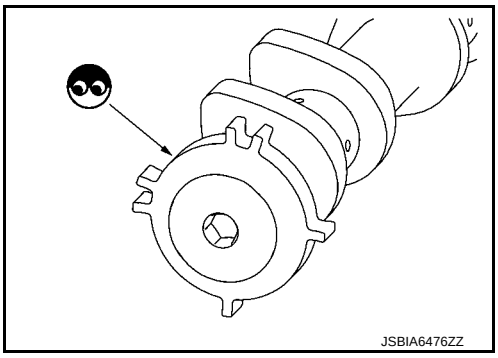
YES >> GO TO 6.
NO >> Replace camshaft position sensor. Refer to EM-77, "Exploded View".

6.CHECK CAMSHAFT (INTAKE)

Check the following.
- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 7.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to EM-77, "Removal and Installation".


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7.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-66, "Removal and Installation".
NO >> GO TO 8.

8.CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean lubrication line.

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000014631192

1.CHECK INTAKE VALVE TIMING (IVT) CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect IVT control solenoid valve harness connector.
3. Check the resistance between IVT control solenoid valve terminals as per the following.

IVT control solenoid valve		Condition		Resistance
Terminal				
1	2	Temperature	20°C (68°F)	6.7 – 7.7 Ω

4. Check the resistance between IVT control solenoid valve terminal and solenoid valve body.

IVT control solenoid valve	—	Resistance
Terminal		
1	Solenoid valve body	Not existed
2		

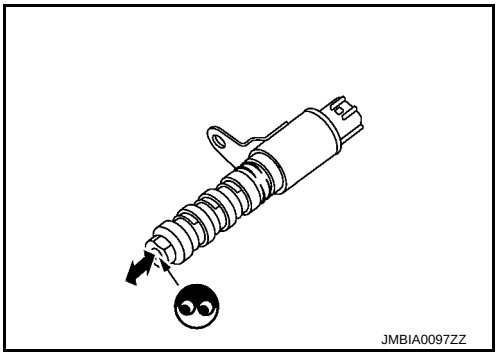
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

2.CHECK IVT CONTROL SOLENOID VALVE-2

1. Remove IVT control solenoid valve. Refer to EM-65, "Exploded View".
2. Provide battery voltage between IVT control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Never apply battery voltage continuously for 5 seconds or more. Doing so may result in damage to the coil in IVT control solenoid valve.
NOTE:
Always replace O-ring when IVT control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

P0014 EVT CONTROL

DTC Description

INFOID:0000000014631193

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0014	EXH/V TIM CONT-B1 (“B” Camshaft position - timing over-advanced or system performance bank 1)	There is a gap between angle of target and phase-control angle degree.

POSSIBLE CAUSE

- Crankshaft position sensor 1
- Exhaust valve timing control position sensor
- Exhaust valve timing control solenoid valve
- Accumulation of debris to the signal plate of the camshaft
- Timing chain installation
- Foreign matter caught in the oil groove for exhaust valve timing control

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0014 is displayed with DTC P0078, first perform the trouble diagnosis for DTC P0078.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-215, "DTC Description".
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

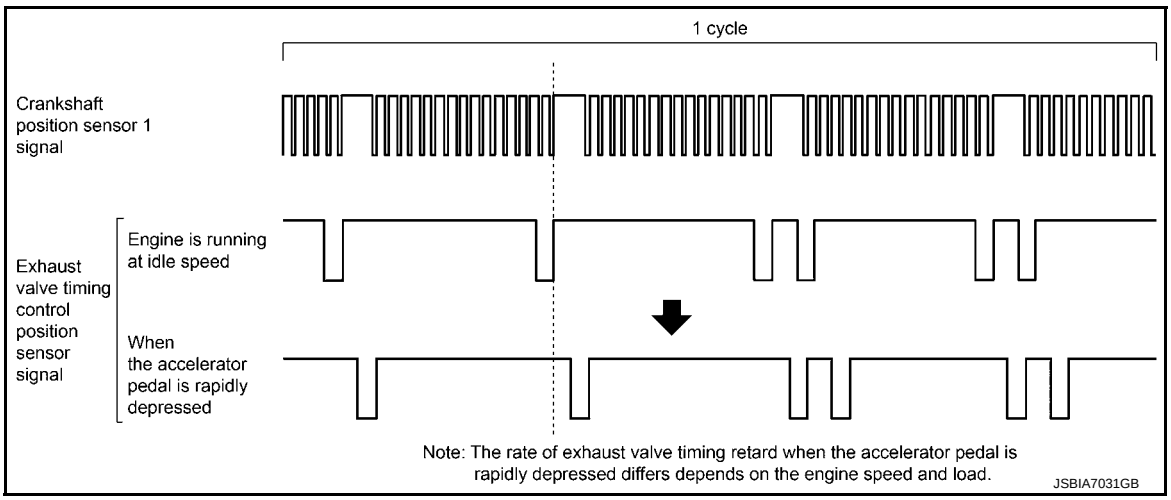
NOTE:

- Use component function check to check the overall function of Exhaust valve timing control. During this check, a 1st trip DTC might not be confirmed.
- If the cause is a temporal jamming of debris, it may be back to normal during the following procedure.

1. Check service records for any recent repairs that may cause timing chain misalignment. If there are, check timing chain installation first.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Set the oscilloscope probe between ECM and ground.

ECM			Signal names
Connector	+	–	
	Terminal		
F51	33	44	Crankshaft position sensor 1
F52	69	63	Exhaust valve timing control position sensor

5. Record the wave pattern of the crankshaft position sensor 1 signal and the exhaust valve timing control position sensor signal at idling.
6. Record the wave pattern of the crankshaft position sensor 1 signal and the exhaust valve timing control position sensor signal when the accelerator pedal is depressed quickly.
7. Compare both wave patterns and confirm that the exhaust valve timing control position sensor signal is shifted to the back side.



Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-203, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631194

1. CHECK DTC PRIORITY

If DTC P0014 is displayed with DTC P0078, first perform the trouble diagnosis for DTC P0078.

Is applicable DTC detected?

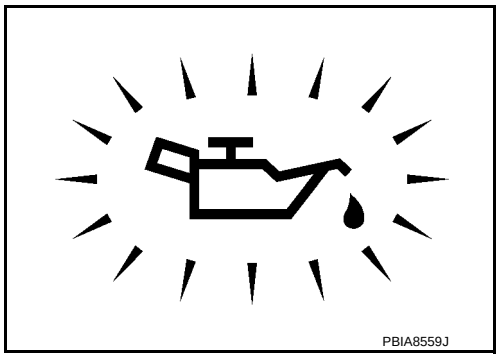
YES >> Perform diagnosis of applicable. Refer to EC-215, "DTC Description".
NO >> GO TO 2.

2. CHECK ENGINE OIL PRESSURE WARNING

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Check that engine oil pressure warning is not displayed.

Is engine oil pressure warning displayed?

YES >> Check the engine oil level. Refer to LU-10, "Inspection".
NO >> GO TO 3.



3. CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-216, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace exhaust valve timing control solenoid valve. Refer to EM-65, "Exploded View".

4. CHECK CRANKSHAFT POSITION SENSOR 1

Refer to EC-348, "Component Inspection (CKP Sensor 1)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace crankshaft position sensor 1. Refer to EM-116, "Exploded View".

5.CHECK EXHAUST VALVE TIMING CONTROL POSITION SENSOR

Refer to EC-204, "Component Inspection".

Is the inspection result normal?

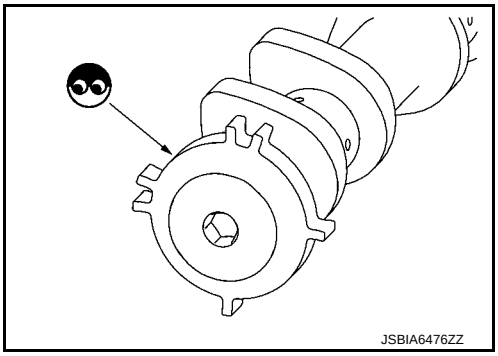
YES >> GO TO 6.
NO >> Replace exhaust valve timing control position sensor. Refer to EM-77, "Exploded View".

6.CHECK CAMSHAFT (EXH)

Check the following.
- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft front end

Is the inspection result normal?

YES >> GO TO 7.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-77, "Removal and Installation".



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?

YES >> Check timing chain installation. Refer to EM-66, "Removal and Installation".
NO >> GO TO 8.

8.CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (EXH) Oil Groove”. Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean lubrication line.

Component Inspection

INFOID:0000000014631195

1.CHECK EXHAUST VALVE TIMING (EVT) CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect EVT control solenoid valve harness connector.
3. Check the resistance between EVT control solenoid valve terminals as per the following.

EVT control solenoid valve		Condition		Resistance
Terminal				
1	2	Temperature	20°C (68°F)	6.7 – 7.7 Ω

4. Check the resistance between EVT control solenoid valve terminal and solenoid valve body.

EVT control solenoid valve	—	Resistance
Terminal		
1	Solenoid valve body	Not existed
2		

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace EVT control solenoid valve. Refer to EM-65, "Exploded View".

2.CHECK EVT CONTROL SOLENOID VALVE-2

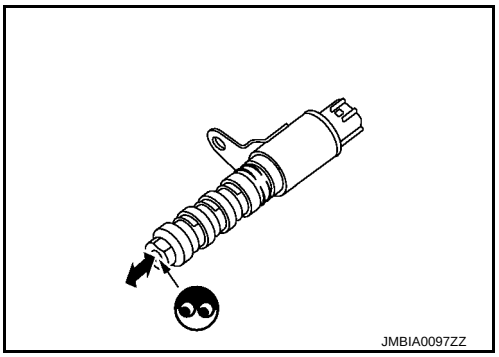
1. Remove EVT control solenoid valve. Refer to EM-65, "Exploded View".
2. Provide battery voltage between EVT control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:

Do not apply battery voltage continuously for 5 seconds or more. Doing so may result in damage to the coil in EVT control solenoid valve.

NOTE:

Always replace O-ring when EVT control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVT control solenoid valve. Refer to EM-65, "Exploded View".

P0030, P0031, P0032 A/F SENSOR HEATER

DTC Description

INFOID:0000000014631196

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0030	A/F SEN1 HTR (B1) (HO2S heater control circuit bank 1 sensor 1)	Voltage signal transmitted from A/F sensor 1 heater to ECM is higher/lower than voltage in the normal range.
P0031	A/F SEN1 HTR (B1) (HO2S heater control circuit low bank 1 sensor 1)	An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.
P0032	A/F SEN1 HTR (B1) (HO2S heater control circuit high bank 1 sensor 1)	An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.

POSSIBLE CAUSE

P0030 and P0031
- Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.)
- The A/F sensor 1 heater

P0032
- Harness or connectors (The A/F sensor 1 heater circuit is shorted.)
- The A/F sensor 1 heater

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 10 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-206, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631197

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

1. Turn ignition switch OFF.

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

+		–	Voltage
A/F sensor 1			
Connector	Terminal		
F18	4	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

A/F sensor 1		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F18	4	F35	75	Existed

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	3	F52	116	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK A/F SENSOR 1 HEATER

Refer to EC-207, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".

Component Inspection

INFOID:0000000014631198

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

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

A/F sensor 1		Condition		Resistance
+	–			
Terminal				
3	4	Temperature	25°C (77°F)	1.80 – 2.44 Ω
	1			Not existed
	2			
4	1			
	2			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".

P0037, P0038 HO2S2 HEATER

DTC Description

INFOID:0000000014631199

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0037	HO2S2 HTR (B1) (HO2S heater control circuit low bank 1 sensor 2)	• An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater. • ECM detects the heated oxygen sensor 2 heater circuit is short to ground.
P0038	HO2S2 HTR (B1) (HO2S heater control circuit high bank 1 sensor 2)	An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.

POSSIBLE CAUSE

P0037
- Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.)
- Heated oxygen sensor 2 heater

P0038
- Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.)
- Heated oxygen sensor 2 heater

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11 to 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-209, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631200

1.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect HO2S2 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between HO2S2 harness connector and ground.

+		–	Voltage
HO2S2			
Connector	Terminal		
F21	4	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between HO2S2 harness connector and IPDM E/R harness connector.

HO2S2		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F21	4	F35	75	Existed

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	3	F52	117	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK HO2S2 HEATER

Refer to EC-210, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

Component Inspection

INFOID:0000000014631201

1.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) HEATER

1. Turn ignition switch OFF.
2. Disconnect HO2S2 harness connector.
3. Check resistance between HO2S2 terminals as per the follows.

HO2S2		Condition		Resistance
+	–			
Terminal				
4	3	Temperature	25°C (77°F)	3.4 – 4.4 Ω
1	2			Not existed
	3			
	4			
4	1			
	2			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

P0075 IVT CONTROL SOLENOID VALVE

DTC Description

INFOID:0000000014631202

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0075	INT/V TIM V/CIR-B1 (Intake valve control solenoid circuit bank 1)	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.

POSSIBLE CAUSE

- Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.)
- Intake valve timing control solenoid valve

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-212, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631203

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between IVT control solenoid valve harness connector and ground.

+		–	Voltage
IVT control solenoid valve			
Connector	Terminal		
F25	1	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IVT control solenoid valve harness connector and IPDM E/R harness connector.

IVT control solenoid valve		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F25	1	F35	78	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT

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.

IVT control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F25	2	F52	111	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK IVT CONTROL SOLENOID VALVE

Refer to EC-213, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000014631204

1.CHECK INTAKE VALVE TIMING (IVT) CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect IVT control solenoid valve harness connector.
3. Check the resistance between IVT control solenoid valve terminals as per the following.

IVT control solenoid valve		Condition		Resistance
Terminal				
1	2	Temperature	20°C (68°F)	6.7 – 7.7 Ω

4. Check the resistance between IVT control solenoid valve terminal and solenoid valve body.

IVT control solenoid valve Terminal	—	Resistance
1	Solenoid valve body	Not existed
2		

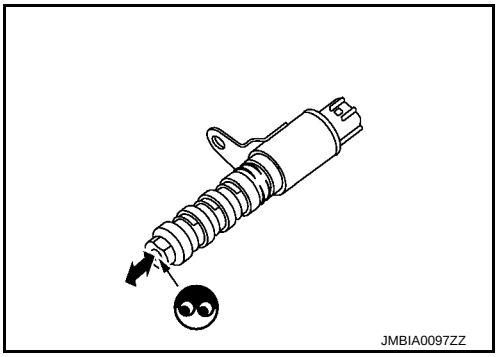
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

2.CHECK IVT CONTROL SOLENOID VALVE-2

1. Remove IVT control solenoid valve. Refer to EM-65, "Exploded View".
2. Provide battery voltage between IVT control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Never apply battery voltage continuously for 5 seconds or more. Doing so may result in damage to the coil in IVT control solenoid valve.
NOTE:
Always replace O-ring when IVT control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

P0078 EVT CONTROL SOLENOID VALVE

DTC Description

INFOID:0000000014631205

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0078	EX V/T ACT/CIRC-B1 (Exhaust valve control solenoid circuit bank 1)	An improper voltage is sent to the ECM through exhaust valve timing control solenoid valve.

POSSIBLE CAUSE

- Harness or connectors (Exhaust valve timing control solenoid valve circuit is open or shorted.)
- Exhaust valve timing control solenoid valve

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-215, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631206

1.CHECK EXHAUST VALVE TIMING (EVT) CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVT control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVT control solenoid valve harness connector and ground.

+		–	Voltage
EVT control solenoid valve			
Connector	Terminal		
F24	2	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK EVT CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVT control solenoid valve harness connector and IPDM E/R harness connector.

EVT control solenoid valve		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F24	2	F35	78	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for the power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK EVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVT control solenoid valve harness connector and ECM harness connector.

EVT control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F24	1	F52	112	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK EVT CONTROL SOLENOID VALVE

Refer to EC-216, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVT control solenoid valve. Refer to EM-65, "Exploded View".

Component Inspection

INFOID:0000000014631207

1.CHECK EXHAUST VALVE TIMING (EVT) CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect EVT control solenoid valve harness connector.
3. Check the resistance between EVT control solenoid valve terminals as per the following.

EVT control solenoid valve		Condition		Resistance
Terminal				
1	2	Temperature	20°C (68°F)	6.7 – 7.7 Ω

4. Check the resistance between EVT control solenoid valve terminal and solenoid valve body.

EVT control solenoid valve Terminal	—	Resistance
1	Solenoid valve body	Not existed
2		

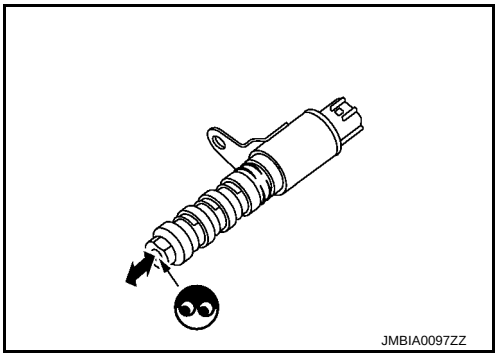
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace EVT control solenoid valve. Refer to EM-65, "Exploded View".

2.CHECK EVT CONTROL SOLENOID VALVE-2

1. Remove EVT control solenoid valve. Refer to EM-65, "Exploded View".
2. Provide battery voltage between EVT 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 battery voltage continuously for 5 seconds or more. Doing so may result in damage to the coil in EVT control solenoid valve.
NOTE:
Always replace O-ring when EVT control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVT control solenoid valve. Refer to EM-65, "Exploded View".

P0087 FRP CONTROL SYSTEM

DTC Description

INFOID:0000000014631208

DTC DETECTION LOGIC

NOTE:
DTC P0087 may be displayed when running out of gas.

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0087	LOW FUEL PRES (Fuel rail/system pressure - too low)	• Fuel rail pressure does not reach 1.3 MPa (13.3 kg/cm^2, 188.5 psi) at engine cold start [water temperature −10°C (14°F) – 40°C (104°F)]. • Fuel rail pressure remains at 7.0 MPa (71.4 kg/cm^2, 1015 psi) or less for 1 second or more during engine idle condition after cold start [water temperature −10°C (14°F) – 40°C (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 (27.5 kg/cm^2, 392 psi) or less.

POSSIBLE CAUSE

- Fuel system
- Leakage in fuel line
- High pressure fuel pump
- Low pressure fuel pump
- Damage in lifter

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Device fix mode*		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

*: This mode may not be executed.

Hybrid Control System
- Limiting accelerator angle variation control
- Idling stop is prohibited

or
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0087 is displayed with DTC P0090 and/or P1197, first perform the confirmation procedure for DTC P0090 and/or P1197.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.

- DTC P0090: Refer to EC-226, "DTC Description".
- DTC P1197: Refer to EC-469, "DTC Description".

NO >> GO TO 2.

2.CHECK FUEL LEAKAGE

1. Turn ignition switch ON.
2. Visually check the piping between low pressure fuel pump and fuel injectors for fuel leakage.
3. Start the engine.
4. Visually check the piping between low pressure fuel pump and fuel injectors for fuel leakage.

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 4.

4.DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Turn ignition switch ON.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode of “ENGNE” using CONSULT.
3. Check the following condition;

COOLAN TEMP/S	**: (–10) – (+40)°C (14 – 104°F)**

With GST

Follow the above steps for “With CONSULT”.

Is the condition satisfied?

YES >> GO TO 5.
NO >> 1. Satisfy the condition.
2. Retry from step 1.
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start the engine and let it idle for 10 seconds.
3. Check 1st trip DTC.

With GST

Follow the above steps for “With CONSULT”.

Is 1st trip DTC detected?

YES >> Proceed to EC-220, "Diagnosis Procedure".
NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-3

With CONSULT

1. Select “COOLAN TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Maintain the following condition for 10 seconds or more at idle.

COOLAN TEMP/S	**: 70°C (158°F) or more**

3. Check 1st trip DTC.

With GST

Follow the above steps for “With CONSULT”.

Is 1st trip DTC detected?

YES >> Proceed to EC-220, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631209

1.CHECK DTC PRIORITY

If DTC P0087 is displayed with DTC P0090 and/or P1197, first perform the confirmation procedure for DTC P0090 and/or P1197.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0090: Refer to EC-226, "DTC Description".
- DTC P1197: Refer to EC-469, "DTC Description".

NO >> GO TO 2.

2.BLEED THE FUEL LINE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start the engine, and let the engine run at idle at least for 10 minutes.
3. Perform DTC confirmation procedure of DTC P0087. Refer to EC-218, "DTC Description".

Is the DTC P0087 detected again?

YES >> GO TO 3.
NO >> GO TO 7.

3.CHECK LOW FUEL PRESSURE

Check low fuel pressure. Refer to EC-162, "Work Procedure".

Is inspection result normal?

YES >> GO TO 4.
NO >> Check low fuel pressure system. Refer to EC-162, "Work Procedure".

4.CHECK LOW PRESSURE FUEL LINE FOR INTERNAL LEAKAGE

1. Turn ignition switch OFF.
2. Turn ignition switch ON.
3. Check the following value 30 minutes after turning the ignition switch ON.

Low fuel pressure : 206 kPa (2.2 kgf/cm^2, 30 psi) or more

Is inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filter and fuel pump assembly. Refer to FL-7, "Removal and Installation".

5.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-221, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace the error-detected parts.

6.CHECK HIGH PRESSURE FUEL PUMP LIFTER

Check high pressure fuel pump lifter. Refer to EM-49, "Exploded View".

Does the lifter top surface have scratches and/or dents?

YES >> Replace the error-detected parts.
NO >> INSPECTION END

7.CHECK LOW PRESSURE FUEL LINE FOR INTERNAL LEAKAGE

1. Turn ignition switch OFF.
2. Connect fuel pressure gauge. Refer to EC-162, "Work Procedure".
3. Turn ignition switch ON.

4. Check the following value 30 minutes after turning the ignition switch ON.

Low fuel pressure : 206 kPa (2.2 kgf/cm^2, 30 psi) or more

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000014631210

1. CHECK HIGH PRESSURE FUEL PUMP-1

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump harness connector.
3. check the resistance between high pressure fuel pump terminals as per the following conditions.

High pressure fuel pump		Condition		Resistance
+	–			
Terminal				
1	2	Temperature [°C (°F)]	20 – 30 (68 – 86)	0.46 – 0.51 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

2. CHECK HIGH PRESSURE FUEL PUMP-2

With CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine.
4. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication as per the following conditions.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Check fuel rail pressure sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

P0088 FRP CONTROL SYSTEM

DTC Description

INFOID:0000000014708451

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0088	HIGH FUEL PRES (Fuel rail/system pressure - too high)	• Fuel rail pressure remains at more than 15.5 MPa (158.1 kg/cm^2, 2247.5 psi) for 1 second or more during engine idle condition after cold start [water temperature −10°C (14°F) – 40°C (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 (27.5 kg/cm^2, 392 psi) or more.

POSSIBLE CAUSE

- Harness or connectors (The high pressure fuel pump circuit is open or shorted.)
- High pressure fuel pump

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Device fix mode*		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

*: This mode may not be executed.

Hybrid Control System

- Limiting accelerator angle variation control
- Idling stop is prohibited

or

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0088 is displayed with DTC P0090, first perform the trouble diagnosis for DTC P0090.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-226, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 3.

3.DTC CONFIRMATION PROCEDURE-1

1. Check that the fuel tank is 1/8 full of fuel.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Warm up the engine to the normal operating temperature and keep the engine speed at idle for 15 seconds.
   NOTE:
   Warm up the engine until “COOLANT TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-227, "Diagnosis Procedure".
NO >> GO TO 4.

4.DTC CONFIRMATION PROCEDURE-2

1. Cool the engine until the engine coolant temperature reaches 60°C (140°F) or less.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle at least 40 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-227, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014708452

1.CHECK DTC PRIORITY

If DTC P0087 is displayed with DTC P0090, first perform the confirmation procedure for DTC P0090.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-226, "DTC Description".
NO >> GO TO 2.

2.CHECK LOW FUEL PRESSURE

Check low fuel pressure. Refer to EC-162, "Work Procedure".

Is inspection result normal?

YES >> GO TO 3.
NO >> Check low fuel pressure system. Refer to FL-7, "Removal and Installation".

3.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-224, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> GO TO 4.
NO >> Replace error-detected parts.

4.CHECK FUEL LEAKAGE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start the engine.
3. Visually check that the fuel pump, fuel rail, and fuel piping have no fuel leakage.

Is inspection result normal?

YES >> Check that the fuel system has no breakage, bend, and crush. Refer to FL-6, "Inspection".
NO >> Replace or replace the error-detected parts.

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000014708453

1.CHECK HIGH PRESSURE FUEL PUMP-1

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump harness connector.
3. check the resistance between high pressure fuel pump terminals as per the following conditions.

High pressure fuel pump		Condition		Resistance
+	–			
Terminal				
1	2	Temperature [°C (°F)]	20 – 30 (68 – 86)	0.46 – 0.51 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

2.CHECK HIGH PRESSURE FUEL PUMP-2

With CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine.
4. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication as per the following conditions.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Check fuel rail pressure sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

P0090 FRP SYSTEM

DTC Description

INFOID:0000000014708457

DTC DETECTION LOGIC

NOTE:
DTC P0090 may be displayed when running out of gas.

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0090	FUEL PRESSURE CONTROL FUNCTION (Fuel pressure regulator 1 control circuit)	• Fuel rail pressure remains at 1.1 MPa (11.2 kg/cm^2, 159.5 psi) or less for 5 seconds or more during engine rev. • Fuel rail pressure remains at 18.5 MPa (188.7 kg/cm^2, 2682.5 psi) or more for 0.3 seconds or more during engine rev.

POSSIBLE CAUSE

- Harness or connectors (The high pressure fuel pump circuit is open or shorted.)
- High pressure fuel pump

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System

- Limiting output control
- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0090 is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-469, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 3.

3.DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “COOLAN TEMP/S” in “DATA MONITOR” of “ENGINE” using CONSULT
4. Maintain the following condition for 5 seconds or more at idle.

COOLAN TEMP/S	70°C (158°F) or more

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-227, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014708458

1.CHECK DTC PRIORITY

If DTC P0090 is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197.

Is DTC P1197 detected?

YES >> Perform diagnosis for P1197. Refer to EC-469, "DTC Description".
NO >> GO TO 2.

2.CHECK HIGH PRESSURE FUEL PUMP CIRCUIT

1. Turn ignition switch ON.
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.

ECM		High pressure fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
F51	48	F64	1	Existed
	49		2	

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

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace the error-detected parts.

3.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-227, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000014708459

1.CHECK HIGH PRESSURE FUEL PUMP-1

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump harness connector.
3. check the resistance between high pressure fuel pump terminals as per the following conditions.

High pressure fuel pump		Condition		Resistance
+	–			
Terminal				
1	2	Temperature [°C (°F)]	20 – 30 (68 – 86)	0.46 – 0.51 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

2.CHECK HIGH PRESSURE FUEL PUMP-2

With CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine.
4. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication as per the following conditions.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Check fuel rail pressure sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

P0101 MAF SENSOR

DTC Description

INFOID:0000000014631211

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0101	MAF SEN/CIRCUIT-B1 (Mass air flow sensor (bank 1) circuit range/ performance)	• A high voltage from the mass air flow sensor is sent to ECM under light load driving condition. • A low voltage from the mass air flow sensor is sent to ECM under heavy load driving condition.

POSSIBLE CAUSE

- Harness or connectors (The mass air flow sensor circuit is open or shorted.)
- Mass air flow sensor circuit is open or shorted.
- Sensor power supply 2 is shorted.
- Mass air flow sensor
- Intake valve timing control solenoid valve
- EVAP control system pressure sensor
- Intake air leaks
- Intake air temperature sensor
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

or

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Fail safe mode		Vehicle behavior
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.
	Ignition timing correction control	Partially controls ignition timing control.
	Retardation control	Controls ignition timing delay control in the intermediate water temperature range.

Hybrid Control System
- Limiting accelerator angle variation control
- Idling stop is prohibited

or
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

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

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-212, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
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 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Drive the vehicle for at least 5 seconds under the following conditions:
   CAUTION:
   Always drive at a safe speed.

Selector lever	Suitable position
Vehicle speed	40 km/h (25 MPH) or more

   NOTE:
   - The gear must be fixed while driving the vehicle.
   - Keep the accelerator pedal as steady as possible during cruising.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-231, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631212

1.CHECK INTAKE SYSTEM

Check the following items to see the installation condition and the connection condition of the joint.
- 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 MASS AIR FLOW (MAF) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between MAF sensor harness connectors.

MAF sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F22	1	3	5 V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3.CHECK MASS AIR FLOW SENSOR POWER SUPPLY-2

Check the voltage between MAF sensor harness connector and ground.

+		–	Voltage (Approx.)
MAF sensor			
Connector	Terminal		
F22	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 4.

4.CHECK MAF SENSOR POWER CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	1	F51	26	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Refer to EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Repair or replace malfunctioning part.

6.CHECK MAF SENSOR GROUND CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	3	F51	42	Existed

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

8.CHECK MAF SENSOR INPUT SIGNAL CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	2	F51	37	Existed

4. 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 INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to EC-244, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace MAF sensor (with intake air temperature sensor). Refer to EM-29, "Exploded View".

10.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-395, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation"

11. CHECK MAF SENSOR

Check MAF sensor. Refer to EC-233, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor. Refer to EM-29, "Exploded View".

Component Inspection

INFOID:0000000014682357

1. CHECK MASS AIR FLOW (MAF) SENSOR-1

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “MASS AIR FLOW SENSOR (Hz)” in “DATE MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH INTAKE AIR DUCT

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through intake air duct. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt like leaves or insects of air cleaner element
- Intake valve deposit
- Improper specification of intake air system parts

Is the inspection result normal?

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

3. CHECK MAF SENSOR-2

With CONSULT

1. Repair malfunctioning part.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Select “MASS AIR FLOW SENSOR (Hz)” in “DATE MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Repair malfunctioning part.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK MAF SENSOR-3

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “MASS AIR FLOW SENSOR (Hz)” in “DATE MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.

3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor. Refer to EM-29, "Exploded View".

P0102, P0103 MAF SENSOR

DTC Description

INFOID:0000000014631214

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0102	MAF SEN/CIRCUIT-B1 (Mass or volume air flow “A” circuit low)	An excessively low voltage from the MAF sensor is sent to ECM during engine running.
P0103	MAF SEN/CIRCUIT-B1 (Mass or volume air flow “A” circuit high)	An excessively high voltage from the MAF sensor is sent to ECM.

POSSIBLE CAUSE

P0102
- Harness or connectors
- The mass air flow sensor circuit is open or shorted.
- Sensor power supply 2 circuit is shorted.
- Intake air leaks
- Mass air flow sensor
- Each sensor, connected with sensor power supply 2 circuit

P0103
- Harness or connectors
- The mass air flow sensor circuit is open or shorted.
- Sensor power supply 2 circuit is shorted.
- Mass air flow sensor
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Fail safe mode		Vehicle behavior
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.
	Ignition timing correction control	Partially controls ignition timing control.
	Retardation control	Controls ignition timing delay control in the intermediate water temperature range.

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Which DTC is detected?

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2.DTC CONFIRMATION PROCEDURE-DTC P0102

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle at least 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-238, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

3.DTC CONFIRMATION PROCEDURE-DTC P0103-1

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

Is DTC detected?

YES >> Proceed to EC-238, "Diagnosis Procedure".
NO >> GO TO 4.

4.DTC CONFIRMATION PROCEDURE-DTC P0103-2

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle at least 5 seconds.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-238, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631215

1.INSPECTION START

Confirm the detected DTC. Refer to EC-236, "DTC Description".

Which DTC is detected?

P0102 >> GO TO 2.
P0103 >> GO TO 3.

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.

3.CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between MAF sensor harness connector terminals.

MAF sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F22	1	3	5 V

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 4.

4.CHECK MAF SENSOR POWER SUPPLY-2

Check the voltage between MAF sensor harness connector and ground.

+		–	Voltage (Approx.)
MAF sensor			
Connector	Terminal		
F22	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 5.

5.CHECK MAF SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	1	F51	26	Existed

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

Is the inspection result normal?

YES >> GO TO 6.

NO >> Repair or replace malfunctioning part.

6. CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Refer to EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".

NO >> Repair or replace malfunctioning part.

7. CHECK MAF SENSOR GROUND CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	3	F51	42	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace malfunctioning part.

8. CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Repair or replace malfunctioning part.

9. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	2	F51	37	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

NO >> Repair or replace malfunctioning part.

10. CHECK MAF SENSOR

Refer to EC-240, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor. Refer to EM-29, "Exploded View".

Component Inspection

INFOID:0000000014631216

1. CHECK MASS AIR FLOW (MAF) SENSOR-1

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “MASS AIR FLOW SENSOR (Hz)” in “DATE MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH INTAKE AIR DUCT

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through intake air duct. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt like leaves or insects of air cleaner element
- Intake valve deposit
- Improper specification of intake air system parts

Is the inspection result normal?

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

3. CHECK MAF SENSOR-2

With CONSULT

1. Repair malfunctioning part.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Select “MASS AIR FLOW SENSOR (Hz)” in “DATE MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Repair malfunctioning part.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK MAF SENSOR-3

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “MASS AIR FLOW SENSOR (Hz)” in “DATE MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor. Refer to EM-29, "Exploded View".

P0111 IAT SENSOR

DTC Description

INFOID:0000000014631219

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0111	IAT SENSOR 1 B1 (Intake air temperature sensor 1 circuit range/performance bank 1)	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.

POSSIBLE CAUSE

- Harness or connectors (High or low resistance in the IAT sensor circuit)
- Intake air temperature sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

NOTE:
Use the component function check to check the overall function of the IAT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Turn ignition switch ON.
4. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
5. Check that “INT/A TEMP SEN” indicates as per following condition.

Monitor item	Condition		Value
INT/A TEMP SEN	Temperature [°C (°F)]	25 (77)	1.9 – 2.1 V

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-244, "Diagnosis Procedure".

3.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
2. Turn ignition switch OFF and leave the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during this procedure.
   NOTE:
   The vehicle must be cooled with the hood open.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-244, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631220

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Refer to EC-244, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (IAT sensor is built-in). Refer to EM-29, "Exploded View".

Component Inspection

INFOID:0000000014682358

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow (MAF) sensor harness connector and reconnect it.
3. Turn ignition switch ON.
4. Select “INT/A TEMP SEN” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
5. Check that the indicated value of “INT/A TEMP SEN” is almost the same as intake air temperature.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor (IAT sensor is built-in). Refer to EM-29, "Exploded View".

P0112, P0113 IAT SENSOR

DTC Description

INFOID:0000000014631222

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0112	IAT SEN/CIRCUIT-B1 (Intake air temperature sensor 1 circuit low bank 1)	An excessively low voltage from the IAT sensor is sent to ECM.
P0113	IAT SEN/CIRCUIT-B1 (Intake air temperature sensor 1 circuit high bank 1)	An excessively high voltage from the IAT sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (The IAT sensor circuit is open or shorted.)
- Intake air temperature sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

PERFORM DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> 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-245, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631223

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect mass air flow (MAF) sensor (intake air temperature sensor is built-in) harness connector.
3. Turn ignition switch ON.
4. Check the voltage between MAF sensor harness connector terminals.

MAF sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F22	4	3	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK IAT SENSOR POWER SUPPLY-2

Check the voltage between MAF sensor harness connector and ground.

+		–	Voltage (Approx.)
MAF sensor			
Connector	Terminal		
F22	4	Ground	5 V

Is the inspection result normal?

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

3.CHECK IAT SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	4	F51	36	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

4.CHECK IAT SENSOR GROUND CIRCUIT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F22	3	F51	42	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

6. CHECK IAT SENSOR

Refer to EC-247, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor (IAT sensor is built-in). Refer to EM-29, "Exploded View".

Component Inspection

INFOID:0000000014631224

1. CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow (MAF) sensor harness connector and reconnect it.
3. Turn ignition switch ON.
4. Select “INT/A TEMP SEN” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
5. Check that the indicated value of “INT/A TEMP SEN” is almost the same as intake air temperature.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor (IAT sensor is built-in). Refer to EM-29, "Exploded View".

P0116 ECT SENSOR

DTC Description

INFOID:0000000014631225

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0116	ECT SEN/CIRC (Engine coolant temperature sensor 1 circuit range/performance)	• The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, engine outlet coolant temperature sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the engine outlet coolant temperature sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state. • 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.

POSSIBLE CAUSE

- Harness or connectors (High or low resistance in the engine outlet coolant temperature sensor circuit)
- Engine outlet coolant temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

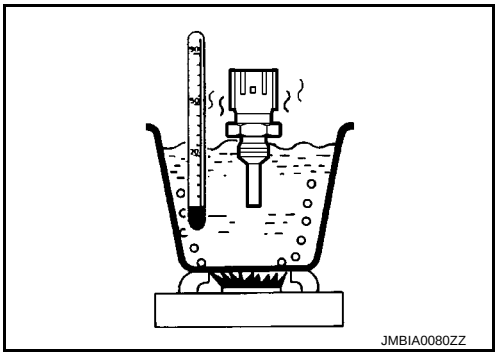
Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

NOTE:
Use the component function check to check the overall function of the engine outlet coolant temperature sensor circuit. During this check, a 1st trip DTC might not be confirmed.

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Remove engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".
4. Check resistance between engine outlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine outlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.1 – 2.9 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-249, "Diagnosis Procedure".

3.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
2. Turn ignition switch OFF and leave the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during this procedure.
   NOTE:
   The vehicle must be cooled with the hood open.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and let it idle for 20 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-249, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631226

1. CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

Refer to EC-249, "Component Inspection (Engine Outlet Coolant Temperature Sensor)".

Is the inspection result normal?

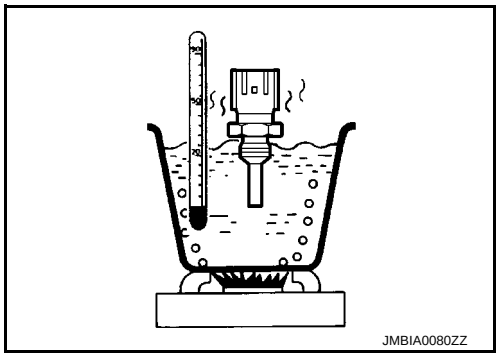
YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

Component Inspection (Engine Outlet Coolant Temperature Sensor)

INFOID:0000000014682360

1. CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Remove engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".
4. Check the resistance between engine outlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine outlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

P0117, P0118 ENGINE OUTLET COOLANT TEMPERATURE SENSOR

DTC Description

INFOID:0000000014631228

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0117	ECT SEN/CIRC (Engine coolant temperature sensor 1 circuit low)	An excessively low voltage from the engine outlet coolant temperature sensor is sent to ECM.
P0118	ECT SEN/CIRC (Engine coolant temperature sensor 1 circuit high)	An excessively high voltage from the engine outlet coolant temperature sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (The engine outlet coolant temperature sensor circuit is open or shorted.)
- Engine outlet coolant temperature sensor

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.
Others		Engine speed will not rise more than 1,800 rpm due to the fuel cut.

Hybrid Control System

- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Proceed to EC-250, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631229

1.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between engine outlet coolant temperature sensor harness connector terminals.

Engine outlet coolant temperature sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F61	1	2	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR POWER SUPPLY-2

Check the voltage between engine outlet coolant temperature sensor harness connector and ground.

+		–	Voltage (Approx.)
Engine outlet coolant temperature sensor			
Connector	Terminal		
F61	1	Ground	5 V

Is the inspection result normal?

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

3.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between engine outlet coolant temperature sensor harness connector and ECM harness connector.

Engine outlet coolant temperature sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F61	1	F51	35	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

4.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between engine outlet coolant temperature sensor harness connector and ECM harness connector.

Engine outlet coolant temperature sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F61	2	F51	45	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace malfunctioning part.

5.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

6.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

Refer to EC-252, "Component Inspection (Engine Outlet Coolant Temperature Sensor)".

Is the inspection result normal?

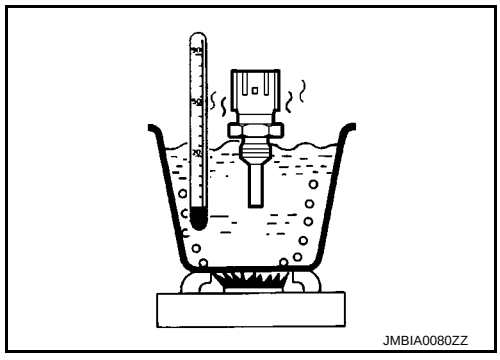
YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

Component Inspection (Engine Outlet Coolant Temperature Sensor)

INFOID:0000000014631230

1.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Remove engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".
4. Check the resistance between engine outlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine outlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

P0122, P0123 TP SENSOR

DTC Description

INFOID:0000000014631231

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0122	TP SEN 2/CIRC-B1 (Throttle/pedal position sensor/switch “A” circuit low)	An excessively low voltage from the TP sensor 2 is sent to ECM.
P0123	TP SEN 2/CIRC-B1 (Throttle/pedal position sensor/switch “A” circuit high)	An excessively high voltage from the TP sensor 2 is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (TP sensor 2 circuit is open or shorted.)
- Electric throttle control actuator (TP sensor 2)

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	• The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. • The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor. **NOTE:** If throttle position sensor 1 and 2 malfunction at the same time conducts following control. • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

2. Start engine and let it idle for 1 second.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-254, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631232

1.CHECK DTC PRIORITY

If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.CHECK THROTTLE POSITION (TP) SENSOR 2 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector terminals.

Electric throttle control actuator			Voltage (Approx.)
Connector	+	–	
	Terminal		
F50	2	4	5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK TP SENSOR 2 POWER SUPPLY-2

Check the voltage between electric throttle control actuator harness connector and ground.

+		–	Voltage (Approx.)
Electric throttle control actuator			
Connector	Terminal		
F50	2	Ground	5 V

Is the inspection result normal?

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

4.CHECK TP SENSOR 2 POWER SUPPLY CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	2	F52	83	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

5. CHECK TP SENSOR 2 GROUND CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	4	F52	85	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6. CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

7. CHECK TP SENSOR 2 INPUT SIGNAL CIRCUIT

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

+		–		Continuity
Electric throttle control actuator		ECM		
Connector	Terminal	Connector	Terminal	
F50	3	F52	80	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8.CHECK TP SENSOR

Refer to EC-256, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

Component Inspection

INFOID:0000000014631233

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".
4. Turn ignition switch ON.
5. Shift the selector lever to D position.
6. Check the voltage between ECM harness connector terminals as per the following conditions.

ECM			Condition		Voltage
Connector	+	–			
	Terminal				
F52	88	85	Accelerator pedal	Fully released	0.36 V or more
				Fully depressed	4.75 V or less
	80			Fully released	4.75 V or less
				Fully depressed	0.36 V or more

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

P0125 ECT SENSOR

DTC Description

INFOID:0000000014631234

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0125	ECT SENSOR (Insufficient coolant temperature for closed loop fuel control)	• Voltage sent to ECM from the engine outlet coolant temperature sensor is not practical, even when some time has passed after starting the engine. • Engine outlet coolant temperature sensor is insufficient for closed loop fuel control.

POSSIBLE CAUSE

- Harness or connectors (High resistance in the engine outlet coolant temperature sensor circuit)
- Engine outlet coolant temperature sensor
- Thermostat

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

- If DTC P0125 is displayed with DTC P0116, first perform the trouble diagnosis for DTC P0116.
- If DTC P0125 is displayed with DTC P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0116: Refer to EC-248, "DTC Description".
- DTC P0117 or P0118: Refer to EC-250, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

With CONSULT
1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Check that “COOLANT TEMP/S” is above −4°C (25°F).

With GST
Follow the procedure “With CONSULT” above.

Is it above −4°C (25°F)?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

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

2. Check 1st tip DTC.

If "COOLANT TEMP/S" indication increases to more than −4°C (25°F) within 65 minutes, stop engine because the test result will be OK.

CAUTION:

Be careful not to overheat engine.

With GST

Follow the procedure "With CONSULT" above.

Is 1st trip DTC detected?

YES >> Proceed to EC-258, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631235

1.CHECK DTC PRIORITY

- If DTC P0125 is displayed with DTC P0116, first perform the trouble diagnosis for DTC P0116.
- If DTC P0125 is displayed with DTC P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0116: Refer to EC-248, "DTC Description".
- DTC P0117 or P0118: Refer to EC-250, "DTC Description".

NO >> GO TO 2.

2.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

Refer to EC-258, "Component Inspection (Engine Outlet Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

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?

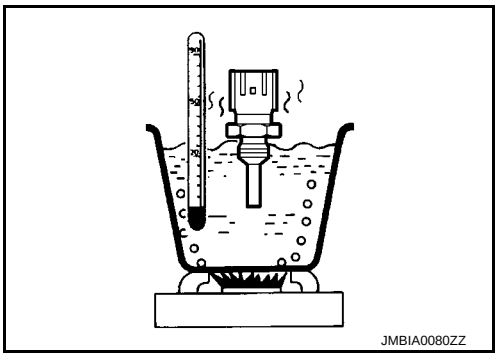
YES >> INSPECTION END
NO >> Repair or replace thermostat. Refer to CO-24, "Removal and Installation".

Component Inspection (Engine Outlet Coolant Temperature Sensor)

INFOID:0000000014682362

1.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Remove engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".
4. Check the resistance between engine outlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine outlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

P0127 IAT SENSOR

DTC Description

INFOID:0000000014631237

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0127	IAT SENSOR-B1 (Intake air temperature too high)	Rationally incorrect voltage from the IAT sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.

POSSIBLE CAUSE

- Harness or connectors (The IAT sensor circuit is open or shorted.)
- Intake air temperature sensor

FAIL-SAFE

Not applicable

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Wait until engine coolant temperature is less than 96°C (205°F)
- Turn ignition switch ON.
- Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.

NOTE:

Perform the following steps before engine coolant temperature is above 96°C (205°F).

2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine.
6. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.

CAUTION:

Always drive vehicle at a safe speed.

7. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-260, "Diagnosis Procedure".

NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631238

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Refer to EC-260, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (IAT sensor is built-in). Refer to EM-29, "Exploded View".

Component Inspection

INFOID:0000000014682364

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow (MAF) sensor harness connector and reconnect it.
3. Turn ignition switch ON.
4. Select “INT/A TEMP SEN” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
5. Check that the indicated value of “INT/A TEMP SEN” is almost the same as intake air temperature.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAF sensor (IAT sensor is built-in). Refer to EM-29, "Exploded View".

P0128 THERMOSTAT FUNCTION

DTC Description

INFOID:0000000014631240

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0128	THERMSTAT FNCTN [Coolant thermostat (coolant temperature below thermostat regulating temperature)]	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.

POSSIBLE CAUSE

- Thermostat
- Leakage from sealing portion of thermostat
- Engine outlet coolant temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

NOTE:
Never refuel before and during the following procedure.

1. CHECK DTC PRIORITY

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303 or P0304, first perform the trouble diagnosis for DTC P0300, P0301, P0302, P0303 or P0304.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-336, "DTC Description".
NO >> GO TO 2.

2. PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3. PRECONDITIONING-2

With CONSULT

1. Turn ignition switch ON.
2. Check the following conditions:

Ambient temperature	−10°C (14°F) or more
A/C switch	OFF
Blower fan switch	OFF

3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check the following conditions:

COOLANT TEMP/S	−10°C – 46°C (14 – 115°F)

Is the condition satisfied?

YES >> GO TO 4.
NO >> 1. Satisfy the condition.
2. GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Drive the vehicle until the following condition is satisfied.

CAUTION:
Always drive vehicle at safe speed.

- **STEP 1**

Drive the vehicle under the conditions instructed below until the difference between “COOLANT TEMP/S” and “FUEL T/TMP SE” becomes at least 21°C (38°F).

COOLANT TEMP/S	65°C (149°F) or less
FUEL T/TMP SE	Less than the value calculated by subtracting 21°C (38°F) from “COOLANT TEMP/S”.*

*: Example

COOLANT TEMP/S	FUEL T/TMP SE
70°C (158°F)	49°C (120°F) or less
65°C (149°F)	44°C (111°F) or less
60°C (140°F)	39°C (102°F) or less

- **STEP 2**

Drive the vehicle at 50 km/h (32 MPH) or more with the difference between “COOLANT TEMP/S” and “FUEL T/TMP SE” maintained at 21°C (38°F) or more.

NOTE:
Keep the accelerator pedal as steady as possible during cruising.

- **STEP 3**

Drive the vehicle at 50 km/h (32 MPH) or more until “COOLANT TEMP/S” increases by 6°C (11°F).

NOTE:
Keep the accelerator pedal as steady as possible during cruising.

Is the condition satisfied?

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

5. PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Drive the vehicle until the following condition is satisfied.

COOLANT TEMP/S	59°C (139°F) or more

CAUTION:
Always drive vehicle at safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-262, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631241

1. CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

Refer to EC-263, "Component Inspection (Engine Outlet Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

2.CHECK THERMOSTAT

Check the thermostat. Refer to CO-25, "Inspection".

Is the inspection result normal?

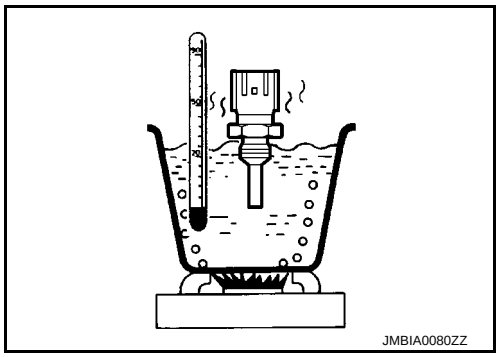
YES >> INSPECTION END
NO >> Replace thermostat. Refer to CO-24, "Removal and Installation".

Component Inspection (Engine Outlet Coolant Temperature Sensor)

INFOID:0000000014689705

1.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Remove engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".
4. Check the resistance between engine outlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine outlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

P0130 A/F SENSOR 1

DTC Description

INFOID:0000000014631243

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0130	A/F SENSOR1 (B1) (O2 sensor circuit bank 1 sensor 1)	The output voltage computed by ECM according to the A/F sensor 1 signal is constant.

POSSIBLE CAUSE

- Harness or connectors (The A/F sensor 1 circuit is open or shorted.)
- Air fuel ratio (A/F) sensor 1

FAIL-SAFE

Not applicable

PERFORM DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 6.

2.CHECK A/F SENSOR 1 FUNCTION

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check “A/F SEN1 (B1)” indication.

Does the indication constantly fluctuate at around 2.2 V?

YES >> GO TO 3.
NO >> Proceed to EC-265, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE-1

1. Select “A/F SEN1 (B1) P1276” in “A/F SEN1” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
2. “TESTING” is displayed on the CONSULT screen when the following conditions are met.

ENG SPEED	1,000 – 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 mph)
B/FUEL SCHDL	1.0 – 8.0 msec
Selector lever	D position

CAUTION:

Always drive vehicle at a safe speed.

Is “TESTING” displayed on CONSULT screen?

YES >> GO TO 4.
NO >> If “TESTING” is not displayed after 20 seconds, GO TO 2.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

Release accelerator pedal fully.

NOTE:

Never operate brake pedal when releasing the accelerator pedal.

Which does “TESTING” change to?

“COMPLETED”>>GO TO 5.

“OUT OF CONDITION”>>Retry DTC CONFIRMATION PROCEDURE. GO TO 3.

5. PERFORM DTC CONFIRMATION PROCEDURE-3

Touch “SELF - DIAG RESULT”.

Is “OK” displayed on CONSULT screen?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".

YES-2 >> Confirmation after repair: INSPECTION END

NO >> Proceed to EC-265, "Diagnosis Procedure".

6. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Shift the selector lever to D position and drive for a few minutes at 80 km/h (50 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   NOTE:
   Never apply brake when releasing the accelerator pedal.
5. Repeat steps 3 and 4, 5 times.
6. Stop the vehicle, turn ignition switch OFF and wait at least 10 seconds.
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Restart engine.
9. Repeat steps 3 and 4, 5 times.
10. Stop the vehicle and check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-265, "Diagnosis Procedure".

NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".

NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631244

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

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

+		–	Voltage
A/F sensor 1			
Connector	Terminal		
F18	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

A/F sensor 1		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F18	4	F35	75	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".
NO >> Repair or replace malfunctioning part.

P0131 A/F SENSOR 1

DTC Description

INFOID:0000000014631245

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0131	A/F SENSOR1 (B1) (O2 sensor circuit low voltage bank 1 sensor 1)	The output voltage computed by ECM according to the A/F sensor 1 signal is excessively low at all times.

POSSIBLE CAUSE

- Harness or connectors (The A/F sensor 1 circuit is open or shorted.)
- Air fuel ratio (A/F) sensor 1

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.CHECK A/F SENSOR 1 FUNCTION

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check “A/F SEN1 (B1)” indication.

Is the indication constantly approx. 0 V?

YES >> Proceed to EC-268, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Restart engine.
4. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
5. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 – 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 – 9.0 msec
Selector lever	D 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 3, return to step 1.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-268, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

4. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Shift the selector lever to D position and drive for a few minutes at 80 km/h (50 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   NOTE:
   Never apply brake when releasing the accelerator pedal.
5. Repeat steps 3 and 4, 5 times.
6. Stop the vehicle, turn ignition switch OFF and wait at least 10 seconds.
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Restart engine.
9. Repeat steps 3 and 4, 5 times.
10. Stop the vehicle and check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-268, "Diagnosis Procedure"
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631246

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

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

+		–	Voltage
A/F sensor 1			
Connector	Terminal		
F18	4	Ground	Battery voltage

Is the inspection result normal?

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

2. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

A/F sensor 1		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F18	4	F35	75	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".
NO >> Repair or replace malfunctioning part.

P0132 A/F SENSOR 1

DTC Description

INFOID:0000000014631247

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0132	A/F SENSOR1 (B1) (O2 sensor circuit high voltage bank 1 sensor 1)	The output voltage computed by ECM according to the A/F sensor 1 signal is excessively high at all times.

POSSIBLE CAUSE

- Harness or connectors (The A/F sensor 1 circuit is open or shorted.)
- Air fuel ratio (A/F) sensor 1

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.CHECK A/F SENSOR 1 FUNCTION

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check “A/F SEN1 (B1)” indication.

Does the indication constantly approximately 5 V?

YES >> Proceed to EC-271, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Restart engine.
4. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
5. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 – 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 – 9.0 msec
Selector lever	D 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 3, return to step 1.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-271, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

4. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Shift the selector lever to D position and drive for a few minutes at 80 km/h (50 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   NOTE:
   Never apply brake when releasing the accelerator pedal.
5. Repeat steps 3 and 4, 5 times.
6. Stop the vehicle, turn ignition switch OFF and wait at least 10 seconds.
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Restart engine.
9. Repeat steps 3 and 4, 5 times.
10. Stop the vehicle and check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-271, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631248

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

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

+		–	Voltage
A/F sensor 1			
Connector	Terminal		
F18	4	Ground	Battery voltage

Is the inspection result normal?

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

2. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

A/F sensor 1		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F18	4	F35	75	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".
NO >> Repair or replace malfunctioning part.

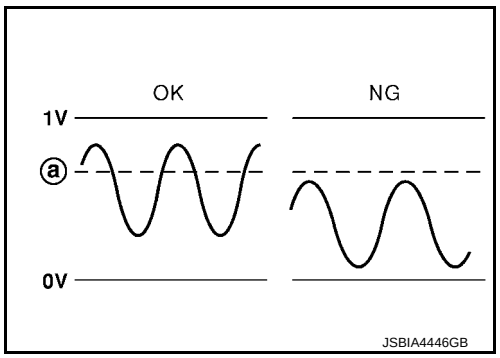
P0137 HO2S2

DTC Description

INFOID:0000000014631249

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.

ⓐ : 0.72 V



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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0137	HO2S2 (B1) (O2 sensor circuit low voltage bank 1 sensor 2)	• The maximum voltage from the sensor does not reach the specified voltage. • ECM detects the heated oxygen sensor 2 circuit is short to ground.

POSSIBLE CAUSE

- Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted.)
- Heated oxygen sensor 2
- Incorrect fuel pressure
- Fuel injector
- Intake air leaks

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Check that temperature is between 0°C to 30°C (32°F to 86°F) before conducting following procedure.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Restart engine.
6. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
7. Keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
8. Let engine idle for 1 minute.
9. Check that “COOLANT TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLANT TEMP/S” indication reaches 70°C (158°F).
10. Open engine hood.
11. Select “HO2S2 (B1) P1147” in “HO2S2” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
12. Follow the instruction of CONSULT display.
    NOTE:

It will take at most 10 minutes until “COMPLETED” is displayed.
13. Touch “SELF-DIAG RESULTS”

Is “OK” displayed on CONSULT screen?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO-1 >> “NG” is displayed: Proceed to EC-275, "Diagnosis Procedure".
NO-2 >> “CAN NOT BE DIAGNOSED” is displayed: 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-1

Without CONSULT

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.

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Revving up to 4,000 rpm quickly under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 5.

5. PERFORM COMPONENT FUNCTION CHECK-2

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine at idle for 10 minutes.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK-3

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

CAUTION:

Always drive vehicle at a safe speed.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Coasting from 80 km/h (50 MPH) with selector lever in the D position.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-275, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631250

1.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171. Refer to EC-300, "Diagnosis Procedure".
NO >> GO TO 2.

2.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect HO2S2 harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	1	F52	78	Existed

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	2	F52	84	Existed

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

HO2S2		—	Continuity
Connector	Terminal		
F21	2	Ground	Not existed

ECM		—	Continuity
Connector	Terminal		
F52	84	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-276, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

Component Inspection

INFOID:0000000014631251

1. INSPECTION START

Will CONSULT be used?

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

2. CHECK HEATED OXYGEN SENSOR 2-1

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item using CONSULT.
8. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ± 25%.
   “HO2S2 (B1)/(B2)” should be above 0.72 V at least once when the “FUEL INJECTION” is +25%.
   “HO2S2 (B1)/(B2)” should be below 0.28 V at least once when the “FUEL INJECTION” is +25%.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

3. CHECK HEATED OXYGEN SENSOR 2-2

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Revving up to 4,000 rpm quickly under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-3

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine at idle for 10 minutes.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-4

Without CONSULT

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

CAUTION:

Always drive vehicle at a safe speed.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Coasting from 80 km/h (50 MPH) with selector lever in the D position.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

P0138 HO2S2

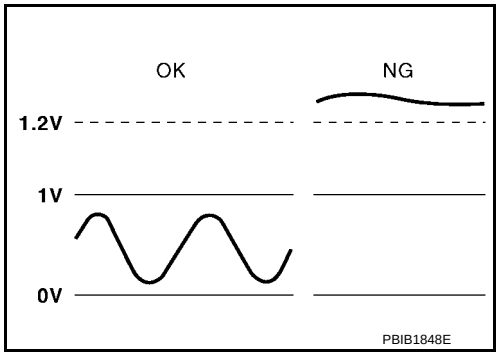
DTC Description

INFOID:0000000014631252

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

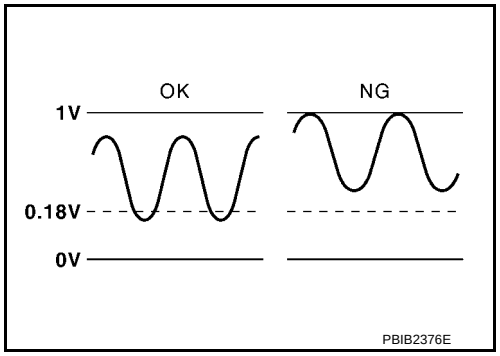
To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage is excessively high during various driving conditions such as fuel cut.

ⓐ : 0.28 V



DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition	
P0138	HO2S2 (B1) (O2 sensor circuit high voltage bank 1 sensor 2)	A	An excessively high voltage from the heated oxygen sensor 2 is sent to ECM.
		B	The minimum voltage from the heated oxygen sensor 2 is not reached to the specified voltage.

POSSIBLE CAUSE

P0138-A

- Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted.)
- Heated oxygen sensor 2

P0138-B

- Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted.)
- Heated oxygen sensor 2
- Incorrect fuel pressure
- Fuel injector

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2. DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-281, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> Without CONSULT: GO TO 5.

3. DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-1

With CONSULT

Test condition: For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Restart engine.
6. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
7. Keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
8. Let engine idle for 1 minute.
9. Check that “COOLANT TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLANT TEMP/S” indication reaches 70°C (158°F).
10. Open engine hood.
11. Select “HO2S2 (B1) P1146” in “HO2S2” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
12. Follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED”is displayed.
13. Touch “SELF-DIAG RESULTS”.

Is “OK” displayed on CONSULT screen?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO-1 >> “NG” is displayed: Proceed to EC-281, "Diagnosis Procedure".
NO-2 >> “CAN NOT BE DIAGNOSED” is displayed: GO TO 4.

4. DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-2

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-1

Without CONSULT

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.

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

5. 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.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Revving up to 4,000 rpm quickly under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK-2

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine at idle for 10 minutes.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 7.

7. PERFORM COMPONENT FUNCTION CHECK-3

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

CAUTION:
Always drive vehicle at a safe speed.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Coasting from 80 km/h (50 MPH) with selector lever in the D position.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-281, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631253

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-279, "DTC Description".

Which malfunction is detected?

A >> GO TO 2.
B >> GO TO 7.

2.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) CONNECTOR

1. Disconnect HO2S2 harness connector.
2. Check that water is not inside connectors.

Is there no leakage?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK HO2S2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect HO2S2 harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	1	F52	78	Existed

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	2	F52	84	Existed

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

HO2S2		—	Continuity
Connector	Terminal		
F21	2	Ground	Not existed

ECM		—	Continuity
Connector	Terminal		
F52	84	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-284, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

7. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172. Refer to EC-305, "Diagnosis Procedure".
NO >> GO TO 8.

8. CHECK HEATED OXYGEN SENSOR 2 (HO2S2) GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect HO2S2 harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	1	F52	78	Existed

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace malfunctioning part.

9. CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace malfunctioning part.

10. CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	2	F52	84	Existed

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

HO2S2		—	Continuity
Connector	Terminal		
F21	2	Ground	Not existed

ECM		—	Continuity
Connector	Terminal		
F52	84	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace malfunctioning part.

11. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-284, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

Component Inspection

INFOID:0000000014631254

1. INSPECTION START

Will CONSULT be used?

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

2. CHECK HEATED OXYGEN SENSOR 2-1

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item using CONSULT.
8. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ± 25%.
   “HO2S2 (B1)/(B2)” should be above 0.72 V at least once when the “FUEL INJECTION” is +25%.
   “HO2S2 (B1)/(B2)” should be below 0.28 V at least once when the “FUEL INJECTION” is +25%.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

3. CHECK HEATED OXYGEN SENSOR 2-2

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Revving up to 4,000 rpm quickly under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-3

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine at idle for 10 minutes.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-4

Without CONSULT
Check the voltage between ECM harness connector terminals under the following conditions.
CAUTION:
Always drive vehicle at a safe speed.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Coasting from 80 km/h (50 MPH) with selector lever in the D position.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

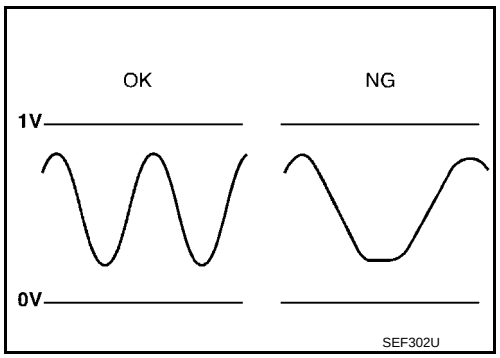
YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

P0139 HO2S2

DTC Description

INFOID:0000000014631255

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0139	HO2S2 (B1) (O2 sensor circuit slow response bank 1 sensor 2)	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM.

POSSIBLE CAUSE

- Harness or connectors (The heated oxygen sensor 2 sensor circuit is open or shorted.)
- Heated oxygen sensor 2
- Fuel system
- EVAP system
- Intake air system

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0139 is displayed with DTC P0137 or P0138, first perform the trouble diagnosis for DTC P0137 or P0138.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0137: Refer to EC-273, "DTC Description".
- DTC P0138: Refer to EC-279, "DTC Description".

NO >> GO TO 2.

2.INSPECTION START

Do you have CONSULT?

YES >> GO TO 3.
NO >> GO TO 8.

3.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
7. Restart engine.
8. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
9. Keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
10. Let engine idle for 1 minute.
11. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
12. Drive the vehicle in a proper at 60 km/h (38 MPH) and maintain the speed.
    CAUTION:
    Always drive vehicle at a safe speed.
13. Release the accelerator pedal fully at least 5 seconds.
    CAUTION:
    - **Enable engine brake.**
    - **Always drive carefully.**
    - **Never apply brake when releasing the accelerator pedal.**
14. Repeat step 12 and 13 at least 8 times.
15. Check the following item of “DATA MONITOR”.

Data monitor item	Status
HO2 S2 DIAG1 (B1)	CMPLT
HO2 S2 DIAG2 (B1)	

Is “CMPLT” displayed on CONSULT screen?

YES >> GO TO 7.
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 5.

5. PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Select “HO2S2 (B1) P0139” in “HO2S2” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
4. Start engine and follow the instruction of CONSULT display.
   NOTE:
   It will take at most 10 minutes until “COMPLETED” is displayed.

Is “COMPLETED” displayed on CONSULT screen?

YES >> GO TO 7.
NO >> GO TO 6.

6. 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 4.

7. PERFORM SELF-DIAGNOSIS

With CONSULT
Perform ECM self-diagnosis.

Is DTC P0139 detected?

YES >> Proceed to EC-289, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

8. PERFORM COMPONENT FUNCTION CHECK-1

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector and ground as per the following condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.12 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 9.

9. PERFORM COMPONENT FUNCTION CHECK-2

Check the voltage between ECM harness connector and ground as per the following condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.12 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> GO TO 10.

10. PERFORM COMPONENT FUNCTION CHECK-3

Check the voltage between ECM harness connector and ground as per the following condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.12 V at least once during this procedure.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-289, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631256

1. CHECK DTC PRIORITY

If DTC P0139 is displayed with DTC P0137 or P0138, first perform the trouble diagnosis for DTC P0137 or P0138.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0137: Refer to EC-273, "DTC Description".
- DTC P0138: Refer to EC-279, "DTC Description".

NO >> GO TO 2.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-299, "DTC Description" or EC-304, "DTC Description".

NO >> GO TO 3.

3.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect HO2S2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	1	F52	78	Existed

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.

NO >> Repair or replace malfunctioning part.

4.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.

NO >> Repair or replace malfunctioning part.

5.CHECK HO2S2 INPUT SIGNAL CIRCUIT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	2	F52	84	Existed

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

HO2S2		—	Continuity
Connector	Terminal		
F21	2	Ground	Not existed

ECM		—	Continuity
Connector	Terminal		
F52	84	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

6.CHECK HEATED OXYGEN SENSOR 2

Check the heated oxygen sensor 2. Refer to EC-291, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

Component Inspection

INFOID:0000000014631257

1.INSPECTION START

Will CONSULT be used?

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

2.CHECK HEATED OXYGEN SENSOR 2-1

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item using CONSULT.
8. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ± 25%.
   “HO2S2 (B1)/(B2)” should be above 0.72 V at least once when the “FUEL INJECTION” is +25%.
   “HO2S2 (B1)/(B2)” should be below 0.28 V at least once when the “FUEL INJECTION” is +25%.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

3.CHECK HEATED OXYGEN SENSOR 2-2

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Revving up to 4,000 rpm quickly under no load at least 10 times. (Depress and release the accelerator pedal as quickly as possible.)	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-3

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine at idle for 10 minutes.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-4

Without CONSULT

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

CAUTION:

Always drive vehicle at a safe speed.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Coasting from 80 km/h (50 MPH) with selector lever in the D position.	The voltage should be above 0.72 V at least once during this procedure. The voltage should be below 0.28 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

P014C, P014D, P015A, P015B A/F SENSOR 1

DTC Description

INFOID:0000000014631258

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P014C	A/F SENSOR1 (B1) (O2 sensor slow response - rich to lean bank 1 sensor 1)	The response time of a A/F sensor 1 signal delays more than the specified time computed by ECM.
P014D	A/F SENSOR1 (B1) (O2 sensor slow response - lean to rich bank 1 sensor 1)	
P015A	A/F SENSOR1 (B1) (O2 sensor delayed response - rich to lean bank 1 sensor 1)	
P015B	A/F SENSOR1 (B1) (O2 sensor delayed response - lean to rich bank 1 sensor 1)	

POSSIBLE CAUSE

- Harness or connectors (The A/F sensor 1 circuit is open or shorted.)
- A/F sensor 1
- A/F sensor 1 heater
- Incorrect fuel pressure
- Fuel injector
- Intake air leaks
- Exhaust gas leaks
- PCV valve
- Mass air flow sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P014C, P014D, P015A or P015B is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is other DTC detected?

YES >> Perform diagnosis of detected DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

Do you have CONSULT?

YES >> GO TO 3.
NO >> GO TO 6.

3. PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine 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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
7. Start engine and let it idle at least 15 minutes.
   CAUTION:
   Never turn ignition switch to OFF during this step.
8. On CONSULT screen, select the following items in “DATA MONITOR” of “ENGINE”.

- ENG SPEED
- VHCL SPEED SE
- COOLANT TEMP/S
- B/FUEL SCHDL
- A/F SEN1 DIAG1 (B1)
- A/F SEN1 DIAG2 (B1)
- A/F SEN1 DIAG3 (B1)

9. Drive the vehicle under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   • Drive the vehicle on an uphill allows easy diagnosis.
   • Keep the accelerator pedal as possible during cruising.

Item	Condition
ENG SPEED	1,000 – 1,500 rpm
VHCL SPEED SE	55 – 110 km/h (35 – 68 MPH)
COOLANT TEMP/S	More than 80°C (176°F)
B/FUEL SCHDL	4 – 6 msec
Selector lever position	D position

10. Keep the driving condition and check the items status of “DATA MONITOR” as follows.
    CAUTION:
    This procedure must be performed by two or more persons.
    NOTE:
    If “PRSNT” changed to “ABSNT”, proceed to EC-176, "Component Function Check".

DTC	Data monitor item	Status
• P014C • P014D • P015A • P015B	A/F SEN1 DIAG3 (B1)	PRSNT

Is “PRSNT” displayed on CONSULT screen?

YES >> GO TO 4.
NO >> Proceed to EC-296, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Keep the driving for 10 seconds or more.
2. Check the items status of “DATA MONITOR” as follows.
   NOTE:
   If “CMPLT” changed to “INCMP”, proceed to EC-176, "Component Function Check".

DTC	Data monitor item	Status
• P014C • P014D • P015A • P015B	A/F SEN1 DIAG1 (B1)	CMPLT
	A/F SEN1 DIAG2 (B1)	

Is “CMPLT” displayed on CONSULT screen?

YES >> GO TO 5.
NO >> Proceed to EC-296, "Diagnosis Procedure".

5. PERFORM SELF-DIAGNOSIS

With CONSULT

Check the “SELF-DIAG RESULT”.

Is any DTC detected?

YES >> Proceed to EC-296, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

6. CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

With GST

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select Service $01 with GST.
4. Calculate the total value of “Short term fuel trim” and “Long term fuel trim” indications.

Is the total percentage within ±15%?

YES >> GO TO 8.
NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

8. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and let it idle at least 15 minutes.
   CAUTION:
   Never turn ignition switch to OFF during this step.
6. Check that the engine coolant temperature reaches normal operating temperature.
7. Drive the vehicle for 10 seconds or more under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   - Drive the vehicle on an uphill allows easy diagnosis.
   - Keep the accelerator pedal as possible during cruising.

Item	Condition
Engine speed	1,000 – 1,500 rpm
Vehicle speed	55 – 110 km/h (35 – 68 MPH)
Selector lever position	D position

8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-296, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631259

1.CHECK DTC PRIORITY

If DTC P014C, P014D, P015A or P015B is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is other DTC detected?

YES >> Perform diagnosis of detected DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

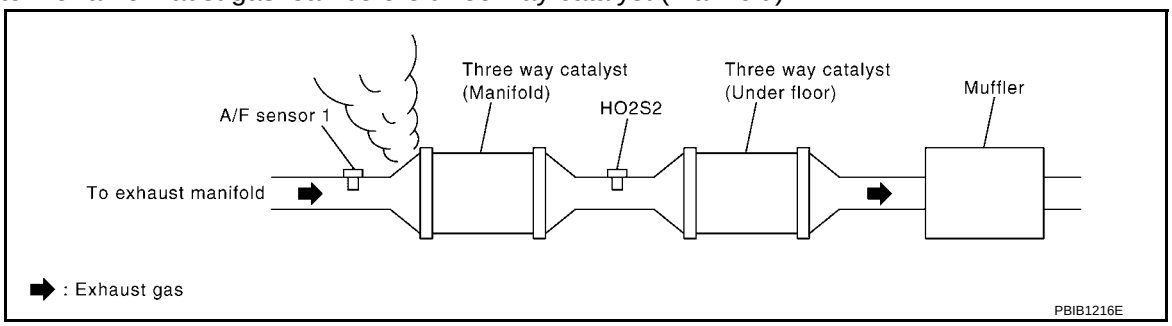
2.RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to EM-37, "Exploded View".

>> GO TO 3.

3.CHECK EXHAUST GAS LEAK

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and run it at idle.
3. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

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

4.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 5.

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Run engine for at least 16 minutes at idle speed.
3. Check 1st trip DTC.

Is the 1st trip DTC P0171 or P172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-299, "DTC Description" or EC-304, "DTC Description".
NO >> GO TO 6.

6. CHECK A/F SENSOR 1 POWER SUPPLY

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

+		–	Voltage
A/F sensor 1			
Connector	Terminal		
F18	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

A/F sensor 1		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F18	4	F35	75	Existed

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace malfunctioning part.

9. CHECK A/F SENSOR 1 HEATER

Refer to EC-207, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".

10. CHECK MASS AIR FLOW SENSOR

Refer to EC-240, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace mass air flow sensor. Refer to EM-29, "Exploded View".

11. CHECK PCV VALVE

Refer to EC-594, "Inspection".

Is the inspection result normal?

YES >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".
NO >> Repair or replace PCV valve. Refer to EM-63, "Exploded View".

P0171 FUEL INJECTION SYSTEM FUNCTION

DTC Description

INFOID:0000000014631260

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0171	FUEL SYS-LEAN-B1 (System too lean bank 1)	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)

POSSIBLE CAUSE

- Intake air leakage
- A/F sensor 1
- Fuel injector
- Exhaust gas leakage
- Incorrect fuel pressure
- Lack of fuel
- Mass air flow sensor
- Incorrect PCV hose connection

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.

Hybrid Control System

- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. 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-300, "Diagnosis Procedure".
NO >> Check exhaust and intake air leakage visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Keep engine idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-300, "Diagnosis Procedure".
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-3

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

Vehicle speed	50 – 100 km/h (31 – 62 MPH)

CAUTION:
Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

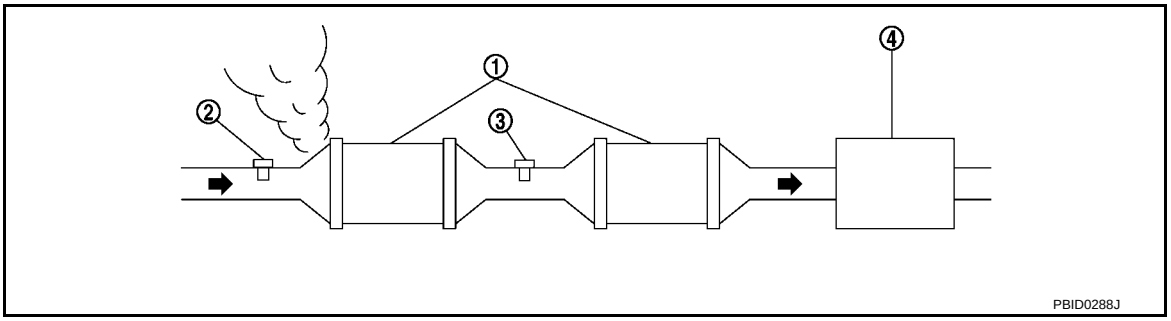
YES >> Proceed to EC-300, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631261

1.CHECK EXHAUST GAS LEAKAGE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and run it at idle.
3. Listen for an exhaust gas leakage before three way catalyst (manifold).



① Three way catalyst ② A/F sensor 1 ③ HO2S2
④ Muffler

Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAKAGE

1. Listen for an intake air leakage after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part. Refer to EM-29, "Exploded View" and EM-32, "Exploded View".
NO >> GO TO 3.

3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to 0. Refer to EC-162, "Work Procedure".
3. Set a fuel pressure meter and check fuel pressure. Refer to EC-162, "Work Procedure".

At idle: Approximately 500 kPa (5.1 kg/cm^2, 72.5 psi)

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging. Refer to FL-6, "Inspection".

Is the inspection result normal?

YES >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check “MASS AIR FLOW SENSOR (Hz)” in “DATA MONITOR” mode of “ENGINE” using CONSULT.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Install all removed parts.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

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-238, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

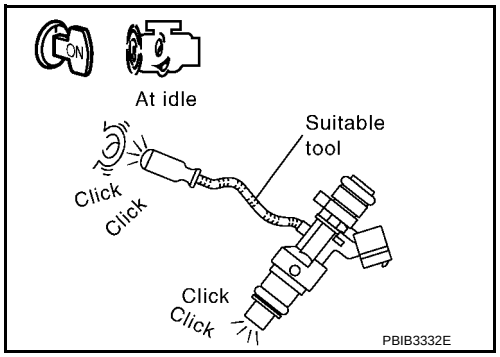
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

3. Perform “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
4. Check that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle.
3. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Perform trouble diagnosis for fuel injector and circuit, refer to EC-555, "Diagnosis Procedure".

P0172 FUEL INJECTION SYSTEM FUNCTION

DTC Description

INFOID:0000000014631262

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0172	FUEL SYS-RICH-B1 (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.)

POSSIBLE CAUSE

- A/F sensor 1
- Fuel injector
- Exhaust gas leakage
- Incorrect fuel pressure
- Mass air flow sensor

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.

Hybrid Control System

- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Work Procedure".
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. 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-305, "Diagnosis Procedure".
NO >> Check exhaust and intake air leakage visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Keep engine idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-305, "Diagnosis Procedure".
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-3

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

Vehicle speed	50 – 100 km/h (31 – 62 MPH)

CAUTION:
Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

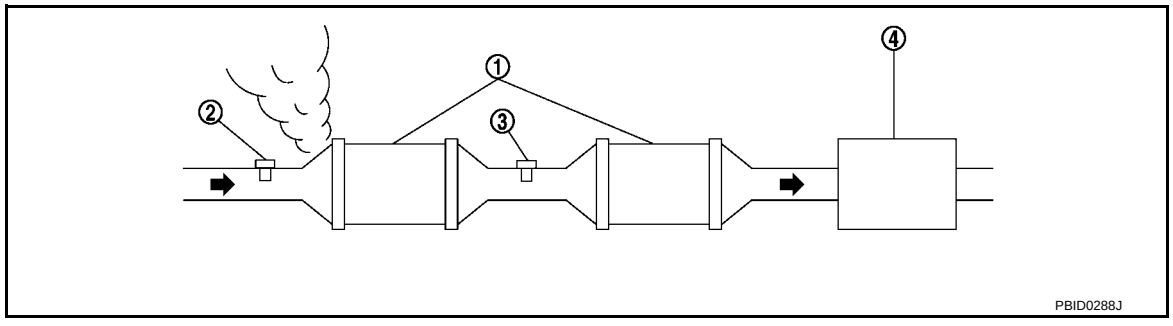
YES >> Proceed to EC-305, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631263

1.CHECK EXHAUST GAS LEAKAGE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and run it at idle.
3. Listen for an exhaust gas leakage before three way catalyst (manifold).



PBID0288J

① Three way catalyst ② A/F sensor 1 ③ HO2S2
④ Muffler

Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAKAGE

1. Listen for an intake air leakage after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part. Refer to EM-29, "Exploded View" and EM-32, "Exploded View".
NO >> GO TO 3.

3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to 0. Refer to EC-162, "Work Procedure".
3. Set a fuel pressure meter and check fuel pressure. Refer to EC-162, "Work Procedure".

At idle: Approximately 500 kPa (5.1 kg/cm^2, 72.5 psi)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".

5. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check “MASS AIR FLOW SENSOR (Hz)” in “DATA MONITOR” mode of “ENGINE” using CONSULT.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Install all removed parts.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-238, "Diagnosis Procedure".

6. CHECK FUNCTION OF FUEL INJECTOR

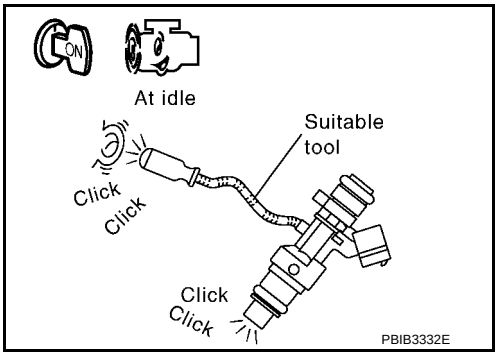
With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Perform “POWER BALANCE” in “ACTIVE TEST” mode using CONSULT.
4. Check that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle.
3. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Perform trouble diagnosis for fuel injector and circuit, refer to EC-555, "Diagnosis Procedure".

P0181 FTT SENSOR

DTC Description

INFOID:0000000014631264

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)		DTC detecting condition
P0181	FTT SENSOR (Fuel temperature sensor ″A″ circuit range/ performance)	A	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor.
		B	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.

POSSIBLE CAUSE

Malfunction A
- Harness or connectors (FTT sensor circuit is open or shorted)
- FTT sensor

Malfunction B
- Harness or connectors (High or low resistance in the FTT sensor circuit)
- FTT sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 7.
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-1

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-310, "Diagnosis Procedure".
NO >> GO TO 4.

4.CHECK ENGINE COOLANT TEMPERATURE

With CONSULT
1. Select “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Check “COOLANT TEMP/S” value.

With GST
Follow the procedure “With CONSULT” above.

“COOLANT TEMP/S” less than 60°C (140°F)?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-2

With CONSULT
1. Cool engine down until “COOLANT TEMP/S” is less than 60°C (140°F).
2. Wait at least 10 seconds.
3. Check 1st trip DTC.

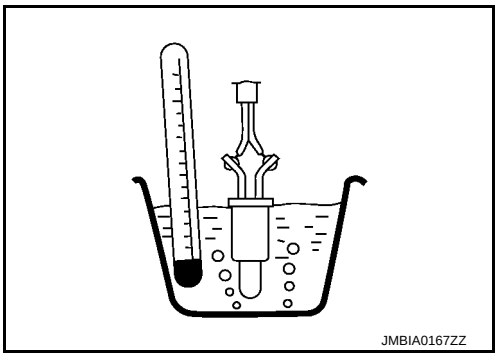
With GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-310, "Diagnosis Procedure".
NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

NOTE:
Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.
1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to FL-7, "Removal and Installation".
4. Check resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.



Fuel level sensor unit and fuel pump		Condition		Resistance
Terminal				
4	6	Temperature [°C (°F)]	20 (68)	2.3 – 2.7 kΩ
			50 (122)	0.79 – 0.90 kΩ

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-310, "Diagnosis Procedure".

7. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE

1. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
2. Turn ignition switch OFF and leave the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during this procedure.
   NOTE:
   The vehicle must be cooled with the hood open.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-310, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631265

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-308, "DTC Description".

Which malfunction is detected?

A >> GO TO 2.
B >> GO TO 5.

2.CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel level sensor unit and fuel pump harness connector and ground.

+		–	Voltage (Approx.)
Fuel level sensor unit and fuel pump			
Connector	Terminal		
B103	3	Ground	5 V

Is the inspection result normal?

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

3.CHECK FTT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and ECM harness connector.

Fuel level sensor unit and fuel pump		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B103	3	E16	128	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

4.CHECK FTT SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and ECM harness connector.

Fuel level sensor unit and fuel pump		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B103	1	E16	148	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK FTT SENSOR

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

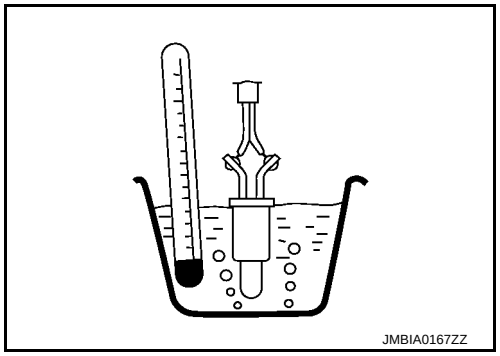
YES >> INSPECTION END
NO >> Replace fuel tank temperature sensor. Refer to FL-7, "Exploded View".

Component Inspection

INFOID:0000000014682365

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".
4. Check the resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.



Fuel level sensor unit and fuel pump		Condition		Resistance
Terminal				
4	6	Temperature [°C (°F)]	20 (68)	2.3 – 2.7 kΩ
			50 (122)	0.79 – 0.90 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel tank temperature sensor. Refer to FL-7, "Exploded View".

P0182, P0183 FTT SENSOR

DTC Description

INFOID:0000000014631267

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0182	FTT SEN/CIRCUIT (Fuel temperature sensor ″A″ circuit low)	An excessively low voltage from the FTT sensor is sent to ECM.
P0183	FTT SEN/CIRCUIT (Fuel temperature sensor ″A″ circuit high)	An excessively high voltage from the FTT sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (FTT sensor circuit is open or shorted.)
- Fuel temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> 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-312, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631268

1.CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel level sensor unit and fuel pump harness connector and ground.

+		−	Voltage (Approx.)
Fuel level sensor unit and fuel pump			
Connector	Terminal		
B103	3	Ground	5 V

Is the inspection result normal?

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

2.CHECK FTT SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and ECM harness connector.

Fuel level sensor unit and fuel pump		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B103	3	E16	128	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

3. CHECK FTT SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and ECM harness connector.

Fuel level sensor unit and fuel pump		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B103	1	E16	148	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. CHECK FTT SENSOR

Refer to EC-313, "Component Inspection".

Is the inspection result normal?

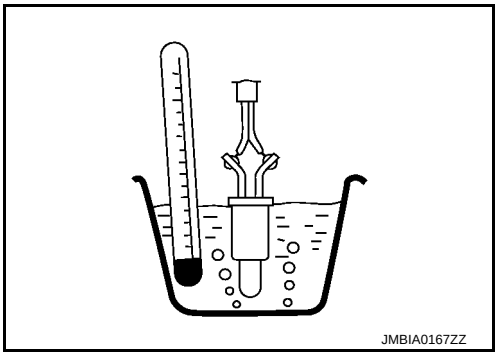
YES >> INSPECTION END
NO >> Replace fuel tank temperature sensor. Refer to FL-7, "Exploded View".

Component Inspection

INFOID:0000000014631269

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".
4. Check the resistance between fuel level sensor unit and fuel pump terminals by heating with hot water as shown in the figure.


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Fuel level sensor unit and fuel pump		Condition		Resistance
Terminal				
4	6	Temperature [°C (°F)]	20 (68)	2.3 – 2.7 kΩ
			50 (122)	0.79 – 0.90 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel tank temperature sensor. Refer to FL-7, "Exploded View".

P0190, P0192, P0193 FRP SENSOR

DTC Description

INFOID:0000000014631270

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0190	FUEL PRES SEN/CIRC (Fuel rail pressure sensor “A” circuit)	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.
P0192	FRP SEN/CIRC (Fuel rail pressure sensor “A” circuit low)	Signal voltage from the fuel rail pressure sensor remains at less than 0.27 V for 5 seconds or more.
P0193	FRP SEN/CIRC (Fuel rail pressure sensor “A” circuit high)	Signal voltage from the fuel rail pressure sensor remains at more than 3.9 V for 5 seconds or more.

POSSIBLE CAUSE

- Harness or connectors
- Fuel rail pressure sensor circuit is open or shorted.
- Sensor power supply 2 is shorted.
- Fuel rail pressure sensor
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Engine Control System

DTC P0190

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.

DTC P0191 and P0192

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System

DTC P0190

- Limiting output control

- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC P0192 and P0193
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0193 is displayed with DTC P0088 or P0090, first perform the trouble diagnosis for DTC P0088 or P0090.

Is other DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0088: Refer to EC-223, "DTC Description".
- DTC P0090: Refer to EC-226, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 1 minute.
3. Check DTC or 1st trip DTC.

Is DTC or 1st trip DTC detected?

YES >> Proceed to EC-315, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631271

NOTE:

Turning the ignition switch ON with FRP sensor harness connector disconnected causes ECM to detect DTC P0190. Be sure to erase the DTC when the diagnosis procedure.

1.CHECK DTC PRIORITY

If DTC P0193 is displayed with DTC P0088 or P0090, first perform the trouble diagnosis for DTC P0088 or P0090.

Is other DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P0088: Refer to EC-223, "DTC Description".
- DTC P0090: Refer to EC-226, "DTC Description".

NO >> GO TO 2.

2.CHECK FUEL RAIL PRESSURE (FRP) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect FRP sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FRP sensor harness connector terminals.

FRP sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F56	1	3	5 V

Is inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3.CHECK FRP SENSOR POWER SUPPLY-2

Check the voltage between FRP sensor harness connector and ground.

+		–	Voltage (Approx.)
FRP sensor			
Connector	Terminal		
F56	1	Ground	5 V

Is inspection result normal?

YES >> GO TO 6.
NO >> GO TO 4.

4.CHECK FRP SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. 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	
F56	1	F51	29	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Refer to EC-582, "Diagnosis Procedure".

Is inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Replace malfunctioning part.

6.CHECK FRP SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. 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	
F56	3	F51	13	Existed

4. Also check harness for short to power.

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and the ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

8.CHECK FRP SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. 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	
F56	2	F51	25	Existed

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

Is inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace malfunctioning part.

9.CHECK FRP SENSOR

Refer to EC-317, "Component Inspection".

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace FRP sensor. Refer to EM-54, "Exploded View".

Component Inspection

INFOID:0000000014631272

1.CHECK FUEL RAIL PRESSURE (FRP) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check FRP sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace FRP sensor. Refer to EM-54, "Exploded View".

P0191 FRP SENSOR

DTC Description

INFOID:0000000014631273

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0191	FRP SENSOR A (Fuel rail pressure sensor “A” circuit range/ performance)	Fuel rail pressure remains at more than 14.5 MPa (147.9 kg/cm^2, 21025 psi) for 0.2 seconds or more during ignition ON.

POSSIBLE CAUSE

- Harness or connectors
- Fuel rail pressure sensor circuit is open or shorted.
- Sensor power supply 2 is shorted.
- Fuel rail pressure sensor
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System

- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

DTC P0191 is displayed with DTCs related to crankshaft position sensor, first perform the trouble diagnosis of DTCs.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is less than 1/8 full of fuel.**

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start the engine and warm it up to the normal operating temperature.
   NOTE:

Warm up the engine until “COOLANT TEMP/S” in “DATA MONITOR” mode in “ENGINE” of CONSULT reaches at least 70°C (158°F).

3. 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 (9°F) or less.**
- **Never turn ignition switch ON.**

4. Turn ignition switch ON and wait at least 60 seconds.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-320, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631274

NOTE:
Turning the ignition switch ON with FRP sensor harness connector disconnected causes ECM to detect DTC P0190. Be sure to erase the DTC when the diagnosis procedure.

1.CHECK FUEL RAIL PRESSURE (FRP) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect FRP sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FRP sensor harness connector terminals.

FRP sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F56	1	3	5 V

Is inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK FRP SENSOR POWER SUPPLY-2

Check the voltage between FRP sensor harness connector and ground.

+		–	Voltage (Approx.)
FRP sensor			
Connector	Terminal		
F56	1	Ground	5 V

Is inspection result normal?

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

3.CHECK FRP SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. 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	
F56	1	F51	29	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Refer to EC-582, "Diagnosis Procedure".

Is inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

5. CHECK FRP SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. 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	
F56	3	F51	13	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

Is inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

7. CHECK FRP SENSOR SIGNSL CIRCUIT

1. Turn ignition switch OFF.
2. 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	
F56	2	F51	25	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.

NO >> Repair or replace malfunctioning part.

8.CHECK FRP SENSOR

Check FRP sensor. Refer to EC-322, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace FRP sensor. Refer to EM-54, "Exploded View".

Component Inspection

INFOID:0000000014682366

1.CHECK FUEL RAIL PRESSURE (FRP) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check FRP sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace FRP sensor. Refer to EM-54, "Exploded View".

P0196 EOT SENSOR

DTC Description

INFOID:0000000014631276

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition	
P0196	EOT SENSOR (Engine oil temperature sensor range/performance)	A	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from EOT sensor and intake air temperature sensor.
		B	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the signal voltage of the EOT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.

POSSIBLE CAUSE

Malfunction A
- Harness or connectors (EOT sensor circuit is open or shorted.)
- Engine oil temperature sensor

Malfunction B
- Harness or connectors (High or low resistance in EOT sensor circuit)
- Engine oil temperature sensor

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	Intake and exhaust valve timing control does not function.

Hybrid Control System
- Limiting output control*
- Limiting accelerator angle variation control *

*: This control may not be executed.

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0196 is displayed with DTC P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-327, "DTC Description".
NO >> GO TO 2.

2.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 7.
NO >> GO TO 3.

3.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-1

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine 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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
7. Start engine and let it idle for 5 minutes and 10 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-325, "Diagnosis Procedure".
NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-2

With CONSULT

1. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Check that “COOLANT 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 “COOLANT TEMP/S” indicates more than 80°C (176°F). Then perform the following steps.
3. Turn ignition switch OFF and soak the vehicle in a cool place.
4. Turn ignition switch ON.
   NOTE:
   Do not turn ignition switch OFF until step 8.
5. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Check the following.

COOLANT TEMP/S	Below 40°C (104°F)
INT/A TEMP SE	Below 40°C (104°F)
Difference between “COOLANT 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.
   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.
8. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

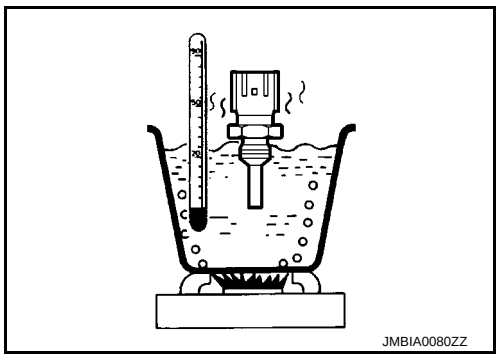
YES >> Proceed to EC-325, "Diagnosis Procedure".
NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

NOTE:
Use the component function check to check the overall function of the EOT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

1. Turn ignition switch OFF.
2. Disconnect EOT sensor harness connector.
3. Remove EOT sensor. Refer to EM-116, "Exploded View".

4. Check resistance between EOT sensor terminals by heating with hot water as shown in the figure.



EOT sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-325, "Diagnosis Procedure".

7. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE

1. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
2. Turn ignition switch OFF and leave the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during this procedure.
   NOTE:
   The vehicle must be cooled with the hood open.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-325, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631277

1. CHECK DTC PRIORITY

If DTC P0196 is displayed with DTC P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-327, "DTC Description".
NO >> GO TO 2.

2. CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

Refer to EC-326, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END

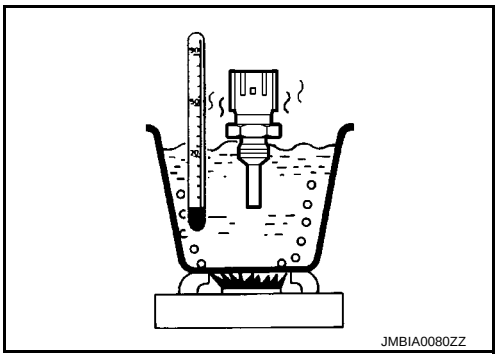
NO >> Replace EOT sensor. Refer to EM-116, "Exploded View".

Component Inspection

INFOID:0000000014682367

1. CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect EOT sensor harness connector.
3. Remove EOT sensor. Refer to EM-116, "Exploded View".
4. Check the resistance between EOT sensor terminals by heating with hot water as shown in the figure.



EOT sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOT sensor. Refer to EM-116, "Exploded View".

P0197, P0198 EOT SENSOR

DTC Description

INFOID:0000000014631279

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0197	EOT SEN/CIRC (Engine oil temperature sensor low)	An excessively low voltage from the EOT sensor is sent to ECM.
P0198	EOT SEN/CIRC (Engine oil temperature sensor high)	An excessively high voltage from the EOT sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (EOT sensor circuit is open or shorted.)
- Engine oil temperature sensor

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	Intake and exhaust valve timing control does not function.

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait at least 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-327, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631280

1.CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect EOT sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EOT sensor harness connector terminals.

EOT sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F68	1	2	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK EOT SENSOR POWER SUPPLY-2

Check the voltage between EOT sensor harness connector and ground.

+		−	Voltage (Approx.)
EOT sensor			
Connector	Terminal		
F68	1	Ground	5 V

Is the inspection result normal?

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

3.CHECK EOT SENSOR POWER SUPPLY CIRCUIT

1. 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	
F68	1	F51	22	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

4.CHECK EOT SENSOR GROUND CIRCUIT

1. 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	
F68	2	F51	45	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

6.CHECK EOT SENSOR

Refer to EC-329, "Component Inspection".

Is the inspection result normal?

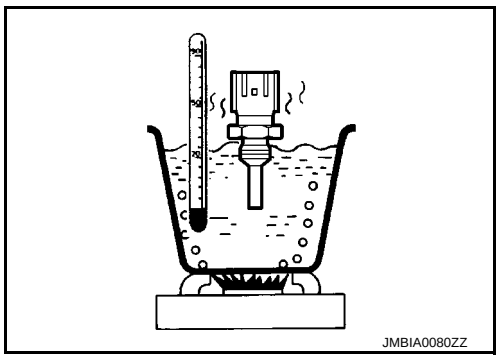
YES >> INSPECTION END
NO >> Replace EOT sensor. Refer to EM-116, "Exploded View".

Component Inspection

INFOID:0000000014631281

1.CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect EOT sensor harness connector.
3. Remove EOT sensor. Refer to EM-116, "Exploded View".
4. Check the resistance between EOT sensor terminals by heating with hot water as shown in the figure.



EOT sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOT sensor. Refer to EM-116, "Exploded View".

P0201, P0202, P0203, P0204 FUEL INJECTOR

DTC Description

INFOID:0000000014631282

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0201	INJECTOR CIRC-CYL1 (Injector circuit open - cylinder 1)	ECM detects No. 1 injector circuit is open or shorted.
P0202	INJECTOR CIRC-CYL2 (Injector circuit open - cylinder 2)	ECM detects No. 2 injector circuit is open or shorted.
P0203	INJECTOR CIRC-CYL3 (Injector circuit open - cylinder 3)	ECM detects No. 3 injector circuit is open or shorted.
P0204	INJECTOR CIRC-CYL4 (Injector circuit open - cylinder 4)	ECM detects No. 4 injector circuit is open or shorted.

POSSIBLE CAUSE

- Harness or connectors (Fuel injector circuit is open or shorted.)
- Fuel injector
- ECM

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle for at least 30 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-331, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631283

1. CHECK FUEL INJECTOR

Refer to EC-555, "Component Function Check".

Is inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

P0222, P0223 TP SENSOR

DTC Description

INFOID:0000000014631284

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0222	TP SEN 1/CIRC-B1 (Throttle/pedal position sensor/switch “B” circuit low)	An excessively low voltage from the TP sensor 1 is sent to ECM.
P0223	TP SEN 1/CIRC-B1 (Throttle/pedal position sensor/switch “B” circuit high)	An excessively high voltage from the TP sensor 1 is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (TP sensor 1 circuit is open or shorted.)
- Electric throttle control actuator (TP sensor 1)

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	• The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. • The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor. **NOTE:** If throttle position sensor 1 and 2 malfunction at the same time conducts following control. • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

2. Start engine and let it idle for 1 second.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-333, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631285

1.CHECK DTC PRIORITY

If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.CHECK THROTTLE POSITION (TP) SENSOR 1 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector terminals.

Electric throttle control actuator			Voltage (Approx.)
Connector	+	–	
	Terminal		
F50	2	4	5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK TP SENSOR 1 POWER SUPPLY-2

Check the voltage between electric throttle control actuator harness connector and ground.

+		–	Voltage (Approx.)
Electric throttle control actuator			
Connector	Terminal		
F50	2	Ground	5 V

Is the inspection result normal?

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

4.CHECK TP SENSOR 1 POWER SUPPLY CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	2	F52	83	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".

NO >> Repair or replace malfunctioning part.

5.CHECK TP SENSOR 1 GROUND CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	4	F52	85	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

7.CHECK TP SENSOR 1 INPUT SIGNAL CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	1	F52	88	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8.CHECK TP SENSOR

Refer to EC-335, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

Component Inspection

INFOID:0000000014631286

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".
4. Turn ignition switch ON.
5. Shift the selector lever to D position.
6. Check the voltage between ECM harness connector terminals as per the following conditions.

ECM			Condition		Voltage
Connector	+	–			
	Terminal				
F52	88	85	Accelerator pedal	Fully released	0.36 V or more
				Fully depressed	4.75 V or less
	80			Fully released	4.75 V or less
				Fully depressed	0.36 V or more

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

P0300, P0301, P0302, P0303, P0304 MISFIRE

DTC Description

INFOID:0000000014631287

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor 1 signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor 1	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 1 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.
2. 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 1 signal every 1,000 engine revolutions.

A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0300	MULTI CYL MISFIRE (Random/multiple cylinder misfire detected)	Multiple cylinders misfire.
P0301	CYL 1 MISFIRE (Cylinder 1 Misfire Detected)	No. 1 cylinder misfires.
P0302	CYL 2 MISFIRE (Cylinder 2 Misfire Detected)	No. 2 cylinder misfires.
P0303	CYL 3 MISFIRE (Cylinder 3 Misfire Detected)	No. 3 cylinder misfires.
P0304	CYL 4 MISFIRE (Cylinder 4 Misfire Detected)	No. 4 cylinder misfires.

POSSIBLE CAUSE

- Improper spark plug
- Insufficient compression
- Incorrect fuel pressure
- The fuel injector circuit is open or shorted.
- Fuel injector
- Intake air leakage
- The ignition signal circuit is open or shorted.
- Lack of fuel
- Signal plate
- A/F sensor 1
- Mass air flow sensor
- Incorrect PCV hose connection

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.

Hybrid Control System
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Restart engine and let it idle for about 35 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-338, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. 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.

Engine speed	Engine speed in the freeze frame data ± 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
Base fuel schedule	Base fuel schedule in the freeze frame data ± 10%
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 20 minutes
Around 2,000 rpm	Approximately 10 minutes
More than 3,000 rpm	Approximately 7 minutes

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-338, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631288

1.CHECK GROUND CONNECTION

Check the following.
- Connection condition of the ground F1 and F2
- Connection condition of the ground harness between engine assembly and vehicle body (If equipped)

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK FOR INTAKE AIR LEAKAGE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and run it at idle speed.
3. Listen for an intake air leakage after the mass air flow sensor.
4. Check PCV hose connection.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part. Refer to EM-29, "Exploded View" and EM-32, "Exploded View".
NO >> GO TO 3.

3.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: GO TO 4.
YES-2 >> Without CONSULT: GO TO 5.
NO >> Repair or replace malfunctioning part. Refer to EX-7, "Exploded View".

4.PERFORM POWER BALANCE TEST

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Perform “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
4. Check that each circuit produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 5.

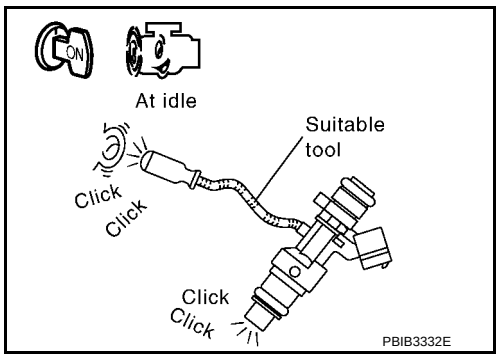
5.CHECK FUNCTION OF FUEL INJECTOR

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

3. Listen to each fuel injector operation.

Clicking sound should be heard.



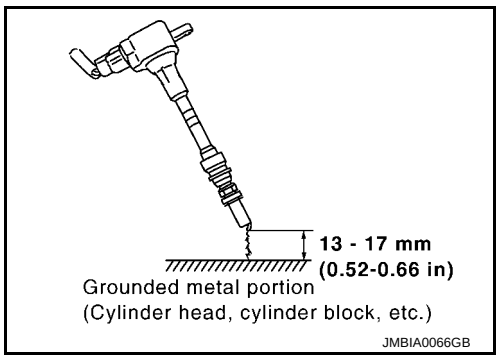
Is the inspection result normal?

YES >> GO TO 6.
NO >> Perform trouble diagnosis for fuel injector, refer to EM-54, "Removal and Installation".

6. CHECK FUNCTION OF IGNITION COIL-1

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 (No.44) in IPDM E/R to release fuel pressure. Refer to PG-118, "IPDM E/R Terminal Arrangement".
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine.
5. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-61, "Removal and Installation".
9. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
10. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
11. Connect spark plug and harness connector to ignition coil.
12. 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.
13. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
14. 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.**

NOTE:
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

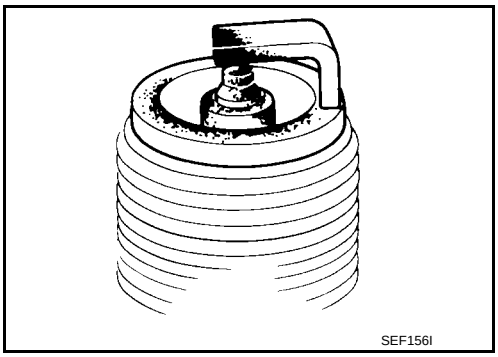
Spark should be generated.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Check ignition coil, power transistor, and their circuits. Refer to EC-564, "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). Refer to EM-142, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 9.

9.CHECK FUNCTION OF IGNITION COIL-3

1. Reconnect the initial spark plugs.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. 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). Refer to EM-142, "Spark Plug".

10.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-18, "Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Check pistons, piston rings, valves, valve seats, and cylinder head gaskets.

11.CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure. Refer to EC-162, "Work Procedure".
3. Set a fuel pressure meter and check fuel pressure. Refer to EC-162, "Work Procedure".

At idle: Approximately 500 kPa (5.1 kg/cm^2, 72.5 psi)

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

13.CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.
Idle speed: For procedure, refer to EC-589, "Inspection", for specification, refer to EC-596, "Idle Speed".

Ignition timing: For procedure, refer to EC-590, "Inspection", for specification, refer to EC-596, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Perform basic inspection. Refer to EC-159, "Work Procedure".

14. CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair or replace malfunctioning part.

15. CHECK A/F SENSOR 1 HEATER

Refer to EC-207, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace A/F sensor 1. Refer to EM-37, "Exploded View".

16. CHECK MASS AIR FLOW SENSOR OUTPUT VOLTAGE

With CONSULT

1. Install all removed parts.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Select “MASS AIR FLOW SENSOR (Hz)” in “DATA MONITOR” mode using CONSULT and check the indication under the following condition.

Monitor item	Condition	Indication
MASS AIR FLOW SENSOR (Hz)	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
	Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
	Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Without CONSULT

1. Install all removed parts.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check the frequency between ECM harness connector terminals under the following conditions.

ECM			Condition	Frequency
Connector	+	–		
	Terminal			
F51	37	42	Ignition switch ON (Engine stopped.)	Approx. 3,700 Hz
			Idle (Engine is warmed-up to normal operating temperature.)	Approx. 5,500 Hz
			Idle to about 4,000 rpm	5,500 Hz → 7,000 Hz*

*: Check for linear frequency rise in response to increase of engine speed.

Is the inspection result normal?

YES >> GO TO 17.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-238, "Diagnosis Procedure".

17. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-583, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 18.
NO >> Repair or replace malfunctioning part.

18. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to EC-78, "CONSULT Function".

>> INSPECTION END

P0327, P0328 KS

DTC Description

INFOID:0000000014631289

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0327	KNOCK SEN/CIRC-B1 (Knock sensor 1 circuit low bank 1 or single sensor)	An excessively low voltage from the knock sensor is sent to ECM.
P0328	KNOCK SEN/CIRC-B1 (Knock sensor 1 circuit high bank 1 or single sensor)	An excessively high voltage from the knock sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (Knock sensor circuit is open or shorted.)
- Knock sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 5 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-343, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631290

1.CHECK KNOCK SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between knock sensor harness connector and ECM harness connector.

Knock sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F9	2	F51	20	Existed

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT

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

Knock sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F9	1	F51	15	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK KNOCK SENSOR

Refer to EC-344, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace knock sensor. Refer to EM-116, "Exploded View".

Component Inspection

INFOID:0000000014631291

1.CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check the resistance between knock sensor terminals as follows.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Knock sensor		Condition		Resistance
Terminal				
1	2	Temperature	20°C (68°F)	532 – 588 kΩ

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 knock sensor. Refer to EM-116, "Exploded View".

P0335 CKP SENSOR 1

DTC Description

INFOID:0000000014631292

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0335	CKP SEN/CIRCUIT (Crankshaft position sensor “A” circuit)	• The crankshaft position sensor 1 signal is not sent to ECM during the first few seconds during engine cranking. • The crankshaft position sensor 1 signal is not sent to ECM during engine running. • The pulse signal sent from the crankshaft position sensor 1 to ECM is not in the normal pattern during engine running.

POSSIBLE CAUSE

- Harness or connectors (Crankshaft position sensor 1 circuit is open or shorted.)
- Crankshaft position sensor 1
- Signal plate

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0335 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-346, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".

NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631293

1.CHECK DTC PRIORITY

If DTC P0335 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.CHECK CRANKSHAFT POSITION (CKP) SENSOR 1 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect CKP sensor 1 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between CKP sensor 1 harness connector terminals.

CKP sensor 1			Condition	Voltage (Approx.)
Connector	+	–		
	Terminal			
F17	1	2	Ignition switch: ON	5 V
			Ignition switch: OFF	0 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 6.

3.CHECK CKP SENSOR 1 INPUT SIGNAL CIRCUIT

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

CKP sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F17	3	F51	33	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK CKP SENSOR 1

Refer to EC-348, "Component Inspection (CKP Sensor 1)".

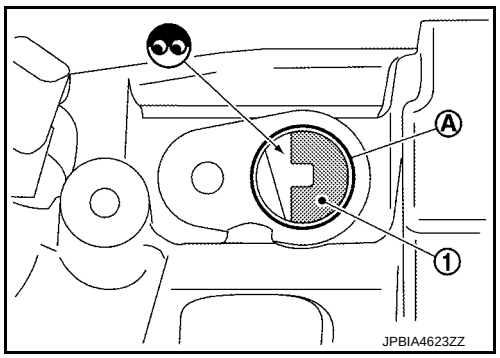
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace CKP sensor 1. Refer to EM-116, "Exploded View".

5.CHECK GEAR TOOTH

1. Remove CKP sensor 1. Refer to EM-116, "Exploded View".

2. Look into the mounting hole Ⓐ of the CKP sensor 1 to check that there is no missing gear tooth in the signal plate ①.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace the signal plate. Refer to EM-116, "Exploded View".

6. CHECK CKP SENSOR 1 POWER SUPPLY-2

Check the voltage between CKP sensor 1 harness connector and ground.

+		–	Condition	Voltage (Approx.)
CKP sensor 1				
Connector	Terminal			
F17	1	Ground	Ignition switch: ON	5 V
			Ignition switch: OFF	0 V

Is the inspection result normal?

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

7. CHECK CKP SENSOR 1 GROUND CIRCUIT

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

CKP sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F17	2	F51	44	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8. CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

9.CHECK CKP SENSOR 1 POWER SUPPLY CIRCUIT

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

CKP sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F17	1	F51	27	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

Component Inspection (CKP Sensor 1)

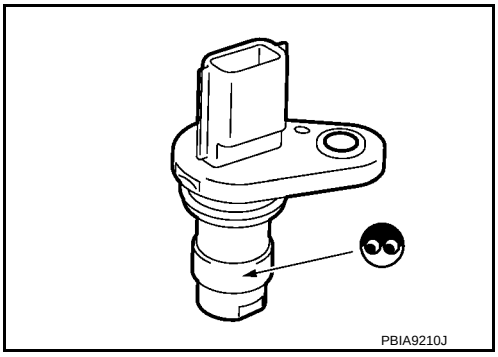
INFOID:0000000014631294

1.CHECK CRANKSHAFT POSITION (CKP) SENSOR 1-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of CKP sensor 1.
3. Disconnect CKP sensor 1 harness connector.
4. Remove the CKP sensor 1. Refer to EM-116, "Exploded View"
5. Visually check the CKP sensor 1 for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace CKP sensor 1. Refer to EM-116, "Exploded View".



2.CHECK CKP SENSOR 1-2

Check the resistance between CKP sensor 1 terminals as follows.

CKP sensor 1 Terminal		Condition		Resistance
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace CKP sensor 1. Refer to EM-116, "Exploded View".

P0340 CMP SENSOR

DTC Description

INFOID:0000000014631295

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0340	CMP SEN/CIRC-B1 (Camshaft position sensor “A” circuit bank 1 or single sensor)	• The camshaft position sensor signal is not sent to ECM for the first few seconds during engine cranking. • The camshaft position sensor signal is not sent to ECM during engine running. • The camshaft position sensor signal is not in the normal pattern during engine running.

POSSIBLE CAUSE

- Harness or connectors
- Camshaft position sensor circuit is open or shorted.
- Sensor power supply circuit 2 is shorted.
- Camshaft position sensor
- Intake camshaft
- Starter motor
- Starting system circuit
- Battery deterioration
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2.DTC CONFIRMATION PROCEDURE-1

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-351, "Diagnosis Procedure".
NO >> GO TO 3.

3.DTC CONFIRMATION PROCEDURE-2

1. Maintaining engine speed at more than 1,150 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-351, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631296

1.CHECK STARTING SYSTEM

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Set the vehicle to READY.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.
NO >> Check starting system. Refer to STR-13, "Work Flow (With GR8-1200 NI)", STR-17, "Work Flow (Without GR8-1200 NI)".

2.CHECK CAMSHAFT POSITION (CMP) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect CMP sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between CMP sensor harness connector terminals.

CMP sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F44	1	2	5 V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3.CHECK CMP SENSOR POWER SUPPLY-2

Check the voltage between CMP sensor harness connector and ground.

+		–	Voltage (Approx.)
CMP sensor			
Connector	Terminal		
F44	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 4.

4.CHECK CMP SENSOR POWER SUPPLY CIRCUIT

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

CMP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F44	1	F52	66	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Refer to EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Replace malfunctioning part.

6.CHECK CMP SENSOR GROUND CIRCUIT

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

CMP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F44	2	F52	71	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

8.CHECK CMP SENSOR INPUT SIGNAL CIRCUIT

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

CMP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F44	3	F52	67	Existed

4. 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 CMP SENSOR

Refer to EC-353, "Component Inspection (CMP Sensor)".

Is the inspection result normal?

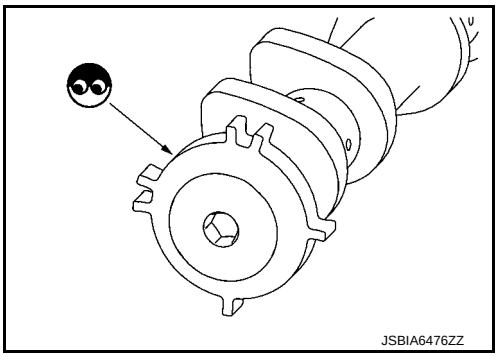
YES >> GO TO 10.
NO >> Replace CMP sensor. Refer to EM-77, "Exploded View".

10. CHECK CAMSHAFT (INTAKE)

Check the following.
- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> INSPECTION END
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to EM-77, "Removal and Installation".


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Component Inspection (CMP Sensor)

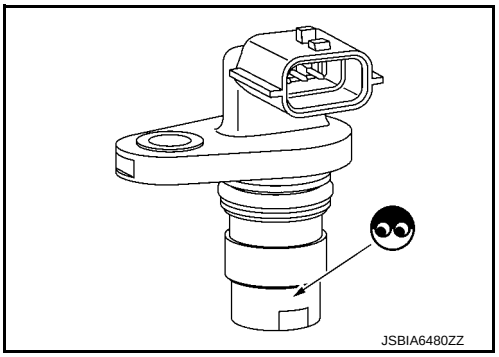
INFOID:0000000014631297

1. CHECK CAMSHAFT POSITION (CMP) SENSOR-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of CMP sensor.
3. Disconnect CMP sensor harness connector.
4. Remove the CMP sensor. Refer to EM-77, "Exploded View".
5. Visually check the CMP sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace CMP sensor. Refer to EM-77, "Exploded View".


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2. CHECK CMP SENSOR -2

Check the resistance CMP sensor terminals as follows.

CMP sensor		Condition		Resistance
Terminal				
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace CMP sensor. Refer to EM-77, "Exploded View".

P0365 EXHAUST VALVE TIMING CONTROL POSITION SENSOR

DTC Description

INFOID:0000000014631298

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0365	CMP SEN/CIRC-B1 (Camshaft position sensor circuit bank 1)	• EVT control position sensor signal is not sent to ECM during engine cranking. • EVT control position sensor signal is not sent to ECM during engine running. • The pulse signal sent from the EVT control position sensor to ECM is not in the normal pattern during engine running.

Possible Cause

- Harness or connectors (Exhaust valve timing control position sensor circuit is open or shorted.)
- Exhaust valve timing control position sensor
- Exhaust camshaft
- Starter motor
- Starting circuit
- Battery deterioration

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0365 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idling.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-1

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-355, "Diagnosis Procedure".
NO >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE-2

1. Keep the engine speed at more than 1,150 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-355, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631299

1. CHECK DTC PRIORITY

If DTC P0365 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2. CHECK STARTING SYSTEM

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Set the vehicle to READY.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 3.
NO >> Check starting system. Refer to STR-13, "Work Flow (With GR8-1200 NI)", STR-17, "Work Flow (Without GR8-1200 NI)".

3. CHECK EXHAUST VALVE TIMING (EVT) CONTROL POSITION SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect EVT control position sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVT control position sensor harness connector terminals.

EVT control position sensor			Voltage (Approx.)
Connector	+	–	
	Terminals		
F43	1	2	5 V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 4.

4. CHECK EVT CONTROL POSITION SENSOR POWER SUPPLY-2

Check the voltage between EVT control position sensor harness connector and ground.

+		–	Voltage (Approx.)
EVT control position sensor			
Connector	Terminal		
F43	1	Ground	5 V

Is the inspection result normal?

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

5. CHECK EVT CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.
3. Check the continuity between EVT control position sensor harness connector and ECM harness connector.

EVT control position sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F43	1	F52	73	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

6. CHECK EVT CONTROL POSITION SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVT control position sensor harness connector and ECM harness connector.

EVT control position sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F43	2	F52	63	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7. CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

8. CHECK EVT CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVT control position sensor harness connector and ECM harness connector.

EVT control position sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F43	3	F52	69	Existed

4. 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 EVT CONTROL POSITION SENSOR

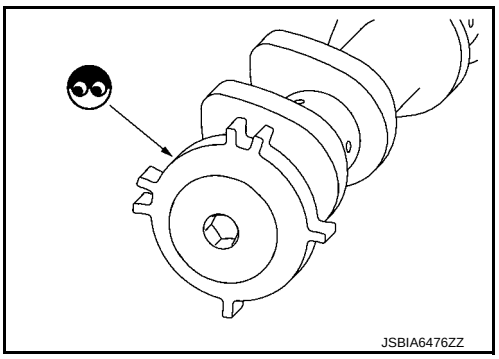
Refer to EC-357, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVT control position sensor. Refer to EM-77, "Exploded View".

10. CHECK CAMSHAFT (EXHAUST)

Check the following.
- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end



Is the inspection result normal?

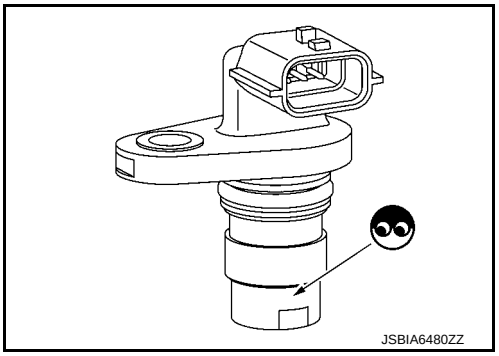
YES >> INSPECTION END
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to EM-77, "Removal and Installation".

Component Inspection

INFOID:0000000014631300

1. CHECK EXHAUST VALVE TIMING (EVT) CONTROL POSITION SENSOR-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of EVT control position sensor.
3. Disconnect the EVT control position sensor harness connector.
4. Remove the EVT control position sensor. Refer to EM-77, "Exploded View".
5. Visually check the EVT control position sensor for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace EVT control position sensor. Refer to EM-77, "Exploded View".

2. CHECK EVT CONTROL POSITION SENSOR-2

Check resistance between EVT control position sensor terminals as shown below.

EVT control position sensor		Condition		Resistance
Terminal				
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVT control position sensor. Refer to EM-77, "Exploded View".

P0385 CKP SENSOR 2

DTC Description

INFOID:0000000014631301

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0385	CKP SENSOR B (Crankshaft position sensor “B” circuit)	• The crankshaft position sensor 2 signal is not sent to ECM during the first few seconds during engine cranking. • The pulse signal sent from the crankshaft position sensor 2 to ECM is not in the normal pattern during engine running.

POSSIBLE CAUSE

- Harness or connectors
- Crankshaft position sensor 2 circuit is open or shorted.
- Sensor power supply 2 circuit is shorted.
- Crankshaft position sensor 2
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-359, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631302

1.CHECK CRANKSHAFT POSITION (CKP) SENSOR 2 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect CKP sensor 2 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between CKP sensor 2 harness connector terminals.

CKP sensor 2			Condition	Voltage (Approx.)
Connector	+	–		
	Terminal			
F58	1	2	Ignition switch: ON	5 V
			Ignition switch: OFF	0 V

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 4.

2.CHECK CKP SENSOR 2 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor 2 harness connector and ECM harness connector.

CKP sensor 2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F58	3	F52	62	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK CKP SENSOR 2

Refer to EC-361, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace CKP sensor 2. Refer to EM-116, "Exploded View".

4.CHECK CKP SENSOR 2 POWER SUPPLY-2

Check the voltage between CKP sensor 2 harness connector and ground.

+		–	Condition	Voltage (Approx.)
CKP sensor 2				
Connector	Terminal			
F58	1	Ground	Ignition switch: ON	5 V
			Ignition switch: OFF	0 V

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 7.

5.CHECK CKP SENSOR 2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor 2 harness connector and ECM harness connector.

CKP sensor 2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F58	2	F52	71	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

7. CHECK CKP SENSOR 2 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor 2 harness connector and ECM harness connector.

CKP sensor 2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F58	1	F52	66	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8. CHECK SENSOR POWER SUPPLY 2

Refer to EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

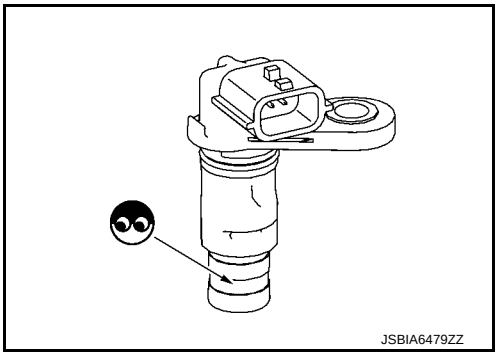
Component Inspection

INFOID:0000000014631303

1. CHECK CRANKSHAFT POSITION (CKP) SENSOR 2-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of CKP sensor 2.
3. Disconnect CKP sensor 2 harness connector.
4. Remove the CKP sensor 2. Refer to EM-116, "Exploded View"

5. Visually check the CKP sensor 2 for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace CKP sensor 2. Refer to EM-116, "Exploded View".

2.CHECK CKP SENSOR2-2

Check the resistance between CKP sensor 2 terminals as follows.

CKP sensor 2 Terminal		Condition		Resistance
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace CKP sensor 2. Refer to EM-116, "Exploded View".

P0386 CKP SENSOR 2

DTC Description

INFOID:0000000014631304

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0386	CKP SENSOR B (Crankshaft position sensor “B” circuit range/performance)	Right before engine stop by idling stop or at engine restart, a pulse signal transmitted from crankshaft position sensor 2 to ECM is abnormal.

POSSIBLE CAUSE

- Harness or connectors
- Crankshaft position sensor 2 circuit is open or shorted.
- Sensor power supply 2 circuit is shorted.
- Crankshaft position sensor 2
- Torsion damper (ring gear)
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Drive the vehicle with motor. Refer to HBC-21, "HYBRID CONTROL SYSTEM : System Description".
4. Stop vehicle.
5. Drive the vehicle again and restart engine.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-363, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631305

1.CHECK CRANKSHAFT POSITION (CKP) SENSOR 2 POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect CKP sensor 2 harness connector.
3. Turn ignition switch ON.
4. Check the voltage between CKP sensor 2 harness connector terminals.

CKP sensor 2			Condition	Voltage (Approx.)
Connector	+	–		
	Terminal			
F58	1	2	Ignition switch: ON	5 V
			Ignition switch: OFF	0 V

Is the inspection result normal?

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

2.CHECK CKP SENSOR 2 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor 2 harness connector and ECM harness connector.

CKP sensor 2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F58	3	F52	62	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK CKP SENSOR 2

Refer to EC-361, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace CKP sensor 2. Refer to EM-116, "Exploded View".

4.CHECK GEAR TOOTH

1. Remove CKP sensor 2. Refer to EM-116, "Exploded View".
2. Look into the mounting hole of the crankshaft position sensor 2 to check that there is no missing gear tooth in the torsion damper.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace torsion damper. Refer to EM-103, "Removal and Installation".

5.CHECK CKP SENSOR 2 POWER SUPPLY-2

Check the voltage between CKP sensor 2 harness connector and ground.

+		–	Condition	Voltage (Approx.)
CKP sensor 2				
Connector	Terminal			
F58	1	Ground	Ignition switch: ON	5 V
			Ignition switch: OFF	0 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 8.

6.CHECK CKP SENSOR 2 GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor 2 harness connector and ECM harness connector.

CKP sensor 2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F58	2	F52	71	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7. CHECK ECM GROUND CIRCUIT

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

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

8. CHECK CKP SENSOR 2 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor 2 harness connector and ECM harness connector.

CKP sensor 2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F58	1	F52	66	Existed

4. 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 SENSOR POWER SUPPLY 2

Refer to EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

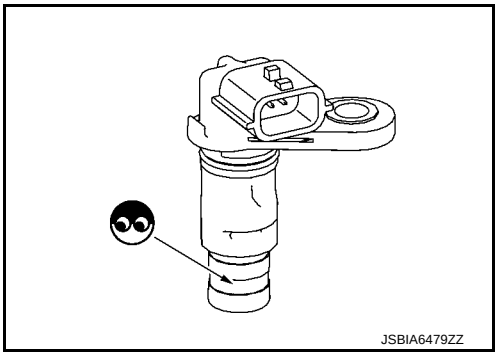
Component Inspection

INFOID:0000000014682368

1. CHECK CRANKSHAFT POSITION (CKP) SENSOR 2-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of CKP sensor 2.
3. Disconnect CKP sensor 2 harness connector.
4. Remove the CKP sensor 2. Refer to EM-116, "Exploded View"

5. Visually check the CKP sensor 2 for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace CKP sensor 2. Refer to EM-116, "Exploded View".

2.CHECK CKP SENSOR2-2

Check the resistance between CKP sensor 2 terminals as follows.

CKP sensor 2 Terminal		Condition		Resistance
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

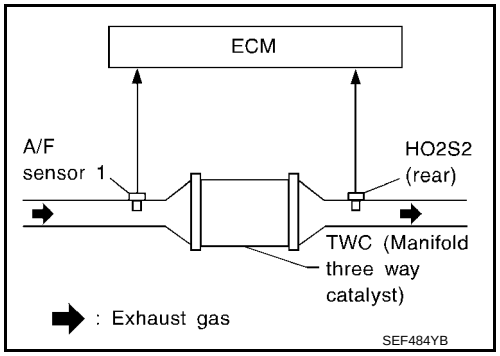
YES >> INSPECTION END
NO >> Replace CKP sensor 2. Refer to EM-116, "Exploded View".

P0420 THREE WAY CATALYST FUNCTION

DTC Description

INFOID:0000000014631307

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0420	TW CATALYST SYS-B1 (Catalyst system efficiency below threshold bank 1)	• Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity.

POSSIBLE CAUSE

- Three way catalyst (manifold)
- Exhaust tube
- Intake air leaks
- Exhaust air leaks
- Fuel injector
- Fuel injector leaks
- Spark plug
- Improper ignition timing

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Do not hold engine speed for more than the specified minutes below.

Will CONSULT be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
7. Let engine idle for 1 minute.
8. Check that “COOLANT TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLANT TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.

10. Select “SRT WORK SUPPORT” mode in “DTC & SRT CONFIRMATION” mode of “ENGINE” using CONSULT.
11. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of “CATALYST”.

Is “CMPLT” displayed on CONSULT screen?

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

3. PERFORM DTC CONFIRMATION PROCEDURE-2

1. Let engine idle for 5 seconds.
2. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT”.
   NOTE:
   It will take approximately 5 minutes.
   If “CMPLT” is not displayed after 5 minutes, turn ignition switch OFF and cool down the engine. Retry from step 1 when “COOLANT TEMP/S” indication reaches to 70°C (158°F).

Does the indication change to “CMPLT”

YES >> GO TO 4.
NO >> GO TO 2.

4. PERFORM DTC CONFIRMATION PROCEDURE-3

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-369, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT
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.

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. 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. Open engine hood.
8. Check the voltage between ECM harness connector terminals as per the following condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F52	84	78	Keeping engine speed at 2,500 rpm constant under no load	The voltage fluctuation cycle takes more than 5 seconds. 1 cycle: 0.6 - 1.0 V → 0 - 0.3 V → 0.6 - 1.0 V

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-369, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631308

1. CHECK EXHAUST SYSTEM

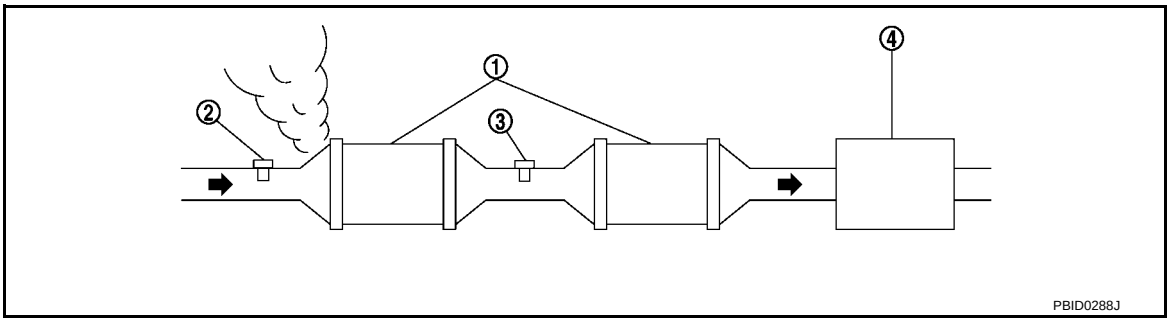
Visually check exhaust tubes, three way catalyst and muffler for dent.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part. Refer to EX-7, "Exploded View".

2.CHECK EXHAUST GAS LEAK

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and run it at idle.
3. Listen for an exhaust gas leak before the three way catalyst (manifold).



① Three way catalyst ② A/F sensor 1 ③ HO2S2
④ Muffler

Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part. Refer to EX-7, "Exploded View".
NO >> GO TO 3.

3.CHECK INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part. Refer to EM-29, "Exploded View" and EM-32, "Exploded View".
NO >> GO TO 4.

4.CHECK IGNITION TIMING AND IDLE SPEED

Check the following items. Refer to EC-159, "Work Procedure".

Item	Specification
Idle speed	Refer to EC-596, "Idle Speed".
Ignition timing	Refer to EC-596, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-159, "Work Procedure".

5.CHECK FUEL INJECTOR

Check the fuel injector. Refer to EC-555, "Component Function Check".

Is the inspection result normal?

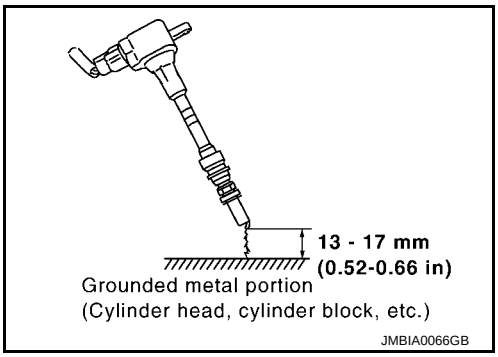
YES >> GO TO 6.
NO >> Perform EC-555, "Diagnosis Procedure".

6.CHECK FUNCTION OF IGNITION COIL-1

CAUTION:
Do the following procedure in the place where ventilation is good without the combustible.

1. Turn ignition switch OFF.

2. Remove fuel pump fuse (No.44) in IPDM E/R to release fuel pressure. Refer to PG-118, "IPDM E/R Terminal Arrangement".
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine.
5. After engine stalls, crank it 2 or 3 times to release all fuel pressure
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-61, "Removal and Installation".
9. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
10. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
11. Connect spark plug and harness connector to ignition coil.
12. 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.



13. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
14. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.
    CAUTION:
    - **Never approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
    - **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

    NOTE:
    When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. 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?

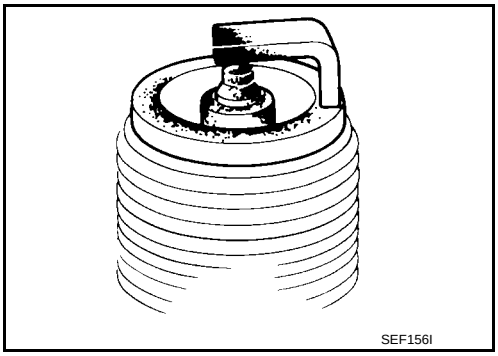
YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-564, "Diagnosis Procedure".

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-142, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-3

1. Reconnect the initial spark plugs.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. 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-142, "Spark Plug".

10. PERFORM DTC CONFIRMATION PROCEDURE

1. Replace three way catalyst (manifold). Refer to EX-7, "Exploded View".
2. Perform DTC confirmation procedure. Refer to EC-367, "DTC Description".

Is DTC “P0420” detected?

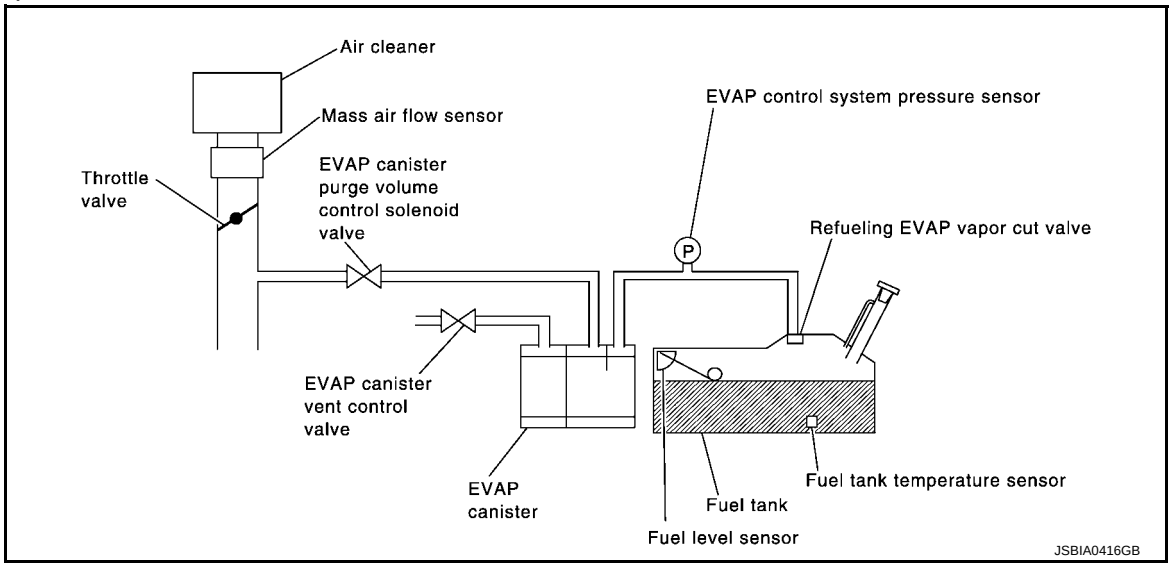
YES >> Replace all fuel injector. Refer to EM-54, "Removal and Installation".
NO >> INSPECTION END

P0441 EVAP CONTROL SYSTEM

DTC Description

INFOID:0000000014631309

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0441	EVAP PURG FLOW/MON (Evaporative emission system incorrect purge flow)	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.

POSSIBLE CAUSE

- 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

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Will CONSULT be used?

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

2. PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine 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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
7. Start engine and let it idle for at least 70 seconds.
8. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
9. Touch “START”.

Is “COMPLETED” displayed on CONSULT screen?

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

3. PERFORM DTC CONFIRMATION PROCEDURE-2

When the following conditions are met, “TESTING” will be displayed on the CONSULT screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
VHCL SPEED SE	32 – 120 km/h (20 – 75 MPH)
ENG SPEED	500 – 3,200 rpm
B/FUEL SCHDL	1.0 – 9.0 msec
COOLANT 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 screen?

YES >> GO TO 4.
NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 2.

4. PERFORM DTC CONFIRMATION PROCEDURE-3

Touch “SELF-DIAG RESULTS”.

Is “OK” displayed on CONSULT screen?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-374, "Diagnosis Procedure".

5. PERFORM 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.

With GST
1. Lift up drive wheels.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
6. Start engine and wait at least 70 seconds.
7. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM		
Connector	+	–
	Terminal	
E16	121	148

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
Selector lever position	Any position other than P, N or R

10. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 6) for at least 1 second.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-374, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631311

1.CHECK EVAP CANISTER

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 2.
YES-2 >> Without CONSULT: GO TO 3.
NO >> Replace EVAP canister. Refer to FL-25, "Removal and Installation".

2.CHECK PURGE FLOW

With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port. Refer to FL-30, "Exploded View".
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle.
4. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
5. Touch “Qd” and “Qu” on CONSULT 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

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Stop engine.
4. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. Refer to FL-30, "Exploded View".

5. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
6. Start engine and let it idle.
   Never depress accelerator pedal even slightly.
7. Check vacuum gauge indication before 60 seconds pass after starting engine.

Vacuum should not exist.

8. Rev engine up to 2,000 rpm after 100 seconds pass after starting engine.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK EVAP PURGE LINE

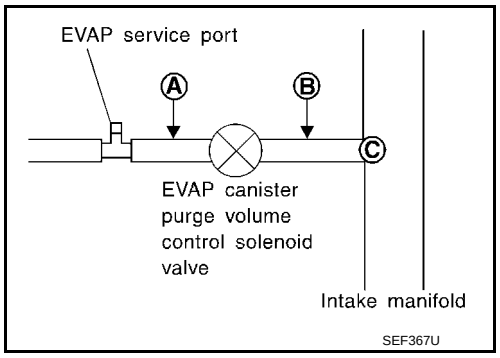
1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection. Refer to EC-63, "EVAPORATIVE EMISSION SYSTEM : System Description".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair EVAP purge line.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

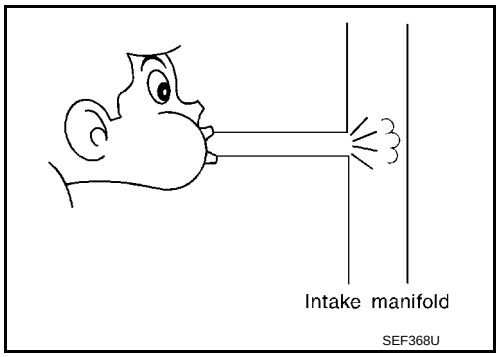
1. Disconnect purge hoses connected to EVAP service port Ⓐ and EVAP canister purge volume control solenoid valve Ⓑ.
2. Blow air into each hose and EVAP purge port Ⓒ.



3. Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.
YES-2 >> Without CONSULT: GO TO 7.
NO >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.
NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check the EVAP canister purge volume control solenoid valve. Refer to EC-381, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-30, "Removal and Installation".

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-397, "DTC Description" for DTC P0452, EC-400, "DTC Description" for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to EC-387, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or replace malfunctioning part.

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Description

INFOID:0000000014631312

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)		DTC detecting condition
P0443	PURG VOLUME CONT/V (Evaporative emission system purge control valve circuit)	A	The canister purge flow is detected during the vehicle is stopped while the engine is running, even when EVAP canister purge volume control solenoid valve is completely closed.
		B	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.

POSSIBLE CAUSE

- 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.)

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

- **Perform DTC CONFIRMATION PROCEDURE when the fuel is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 5 to 60°C (41 to 140°F).**
- **Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.**

Do you have CONSULT

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE A

With CONSULT

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Check that the following condition are met.
   FUEL T/TMP SE: 0 – 35°C (32 – 95°F)
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and wait at least 60 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-378, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE B

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine 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. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
6. Touch “START”.
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Start engine and let it idle until “TESTING” on CONSULT changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.
9. Touch “SELF-DIAG RESULT”.

Is “OK” displayed on CONSULT screen?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-378, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE A

With GST

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

+		–	Voltage
ECM			
Connector	Terminal		
E16	128	Ground	3.1 – 4.0 V

3. Start engine and wait at least 60 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-378, "Diagnosis Procedure".
NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE

With GST

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and let it idle for at least 20 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-378, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631313

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

+		–	Voltage
EVAP canister purge volume control solenoid valve			
Connector	Terminal		
F16	1	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

+		–		Continuity
EVAP canister purge volume control solenoid valve		IPDM E/R		
Connector	Terminal	Connector	Terminal	
F16	1	F35	73	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

+		–		Continuity
EVAP canister purge volume control solenoid valve		ECM		
Connector	Terminal	Connector	Terminal	
F16	2	F52	115	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to EC-395, "Component Inspection".

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.
YES-2 >> Without CONSULT: GO TO 7.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine.
5. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT. Check that engine speed varies according to the valve opening.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check the EVAP canister purge volume control solenoid valve. Refer to EC-381, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-30, "Removal and Installation".

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to EC-387, "Component Inspection".

Is the inspection result normal?

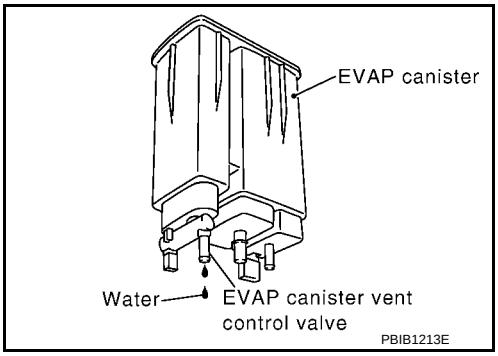
YES >> GO TO 10.
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

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.

Does water drain from the EVAP canister?

YES >> GO TO 11.
NO >> INSPECTION END



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 >> INSPECTION END

NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-25, "Removal and Installation".

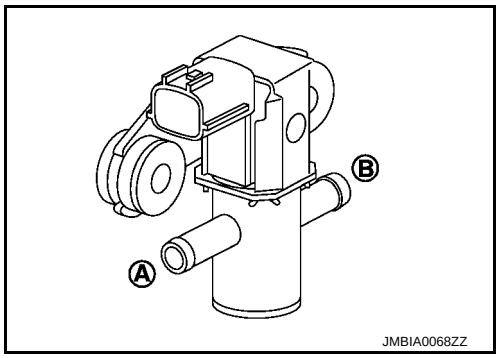
Component Inspection

INFOID:0000000014631314

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

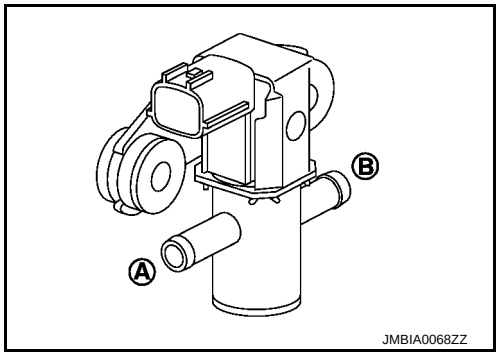
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine.
6. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
7. Touch “Qd” or “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.



Condition (PURG VOL C/V value)	Air passage continuity between Ⓐ and Ⓑ
100%	Existed
0%	Not existed

Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.



Condition	Air passage continuity between Ⓐ and Ⓑ
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-30, "Removal and Installation".

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Description

INFOID:0000000014631315

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0444	PURG VOLUME CONT/V (Evaporative emission system purge control valve circuit open)	An excessively low voltage signal is sent to ECM through the EVAP canister purge volume control solenoid valve.
P0445	PURG VOLUME CONT/V (Evaporative emission system purge control valve circuit shorted)	An excessively high voltage signal is sent to ECM through the EVAP canister purge volume control solenoid valve.

POSSIBLE CAUSE

P0444
- Harness or connectors (EVAP canister purge volume control solenoid valve circuit is open or shorted.)
- EVAP canister purge volume control solenoid valve

P0445
- Harness or connectors (EVAP canister purge volume control solenoid valve circuit is shorted.)
- EVAP canister purge volume control solenoid valve

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 13 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-382, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631316

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

+		–	Voltage
EVAP canister purge volume control solenoid valve			
Connector	Terminal		
F16	1	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and IPDM E/R harness connector.

EVAP canister purge volume control solenoid valve		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F16	1	F35	73	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

EVAP canister purge volume control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F16	2	F52	115	Existed

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

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 4.
YES-2 >> Without CONSULT: GO TO 5.
NO >> Repair or replace malfunctioning part.

4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Reconnect all harness connectors disconnected.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” with CONSULT.

Does engine speed vary according to the valve opening?

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

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-384, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-30, "Removal and Installation".

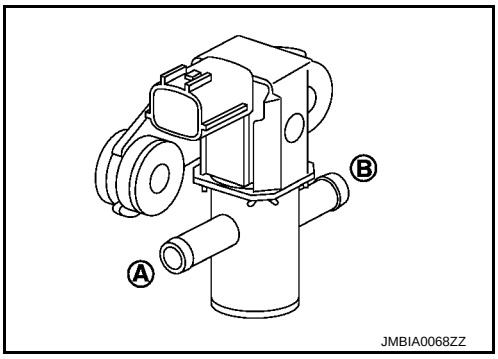
Component Inspection

INFOID:0000000014682369

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

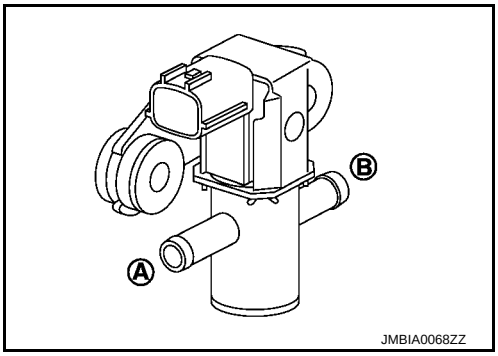
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine.
6. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
7. Touch “Qd” or “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.



Condition (PURG VOL C/V value)	Air passage continuity between Ⓐ and Ⓑ
100%	Existed
0%	Not existed

Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve as per the following conditions.



Condition	Air passage continuity between Ⓐ and Ⓑ
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-30, "Removal and Installation".

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Description

INFOID:0000000014631318

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0447	VENT CONTROL VALVE (Evaporative emission system vent control circuit open)	An improper voltage signal is sent to ECM through EVAP canister vent control valve.

POSSIBLE CAUSE

- Harness or connectors (EVAP canister vent control valve circuit is open or shorted.)
- EVAP canister vent control valve

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait at least 8 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-385, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631319

1.INSPECTION START

Do you have CONSULT?

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

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT
1. Turn ignition switch OFF and then turn ON.
2. Select “VENT CONTROL/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
3. Touch “ON/OFF” on CONSULT screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EVAP canister vent control valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister vent control valve harness connector and ground.

+		–	Voltage
EVAP canister vent control valve			
Connector	Terminal		
B135	1	Ground	Battery voltage

Is the inspection result normal?

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

4. CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVAP canister vent control valve harness connector and IPDM E/R harness connector.

EVAP canister vent control valve		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
B135	1	F35	78	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister vent control valve harness connector and ECM harness connector.

EVAP canister vent control valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B135	2	E16	141	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Clean the rubber tube using an air blower.

7. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to EC-387, "Component Inspection".

Is the inspection result normal?

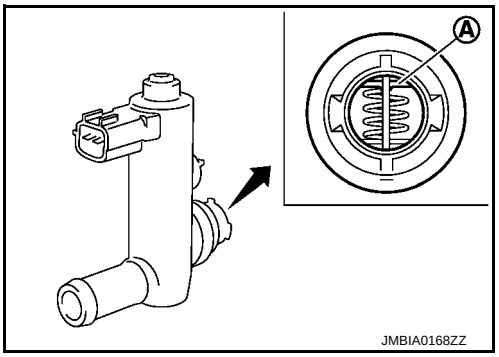
YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation"

Component Inspection

INFOID:0000000014631320

1. CHECK EVAP CANISTER VENT CONTROL VALVE-1

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion Ⓐ of EVAP canister vent control valve for being rusted.



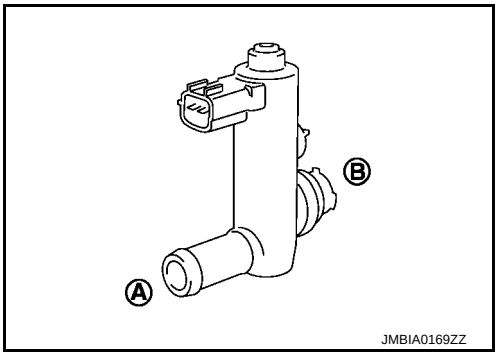
Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".
NO >> GO TO 2.

2. CHECK EVAP CANISTER VENT CONTROL VALVE-2

With CONSULT

1. Reconnect harness connectors disconnected.
2. Start engine.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
4. Check air passage continuity and operation delay time.
   Make sure new O-ring is installed properly.

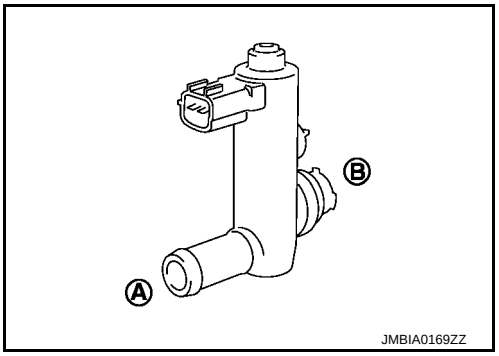


Condition (VENT CONT/V)	Air passage continuity between Ⓐ and Ⓑ
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT

Check air passage continuity and operation delay time under the following conditions.
Make sure new O-ring is installed properly.



Condition	Air passage continuity between Ⓐ and Ⓑ
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

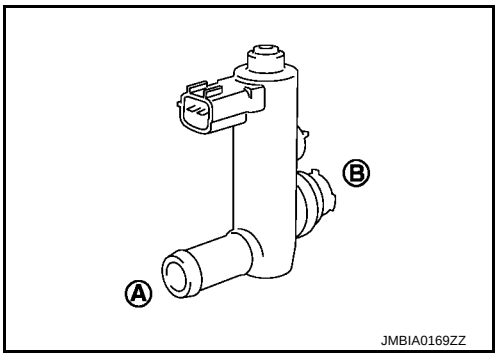
Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-3

With CONSULT

1. Clean the air passage [portion Ⓐ to Ⓑ] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
3. Check air passage continuity and operation delay time.
   Make sure new O-ring is installed properly.

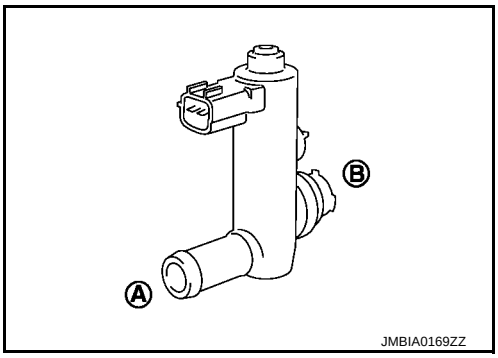


Condition (VENT CONT/V)	Air passage continuity between Ⓐ and Ⓑ
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT

1. Clean the air passage [portionⒶ to Ⓑ] 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 new O-ring is installed properly.



Condition	Air passage continuity between Ⓐ and Ⓑ
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

P0448 EVAP CANISTER VENT CONTROL VALVE

DTC Description

INFOID:0000000014631321

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0448	VENT CONTROL VALVE (Evaporative emission system vent control circuit shorted)	EVAP canister vent control valve remains closed under specified driving conditions.

POSSIBLE CAUSE

- 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

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and let it idle for at least 1 minute.
6. Repeat next procedures three times.

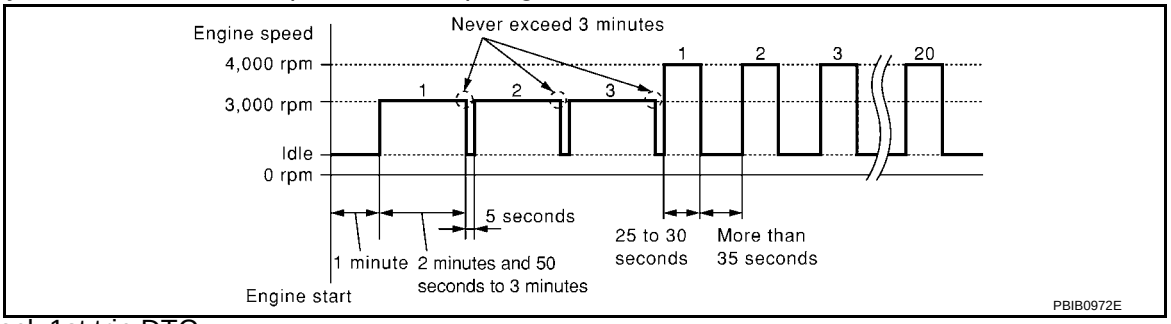
- Increase the engine speed up to 3,000 to 3,500 rpm and keep it for 2 minutes and 50 seconds to 3 minutes.

Never exceed 3 minutes.

- Fully released accelerator pedal and keep engine idle for about 5 seconds.

7. Repeat next procedure 20 times.

- Quickly increase the engine speed up to 4,000 to 4,500 rpm or more and keep it for 25 to 30 seconds.
- Fully released accelerator pedal and keep engine idle for at least 35 seconds.



8. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-390, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631322

1.CHECK RUBBER TUBE

1. Turn ignition switch OFF.
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Clean rubber tube using an air blower.

2.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the EVAP canister vent control valve. Refer to EC-391, "Component Inspection".

Is the inspection result normal?

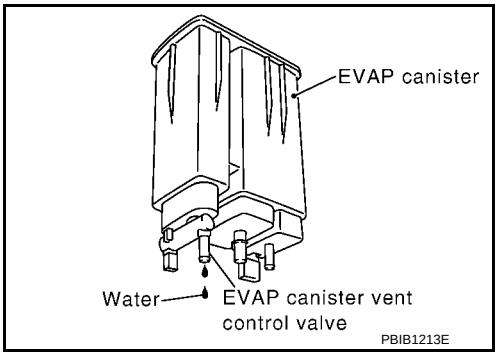
YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

3.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.

Does water drain from EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.



4.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-25, "Removal and Installation".

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to EC-395, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

Component Inspection

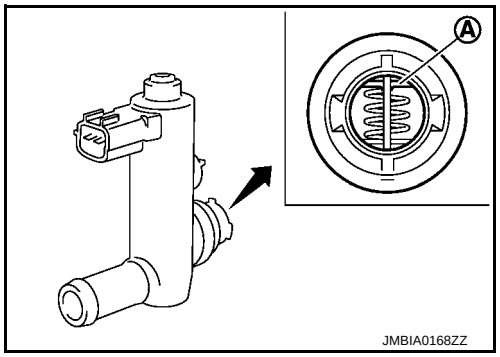
INFOID:0000000014682370

1. CHECK EVAP CANISTER VENT CONTROL VALVE-1

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion Ⓐ of EVAP canister vent control valve for being rusted.

Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".
NO >> GO TO 2.



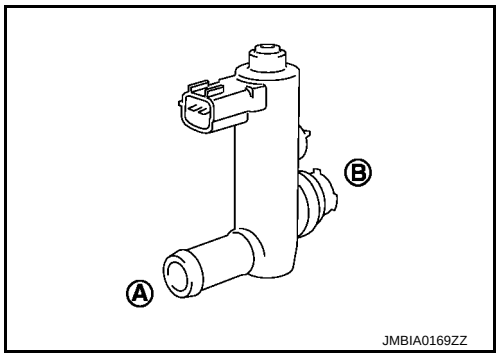
2. CHECK EVAP CANISTER VENT CONTROL VALVE-2

With CONSULT

1. Reconnect harness connectors disconnected.
2. Start engine.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
4. Check air passage continuity and operation delay time.
   Make sure new O-ring is installed properly.

Condition (VENT CONT/V)	Air passage continuity between Ⓐ and Ⓑ
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

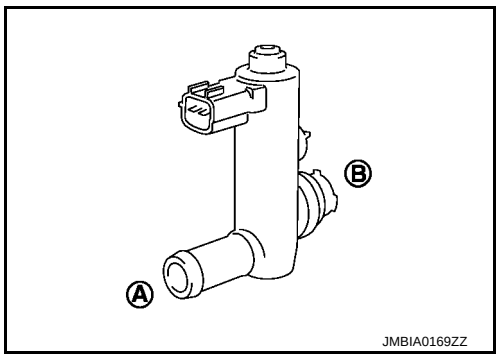


Without CONSULT

Check air passage continuity and operation delay time under the following conditions.
Make sure new O-ring is installed properly.

Condition	Air passage continuity between Ⓐ and Ⓑ
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.



Is the inspection result normal?

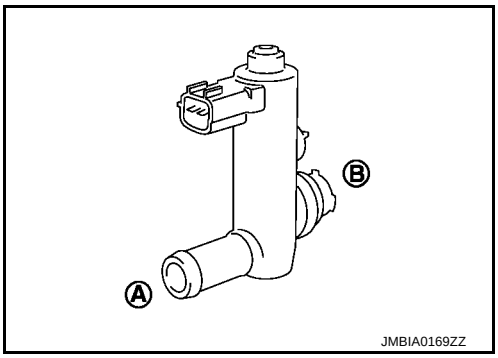
YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-3

With CONSULT

1. Clean the air passage [portion Ⓐ to Ⓑ] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
3. Check air passage continuity and operation delay time.
   Make sure new O-ring is installed properly.

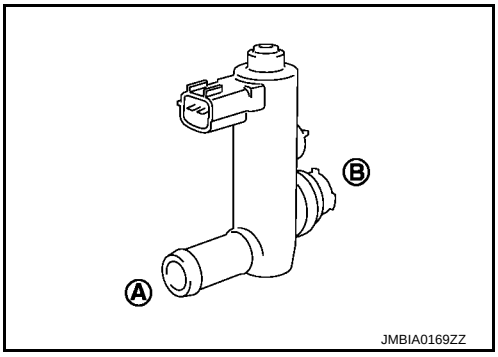


Condition (VENT CONT/V)	Air passage continuity between Ⓐ and Ⓑ
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT

1. Clean the air passage [portion Ⓐ to Ⓑ] 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 new O-ring is installed properly.



Condition	Air passage continuity between Ⓐ and Ⓑ
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Description

INFOID:0000000014631324

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0451	EVAP SYS PRES SEN (Evaporative emission system pressure sensor/switch range/performance)	ECM detects a sloshing signal from the EVAP control system pressure sensor.

POSSIBLE CAUSE

- Harness or connectors (EVAP control system pressure sensor circuit is shorted.)
- EVAP control system pressure sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

NOTE:
Never remove fuel filler cap during DTC confirmation procedure.

1. PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Do you have CONSULT?

With CONSULT>>GO TO 2.
Without CONSULT>>GO TO 5.

2. PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-394, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT
1. Select “EVAP DIAG READY” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Let it idle until “OFF” of “EVAP DIAG READY” changes to “ON”.
   NOTE:
   It will take at most 2 hours until “OFF” of “EVAP DIAG READY” changes to “ON”.
3. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON.
5. Select “EVAP LEAK DIAG” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Check that “EVAP LEAK DIAG” indication.

Which is displayed on CONSULT?

“CMPLT”>>GO TO 4.
“YET” >> 1. Perform DTC CONFIRMATION PROCEDURE again.
2. GO TO 1.

4. PERFORM DTC CONFIRMATION PROCEDURE-3

With CONSULT
Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-394, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

5. PERFORM DTC CONFIRMATION PROCEDURE-4

With GST
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-394, "Diagnosis Procedure".
NO >> GO TO 6.

6. PERFORM DTC CONFIRMATION PROCEDURE-5

With GST
1. Let it idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-394, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631325

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

+		–	Voltage (Approx.)
EVAP control system pressure sensor			
Connector	Terminal		
B111	3	Ground	5 V

Is the inspection result normal?

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

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	3	E16	125	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	1	E16	148	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR SIGNAL CIRCUIT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	2	E16	121	Existed

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

Is the inspection result normal?

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

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to EC-395, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

Component Inspection

INFOID:0000000014631326

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.

2. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. **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 and ground under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage
Connector	+	–		
	Terminal			
E16	121	148	Not applied	0.5 – 4.6 V
			–26.7 (–0.272, –3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below –93.3 kPa (–0.952 kg/cm^2, –13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm^2, 14.69 psi).**

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Description

INFOID:0000000014631327

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0452	EVAP SYS PRES SEN (Evaporative emission system pressure sensor/switch low)	An excessively low voltage from the sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (EVAP control system pressure sensor circuit is shorted.)
- EVAP control system pressure sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine 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. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Make sure that “FUEL T/TMP SE” indication is more than 0°C (32°F).
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM			Voltage
Connector	+	–	
	Terminal		
E16	121	148	Less than 4.2 V

4. Make sure that the voltage is less than 4.2 V.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 20 seconds.

7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-398, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631328

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

+		–	Voltage (Approx.)
EVAP control system pressure sensor			
Connector	Terminal		
B111	3	Ground	5 V

Is the inspection result normal?

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

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	3	E16	125	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	1	E16	148	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR SIGNAL CIRCUIT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	2	E16	121	Existed

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

Is the inspection result normal?

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

6. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to EC-395, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

Component Inspection

INFOID:0000000014682371

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. **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 and ground under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage
Connector	+	–		
	Terminal			
E16	121	148	Not applied	0.5 – 4.6 V
			–26.7 (–0.272, –3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below –93.3 kPa (–0.952 kg/cm^2, –13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm^2, 14.69 psi).**

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Description

INFOID:0000000014631330

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0453	EVAP SYS PRES SEN (Evaporative emission system pressure sensor/switch high)	An excessively high voltage from the sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors (EVAP control system pressure sensor circuit is shorted.)
- EVAP control system pressure sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine 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. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Make sure that “FUEL T/TMP SE” indication is more than 0°C (32°F).
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM			Voltage
Connector	+	–	
	Terminal		
E16	121	148	Less than 4.2 V

4. Make sure that the voltage is less than 4.2 V.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 20 seconds.

7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-401, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631331

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect EVAP control system pressure sensor harness connector.
3. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

+		–	Voltage (Approx.)
EVAP control system pressure sensor			
Connector	Terminal		
B111	3	Ground	5 V

Is the inspection result normal?

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

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	3	E16	125	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	1	E16	148	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR SIGNAL CIRCUIT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	2	E16	121	Existed

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

Is the inspection result normal?

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

6.CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

7.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-387, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister vent control valve. Refer to FL-27, "Removal and Installation".

8.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-403, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

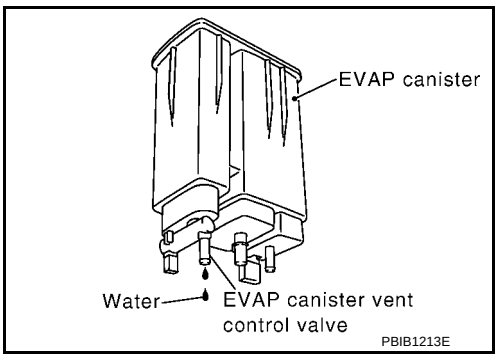
9.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Check if water will drain from the EVAP canister.

Does water drain from EVAP canister?

YES >> GO TO 10.
NO >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".



10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-25, "Removal and Installation".

Component Inspection

INFOID:0000000014682372

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. **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 and ground under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage
Connector	+	–		
	Terminal			
E16	121	148	Not applied	0.5 – 4.6 V
			–26.7 (–0.272, –3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply below –93.3 kPa (–0.952 kg/cm^2, –13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm^2, 14.69 psi).**

Is the inspection result normal?

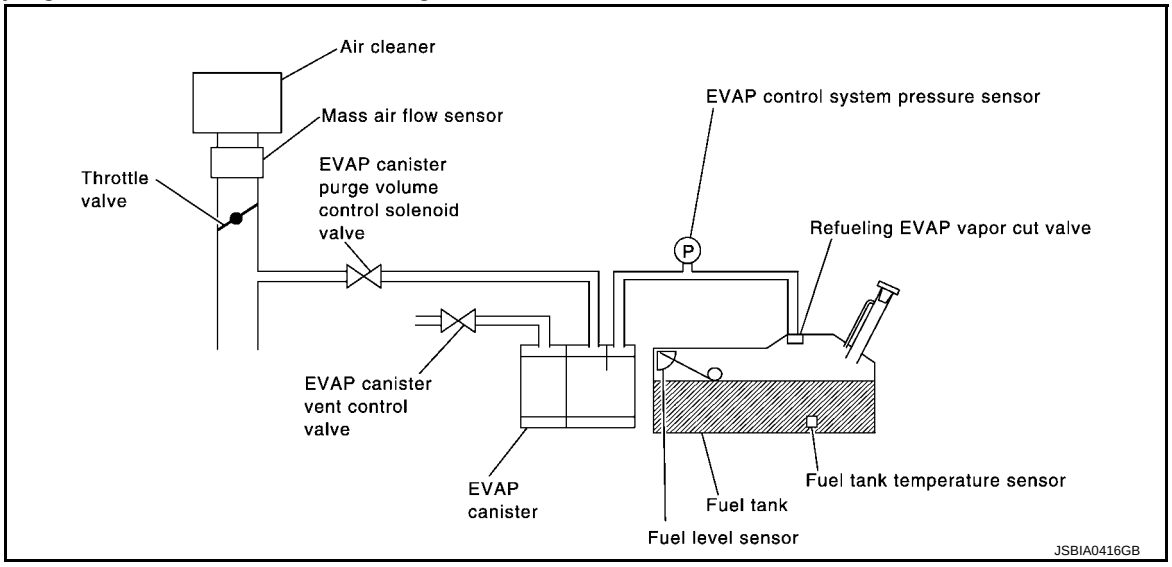
YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

P0456 EVAP CONTROL SYSTEM

DTC Description

INFOID:0000000014631333

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0456	EVAP VERY SML LEAK [Evaporative emission system leak detected (very small leak)]	• EVAP system has a leak. • EVAP system does not operate properly.

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.**

POSSIBLE CAUSE

- 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

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Turn ignition switch ON and select “EVAP DIAG READY” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. 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”.
4. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
5. Turn ignition switch ON and select “EVAP LEAK DIAG” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Check that “EVAP LEAK DIAG” indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 3.
YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-405, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

4.PERFORM DTC CONFIRMATION PROCEDURE

With GST

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait engine idle for at least 2 hours.
3. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-405, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631334

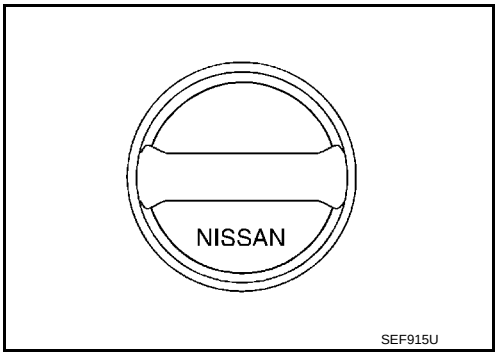
1.CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

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 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-409, "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-592, "Inspection".

Is there any leak in EVAP line?

YES >> Repair or replace.
NO >> GO TO 6.

6. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.
- EVAP canister vent control valve is installed properly.
  Refer to FL-27, "Exploded View".
- EVAP canister vent control valve.
  Refer to FL-27, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to FL-27, "Removal and Installation".

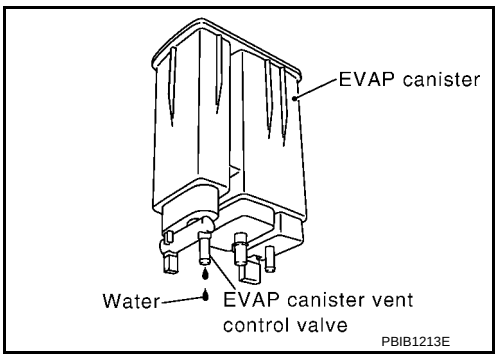
7. CHECK IF EVAP CANISTER SATURATED WITH WATER

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.

Does water drain from EVAP canister?

YES >> GO TO 8.
NO-1 >> With CONSULT: GO TO 10.
NO-2 >> Without CONSULT: GO TO 11.



8. CHECK EVAP CANISTER

Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to FL-25, "Removal and Installation".

The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 10.
YES-2 >> Without CONSULT: GO TO 11.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-25, "Removal and Installation".

10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port. Refer to FL-30, "Exploded View".
2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
4. Touch “Qu” on CONSULT 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

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose to EVAP canister purge volume control solenoid valve at EVAP service port. Refer to FL-30, "Exploded View".
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.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or reconnect the hose.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Check the EVAP canister purge volume control solenoid valve. Refer to EC-381, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-30, "Removal and Installation".

14. CHECK FUEL TANK TEMPERATURE SENSOR

Check the fuel tank temperature sensor. Refer to EC-313, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel tank temperature sensor. Refer to FL-7, "Exploded View".

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Check the EVAP control system pressure sensor. Refer to EC-395, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor. Refer to FL-28, "Removal and Installation".

16. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-63, "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, kink, looseness and improper connection. For location, refer to EC-63, "EVAPORATIVE EMISSION SYSTEM : System Description".

Is the inspection result normal?

YES >> GO TO 19.
NO >> Repair or replace hoses and tubes.

19. CHECK RECIRCULATION LINE

Check recirculation line between fuel filler tube and fuel tank for clogging, kink, cracks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 20.
NO >> Repair or replace hose, tube or fuel filler tube. Refer to FL-16, "2WD : Exploded View" (2WD) or FL-20, "4WD : Exploded View" (4WD).

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Check the refueling EVAP vapor cut valve. Refer to EC-576, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 21.
NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-16, "2WD : Removal and Installation" (2WD) or FL-20, "4WD : Removal and Installation" (4WD).

21.CHECK FUEL LEVEL SENSOR

Check the fuel level sensor. (Perform component function check. Refer to EC-412, "DTC Description".)

Is the inspection result normal?

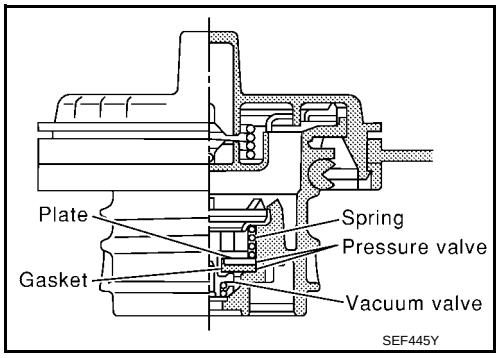
YES >> INSPECTION END
NO >> Replace fuel level sensor unit. Refer to FL-7, "Exploded View".

Component Inspection

INFOID:0000000014631335

1.CHECK FUEL FILLER CAP

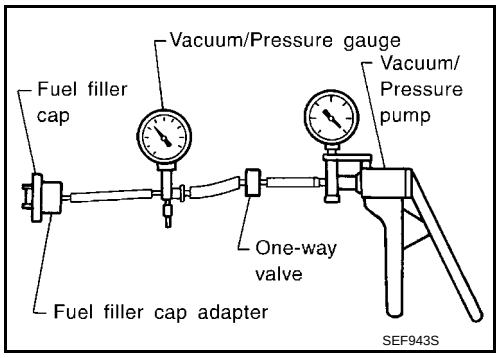
1. Turn ignition switch OFF.
2. Remove fuel filler cap.
3. Wipe clean valve housing.



4. Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
5. Check valve opening pressure and vacuum.

Pressure: **15.3 – 20.0 kPa (0.156 – 0.204 kg/cm^2, 2.22 – 2.90 psi)**

Vacuum: **–6.0 to –3.3 kPa (–0.061 to –0.034 kg/cm^2, –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 Description

INFOID:0000000014631336

When the vehicle is parked, naturally the fuel level in the fuel tank is 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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0460	FUEL LEV SEN SLOSH (Fuel Level Sensor ″A″ Circuit)	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.

POSSIBLE CAUSE

- Harness or connectors
- CAN communication line is open or shorted.
- Fuel level sensor circuit is open or shorted.
- Combination meter
- Fuel level sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

- 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.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait maximum of 2 consecutive minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-410, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631337

1.CHECK DTC PRIORITY

- 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.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX

- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2.CHECK COMBINATION METER FUNCTION

Refer to MWI-64, "Component Function Check".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Refer to MWI-64, "Diagnosis Procedure".

P0461 FUEL LEVEL SENSOR

DTC Description

INFOID:0000000014631338

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0461	FUEL LEVEL SENSOR (Fuel level sensor "A" 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.

POSSIBLE CAUSE

- Harness or connectors
- CAN communication line is open or shorted.
- Fuel level sensor circuit is open or shorted.
- Combination meter
- Fuel level sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

- 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.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

WARNING:
When performing following procedure, be sure to observe the handling of the fuel. Refer to FL-2, "General Precaution".
NOTE:
Use component function check to check the overall function of the fuel level sensor function. During this check, a 1st trip DTC might not be confirmed.
TESTING CONDITION:
Before starting component function check, preparation of draining fuel and refilling fuel is required.

Do you have CONSULT?

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

3.PERFORM COMPONENT FUNCTION CHECK-1

With CONSULT
NOTE:
Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.
1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line, refer to EC-162, "Work Procedure".
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.

5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP RELAY” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
9. Touch “ON” and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check “FUEL LEVEL SE” output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check “FUEL LEVEL SE” output voltage and note it.
13. Confirm whether the voltage changes more than 0.03 V during step 7 to 10 and 10 to 12.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-413, "Diagnosis Procedure".

4. PERFORM COMPONENT FUNCTION CHECK-2

Without CONSULT

NOTE:

Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line. Refer to EC-162, "Work Procedure".
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-413, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631339

1. CHECK DTC PRIORITY

- 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.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2. CHECK COMBINATION METER FUNCTION

Refer to MWI-64, "Component Function Check".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Refer to MWI-64, "Diagnosis Procedure".

P0462, P0463 FUEL LEVEL SENSOR

DTC Description

INFOID:0000000014631340

This diagnosis indicates the former, to detect open or short circuit malfunction.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0462	FUEL LEVL SEN/CIRC (Fuel level sensor "A" circuit low)	An excessively low voltage from the sensor is sent to ECM.
P0463	FUEL LEVL SEN/CIRC (Fuel level sensor "A" circuit high)	An excessively high voltage from the sensor is sent to ECM.

POSSIBLE CAUSE

- Harness or connectors
- CAN communication line is open or shorted.
- Fuel level sensor circuit is open or shorted.
- Combination meter
- Fuel level sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

- 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.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11 V and 16 V at ignition switch ON.

>> GO TO 3.

3.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-414, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631341

1.CHECK DTC PRIORITY

- 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.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2. CHECK COMBINATION METER FUNCTION

Refer to MWI-64, "Component Function Check".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Refer to MWI-64, "Diagnosis Procedure".

P0500 VSS

DTC Description

INFOID:0000000014631342

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0500	VEHICLE SPEED SENSOR A (Vehicle speed sensor “A”)	At 20 km/h (13 MPH) or more, ECM detects the following status continuously for 5 seconds or more: The difference between a vehicle speed calculated by a output speed sensor transmitted from TCM to ECM via CAN communication and the vehicle speed indicated on the combination meter exceeds 15 km/h (10 MPH).

POSSIBLE CAUSE

- Combination meter
- ABS actuator and electric unit (control unit)
- Wheel sensor
- TCM
- Output speed sensor

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).
	Idle speed control	Stops feedback control of idle speed and controls with specified speed.
	Recovery speed control at decelerating	Stops recovery speed control by the fuel cut at decelerating and controls with specified speed.

Hybrid Control System

- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0500 is displayed with DTC UXXXX or P0607, first perform the trouble diagnosis for DTC UXXXX or P0607.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Shift the selector lever to D position and wait at least for 2 seconds.
4. Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-417, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631343

1.CHECK DTC PRIORITY

If DTC P0500 is displayed with DTC UXXXX or P0607, first perform the trouble diagnosis for DTC UXXXX or P0607.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-55, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble shooting relevant to DTC indicated.

3.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to BRC-49, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform trouble shooting relevant to DTC indicated.

4.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to MWI-21, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble shooting relevant to DTC indicated.

5.CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to TM-180, "Diagnosis Procedure".

Is the inspection result normal?

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

6.CHECK WHEEL SENSOR

Check wheel sensor. Refer to BRC-87, "Diagnosis Procedure" and BRC-92, "Diagnosis Procedure".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

P0506 ISC SYSTEM

DTC Description

INFOID:0000000014631344

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 1 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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0506	ISC SYSTEM (Idle air control system rpm lower than expected)	The idle speed is less than the target idle speed by 100 rpm or more.

POSSIBLE CAUSE

- Electric throttle control actuator
- Intake air leaks

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test. When the target idle speed is not the specified value, perform EC-589, "Inspection" 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 at a temperature above −10°C (14°F).**

NOTE:

In the highlands of over 2,400m altitude, DTC may be detected without abnormality, but that case is not abnormal if the DTC is not detected when "DTC confirmation procedure" is performed at under 2,400m altitude.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and let it idle for at least 1 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-420, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".

NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631345

1.CHECK DTC PRIORITY

If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.CHECK INTAKE AIR LEAK

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle.
3. Listen for an intake air leak after the mass air flow sensor.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.REPLACE ECM

1. Stop the engine.
2. Replace ECM. Refer to EC-595, "Removal and Installation".

>> INSPECTION END

P0507 ISC SYSTEM

DTC Description

INFOID:0000000014631346

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 1 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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0507	ISC SYSTEM (Idle air control system rpm higher than expected)	The idle speed is more than the target idle speed by 200 rpm or more.

POSSIBLE CAUSE

- Electric throttle control actuator
- Intake air leak
- PCV system

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test. When the target idle speed is not the specified value, perform EC-589, "Inspection" 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 at a temperature above −10°C (14°F).**

NOTE:

In the highlands of over 2,400m altitude, DTC may be detected without abnormality, but that case is not abnormal if the DTC is not detected when "DTC confirmation procedure" is performed at under 2,400m altitude.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and let it idle for at least 1 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-422, "Diagnosis Procedure".

NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631347

1.CHECK DTC PRIORITY

If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly. Refer to EM-32, "Exploded View".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK INTAKE AIR LEAK

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle.
3. Listen for an intake air leak after the mass air flow sensor.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part. Refer to EM-29, "Exploded View" and EM-32, "Exploded View".

4.REPLACE ECM

1. Stop engine.
2. Replace ECM. Refer to EC-595, "Removal and Installation".

>> INSPECTION END

P050A, P050B, P050E COLD START CONTROL

DTC Description

INFOID:0000000014631348

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P050A	COLD START CONTROL (Cold start idle air control system performance)	ECM does not control engine idle speed properly when engine is started with pre-warming up condition.
P050A	COLD START CONTROL (Cold start ignition timing performance)	ECM does not control ignition timing properly when engine is started with pre-warming up condition.
P050E	COLD START CONTROL (Cold start engine exhaust temperature too low)	The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition.

POSSIBLE CAUSE

- Lack of intake air volume
- Fuel injection system
- ECM

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P050A, P050B or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check the indication of “COOLANT TEMP/S”.

With GST

Follow the procedure “With CONSULT” above.

Is the value of “COOLANT TEMP/S” between 5°C (41°F) and 36°C (97°F)?

YES >> GO TO 4.
NO-1 [If it is below 5°C (41°F)]>>Warm up the engine until the value of “COOLANT 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.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT
1. Shift the select lever to N position.
2. Start the engine and warm up in idle with the value of “COOLANT TEMP/S” between 5°C (41°F) and 40°C (104°F) for more than 15 seconds.
3. Check 1st trip DTC.

With GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-424, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631349

1.CHECK DTC PRIORITY

If DTC P050A, P050B or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Perform Idle Air Volume Learning. Refer to EC-156, "Description".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 3.
NO >> Follow the instruction of Idle Air Volume Learning.

3.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 4.
NO >> Repair or replace malfunctioning part

4.CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171. Refer to EC-299, "DTC Description".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Proceed to EC-300, "Diagnosis Procedure" for DTC P0171.

5.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure. Refer to EC-423, "DTC Description".

Is the 1st trip DTC P050A, P050B or P050E displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0520 EOP SENSOR

DTC Description

INFOID:0000000014631350

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0520	EOP SENSOR/SWITCH (Engine oil pressure sensor/switch circuit)	• A voltage signal transmitted from the engine oil pressure sensor is lower than 0.3 V. • A voltage signal transmitted from the engine oil pressure sensor is higher than 5.02 V.

POSSIBLE CAUSE

- Harness or connectors
- EOP sensor circuit is open or shorted.
- Sensor power supply 2 circuit is shorted.
- Engine oil pressure sensor
- Each sensor, connected with sensor power supply 2 circuit

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.CHECK ENGINE OIL LEVEL

Check the engine oil level. Refer to LU-10, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform LU-10, "Inspection".

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for 5 second.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-425, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631351

1.CHECK ENGINE OIL PRESSURE (EOP) SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect EOP sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EOP sensor harness connector terminals.

EOP sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F54	3	1	5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK EOP SENSOR POWER SUPPLY-2

Check the voltage between EOP sensor harness connector and ground.

+		–	Voltage (Approx.)
EOP sensor			
Connector	Terminal		
F54	3	Ground	5 V

Is the inspection result normal?

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

3.CHECK EOP SENSOR POWER SUPPLY CIRCUIT

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

EOP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F54	3	F51	29	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Perform EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Replace malfunctioning part.

5.CHECK EOP SENSOR GROUND CIRCUIT

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

EOP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F54	1	F51	13	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

7.CHECK EOP SENSOR INPUT SIGNAL CIRCUIT

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

EOP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F54	2	F51	23	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8.CHECK EOP SENSOR

Refer to EC-427, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOP sensor. Refer to EC-17, "Component Parts Location".

Component Inspection

INFOID:0000000014631352

1.CHECK ENGINE OIL PRESSURE (EOP) SENSOR

1. Turn ignition switch OFF.
2. Disconnect EOP sensor harness connector.
3. Check the resistance between EOP sensor connector terminals.

EOP sensor		Resistance
Terminal		
1	2	4 – 10 kΩ
	3	2 – 8 kΩ
2	3	1 – 3 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOP sensor. Refer to EM-116, "Exploded View".

P0524 ENGINE OIL PRESSURE

DTC Description

INFOID:0000000014631353

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0524	ENGINE OIL PRESSURE (Engine oil pressure too low)	ECM detects that an EOP sensor signal voltage applied to ECM remains lower than the specified value continuously for 10 seconds or more when the engine speed is 1,000 rpm or more.

POSSIBLE CAUSE

- Decrease in engine oil pressure
- Decrease in engine oil level
- Engine oil condition
- EOP sensor
- Engine body

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	• ECM displays engine oil pressure warning on the combination meter. • Engine speed will not rise more than 4,000 rpm due to the fuel cut. • Fail-safe is canceled when ignition switch OFF → ON.

Hybrid Control System

- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

CAUTION:

If EC-430, "Diagnosis Procedure" is unfinished, be sure to perform Step 3 and 4.

1. PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TEST CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2. PRECONDITIONING-2

Is “Diagnosis Procedure” of DTC P0524 finished?

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

3. CHECK ENGINE OIL LEVEL

Check the engine oil level. Refer to LU-10, "Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Proceed to EC-430, "Diagnosis Procedure".

4. CHECK ENGINE OIL PRESSURE

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

2. Start engine.
3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check that “EOP SENSOR” changes, according to engine speeds.

Monitor item	Condition		Value
EOP SENSOR	• Engine oil temperature: 80°C (176°F) • Selector lever: P or N position • Air conditioner switch: OFF • No load	Engine speed: Idle	1.450 V
		Engine speed: 2,000 rpm	2.850 V

Without CONSULT

Check the engine oil pressure. Refer to LU-10, "Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Proceed to EC-430, "Diagnosis Procedure".

5. PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Maintain the following conditions for at least 10 consecutive seconds.

Selector lever	P or N position
Engine coolant temperature	70°C (158°F) or more
Engine speed	1,700 rpm or more

NOTE:
With engine speed set around 4,000 rpm, the phenomenon can be reproduced more easily.

4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-430, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631354

1. CHECK ENGINE OIL LEVEL

1. Turn ignition switch OFF.
2. Check the engine oil level. Refer to LU-10, "Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 4.

2. CHECK ENGINE OIL PRESSURE

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check that “EOP SENSOR” changes, according to engine speeds.

Monitor item	Condition		Value
EOP SENSOR	• Engine oil temperature: 80°C (176°F) • Selector lever: P or N position • Air conditioner switch: OFF • No load	Engine speed: Idle	1.450 V
		Engine speed: 2,000 rpm	2.850 V

Without CONSULT

Check engine oil pressure. Refer to LU-10, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Check oil pump. Refer to LU-16, "Exploded View".

3. CHECK ENGINE OIL PRESSURE (EOP) SENSOR

Refer to EC-427, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOP sensor. Refer to EM-116, "Exploded View".

4. CHECK ENGINE OIL LEAKAGE

Check engine oil leakage. Refer to LU-10, "Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK CAUSE OF ENGINE OIL CONSUMPTION

Check the following item.

Step	Inspection item	Equipment	Standard	Reference
1	PCV valve	EC-594, "Inspection"		
2	Exhaust front tube	Visual	• No blocking • No abnormal sounds	—
3	Oil pump assembly	Visual	• No blocking • No abnormal sounds	—
4	• Piston • Piston pin • Piston ring	• Piston to piston pin oil clearance • Piston ring side clearance • Piston ring end gap		EM-125, "Inspection"
5	Cylinder block	• Cylinder block top surface distortion • Piston to cylinder bore clearance		EM-125, "Inspection"

>> Repair or replace malfunctioning part.

Component Inspection

INFOID:0000000014631355

1. CHECK ENGINE OIL PRESSURE (EOP) SENSOR

1. Turn ignition switch OFF.
2. Disconnect EOP sensor harness connector.
3. Check the resistance between EOP sensor connector terminals.

EOP sensor		Resistance
Terminal		
1	2	4 – 10 kΩ
	3	2 – 8 kΩ
2	3	1 – 3 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOP sensor. Refer to EM-116, "Exploded View".

P052A, P052B INTAKE VALVE TIMING CONTROL

DTC Description

INFOID:0000000014631356

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P052A	CAMSHAFT POSITION TIMING B1 (Cold start “A” camshaft position timing over-advanced bank 1)	There is a gap between angle of target and phase-control angle degree when the engine is in a cold condition.
P052B	CAMSHAFT POSITION TIMING B1 (Cold start “A” camshaft position timing over-retarded bank 1)	There is a gap between angle of target and phase-control angle degree when the engine is in a cold condition.

POSSIBLE CAUSE

- Crankshaft position sensor 1
- Camshaft position sensor
- Intake valve timing control solenoid valve
- Intake valve timing intermediate lock 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

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P052A or P052B is displayed with DTC P0075, perform the trouble diagnosis for DTC P0075.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-212, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Check “COOLANT TEMP/S” indication value.

With GST

Follow the procedure “With CONSULT” above.

Is the value of “COOLANT TEMP/S” –5°C (23°F) and 40°C (104°F)?

YES >> GO TO 3.
NO-1 [if it is below – 5°C (23°F)]>>Warm up the engine until the value of “COOLANT TEMP/S” indicates – 5°C (23°F) and 40°C (104°F). And then GO TO 3.
NO-2 [if it is above 40°C (104°F)]>>Cool the engine down to the value of “COOLANT TEMP/S” indicates – 5°C (23°F) and 40°C (104°F). And then GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at 10 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine.
4. Shift the selector lever to N position and let it idle for 20 seconds or more.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-433, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631357

1.CHECK DTC PRIORITY

If DTC P052A or P052B is displayed with DTC P0075, perform the trouble diagnosis for DTC P0075.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-212, "DTC Description".
NO >> GO TO 2.

2.INSPECTION START

Will CONSULT be used?

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

3.CHECK VTC POSITION

With CONSULT

1. Turn ignition switch ON.
2. Select “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Check that the “COOLANT TEMP/S” indication value is between –5°C (23°F) and 40°C (104°F).
4. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
5. Start engine and wait at least 5 seconds.
6. Select “INT/V TIM (B1)” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
7. Check that the data monitor item indicates as follows:

Item	Value (°CA)
INT/V TIM (B1)	35 ± 13

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

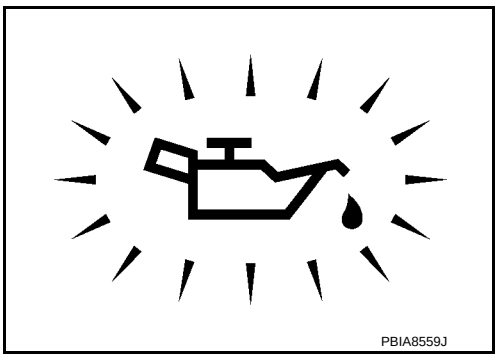
4.CHECK ENGINE OIL PRESSURE WARNING

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

3. Check that engine oil pressure warning is not displayed.

Is engine oil pressure warning displayed?

YES >> Check the engine oil level. Refer to LU-10, "Inspection".
NO >> GO TO 5.


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5. CHECK INTAKE VALVE TIMING INTERMEDIATE LOCK CONTROL SOLENOID VALVE

Refer to EC-435, "Component Inspection (Intake Valve Timing Intermediate Lock Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace intake valve timing intermediate lock control solenoid valve. Refer to EM-65, "Exploded View".

6. CHECK INTAKE VALVE TIMING (IVT) CONTROL SOLENOID VALVE

Refer to EC-435, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

7. CHECK CRANKSHAFT POSITION (CKP) SENSOR 1

Refer to EC-436, "Component Inspection (CKP Sensor 1)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace CKP sensor 1. Refer to EM-116, "Exploded View".

8. CHECK CAMSHAFT POSITION (CMP) SENSOR

Refer to EC-437, "Component Inspection (CMP Sensor)".

Is the inspection result normal?

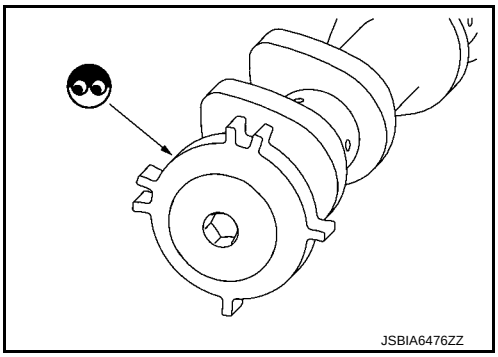
YES >> GO TO 9.
NO >> Replace CMP sensor. Refer to EM-77, "Exploded View".

9. CHECK CAMSHAFT (INTAKE)

Check the following.
1. Accumulation of debris on the signal plate of camshaft front end
2. Chipping signal plate of camshaft front end

Is the inspection result normal?

YES >> GO TO 10.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-77, "Removal and Installation".


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10. 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-66, "Removal and Installation".
NO >> GO TO 11.

11. CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean lubrication line.

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000014691440

1. CHECK INTAKE VALVE TIMING (IVT) CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect IVT control solenoid valve harness connector.
3. Check the resistance between IVT control solenoid valve terminals as per the following.

IVT control solenoid valve		Condition		Resistance
Terminal				
1	2	Temperature	20°C (68°F)	6.7 – 7.7 Ω

4. Check the resistance between IVT control solenoid valve terminal and solenoid valve body.

IVT control solenoid valve	—	Resistance
Terminal		
1	Solenoid valve body	Not existed
2		

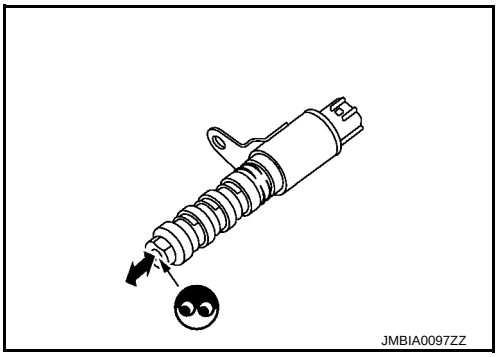
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

2. CHECK IVT CONTROL SOLENOID VALVE-2

1. Remove IVT control solenoid valve. Refer to EM-65, "Exploded View".
2. Provide battery voltage between IVT control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Never apply battery voltage continuously for 5 seconds or more. Doing so may result in damage to the coil in IVT control solenoid valve.
NOTE:
Always replace O-ring when IVT control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace IVT control solenoid valve. Refer to EM-65, "Exploded View".

Component Inspection (Intake Valve Timing Intermediate Lock Control Solenoid Valve)

INFOID:0000000014631359

1. CHECK INTAKE VALVE TIMING (IVT) INTERMEDIATE LOCK CONTROL SOLENOID VALVE-1

1. Turn ignition switch OFF.
2. Disconnect IVT intermediate lock control solenoid valve harness connector.
3. Check the resistance between IVT intermediate lock control solenoid valve terminals as per the following.

IVT intermediate lock control solenoid valve		Condition		Resistance
+	–			
Terminal				
1	2	Temperature	20°C (68°F)	6.7 – 7.7 Ω

4. Check the resistance between IVT intermediate lock control solenoid valve terminal and solenoid valve body.

IVT intermediate lock control solenoid valve	–	Resistance
+		
Terminal		
1	Solenoid valve body	Not existed
2		

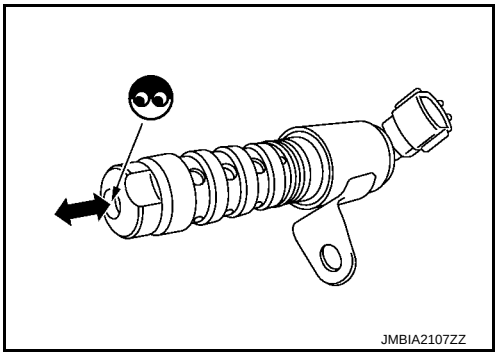
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace IVT intermediate lock control solenoid valve. Refer to EM-65, "Exploded View".

2.CHECK IVT INTERMEDIATE LOCK CONTROL SOLENOID VALVE-2

1. Remove IVT intermediate lock control solenoid valve. Refer to EM-65, "Exploded View".
2. Provide 12 V DC between IVT intermediate lock 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 IVT intermediate lock control solenoid valve.
NOTE:
Always replace O-ring when IVT intermediate lock control solenoid valve is removed.


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Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace IVT intermediate lock control solenoid valve. Refer to EM-65, "Exploded View".

Component Inspection (CKP Sensor 1)

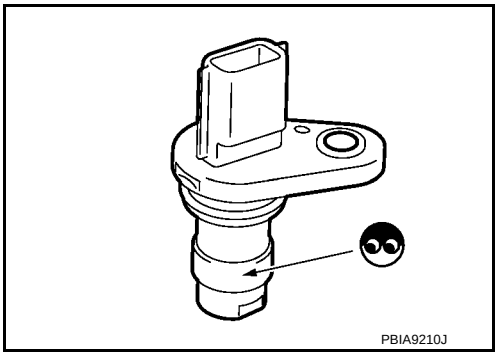
INFOID:0000000014691441

1.CHECK CRANKSHAFT POSITION (CKP) SENSOR 1-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of CKP sensor 1.
3. Disconnect CKP sensor 1 harness connector.
4. Remove the CKP sensor 1. Refer to EM-116, "Exploded View"
5. Visually check the CKP sensor 1 for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace CKP sensor 1. Refer to EM-116, "Exploded View".


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2.CHECK CKP SENSOR 1-2

Check the resistance between CKP sensor 1 terminals as follows.

CKP sensor 1 Terminal		Condition		Resistance
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace CKP sensor 1. Refer to EM-116, "Exploded View".

Component Inspection (CMP Sensor)

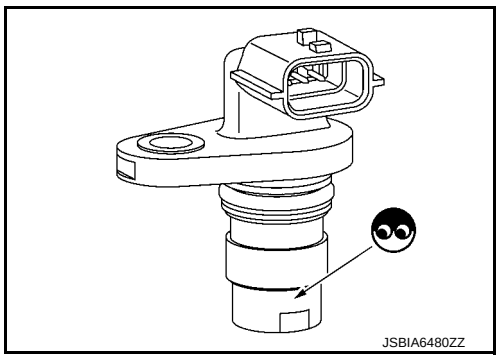
INFOID:0000000014691442

1. CHECK CAMSHAFT POSITION (CMP) SENSOR-1

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of CMP sensor.
3. Disconnect CMP sensor harness connector.
4. Remove the CMP sensor. Refer to EM-77, "Exploded View".
5. Visually check the CMP sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace CMP sensor. Refer to EM-77, "Exploded View".



2. CHECK CMP SENSOR -2

Check the resistance CMP sensor terminals as follows.

CMP sensor Terminal		Condition		Resistance
1	2	Temperature	25°C (77°F)	Except 0 Ω
	3			
2	3			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace CMP sensor. Refer to EM-77, "Exploded View".

P0544 EXHAUST GAS TEMPERATURE SENSOR

DTC Description

INFOID:0000000014631362

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0544	EXHAUST GAS TEMP SENSOR 1 B1 (Exhaust gas temperature sensor 1 circuit)	ECM detects that a voltage signal from exhaust gas temperature sensor is less than 0.025 V for 5 consecutive seconds.

POSSIBLE CAUSE

- Harness or connectors (Exhaust gas temperature sensor circuit is open or shorted.)
- Exhaust gas temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TEST 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 ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-438, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631363

1.CHECK EXHAUST GAS TEMPERATURE (EGT) SENSOR

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “EXHAUST GAS TEMP SEN 1 B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check that “EXHAUST GAS TEMP SEN 1 B1” indication as follows.

Monitor item	Condition	Value
EXHAUST GAS TEMP SEN 1 B1	• Warm-up condition • Engine speed: Idle	1.05 – 4.00 V

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Check that voltage between ECM harness connector terminals as follows.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	19	45	• Warm-up condition • Engine speed: Idle	1.05 – 4.00 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK EGT SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EGT sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EGT sensor harness connector terminal and ground.

+		–	Voltage (Approx.)
EGT sensor			
Connector	Terminal		
F67	1	Ground	5 V

Is the inspection result normal?

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

3.CHECK EGT SENSOR GROUND CIRCUIT

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

EGT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F67	2	F51	45	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> Replace exhaust gas temperature sensor. Refer to EM-37, "Exploded View".
NO >> Repair or replace malfunctioning part.

5. CHECK EGT SENSOR POWER SUPPLY CIRCUIT

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

EGT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F67	1	F51	19	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

P0545, P0546 EXHAUST GAS TEMPERATURE SENSOR

DTC Description

INFOID:0000000014631364

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0545	EXHAUST GAS TEMP SENSOR 1 B1 (Exhaust gas temperature sensor 1 circuit low)	ECM detects that a voltage signal from exhaust gas temperature sensor is less than 0.209 V for 5 consecutive seconds.
P0546	EXHAUST GAS TEMP SENSOR 1 B1 (Exhaust gas temperature sensor 1 circuit high)	ECM detects that a voltage signal from exhaust gas temperature sensor is more than 4.84 V for 5 consecutive seconds.

POSSIBLE CAUSE

- Harness or connectors (Exhaust gas temperature sensor circuit is open or shorted.)
- Exhaust gas temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TEST 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 ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-441, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631365

1.CHECK EXHAUST GAS TEMPERATURE (EGT) SENSOR

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “EXHAUST GAS TEMP SEN 1 B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check that “EXHAUST GAS TEMP SEN 1 B1” indication as follows.

Monitor item	Condition	Value
EXHAUST GAS TEMP SEN 1 B1	• Warm-up condition • Engine speed: Idle	1.05 – 4.00 V

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Check that voltage between ECM harness connector terminals as follows.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	19	45	• Warm-up condition • Engine speed: Idle	1.05 – 4.00 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK EGT SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect EGT sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EGT sensor harness connector terminal and ground.

+		–	Voltage (Approx.)
EGT sensor			
Connector	Terminal		
F67	1	Ground	5 V

Is the inspection result normal?

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

3.CHECK EGT SENSOR GROUND CIRCUIT

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

EGT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F67	2	F51	45	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> Replace exhaust gas temperature sensor. Refer to EM-37, "Exploded View".
NO >> Repair or replace malfunctioning part.

5. CHECK EGT SENSOR POWER SUPPLY CIRCUIT

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

EGT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F67	1	F51	19	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

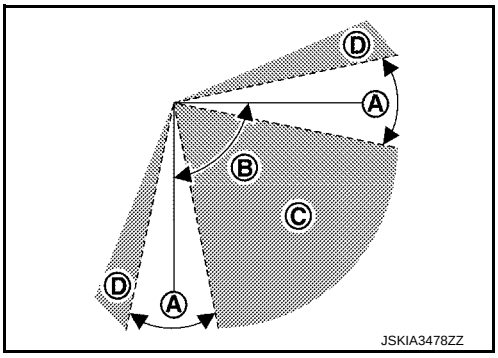
P059F ACTIVE GRILLE SHUTTER

DTC Description

INFOID:0000000014679803

DTC DETECTION LOGIC

Active grille shutter normally stops within zone Ⓐ which is defined by zone Ⓑ (90°±20°).
If the active grille shutter stops within zone Ⓒ stuck error is detected, and if the active grille shutter stops at position beyond zone Ⓓ over-run error is detected.



DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P059F	ACTIVE GRILLE AIR SHUTTER A (Active grille air shutter A performance/ stuck off)	Detects the malfunction of initial position learning or operational malfunctions for specified times.

POSSIBLE CAUSE

- Harness or connectors (Active grille shutter circuit is open or shorted.)
- Active grille shutter
- Foreign objects interferes with active grille shutter

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	• When a voltage and temperature related malfunction is detected, the active grille shutter stops at the position of detection. • Except for the above case, operates the active grille shutter to fully opened position.

Hybrid Control System
Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P059F displayed with DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500, P0607 or P159F first perform the trouble diagnosis for DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500, P0607 or P159F.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0116: Refer to EC-248, "DTC Description".
- DTC P0117: Refer to EC-250, "DTC Description".
- DTC P0118: Refer to EC-250, "DTC Description".
- DTC P0125: Refer to EC-257, "DTC Description".
- DTC P0196: Refer to EC-323, "DTC Description".
- DTC P0197: Refer to EC-327, "DTC Description".
- DTC P0198: Refer to EC-327, "DTC Description".
- DTC P0500: Refer to EC-416, "DTC Description".
- DTC P0607: Refer to EC-457, "DTC Description".
- DTC P159F: Refer to EC-489, "DTC Description".

NO >> GO TO 2.

2.PERFORM DIAGNOSIS PROCEDURE

NOTE:
Since this DTC is difficult to be confirmed, perform diagnosis procedure to judge the normality.

>> Proceed to EC-445, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014679804

1.CHECK DTC PRIORITY

If DTC P059F displayed with DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500, P0607 or P159F first perform the trouble diagnosis for DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500, P0607 or P159F.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0116: Refer to EC-248, "DTC Description".
- DTC P0117: Refer to EC-250, "DTC Description".
- DTC P0118: Refer to EC-250, "DTC Description".
- DTC P0125: Refer to EC-257, "DTC Description".
- DTC P0196: Refer to EC-323, "DTC Description".
- DTC P0197: Refer to EC-327, "DTC Description".
- DTC P0198: Refer to EC-327, "DTC Description".
- DTC P0500: Refer to EC-416, "DTC Description".
- DTC P0607: Refer to EC-457, "DTC Description".
- DTC P159F: Refer to EC-489, "DTC Description".

NO >> GO TO 2.

2.CHECK ACTIVE GRILL SHUTTER

1. Turn ignition switch OFF.
2. Check if any foreign objects interferes with active grille shutter.
3. Check the installation condition of active grille shutter.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace the error-detected parts.

3.CHECK ACTIVE GRILLE SHUTTER POWER SUPPLY

1. Disconnect active grille shutter harness connector.
2. Check the voltage between active grille shutter harness connector and ground as follows.

+		–	Condition	Voltage (Approx.)
Active grille shutter				
Connector	Terminal			
E249	1	Ground	Ignition switch: ON	Battery voltage
			Ignition switch: OFF	0 V

Is the inspection result normal?

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

4.CHECK ACTIVE GRILLE SHUTTER POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between active grille shutter harness connector and IPDM E/R harness connector.

Active grille shutter		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E249	1	F35	78	Existed

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace the error-detected parts.

5.CHECK ACTIVE GRILLE SHUTTER GROUND CIRCUIT

1. Turn ignition switch OFF
2. Check the continuity between active grille shutter harness connector and ground.

Active grille shutter		—	Continuity
Connector	Terminal		
E249	4	Ground	Existed

3. 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 ACTIVE GRILLE SHUTTER INPUT SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and active grille shutter harness connector.

ECM		Active grille shutter		Continuity
Connector	Terminal	Connector	Terminal	
F52	86	E249	3	Existed

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace the error-detected parts.

7.CHECK ACTIVE GRILLE SHUTTER

Check active grille shutter. Refer to EC-446, "Component Inspection (Active Grille Shutter)".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace active grille shutter. Refer to EXT-35, "Removal and Installation".

Component Inspection (Active Grille Shutter)

INFOID:0000000014679805

1.CHECK ACTIVE GRILLE SHUTTER

With CONSULT

1. Start the engine.
2. Select “ACTIVE GRILLE SHUTTER” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
3. Touch “CALIBRTN”.
4. After the calibration completes, check the operation of active grille shutter as follows.

Condition	Active grille shutter
Select “CLOSE”	Close → Open
Select “OPEN”	Open → Close

Without CONSULT

1. Turn ignition switch OFF.
2. Operate shutter by hands to close position.
3. Check the operation of active grille shutter as follows.

Condition	Active grille shutter
Ignition switch: ON	Close → Open

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace active grille shutter. Refer to EXT-35, "Removal and Installation".

P0603, P062F ECM

DTC Description

INFOID:0000000014631366

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0603	ECM BACK UP/CIRCUIT [Internal Control Module Keep Alive Memory (KAM) Error]	ECM buck up system does not function properly.
P062F	CONTROL MODULE (Internal control module EEPROM error)	EEPROM (built-in microcomputer) system internal ECM does not function properly.

POSSIBLE CAUSE

DTC P0603
- Harness or connectors (ECM power supply circuit is open or shorted.)
- ECM

DTC P062F
ECM

FAIL-SAFE

Engine Control System (P0603)

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.

*: This mode may not be executed.

Engine Control System (P062F)
Not applicable

Hybrid Control System (P0603)
- Limiting output control*
- Limiting accelerator angle variation control*
- Idling stop is prohibited*

*: This control may not be executed.

Hybrid Control System (P062F)
Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P062F

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

2. Start engine and wait at least 10 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Repeat steps from 1 to 3 for 4 times.
5. Turn ignition switch ON.
6. Erase DTC.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
9. Start engine and wait for 10 seconds.
10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-449, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0603

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 10 seconds.
3. Turn ignition switch OFF and wait at least 5 minutes.
4. Turn ignition switch ON and wait at least 10 seconds.
5. Repeat steps 3 and 4 for 5 times.
6. Turn ignition switch ON.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-449, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631367

1. INSPECTION START

Check that the battery negative terminal is not disconnected during ignition switch ON.

Did the battery negative terminal disconnect?

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

2. ERASE DTC

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle at least 10 seconds.
3. Turn ignition switch OFF.
4. Repeat steps from 1 to 3 for 4 times.
5. Erase DTC.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
8. Start engine and let it idle for 10 seconds.
9. Check DTC.

Is the DTC P062F detected again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

3. CHECK ECM POWER SUPPLY AND GROUND CIRCUIT

Check ECM power supply and ground circuit. Refer to EC-184, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-448, "DTC Description".

Is the DTC P0603 or P062F detected again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0604 ECM

DTC Description

INFOID:0000000014631368

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0604	ECM [Internal control module random access memory (RAM) error]	Malfunction in the internal RAM of ECM.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Turn ignition switch ON (engine stopped) and wait least 20 minutes.
   CAUTION:
   Never start engine during this procedure.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-451, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631369

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.

2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-451, "DTC Description".

Is the DTC P0604 displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0605 ECM

DTC Description

INFOID:0000000014631370

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0605	ECM [Internal control module read only memory (ROM) error]	Malfunction in the internal ROM of ECM.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode*	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others*	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

*: This mode may not be executed.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

or

- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Turn ignition switch ON (engine stopped) and wait least 20 minutes.
   CAUTION:
   Never start engine during this procedure.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-454, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631371

1. INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-453, "DTC Description".

Is the DTC P0605 detected again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0606 ECM

DTC Description

INFOID:0000000014631372

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0606	CONTROL MODULE (Control module processor)	Malfunction in ECM processor.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode*	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others*	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

*: This mode may not be executed.

Hybrid Control System

- Motor driving

or

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

or

- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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

1. Turn ignition switch ON (engine stopped) and wait at least 10 seconds.
   CAUTION:
   Never start engine during this procedure.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-456, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Rev up the engine quickly to approximately 3,000 rpm under unloaded condition and completely release the accelerator pedal.
4. Let the engine idle and wait at least 10 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Turn ignition switch ON.
7. Check DTC.

Is DTC detected?

YES >> Proceed to EC-456, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631373

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure for 3 times. Refer to EC-455, "DTC Description".

Is the DTC P0606 displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0607 ECM

DTC Description

INFOID:0000000014631374

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 DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0607	ECM (Control module performance)	When detecting error during the initial diagnosis of CAN controller of ECM.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.

*: This mode may not be executed.

Hybrid Control System

- Deactivates electric throttle control actuator control*
- Limiting accelerator angle variation control*
- Idling stop is prohibited*

*: This control may not be executed.

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Turn ignition switch ON (engine stopped) and wait at least 10 seconds.
   CAUTION:
   Never start engine during this procedure.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-458, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631375

1. INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-457, "DTC Description".

Is the DTC P0607 detected again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P060A ECM

DTC Description

INFOID:0000000014631376

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P060A	CONTROL MODULE (Internal control module monitoring processor performance)	ECM internal monitoring processor is malfunctioning.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others*		ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

*: This mode may not be executed.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait at least 10 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Repeat steps from 1 to 3 for 5 times.

5. Turn ignition switch ON.
6. Check DTC.

Is DTC detected?

YES >> Proceed to EC-460, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631377

1. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-459, "DTC Description".

Is the DTC P060A displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P060B ECM

DTC Description

INFOID:0000000014631378

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P060B	CONTROL MODULE (Internal control module A/D processing performance)	ECM internal analog/digital conversion processing system is malfunctioning.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	(Computing part of ECM does not operate normally.) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON (engine stopped) and wait least 10 seconds.
   CAUTION:
   Never start engine during this procedure.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-461, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631379

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-461, "DTC Description".

Is the DTC P060B displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0611 ECM PROTECTION

DTC Description

INFOID:0000000014631380

This DTC is detected when the ECM protective function is activated due to an extreme temperature increase in ECM, resulting from severe conditions such as heavy load driving.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0611	FIC MODULE (Fuel injector control module performance)	ECM overheat protection control is activated.

POSSIBLE CAUSE

ECM overheating

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

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-463, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631381

1.INSPECTION START

1. Perform DTC P0605 confirmation procedure. Refer to EC-463, "DTC Description".
2. Check 1st trip DTC.

Is the 1st trip DTC P0605 detected?

YES >> Proceed to EC-463, "DTC Description".
NO >> Explain the customer about the activation of the protection function.

P062B ECM

DTC Description

INFOID:0000000014631382

This DTC is detected when the ECM-integrated injector driver unit has a malfunction.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P062B	ECM (Internal control module fuel injector control performance)	Injector driver unit is malfunctioning.

POSSIBLE CAUSE

- Harness or connectors (Fuel injector circuit is open or shorted.)
- Battery power supply
- ECM (Injector driver unit)

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode*	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

*: This mode may not be executed.

NOTE:

Fail-safe mode may not start depending on malfunction type of ECM.

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for 30 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-465, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631383

1.CHECK FUEL INJECTOR

Refer to EC-555, "Component Function Check".

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure again. Refer to EC-464, "DTC Description".

Is the 1st trip DTC P062B displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

DTC Description

INFOID:0000000014631384

ECM supplies a voltage of 5 V to some of the sensors systematically divided into 2 groups, respectively. Accordingly, when a short circuit develops in a sensor power source, a malfunction may occur simultaneously in the sensors belonging to the same group as the short-circuited sensor.

Sensor power supply 1

- Crankshaft position sensor 1
- Exhaust valve timing control position sensor
- Intake manifold runner control valve position sensor
- Throttle position sensor

NOTE:
If sensor power supply 1 circuit is malfunctioning, DTC P0643 is displayed.

Sensor power supply 2

- Mass air flow sensor
- Refrigerant pressure sensor
- Fuel rail pressure sensor
- Crankshaft position sensor 2
- Camshaft position sensor
- Engine oil pressure sensor

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P0643	SENSOR POWER/CIRC (Sensor reference voltage “A” circuit high)	ECM detects that the voltage of sensor power supply 1 is excessively low or high.

POSSIBLE CAUSE

- Harness or connectors
- Crankshaft position sensor 1 circuit is shorted.
- Exhaust valve timing control position sensor
- Throttle position sensor circuit is shorted.
- Intake manifold runner control valve position sensor circuit is shorted.
- Crankshaft position sensor 1
- Exhaust valve timing control position sensor
- Throttle position sensor (built-in electric throttle actuator)
- Intake manifold runner control valve position sensor

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for 1 second.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-467, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631385

1.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
F51	27	Crankshaft position sensor 1	F17	1
	30	Intake manifold runner control valve position sensor	F60	1
F52	73	Exhaust valve timing control position sensor	F43	1
	83	Throttle position sensor	F50	2

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor 1 (Refer to EC-348, "Component Inspection (CKP Sensor 1)")
- Intake manifold runner control valve position sensor (Refer to EC-498, "Component Inspection")
- Exhaust valve timing control position sensor (Refer to EC-357, "Component Inspection")
- Throttle position sensor (Refer to EC-525, "Component Inspection")

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

P1148 CLOSED LOOP CONTROL

DTC Description

INFOID:0000000014631389

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1148	CLOSED LOOP-B1 (Closed loop bank 1)	The closed loop control function does not operate even when vehicle is being driven in the specified condition.

POSSIBLE CAUSE

- Harness or connectors (A/F sensor 1 circuit is open or shorted.)
- A/F sensor 1
- A/F sensor 1 heater

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P1148 is displayed with another DTC for A/F sensor 1, perform the trouble diagnosis for the corresponding DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> INSPECTION END

P1197 OUT OF GAS

DTC Description

INFOID:0000000014631390

This diagnosis result is detected when the fuel level of the fuel tank is extremely low and the engine does not run normally.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1197	FUEL RUN OUT	• Fuel rail pressure remains at 1.1 MPa (11.2 kg/cm^2, 159.5 psi) or less for 5 seconds or more with the fuel level too low. • Fuel rail pressure remains 2.7 MPa (27.5 kg/cm^2, 391.5 psi) lower than a target fuel pressure for 5 seconds or more with the fuel level too low.

POSSIBLE CAUSE

- Fuel cut
- Harness or connectors
- Fuel pump circuit is open or shorted.
- High pressure fuel pump circuit is open or shorted.
- High pressure fuel pump relay circuit
- Fuel pump
- Fuel pressure regulator
- Fuel pump system
- High pressure fuel pump
- High pressure fuel pump system
- High pressure fuel pump relay
- Fuel rail pressure sensor
- Hose disconnection

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	Engine torque is limited.

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

Does engine start?

YES >> GO TO 3.
NO >> Proceed to EC-470, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Warm engine up to normal operating temperature.
   NOTE:
   For best results, warm up the engine until “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT 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 1 minute.
3. Check 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-470, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631391

1.REFUEL THE VEHICLE

1. Refuel 10 liter (8 Imp qt).
   CAUTION:
   Never refuel more than 10 liter (8 Imp qt).
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and keep the engine speed at 3,000 rpm for 30 seconds.
   NOTE:
   For best results, warm up the engine until “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT reaches at least 70°C (158°F).
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. Turn ignition switch ON.
8. Erase DTC.
9. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
10. Start engine and let it idle for at least 60 seconds.
11. Perform DTC Confirmation Procedure, again. Refer to EC-469, "DTC Description".

Is 1st trip DTC detected?

YES >> GO TO 2.
NO >> INSPECTION END

2.CHECK FUEL PUMP

Refer to EC-570, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK HIGH PRESSURE FUEL PUMP

Refer to EC-560, "Component Function Check".

Is the inspection result normal?

YES >> Check fuel hose connection.
NO >> Repair or replace malfunctioning part.

P119A, P119B FUEL RAIL PRESSURE SENSOR

DTC Description

INFOID:0000000014679830

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P119A	FUEL PRESSURE SENSOR (Fuel pressure sensor)	All of the following conditions are satisfied: • Battery voltage: 8 V or more • Under engine start condition • Engine coolant temperature at previous ignition switch OFF: 65°C (149°F) or more • Engine coolant temperature: 35°C (65°F) or less • Temperature difference between engine coolant and intake air: Less than 6°C (42°F) • Fuel rail pressure: Less than 1.0 MPa (10.2 kg/cm^2, 145 psi) (calculated by ECM) • Fuel system monitor: Excessively RICH
P119B	FUEL PRESSURE SENSOR (Fuel pressure sensor)	All of the following conditions are satisfied: • Battery voltage: 8 V or more • Ignition switch: ON (engine stopped) • Engine coolant temperature at previous ignition switch OFF: 65°C (149°F) or more • Engine coolant temperature: 35°C (65°F) or less • Temperature difference between engine coolant and intake air: Less than 6°C (42°F) • Fuel rail pressure: More than 1.5 MPa (15.3 kg/cm^2, 217 psi) (calculated by ECM) • Fuel system monitor: Excessively LEAN

POSSIBLE CAUSE

- Harness or connectors
  - The fuel rail pressure sensor circuit is open or shorted.
  - Sensor power supply 2 is shorted.
- Fuel rail pressure sensor

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System

Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-1

If DTC Confirmation Procedure is 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, check that battery voltage is 9 V or more with ignition switch ON.

>> GO TO 2.

2.PRECONDITIONING-2

NOTE:
- When it is certain that the previous driving is performed with the engine warmed up, the next steps can be performed.
- When it is difficult to satisfy the conditions, performing Component Function Check can identify the presence or absence of malfunction in the part/system that may result in a possible cause of this DTC. (Perform DTC Confirmation Procedure as much as possible.)

1. Start the engine and warm it up until engine coolant temperature reaches 70°C (158°F) or more.
2. Stop the engine and leave the vehicle in a cool place (soak 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 (9°F) or less.**
- **Never turn ignition switch ON during soak the engine.**

Are the conditions satisfied?

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

3.COMPONENT FUNCTION CHECK

With CONSULT
1. Turn ignition switch OFF.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT
1. Turn ignition switch OFF.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Check FRP sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Proceed to EC-473, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Turn ignition switch ON (engine stopped).
2. Select “COOLAN TEMP/S” and “INT/A TEMP SE” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Check that the indicated value of “COOLAN TEMP/S” is less than 35°C (95°F).
4. Check that the difference between “INT/A TEMP SE” and “COOLAN TEMP/S” is 5°C (41°F) or less.
5. Check “Self-diagnostic result” of “ENGINE”.

Is the DTC detected?

YES >> Proceed to EC-473, "Diagnosis Procedure".
NO-1 (Conditions satisfied)>>GO TO 5.
NO-2 (Conditions not satisfied)>>GO TO 2.

5.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start the engine (or cranking) at least 1 second.
3. Check “Self-diagnostic result” of “ENGINE”.

Is the DTC detected?

YES >> Proceed to EC-473, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679831

NOTE:
Turning the ignition switch ON with FRP sensor harness connector disconnected causes ECM to detect DTC P0190. Be sure to erase the DTC when the diagnosis procedure.

1.CHECK FUEL RAIL PRESSURE (FRP) SENSOR POWER SUPPLY-1

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.

FRP sensor			Voltage (Approx.)
Connector	+ terminal	–	
F56	1	3	5 V

Inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK FRP SENSOR POWER SUPPLY-2

Check the voltage between FRP sensor harness connector and the ground.

+ FRP sensor		–	Voltage (Approx.)
Connector	Terminal		
F56	1	Ground	5 V

Is inspection result normal?

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

3.CHECK FRP SENSOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	
F56	1	F51	29	Existed

4. Also check harness for short to power.

Is inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Perform EC-582, "Diagnosis Procedure".

Is inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

5.CHECK FRP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	
F56	3	F51	13	Existed

4. Also check harness for short to power.

Is inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace error-detected parts.

6.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace error-detected parts.

7.CHECK FRP SENSOR SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	
F56	2	F51	25	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 FRP SENSOR

Check the FRP sensor. Refer to EC-475, "Component Inspection".

Is inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:0000000014747023

1. CHECK FUEL RAIL PRESSURE (FRP) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check FRP sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace FRP sensor. Refer to EM-54, "Exploded View".

P119C FUEL RAIL PRESSURE SENSOR

DTC Description

INFOID:0000000014679835

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P119C	FUEL PRESSURE SENSOR (Fuel pressure sensor)	All of the following conditions are satisfied: • Battery voltage: 8 V or more • Engine speed: 600 rpm or more • Engine coolant temperature: With a background of 65°C (149°F) or more during the trip • Remaining fuel amount: 15% or more • Fuel cut: No • Fuel rail pressure between MAX and MIN differs less than 0.1 MPa (1.02 kg/cm^2, 14.5 psi)

POSSIBLE CAUSE

- Harness or connectors
- The fuel rail pressure sensor circuit is open or shorted.
- Sensor power supply 2 is shorted.
- Fuel rail pressure sensor

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System
Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P119C is displayed with DTC P0190, first perform the trouble diagnosis for DTC P0190.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-314, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING-1

If DTC Confirmation Procedure is 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, check that battery voltage is 9 V or more with ignition switch ON.**
- **Remaining fuel amount must be 15% or more.**

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and warm it up until the engine coolant temperature reaches 70°C (158°F) or more.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Drive the vehicle and accelerate 10 consecutive seconds or more with the engine speed 1,500 rpm or more.
4. Check “Self-diagnostic result” of “ENGINE”.

Is the DTC detected?

YES >> Proceed to EC-477, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679836

NOTE:
Turning the ignition switch ON with FRP sensor harness connector disconnected causes ECM to detect DTC P119C. Be sure to erase the DTC when the diagnosis procedure.

1.CHECK DTC PRIORITY

If DTC P119C is displayed with DTC P0190, first perform the trouble diagnosis for DTC P0190.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-314, "DTC Description".
NO >> GO TO 2.

2.CHECK FUEL RAIL PRESSURE (FRP) SENSOR POWER SUPPLY-1

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.

FRP sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F56	1	3	5 V

Inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3.CHECK FRP SENSOR POWER SUPPLY-2

Check the voltage between FRP sensor harness connector and the ground.

+		–	Voltage (Approx.)
FRP sensor			
Connector	Terminal		
F56	1	Ground	5 V

Is inspection result normal?

YES >> GO TO 6.
NO >> GO TO 4.

4.CHECK FRP SENSOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	
F56	1	F51	29	Existed

4. Also check harness for short to power.

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Perform EC-582, "Diagnosis Procedure".

Is inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

6.CHECK FRP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	
F56	3	F51	13	Existed

4. Also check harness for short to power.

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace error-detected parts.

8.CHECK FRP SENSOR SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	
F56	2	F51	25	Existed

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

Is inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace error-detected parts.

9. CHECK FRP SENSOR

Check the FRP sensor. Refer to EC-479, "Component Inspection".

Is inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace error-detected parts.

Component Inspection

INFOID:0000000014747024

1. CHECK FUEL RAIL PRESSURE (FRP) SENSOR

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication under the following condition.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: Idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and warm it up to normal operating temperature.
5. Check FRP sensor signal voltage.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	25	13	[Engine is running] • Engine warm-up condition • Engine speed: Idle	0.82 – 1.14 V
			[Engine is running] • Engine warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 2.9 V

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace FRP sensor. Refer to EM-54, "Exploded View".

P1217 ENGINE OVER TEMPERATURE

DTC Description

INFOID:0000000014631392

NOTE:
ECM controls cooling fan to the maximum speed when receives the signal abnormality of each sensor, CAN and IPDM E/R, and severed wire short circuit abnormality.
If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1217	ENG OVER TEMP (Engine over temperature)	Engine coolant temperature reaches an abnormally high temperature.

CAUTION:
When a malfunction is indicated, be sure to exchange the coolant and engine oil.
1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio.**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

POSSIBLE CAUSE

- Harness or connectors (Cooling fan circuit is open or shorted.)
- IPDM E/R
- Cooling fan motor
- Cooling fan
- Radiator hose
- Radiator
- Radiator cap
- Engine cooling electric water pump relay
- Engine cooling electric water pump
- Thermostat
- Water control valve
- Amount of engine coolant
- Engine outlet cooling temperature sensor

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Others	Engine speed will not rise more than 1,800 rpm due to the fuel cut.

Hybrid Control System
- Limiting engine speed
- Limiting accelerator angle variation control
- Idling stop is prohibited

PERFORM DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P1217 is displayed with DTC UXXXX or P0607, first perform the trouble diagnosis for DTC UXXXX or P0607.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0607: Refer to EC-457, "DTC Description".

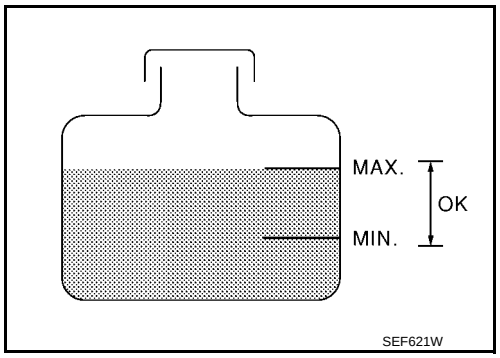
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-1

WARNING:
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.
Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.
Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.
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 coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Proceed to EC-481, "Diagnosis Procedure".
NO >> GO TO 3.



3. PERFORM COMPONENT FUNCTION CHECK-2

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Proceed to EC-481, "Diagnosis Procedure".
NO >> GO TO 4.

4. PERFORM COMPONENT FUNCTION CHECK-3

With CONSULT
1. Turn ignition switch ON.
2. Select “COOLING FAN (PWM)” in “ACTIVE TEST” mode of “IPDM E/R” using CONSULT. Refer to EC-78, "CONSULT Function".
3. Check that cooling fan speed varies according to the percentage.

Is the inspection result normal?

YES-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
YES-2 >> Confirmation after repair: INSPECTION END
NO >> Proceed to EC-481, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631393

1. CHECK DTC PRIORITY

If DTC P1217 is displayed with DTC UXXXX or P0607, first perform the trouble diagnosis for DTC UXXXX or P0607.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0607: Refer to EC-457, "DTC Description".

NO >> GO TO 2.

2. CHECK COOLING FAN OPERATION

With CONSULT
1. Turn ignition switch ON.
2. Select “COOLING FAN (PWM)” in “ACTIVE TEST” mode of “IPDM E/R” using CONSULT. Refer to EC-78, "CONSULT Function".
3. Check that cooling fan speed varies according to the percentage.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Proceed to EC-551, "Diagnosis Procedure".

3. CHECK COOLING SYSTEM FOR LEAK-1

Refer to CO-10, "Inspection".

Is leakage detected?

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

4. CHECK COOLING SYSTEM FOR LEAK-2

Check the following for leak.
- Hose
- Radiator
- Water pump

>> Repair or replace malfunctioning part.

5. CHECK RADIATOR CAP

Refer to CO-13, "RADIATOR CAP : Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace radiator cap. Refer to CO-15, "Exploded View".

6. CHECK THERMOSTAT

Refer to CO-25, "Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace thermostat. Refer to CO-24, "Removal and Installation".

7. CHECK WATER CONTROL VALVE

Refer to CO-28, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace water control valve. Refer to CO-27, "Removal and Installation".

8. CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

Refer to EC-252, "Component Inspection (Engine Outlet Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

9. OVERHEATING CAUSE ANALYSIS

If the cause cannot be isolated, check the CO-8, "Troubleshooting Chart".

>> INSPECTION END

P1225 TP SENSOR

DTC Description

INFOID:0000000014631394

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1225	CTP LEARNING-B1 (Closed throttle position learning bank 1)	Closed throttle position learning value is excessively low.

POSSIBLE CAUSE

Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Proceed to EC-483, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

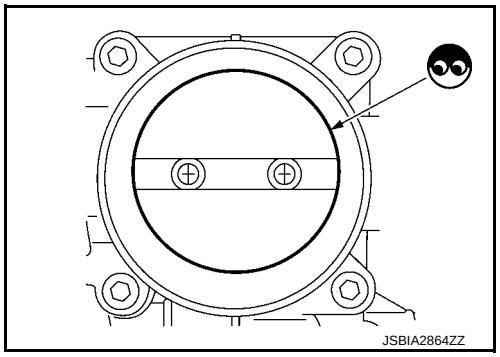
INFOID:0000000014631395

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the air duct. Refer to EM-29, "Exploded View".
3. Check if foreign matter is caught between the throttle valve and the housing

Is the inspection result normal?

YES >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".



P1226 TP SENSOR

DTC Description

INFOID:0000000014631396

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1226	CTP LEARNING-B1 (Closed throttle position learning bank 1)	Closed throttle position learning is not performed successfully, repeatedly.

POSSIBLE CAUSE

Electric throttle control actuator (TP sensor 1 and 2)

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-484, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

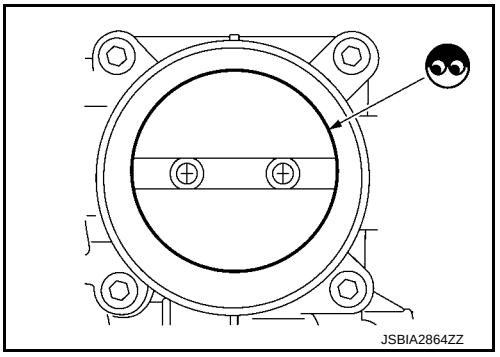
INFOID:0000000014631397

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the air duct. Refer to EM-32, "Exploded View".
3. Check if foreign matter is caught between the throttle valve and the housing

Is the inspection result normal?

YES >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".



P1423, P1424 COLD START CONTROL

DTC Description

INFOID:0000000014679854

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.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
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.
P1424	COLD START CONTROL (Cold start emission reduction strategy monitoring)	ECM does not control fuel injection quantity properly when engine is started with the engine cold.

POSSIBLE CAUSE

ECM

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P1423 or P1424 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check 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.

5. Start engine and let it idle for 5 minutes.
6. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-486, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679855

1.CHECK DTC PRIORITY

If DTC P1423 or P1424 is displayed with other DTC, first perform the trouble diagnosis for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-485, "DTC Description".
4. Check 1st trip DTC.

Is the 1st trip DTC P1423 or P1424 displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P1425 COLD START CONTROL

DTC Description

INFOID:0000000014679857

ECM & HCM control the engine torque properly when engine is started with prewarming up condition.
This control reduces the exhaust gas volume by fixing the engine torque to the low torque.
In this way this control reduces the engine out emission.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1425	COLD START CONTROL (EGVR functional monitor)	ECM & HCM does not fix the engine torque to the low torque when engine is started with prewarming up condition.

POSSIBLE CAUSE

- ECM
- HPCM

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P1425 is displayed with other DTC, first perform the trouble diagnosis for other DTC, according to the following priority.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
1. DTC of ECM
2. DTC of HPCM
3. DTC of Li-ion battery controller
4. DTC of TCM
5. DTC of Traction motor inverter

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Set selector lever to P position.
3. Turn ignition switch ON.
4. Make sure that air conditioner switch and electric load switches (lights, heater fan, rear window defogger) are OFF.
5. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
6. Check that the “COOLAN TEMP/S” indication is between 10°C (50°F) and 36°C (97°F).
   If “COOLAN TEMP/S” indication is within the specified value, go to the following step.
   If “COOLAN TEMP/S” indication is out of the specified value, cool engine down or warm engine up and go to step 1.
7. Select “DATA MONITOR” mode of “EV/HEV” using CONSULT.
8. Check that the “HV BATTERY TEMP” indication is 10°C (50°F) or more.

9. Confirm that the “SOC” indication in “DATA MONITOR” mode of “EV/HEV” using CONSULT is between 35 and 70%
10. Turn ignition switch ON and wait for 35 seconds.
11. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-488, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679858

1.CHECK DTC PRIORITY

If DTC P1425 is displayed with other DTC, first perform the trouble diagnosis for other DTC, according to the following priority.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
1. DTC of ECM
2. DTC of HPCM
3. DTC of Li-ion battery controller
4. DTC of TCM
5. DTC of Traction motor inverter

NO >> GO TO 2.

2.INSPECTION START

With CONSULT
1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode of “ENGINE” using CONSULT.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE. Refer to EC-487, "DTC Description".

With GST
1. Turn ignition switch ON.
2. Select Service $04 with GST.
3. Perform DTC CONFIRMATION PROCEDURE. Refer to EC-487, "DTC Description".

Is the 1st trip DTC P1425 displayed again?

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

3.REPLACE ECM

Replace ECM. Refer to EC-595, "Removal and Installation".

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT
1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode of “ENGINE” using CONSULT.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE. Refer to EC-487, "DTC Description".

With GST
1. Turn ignition switch ON.
2. Select Service $04 with GST.
3. Perform DTC CONFIRMATION PROCEDURE. Refer to EC-487, "DTC Description".

Is the 1st trip DTC P1425 displayed again?

YES >> Replace HPCM. Refer to HBC-335, "Removal and Installation".
NO >> INSPECTION END

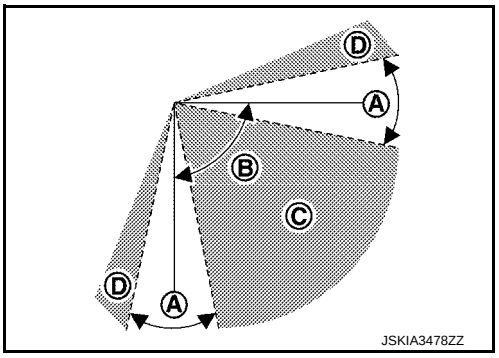
P159F ACTIVE GRILLE SHUTTER

DTC Description

INFOID:0000000014679810

DTC DETECTION LOGIC

Active grille shutter normally stops within zone Ⓐ which is defined by zone Ⓑ (90°±20°).
If the active grille shutter stops within zone Ⓒ stuck error is detected, and if the active grille shutter stops at position beyond zone Ⓓ over-run error is detected.



DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P159F	ACTIVE GRILLE AIR SHUTTER A (Active grille air shutter A)	Detects the malfunction of initial position learning or operational malfunctions for specified times.

POSSIBLE CAUSE

- Foreign objects interferes with active grille shutter

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P059F displayed with DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500 or P0607, first perform the trouble diagnosis for DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500 or P0607.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0116: Refer to EC-248, "DTC Description".
- DTC P0117, P0118: Refer to EC-250, "DTC Description".
- DTC P0125: Refer to EC-257, "DTC Description".
- DTC P0196: Refer to EC-323, "DTC Description".
- DTC P0197, P0198: Refer to EC-327, "DTC Description".
- DTC P0500: Refer to EC-416, "DTC Description".
- DTC P0607: Refer to EC-459, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If another DTC Confirmation Procedure is conducted just before this procedure, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11V and 16V with ignition switch ON.

With CONSULT >>GO TO 3.
Without CONSULT>>GO TO 4.

3.DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch OFF and wait 10 seconds or more.
2. Turn ignition switch ON.
3. Select “ACTIVE GRILLE SHUTTER” in “ACTIVE TEST”of “ENGINE” using CONSULT.
4. Touch “CALIBRTN”at least 30 seconds.
5. Check 1st trip DTC.

Is 1st trip DTC is detected?

YES >> Proceed to EC-490, "Diagnosis Procedure".
NO >> INSPECTION END

4.DTC CONFIRMATION PROCEDURE

1. Drive the vehicle at 30 km/h (19 MPH) or more for at least 30 seconds.
2. Check DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-490, "Diagnosis Procedure"
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679811

1.CHECK DTC PRIORITY

If DTC P059F displayed with DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500 or P0607, first perform the trouble diagnosis for DTC UXXXX, P0116, P0117, P0118, P0125, P0196, P0197, P0198, P0500 or P0607.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC UXXXX: Refer to EC-109, "DTC Index".
- DTC P0116: Refer to EC-248, "DTC Description".
- DTC P0117, P0118: Refer to EC-250, "DTC Description".
- DTC P0125: Refer to EC-257, "DTC Description".
- DTC P0196: Refer to EC-323, "DTC Description".
- DTC P0197, P0198: Refer to EC-327, "DTC Description".
- DTC P0500: Refer to EC-416, "DTC Description".
- DTC P0607: Refer to EC-459, "DTC Description".

NO >> GO TO 2.

2.CHECK ACTIVE GRILL SHUTTER

1. Turn ignition switch OFF.
2. Check if any foreign objects interferes with active grille shutter.
3. Check the installation condition of active grille shutter.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace the error-detected parts.

P161B ENGINE COOLING ELECTRIC WATER PUMP

DTC Description

INFOID:0000000014631398

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P161B	ENG COOLANT ELEC WATER PUMP (Engine coolant electric water pump)	When all of the following conditions are satisfied and engine cooling electric water pump speed is excessively high. • 12V battery voltage: 11 V or more

POSSIBLE CAUSE

Engine cooling electric water pump

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Device fix mode		ECM controls engine cooling electric water pump to achieve its maximum driving force. **NOTE:** Engine cooling electric water pump may not be activated.

*: This mode is executed when engine outlet water temperature, engine inlet water temperature, or CVT fluid temperature rises.

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait at least 10 seconds.
   CAUTION:
   To prevent the engine from overheating, never run the engine for 10 seconds or more.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Check DTC.

Is DTC detected?

YES >> Proceed to EC-492, "Diagnosis Procedure".

NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631399

1. REPLACE ENGINE COOLING ELECTRIC WATER PUMP

Replace engine cooling electric water pump. Refer to CO-21, "Removal and Installation".

>> INSPECTION END

P1805 BRAKE SWITCH

DTC Description

INFOID:0000000014631402

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P1805	BRAKE SW/CIRCUIT (Brake switch circuit)	A stop lamp switch signal is not sent to ECM for extremely long time while the vehicle is driving.

POSSIBLE CAUSE

- Harness or connectors (Stop lamp switch circuit is open or shorted.)
- Stop lamp switch

FAIL-SAFE

Engine Control System

ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.

Vehicle condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

Hybrid Control System

Not applicable

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-493, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631403

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Depress the brake pedal and check the stop lamp when releasing.

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

1. Disconnect stop lamp switch harness connector.
2. Check the voltage between stop lamp switch harness connector and ground.

+		–	Voltage
Stop lamp switch			
Connector	Terminal		
E38	1	Ground	Battery voltage

Is the inspection result normal?

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

3.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect fuse block (J/B) harness connector.
2. Check the continuity between stop lamp switch harness connector and fuse block (J/B) harness connector.

Stop lamp switch		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
E38	1	E28	5M	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> INSPECTION END

4.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT

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.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E38	2	E16	139	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK STOP LAMP SWITCH

Refer to EC-494, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-57, "Exploded View".

Component Inspection (Stop Lamp Switch)

INFOID:0000000014631404

1.CHECK STOP LAMP SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals as per the following conditions.

Stop lamp switch		Condition		Continuity
+	–			
Terminal				
1	2	Brake pedal	Fully released	Not existed
			Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-2

1. Adjust stop lamp switch installation. Refer to BR-49, "Adjustment".
2. Check the continuity between stop lamp switch terminals as per the following conditions.

Stop lamp switch		Condition		Continuity
+	–			
Terminal				
1	2	Brake pedal	Fully released	Not existed
			Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-57, "Exploded View".

P2004 INTAKE MANIFOLD RUNNER CONTROL VALVE

DTC Description

INFOID:0000000014631405

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2004	TUMBLE CONT/V (Intake manifold runner control stuck open bank 1)	The target angle of intake manifold runner control valve controlled by ECM and the input signal from intake manifold runner control valve position sensor is not in the normal range.

POSSIBLE CAUSE

- Harness or connectors (Intake manifold runner control valve motor circuit is open or shorted.)
- Intake manifold runner control valve
- Intake manifold runner control valve is stuck

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Device fix mode		• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Combustion control mode	Stratified charge combustion control at starting	No stratified charge combustion at starting (cold start).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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 −12°C (10°F)**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode of “CONSULT” using CONSULT.

3. Make sure that “COOLANT TEMP/S” indicates between −12°C (10°F) to 47°C (116°F).
   If not, cool engine down or warm engine up until “COOLANT TEMP/S” indicates between −12°C (10°F) to 47°C (116°F). Then go to the following steps.
4. Fully release accelerator pedal and wait at least 10 seconds.
5. Depress accelerator pedal and wait at least 10 seconds.
6. Check 1st trip DTC.

With GST

Following the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-497, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631406

1. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECM harness connector and ground

+		−	Voltage
ECM			
Connector	Terminal		
F51	53	Ground	Battery voltage

Is the inspection result normal?

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

2. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector terminal and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F51	53	E119	8	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3. CHECK ECM GROUND

1. Turn ignition switch OFF.
2. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace ground circuit.

4. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE MOTOR OUTPUT SIGNAL CIRCUIT

1. Disconnect intake manifold runner control valve motor harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between intake manifold runner control valve motor harness connector and ECM harness connector.

Intake manifold runner control valve motor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F19	1	F51	54	Not existed
			55	Existed
	2		54	Existed
			55	Not existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE

Refer to EC-498, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace intake manifold. Refer to EM-32, "Removal and Installation".

Component Inspection

INFOID:0000000014631407

1. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Remove intake manifold. Refer to EM-32, "Removal and Installation".
3. Check if foreign matter is caught between the throttle valve and the housing.
4. Connect intake manifold runner control valve motor harness connector.
5. Turn ignition switch ON.
6. Select “INTAKE MANIFOLD RUNNER CONTROL VALVE (OPEN/CLOSE)” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
7. Touch “OPERATE”, or “CONTINUE” to check the intake manifold runner control valve.

Without CONSULT

1. Turn ignition switch OFF.

2. Remove intake manifold. Refer to EM-32, "Removal and Installation".
3. Check if foreign matter is caught or there is any breakage between the intake manifold runner control valve.
4. Apply battery voltage to the intake manifold runner control valve motor terminals as follows within 2 seconds and check a movement.

Intake manifold runner control valve motor		Movement
Terminal		
+	–	
1	2	Close
2	1	Open

CAUTION:
Never apply battery voltage continuously more than 30 seconds. It may damage the intake manifold runner control valve motor.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace intake manifold. Refer to EM-32, "Removal and Installation".

P2014, P2016, P2017, P2018 INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR

DTC Description

INFOID:0000000014631411

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2014	IN/MANIFOLD RUNNER POS SEN B1 (Intake manifold runner position sensor/ switch circuit bank 1)	An excessively low voltage from the sensor is sent to ECM.
P2016	IN/MANIFOLD RUNNER POS SEN B1 (Intake manifold runner position sensor/ switch circuit low bank 1)	
P2017	IN/MANIFOLD RUNNER POS SEN B1 (Intake manifold runner position sensor/ switch circuit high bank 1)	An excessively high voltage from the sensor is sent to ECM.
P2018	IN/MANIFOLD RUNNER POS SEN B1 (Intake manifold runner position sensor/ switch circuit intermittent bank 1)	

POSSIBLE CAUSE

- Harness or connectors (Intake manifold runner control position sensor circuit is shorted.)
- Intake manifold runner control position sensor

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P2014, P2016, P2017 or P2018 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".

2. Start engine and let it idle for 10 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-501, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631412

1.CHECK DTC PRIORITY

If DTC P2014, P2016, P2017 or P2018 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect intake valve manifold runner control valve position sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between intake valve manifold runner control valve position sensor harness connector.

Intake manifold runner control valve position sensor			Voltage (Approx.)
Connector	+	-	
	Terminal		
F60	1	3	5 V

Is the inspection result normal?

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

3.CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR POWER SUPPLY CIRCUIT

Check the voltage between intake valve manifold runner control valve position sensor harness connector and ground.

+		-	Voltage (Approx.)
Intake manifold runner control valve position sensor			
Connector	Terminal		
F60	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform the trouble diagnosis for power supply circuit.

4.CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

4. Also check harness for short to power.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

5. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between intake manifold runner control valve position sensor harness connector and ECM harness connector.

Intake manifold runner control valve position sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F60	3	F51	43	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace error-detected parts.

6. CHECK INTAKE MANIFOLD RUNNER CONTROL VALVE POSITION SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between intake manifold runner control valve position sensor harness connector and ECM harness connector.

Intake manifold runner control valve position sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F60	2	F51	39	Existed

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

Is the inspection result normal?

YES >> Replace intake manifold. Refer to EM-32, "Removal and Installation".
NO >> Repair or replace error-detected parts.

P2080 EXHAUST GAS TEMPERATURE SENSOR

DTC Description

INFOID:0000000014631413

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2080	EXHAUST GAS TEMP SENSOR 1 B1 (Exhaust gas temperature sensor 1 circuit range/performance)	ECM detects the following status continuously for 20 seconds or more: • The difference between estimated exhaust gas temperature calculated by ECM and temperature sent from exhaust gas temperature sensor is approx. 100°C (212°F) or more. • The difference between exhaust gas temperature sent from exhaust gas temperature calculated by ECM is approx. 100°C (212°F) or more.

POSSIBLE CAUSE

- Exhaust gas leaks
- Exhaust gas temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

- DTC P2080 is displayed with DTCs related to following items, first perform the trouble diagnosis of DTCs.
  - Crankshaft position sensor
  - Misfire
  - Fuel system
  - A/F sensor 1
  - A/F sensor 1 heater
  - Mass air flow sensor
  - Engine coolant temperature sensor
  - Intake air temperature sensor
  - Vehicle speed sensor
- DTC P2080 is displayed with DTC P0544, P0545, P0546 or P2081, first perform the trouble diagnosis for DTC P0544, P0545, P0546 or P2081.

Is applicable DTC detected?

YES >> Perform applicable DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TEST CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
5. Maintain the following conditions for at least 20 consecutive seconds.

   CAUTION:

   Always drive vehicle at a safe speed.

   NOTE:

   Keep the accelerator pedal as steady as possible during cruising.

Items	Conditions
COOLANT TEMP/S	More than 65°C (149°F)
INT/A TEMP SE	• More than 0°C (32°F) • Less than 50°C (122°F)
VHCL SPEED SE	90 – 100 km/h (56 – 62 MPH)

6. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-504, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631414

1.CHECK DTC PRIORITY

- DTC P2080 is displayed with DTCs related to following items, first perform the trouble diagnosis of DTCs.
- Crankshaft position sensor
- Misfire
- Fuel system
- A/F sensor 1
- A/F sensor 1 heater
- Mass air flow sensor
- Engine coolant temperature sensor
- Intake air temperature sensor
- Vehicle speed sensor
- DTC P2080 is displayed with DTC P0544, P0545, P0546 or P2081, first perform the trouble diagnosis for DTC P0544, P0545, P0546 or P2081.

Is applicable DTC detected?

YES >> Perform applicable DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.CHECK FOR EXHAUST GAS LEAKS

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start the engine and let it idle.
3. Listen for an exhaust gas leak upstream the three way catalyst.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK EXHAUST GAS TEMPERATURE SENSOR

With CONSULT

1. Warm engine up to normal operating temperature.
2. Select “EXHAUST GAS TEMP SEN 1 B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Check that “EXHAUST GAS TEMP SEN 1 B1” indication as follows.

Monitor item	Condition	Value
EXHAUST GAS TEMP SEN 1 B1	• Warm-up condition • Idle speed	1.05 – 4.00 V

Without CONSULT

1. Warm engine up to normal operating temperature.
2. Check that voltage between ECM harness connector terminals as follows.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	19	45	• Warm-up condition • Idle speed	1.05 – 4.00 V

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace exhaust gas temperature sensor. Refer to EM-37, "Exploded View".

P2081 EXHAUST GAS TEMPERATURE SENSOR

DTC Description

INFOID:0000000014711797

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2081	EXHAUST GAS TEMP SENSOR 1 B1 (Exhaust gas temperature sensor 1 circuit intermittent)	ECM detects that a voltage signal from exhaust gas temperature sensor is 4.84 V or more for 5 consecutive seconds.

POSSIBLE CAUSE

- Harness or connectors (Exhaust gas temperature sensor circuit is open.)
- Exhaust gas temperature sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TEST CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PRECONDITIONING-2

With CONSULT
1. Turn ignition switch ON.
2. Select “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Check the following conditions:

COOLANT TEMP/S	More than –30°C (–22°F)

With GST
Follow the procedure “With CONSULT” above.

Is the condition satisfied?

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

3.PRECONDITIONING-3

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine until the following condition is satisfied.

COOLANT TEMP/S	More than –30°C (–22°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.

With GST

Follow the procedure “With CONSULT” above.

>> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Shift the selector lever to P position.
2. Start engine and let it idle for at least 20 seconds.
3. Depress the accelerator pedal for 5 seconds or more.
   NOTE:
   Do not release the accelerator pedal during DTC confirmation procedure.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-507, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014711798

1. CHECK EXHAUST GAS TEMPERATURE SENSOR

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Select “EXHAUST GAS TEMP SEN 1 B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check that “EXHAUST GAS TEMP SEN 1 B1” indication as follows.

Monitor item	Condition	Value
EXHAUST GAS TEMP SEN 1 B1	• Warm-up condition • Engine speed: Idle	1.05 – 4.00 V

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Check that voltage between ECM harness connector terminals as follows.

ECM			Condition	Voltage
Connector	+	–		
	Terminal			
F51	19	45	• Warm-up condition • Engine speed: Idle	1.05 – 4.00 V

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace exhaust gas temperature sensor. Refer to EM-37, "Exploded View".

2. CHECK EXHAUST GAS TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect exhaust gas temperature sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between exhaust gas temperature sensor harness connector and ground.

+		–	Voltage (Approx.)
Exhaust gas temperature sensor			
Connector	Terminal		
F67	1	Ground	5 V

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 4.

3.CHECK EXHAUST GAS TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between exhaust gas temperature sensor harness connector and ECM harness connector.

Exhaust gas temperature sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F67	2	F51	45	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

4.CHECK EXHAUST GAS TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between exhaust gas temperature sensor harness connector and ECM harness connector.

Exhaust gas temperature sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F67	1	F51	19	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

P2096, P2097 A/F SENSOR 1

DTC Description

INFOID:0000000014631415

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2096	POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too lean bank 1)	The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period.
P2097	POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too rich bank 1)	The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period.

POSSIBLE CAUSE

- A/F sensor 1
- A/F sensor 1 heater
- Heated oxygen sensor 2
- Fuel pressure
- Fuel injector
- Intake air leaks
- Exhaust gas leaks

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
5. Let engine idle for 1 minute.
6. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-509, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631416

1.CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
3. Check harness connector for water.

Water should not exit.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2. RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to EM-37, "Exploded View" (A/F sensor 1), EX-7, "Exploded View" (heated oxygen sensor 2).

>> GO TO 3.

3. CHECK FOR EXHAUST GAS LEAK

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and run it at idle.
3. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas leak detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 4.

4. CHECK FOR INTAKE AIR LEAK

1. Stop engine.
2. Reconnect A/F sensor 1 harness connector.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine and run it at idle.
5. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 5.

5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-299, "DTC Description" or EC-304, "DTC Description".
NO >> GO TO 6.

6. CHECK A/F SENSOR 1 POWER SUPPLY

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

+		–	Voltage
A/F sensor 1			
Connector	Terminal		
F18	4	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between A/F sensor 1 harness connector and IPDM E/R harness connector.

A/F sensor 1		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F18	4	F35	75	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

8. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F18	1	F52	79	Existed
	2		74	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1		—	Continuity
Connector	Terminal		
F18	1	Ground	Not existed
	2		

ECM		—	Continuity
Connector	Terminal		
F52	74	Ground	Not existed
	79		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace malfunctioning part.

9. CHECK A/F SENSOR 1 HEATER

Refer to EC-207, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 11.

10. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-276, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace heated oxygen sensor 2. Refer to EX-7, "Exploded View".

11. REPLACE A/F SENSOR 1

Refer to EM-37, "Exploded View".

Do you have CONSULT?

YES >> GO TO 12.
NO >> GO TO 13.

12. CONFIRM A/F ADJUSTMENT DATA

With CONSULT

1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Make sure that “0.000” is displayed on CONSULT screen.

Is “0.000” displayed?

YES >> INSPECTION END
NO >> GO TO 13.

13. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-158, "Description".

Do you have CONSULT?

YES >> GO TO 14.
NO >> INSPECTION END

14. CONFIRM A/F ADJUSTMENT DATA

With CONSULT

1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Make sure that “0.000” is displayed on CONSULT screen.

>> INSPECTION END

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Description

INFOID:0000000014631417

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2100	ETC MOT PWR-B1 (Throttle actuator “A” control motor circuit/ open)	ECM detects a voltage of power source for throttle control motor is excessively low.
P2103	ETC MOT PWR-B1 (Throttle actuator “A” control motor circuit high)	ECM detect the throttle control motor relay is stuck ON.

POSSIBLE CAUSE

- Harness or connectors (Throttle control motor relay circuit is open.)
- Throttle control motor relay

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

Witch DTC is detected?

P2100 >> GO TO 2.
P2103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE-DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle for 5 seconds.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-514, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE-DTC P2103

1. Turn ignition switch ON and wait at least 1 second.

2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-514, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631418

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals.

+		–		Voltage
ECM				
Connector	Terminal	Connector	Terminal	
F52	118	E16	152	Battery voltage

Is the inspection result normal?

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

2.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.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	118	F35	72	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL

Check the voltage between ECM harness connector terminals.

+		–		Condition		Voltage (Approx.)
ECM						
Connector	Terminal	Connector	Terminal			
F52	118	E16	152	Ignition switch	OFF	0 V
					ON	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	97	F35	67	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for throttle control motor relay power supply circuit.
NO >> Repair or replace malfunctioning part.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

DTC Description

INFOID:0000000014631419

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2101	ETC FNCTN/CIRC-B1 (Throttle actuator “A” control motor circuit range/performance)	Electric throttle control function does not operate properly.

POSSIBLE CAUSE

- Harness or connectors
- Throttle control motor circuit is open or shorted.
- Throttle control motor relay circuit is open or shorted.
- Electric throttle control actuator

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P2101 is displayed with DTC P2100 or P2119, first perform the trouble diagnosis for DTC P2100 or P2119.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P2100: Refer to EC-513, "DTC Description".
- DTC P2119: Refer to EC-521, "DTC Description".

NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle for 5 seconds.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-517, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631420

1.CHECK DTC PRIORITY

If DTC P2101 is displayed with DTC P2100 or P2119, first perform the trouble diagnosis for DTC P2100 or P2119.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable.
- DTC P2100: Refer to EC-513, "DTC Description".
- DTC P2119: Refer to EC-521, "DTC Description".

NO >> GO TO 2.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL

Check the voltage between ECM harness connector terminals as per the following conditions.

+		–		Condition		Voltage (Approx.)
ECM						
Connector	Terminal	Connector	Terminal			
F52	118	E16	152	Ignition switch	OFF	0 V
					ON	Battery voltage

Is the inspection result normal?

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

3.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	97	F35	67	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	118	F35	72	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

5.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	5	F52	119	Not existed
			120	Existed
	6		119	Existed
			120	Not existed

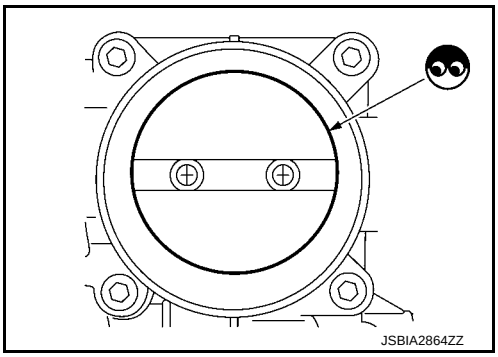
5. Also check harness for short to ground and short to power.

Is the inspection result normal?

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

6.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the air duct. Refer to EM-29, "Exploded View".
2. Check if foreign matter is caught between the throttle valve and the housing.



Is the inspection result normal?

YES >> GO TO 7.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform Throttle Valve Closed Position Learning. Refer to EC-155, "Work Procedure".

7.CHECK THROTTLE CONTROL MOTOR

Refer to EC-518, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

Component Inspection

INFOID:0000000014631421

1.CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Check the resistance between electric throttle control actuator terminals as per the following.

Electric throttle control actuator		Condition		Resistance
Terminal				
5	6	Temperature	25°C (77°F)	1 – 15 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

P2118 THROTTLE CONTROL MOTOR

DTC Description

INFOID:0000000014631422

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2118	ETC MOT-B1 (Throttle actuator control motor current range/performance)	ECM detects short in throttle control motor signal circuit.

POSSIBLE CAUSE

- Harness or connectors (Throttle control motor circuit is shorted.)
- Electric throttle control actuator (Throttle control motor)

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle for 5 seconds.
4. Check DTC.

Is DTC detected?

YES >> Proceed to EC-519, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631423

1.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT

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

+		–		Continuity
Electric throttle control actuator		ECM		
Connector	Terminal	Connector	Terminal	
F50	5	F52	119	Not existed
			120	Existed
	6		119	Existed
			120	Not existed

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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK THROTTLE CONTROL MOTOR

Refer to EC-520, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

Component Inspection

INFOID:0000000014631424

1.CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Check the resistance between electric throttle control actuator terminals as per the following.

Electric throttle control actuator		Condition		Resistance
Terminal				
5	6	Temperature	25°C (77°F)	1 – 15 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Description

INFOID:0000000014631425

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition	
P2119	ETC ACTR-B1 (Throttle actuator control throttle body range/performance)	A	Electric throttle control actuator does not function properly due to the return spring malfunction.
		B	Throttle valve opening angle in fail-safe mode is not in specified range.
		C	ECM detects the throttle valve is stuck open.

POSSIBLE CAUSE

Electric throttle control actuator

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Others		ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

or

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System
- Motor driving

or
- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

or
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift the 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 the selector lever to D position and wait at least 3 seconds.
7. Shift the selector lever to P position.
8. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Proceed to EC-522, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Shift the selector lever to D position and wait at least 3 seconds.
3. Shift the selector lever to P position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Proceed to EC-522, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

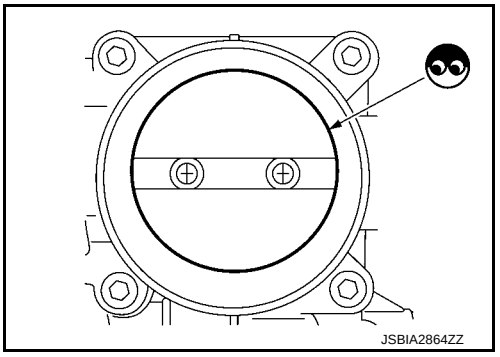
INFOID:0000000014631426

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the air duct. Refer to EM-29, "Exploded View".
3. Check if foreign matter is caught between the throttle valve and the housing

Is the inspection result normal?

YES >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform Throttle Valve Closed Position Learning. Refer to EC-155, "Work Procedure".


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P2135 TP SENSOR

DTC Description

INFOID:0000000014631427

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2135	TP SENSOR-B1 (Throttle/pedal position sensor/switch “A”/ “B” voltage correlation)	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.

POSSIBLE CAUSE

- Harness or connector (TP sensor 1 or 2 circuit is open or shorted.)
- Electric throttle control actuator (TP sensor 1 or 2)

FAIL-SAFE

Engine Control System

Fail safe mode	Vehicle behavior
Device fix mode	• This mode fixes the IVT control solenoid valve and the EVT control solenoid valve in the reference position. • The intake manifold runner control valve motor is turned OFF (intake manifold runner control valve opens).
Others	• The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. • The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor. **NOTE:** If throttle position sensor 1 and 2 malfunction at the same time conducts following control. • ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

Hybrid Control System

- Deactivates electric throttle control actuator control
- Limiting output control
- Limiting accelerator angle variation control
- Idling stop is prohibited

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for 1 second.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-524, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631428

1.CHECK DTC PRIORITY

If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-466, "DTC Description".
NO >> GO TO 2.

2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electric throttle control actuator harness connector and ground.

+		–	Voltage (Approx.)
Electric throttle control actuator			
Connector	Terminal		
F50	2	Ground	5 V

Is the inspection result normal?

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

3.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	2	F52	83	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

4.CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	4	F52	85	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F50	1	F52	88	Existed
	3		80	

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

Is the inspection result normal?

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

6. CHECK THROTTLE POSITION SENSOR

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

Component Inspection

INFOID:0000000014631429

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform Throttle Valve Closed Position Learning. Refer to EC-155, "Description".
4. Turn ignition switch ON.
5. Shift the selector lever to D position.
6. Check the voltage between ECM harness connector terminals as per the following conditions.

ECM			Condition		Voltage
Connector	+	–			
	Terminal				
F52	88	85	Accelerator pedal	Fully released	0.36 V or more
				Fully depressed	4.75 V or less
	80			Fully released	4.75 V or less
				Fully depressed	0.36 V or more

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace electric throttle control actuator. Refer to EM-32, "Exploded View".

P2183 ENGINE INLET COOLANT TEMPERATURE SENSOR

DTC Description

INFOID:0000000014631430

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2183	ENG COOLANT TEMP SENSOR 2 (Engine coolant temperature sensor 2 circuit range/performance)	When all of the following conditions are satisfied and there is a large difference in coolant temperature detection result between the engine outlet coolant temperature sensor and the engine inlet coolant temperature sensor: • Engine outlet coolant temperature sensor: Normal • Engine cooling electric water pump: Normal • Engine running

POSSIBLE CAUSE

- Engine outlet coolant temperature sensor
- Engine inlet coolant temperature sensor

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-526, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631431

1.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

Refer to EC-526, "Component Inspection (Engine Outlet Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

2.CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR

Refer to EC-527, "Component Inspection (Engine Inlet Coolant Temperature Sensor)".

Is the inspection result normal?

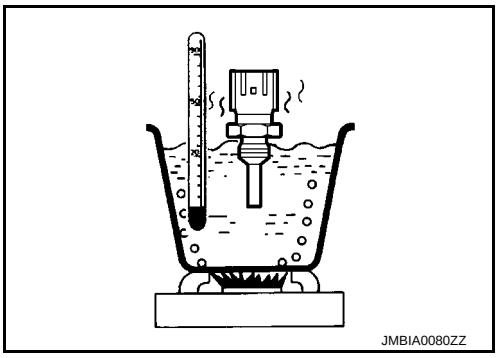
YES >> INSPECTION END
NO >> Replace engine inlet coolant temperature sensor. Refer to CO-24, "Exploded View".

Component Inspection (Engine Outlet Coolant Temperature Sensor)

INFOID:0000000014631432

1.CHECK ENGINE OUTLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine outlet coolant temperature sensor harness connector.
3. Remove engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".
4. Check the resistance between engine outlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine outlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

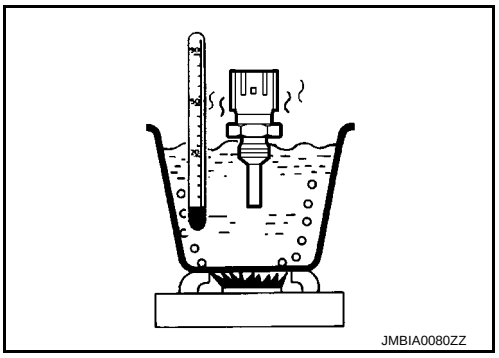
YES >> INSPECTION END
NO >> Replace engine outlet coolant temperature sensor. Refer to CO-27, "Exploded View".

Component Inspection (Engine Inlet Coolant Temperature Sensor)

INFOID:0000000014631433

1. CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine inlet coolant temperature sensor harness connector.
3. Remove engine inlet coolant temperature sensor. Refer to CO-24, "Exploded View".
4. Check resistance between engine inlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine inlet coolant temperature sensor		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine inlet coolant temperature sensor. Refer to CO-24, "Exploded View".

P2184, P2185 ENGINE INLET COOLANT TEMPERATURE SENSOR

DTC Description

INFOID:0000000014631434

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2184	ENG COOLANT TEMP SENSOR 2 (Engine coolant temperature sensor 2 circuit low)	An excessively low voltage from the engine inlet coolant temperature sensor is sent to ECM.
P2185	ENG COOLANT TEMP SENSOR 2 (Engine coolant temperature sensor 2 circuit high)	An excessively high voltage from the engine inlet coolant temperature sensor is sent to ECM.

POSSIBLE CAUSE

DTC P2184
- Harness or connectors (The engine inlet coolant temperature sensor circuit is shorted.)
- Engine inlet coolant temperature sensor

DTC P2185
- Harness or connectors (The engine inlet coolant temperature sensor circuit is open.)
- Engine inlet coolant temperature sensor

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.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-528, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631435

1.CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect engine inlet coolant temperature sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between engine inlet coolant temperature sensor harness connector terminals.

Engine inlet coolant temperature sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F62	1	2	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR POWER SUPPLY-2

Check the voltage between engine inlet coolant temperature sensor harness connector and ground.

+		–	Voltage (Approx.)
Engine inlet coolant temperature sensor			
Connector	Terminal		
F62	1	Ground	5 V

Is the inspection result normal?

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

3.CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between engine inlet coolant temperature sensor harness connector and ECM harness connector.

Engine inlet coolant temperature sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F62	1	F52	77	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

4.CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between engine inlet coolant temperature sensor harness connector and ECM harness connector.

Engine inlet coolant temperature sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F62	2	F52	72	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

6. CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR

Refer to EC-530, "Component Inspection (Engine Inlet Coolant Temperature Sensor)".

Is the inspection result normal?

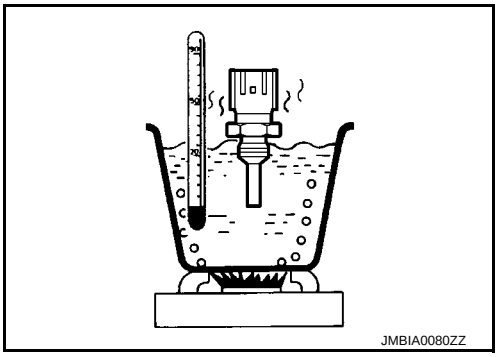
YES >> INSPECTION END
NO >> Replace engine inlet coolant temperature sensor. Refer to CO-24, "Exploded View".

Component Inspection (Engine Inlet Coolant Temperature Sensor)

INFOID:0000000014631436

1. CHECK ENGINE INLET COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine inlet coolant temperature sensor harness connector.
3. Remove engine inlet coolant temperature sensor. Refer to CO-24, "Exploded View".
4. Check resistance between engine inlet coolant temperature sensor terminals by heating with hot water as shown in the figure.



Engine inlet coolant temperature sensor		Condition		Resistance
+	–			
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.37 – 2.63 kΩ
			50 (122)	0.68 – 1.00 kΩ
			90 (194)	0.236 – 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine inlet coolant temperature sensor. Refer to CO-24, "Exploded View".

P219A AIR FUEL RATIO

DTC Description

INFOID:0000000014631437

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P219A	AIR FUEL RATIO IMBALANCE B1 (Air-fuel ratio imbalance bank 1)	ECM detects a lean/rich air fuel ratio state in any cylinder for a specified length of time.

POSSIBLE CAUSE

- Fuel injector
- Exhaust gas leaks
- Incorrect fuel pressure
- Mass air flow sensor
- Intake air leaks
- Lack of fuel
- Incorrect PCV hose connection
- Improper spark plug
- Insufficient compression
- The fuel injector circuit is open or shorted
- ignition coil
- The ignition signal circuit is open or shorted

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P219A is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

NOTE:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 3.

3.PRECONDITIONING-2

1. Turn ignition switch ON.
2. Clear the mixture ratio self-learning value. Refer to EC-158, "Description".

Will CONSULT be used?

YES >> GO TO 4.
NO >> GO TO 7.

4.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “COOLANT TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Make sure that “COOLANT TEMP/S” indicates more than 65°C (149°F).

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Select “SYSTEM 1 DIAGNOSIS B B1” and “SYSTEM 1 DIAGNOSIS A B1” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.

CAUTION:

- **Always drive vehicle at a safe speed.**

ENG SPEED	1,300 – 2,100 rpm
COOLANT TEMP/S	More than 65°C (149°F)
B/FUEL SCHDL	4 – 8 msec
Selector lever	D position
SYSTEM 1 DIAGNOSIS B B1	PRSENT

NOTE:

- Drive the vehicle at approximately 88 km/h (55 MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during cruising.

3. Check “SYSTEM 1 DIAGNOSIS A B1” indication.

Is “CMPLT” displayed?

YES >> GO TO 6.
NO >> GO TO 3.

6.PERFORM DTC CONFIRMATION PROCEDURE-3

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-532, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

7.PERFORM DTC CONFIRMATION PROCEDURE-4

Without CONSULT

1. Start the engine and warm it up to normal operating temperature.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.

CAUTION:

- **Always drive vehicle at a safe speed.**

Engine speed	1,300 – 2,100 rpm
Calculated load value	22 – 58 %
Selector lever	D position

NOTE:

- Drive the vehicle at approximately 88 km/h (55 MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during cruising.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-532, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631438

1.CHECK DTC PRIORITY

If DTC P219A is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".

NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAK

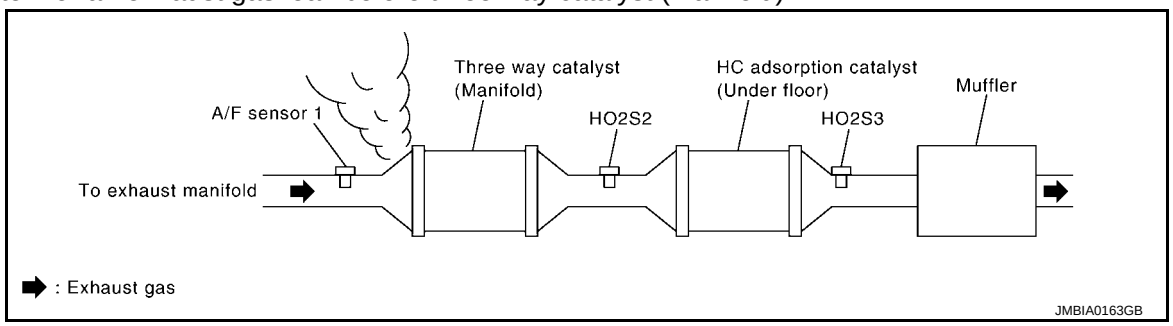
1. Stop engine and check the following for connection.
- Air duct
- Vacuum hoses
- PCV hose
- Intake air passage between air duct to intake manifold
2. Start engine and let it idle.
3. Listen for an intake air leak after the mass air flow sensor.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK EXHAUST GAS LEAK

1. Visually check exhaust tube, three way catalyst and muffler for dents connection.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and let it idle.
4. Listen for an exhaust gas leak before three way catalyst (manifold).



Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-162, "Work Procedure".
2. Check fuel pressure. Refer to EC-162, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 10.

5.CHECK MASS AIR FLOW SENSOR

With CONSULT
Check “MASS AIR FLOW” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
For specification, refer to EC-596, "Mass Air Flow Sensor".

With GST
Check mass air flow sensor signal in Service $01 using GST.
For specification, refer to EC-596, "Mass Air Flow Sensor".

Is the inspection result normal?

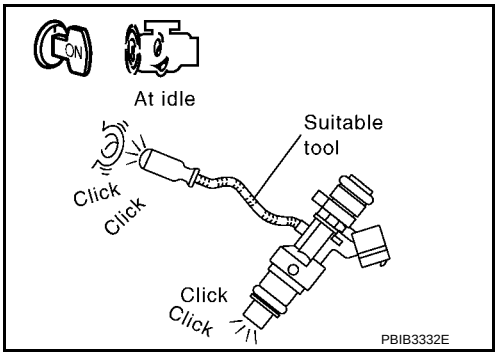
YES >> GO TO 6.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-238, "Diagnosis Procedure".

6.CHECK FUNCTION OF FUEL INJECTOR-1

With CONSULT
1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Perform “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
4. Check that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Let engine idle.
3. Listen to each fuel injector operating sound.



Clicking noise should be heard.

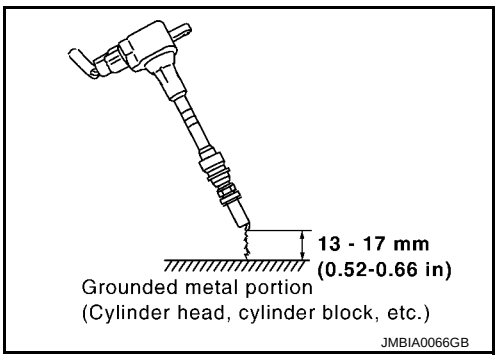
Is the inspection result normal?

YES >> GO TO 7.
NO >> Perform trouble diagnosis for fuel injector, refer to EC-555, "Component Function Check".

7. CHECK FUNCTION OF IGNITION COIL-1

CAUTION:
Perform the following steps in a well-ventilated area with no combustibles.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (No.44) in IPDM E/R to release fuel pressure. Refer to PG-118, "IPDM E/R Terminal Arrangement".
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start the engine.
5. After an engine stall, crank the engine two or three times to release all the fuel pressure.
6. Turn ignition switch OFF.
7. Disconnect all the harness connectors of ignition coil to prevent electric discharge from occurring in ignition coil.
8. Remove ignition coil assembly and spark plug of cylinder. Refer to EM-61, "Removal and Installation".
9. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
10. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
11. Connect spark plug and harness connector to ignition coil.
12. Allow a 13-17mm (0.52-0.66 in) spacing between spark plug and grounded metal portion as shown in the figure to fix the ignition coil with a rope or an equivalent.
13. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
14. Crank the engine for approximately 3 seconds to see if sparking occurs between spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **The discharge voltage becomes 20 kV or higher. Therefore, always stay away from the spark plug and ignition coil at least 50 cm (19.7 in) during the inspection.**
- **Leaving a space of more than 17mm (0.66 in) may damage the ignition coil.**

NOTE:
When the gap is less than 13 mm (0.52 in), a the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

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

8. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-18, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END

NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

9. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".

NO >> Repair or replace error-detected parts.

10. CHECK FUNCTION OF IGNITION COIL-2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

YES >> GO TO 11.

NO >> Check ignition coil, power transistor and their circuits. Refer to EC-564, "Component Function Check".

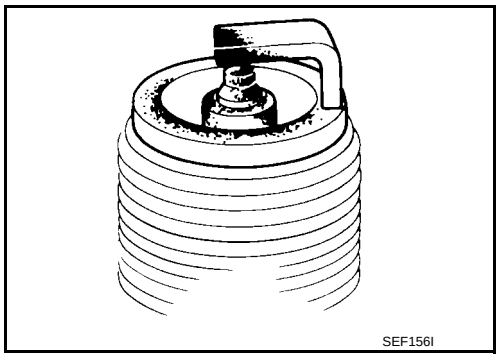
11. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> 1. Repair or clean spark plug. Refer to EM-61, "Removal and Installation".
2. GO TO 12.

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-142, "Spark Plug".



12. CHECK FUNCTION OF IGNITION COIL-3

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-142, "Spark Plug".

P2610 ECM INTERNAL TIMER

DTC Description

INFOID:0000000014679860

This ECM contains a timer and measures time between an ignition switch OFF and the next ignition switch ON. This enables the judging of the state of engine cooling at an engine start.

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P2610	ECM/PCM INTERNAL ENG OFF TIMER (ECM/PCM internal engine off timer performance)	• ECM internal engine off timer is malfunctioning. • The time calculated by ECM based on a descent allowance of engine coolant temperatures during ignition switch OFF is extremely shorter than the time counted by the Engine internal OFF timer.

POSSIBLE CAUSE

- ECM
- ECM power supply

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

It is necessary to erase permanent DTC?

YES >> GO TO 4.
NO >> GO TO 2.

2.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 12 V or more under ignition switch OFF condition.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-1

1. Turn ignition switch ON and wait at least 190 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-537, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

4.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 12 V or more under ignition switch OFF condition.**
- **Before performing the following procedure, check that fuel level is between 2/8 and 7/8.**

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-1

1. Turn ignition switch ON and wait at least 190 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-537, "Diagnosis Procedure".
NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-2

CAUTION:
To start this self-diagnosis, the conditions listed bellow are required to be satisfied. Perform the following steps to satisfy the conditions.
- **Engine coolant temperature decrease by 55°C (131°F) or more during the time between an ignition switch OFF (after engine warm-up) and the second ignition switch ON.**
- **A fuel temperature at the second ignition switch ON is −5°C (23°F) or more and less than 35°C (95°F).**
- **The temperature difference between engine coolant and fuel is 5°C (41°F) or more.**

NOTE:
This self-diagnosis is not performed if the distance traveled is extremely short.
1. Turn ignition switch ON.
2. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and soak the vehicle for at least 12 hours.
   CAUTION:
   - **Never turn ON the ignition switch during soaking.**
   - **Never open the fuel filler cap and perform refueling during soaking.**
5. Turn ignition switch ON and wait at least 190 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-537, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014679861

1.CHECK ECM POWER SUPPLY AND GROUND CIRCUIT

Check ECM power supply and ground circuit. Refer to EC-184, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2.CHECK SELF-DIAGNOSTIC RESULT

Check that DTCs related to the fuel system and the cooling system are not detected.

Is the inspection result normal?

YES >> Check the DTC. Refer to EC-109, "DTC Index".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Erase DTC.
2. Perform DTC Confirmation Procedure again. Refer to EC-536, "DTC Description".

Is the 1st trip DTC P2610 displayed again?

YES >> Replace ECM. Refer to EC-595, "Removal and Installation".
NO >> INSPECTION END

P261B ENGINE COOLING ELECTRIC WATER PUMP

DTC Description

INFOID:0000000014945769

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P261B	COOLANT PUMP B (Coolant pump “B” control circuit range/performance)	When all of the following conditions are satisfied and actual speed of engine cooling electric water pump largely deviates from target speed. • 12V battery voltage: 11 V or more • Engine inlet coolant temperature: 4°C (39.2°F) or more • ECM requests engine cooling electric water pump drive • Engine cooling electric water pump: Normal • Engine inlet coolant temperature sensor: Normal

POSSIBLE CAUSE

Engine cooling electric water pump

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Other		ECM controls engine cooling electric water pump to achieve its maximum driving force. **NOTE:** Engine cooling electric water pump may not be activated.

*: This mode is executed when engine outlet water temperature, engine inlet water temperature, or CVT fluid temperature rises.

Hybrid Control System
- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

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. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle for at least 10 seconds.
   CAUTION:
   When ambient temperature is less than 4°C (39.2°F), warm up until water temperature becomes suitable one.
3. Check DTC.

Is detected DTC?

YES >> Proceed to EC-539, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014945770

1. REPLACE ENGINE COOLING ELECTRIC WATER PUMP

Replace engine cooling electric water pump. Refer to CO-21, "Removal and Installation".

>> INSPECTION END

P261C ENGINE COOLING ELECTRIC WATER PUMP

DTC Description

INFOID:0000000014631439

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P261C	COOLANT PUMP B (Coolant pump “B” control circuit low)	When all of the following conditions are satisfied and actual speed of engine cooling electric water pump is too low. • 12V battery voltage: 11 V or more • Engine inlet coolant temperature: 4°C (39.2°F) or more • Engine inlet coolant temperature sensor: Normal • ECM requests engine cooling electric water pump drive

POSSIBLE CAUSE

• Harness or connectors
- Engine cooling electric water pump power supply circuit is open.
- Engine cooling electric water pump speed sensor circuit is open.
• Engine cooling electric water pump

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Other		ECM controls engine cooling electric water pump to achieve its maximum driving force. **NOTE:** Engine cooling electric water pump may not be activated.

*: This mode is executed when engine outlet water temperature, engine inlet water temperature, or CVT fluid temperature rises.

Hybrid Control System
• Limiting output control
• Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-1

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PRECONDITIONING-2

Check ambient temperature.

Ambient temperature is 4°C (39.2°F) or more>>GO TO 3.

Ambient temperature is less than 4°C (39.2°F)>>GO TO 4.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and wait at least 5 seconds.
   CAUTION:
   To prevent the engine from overheating, never run the engine for 10 seconds or more.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Check DTC.

Is DTC detected?

YES >> Proceed to EC-541, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

4.PERFORM COMPONENT FUNCTION CHECK

NOTE:
Use component function check to check the overall function of the engine cooling electric water pump. During this check, a DTC might not be confirmed.

With CONSULT

1. Turn ignition switch ON.
2. Select “ENGINE COOLANT ELECTIC WATER PUMP” in “ACTIVE TEST” mode of “ENGINE” with CONSULT.
3. Set the vehicle to READY.
4. Touch “On” on the CONSULT screen and check “TARGET ENG W/P SPEED” and “CURRENT ENG W/P SPEED”.
   CAUTION:
   To prevent the engine from overheating, never run the engine for 30 seconds or more.

Is actual speed too low compared to the target speed?

YES >> Proceed to EC-541, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631440

1.CHECK ENGINE COOLING ELECTRIC WATER PUMP POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect engine cooling electric water pump harness connector.
3. Turn ignition switch ON.
4. Check the voltage between engine cooling electric water pump harness connector and ground.

+		–	Voltage
Engine cooling electric water pump			
Connector	Terminal		
F59	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK ENGINE COOLING ELECTRIC WATER PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect engine cooling electric water pump relay harness connector
3. Check the continuity between engine cooling electric water pump harness connector and engine cooling electric water pump relay harness connector.

Engine cooling electric water pump		Engine cooling electric water pump relay		Continuity
Connector	Terminal	Connector	Terminal	
F59	3	H3	5	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK ENGINE COOLING ELECTRIC WATER PUMP RELAY POWER SUPPLY

Check the voltage between engine cooling electric water pump relay harness connector and ground.

Engine cooling electric water pump relay		—	Continuity
Connector	Terminal		
H3	1	Ground	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform the trouble diagnosis for power supply circuit.

4.CHECK ENGINE COOLING ELECTRIC WATER PUMP RELAY CONTROL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and engine cooling electric water pump relay harness connector.

ECM		Engine cooling electric water pump relay		Continuity
Connector	Terminal	Connector	Terminal	
F52	94	H3	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 or replace malfunctioning part.

5.CHECK ENGINE COOLING ELECTRIC WATER PUMP RELAY

Refer to EC-543, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine cooling electric water pump relay.

6.CHECK ENGINE COOLING ELECTRIC WATER PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between engine cooling electric water pump harness connector and ground.

Engine cooling electric water pump		—	Continuity
Connector	Terminal		
F59	4	Ground	Existed

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace malfunctioning part.

7. CHECK ENGINE COOLING ELECTRIC WATER PUMP SPEED SIGNAL CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and engine cooling electric water pump harness connector.

ECM		Engine cooling electric water pump		Continuity
Connector	Terminal	Connector	Terminal	
F51	21	F59	2	Existed

Is the inspection result normal?

YES >> Replace engine cooling electric water pump. Refer to CO-21, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

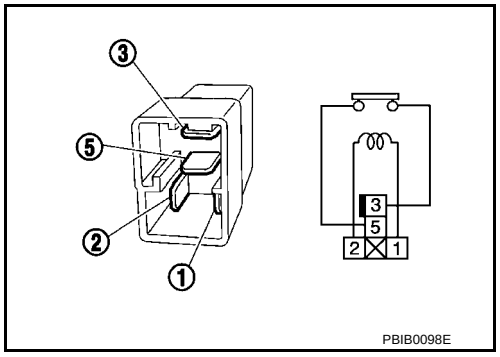
Component Inspection

INFOID:0000000014631441

1. CHECK ENGINE COOLING ELECTRIC WATER PUMP RELAY

1. Turn ignition switch OFF.
2. Remove engine cooling electric water pump relay. Refer to EC-17, "Component Parts Location".
3. Check the continuity between engine cooling electric water pump relay terminals as per the following conditions.

+	–	Condition	Continuity
Engine cooling electric water pump relay			
Terminal			
3	5	12V direct current supply between terminals 1 and 2	Existed
		No current supply	Not existed



PBIB0098E

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine cooling electric water pump.

P261D ENGINE COOLING ELECTRIC WATER PUMP

DTC Description

INFOID:0000000014631442

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P261D	COOLANT PUMP B (Coolant pump “B” control circuit high)	When all of the following conditions are satisfied and actual speed of engine cooling electric water pump is too high when there is no activation request of engine cooling electric water pump. • Vehicle state: READY • 12V battery voltage: 11 V or more • Engine cooling electric water pump: Normal

POSSIBLE CAUSE

- Harness or connectors (Engine cooling electric water pump drive command circuit is open.)
- Engine cooling electric water pump

FAIL-SAFE

Engine Control System

Fail safe mode		Vehicle behavior
Traveling control mode*	Accelerator angle variation control	ECM controls the accelerator pedal depression speed to make it slower than actual speed. This causes a drop in accelerating performance and encourages the driver to repair malfunction. **NOTE:** ECM does not control the accelerator pedal releasing speed.
	Engine output control	ECM reduces the engine output, according to the rise in engine speed. This reduces the vehicle speed to encourage the driver to repair malfunction. Driving at 70 km/h (44 MPH) or more is possible. **NOTE:** This value is a reference value converted from engine power to vehicle speed. Actual power limitation value differs due to the malfunctioning part and driving condition.
Other		ECM controls engine cooling electric water pump to achieve its maximum driving force. **NOTE:** Engine cooling electric water pump may not be activated.

*: This mode is executed when engine outlet water temperature, engine inlet water temperature, or CVT fluid temperature rises.

Hybrid Control System

- Limiting output control
- Limiting accelerator angle variation control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

NOTE:

Use component function check to check the overall function of the engine cooling electric water pump. During this check, a DTC might not be confirmed.

With CONSULT

1. Turn ignition switch ON.

CAUTION:

Never start the engine.
2. Check that following conditions are met.
- Blower fan: OFF
- CVT fluid temperature: 80°C (176°F) or less
3. Select “CURRENT ENG W/P SPEED” in “DATA MONITOR” mode of “ENGINE” with “CONSULT”.

Is the engine cooling electric water pump rotated?

YES >> Proceed to EC-545, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631443

1. CHECK ENGINE COOLING ELECTRIC WATER PUMP DRIVE SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect engine cooling electric water pump harness connector.
4. Check the continuity between ECM harness connector and engine cooling electric water pump harness connector.

+		–		Continuity
ECM		Engine cooling electric water pump		
Connector	Terminal	Connector	Terminal	
F52	109	F59	1	Existed

Is the inspection result normal?

YES >> Replace engine cooling electric water pump. Refer to CO-21, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

P31A5 CAN ERROR

DTC Description

INFOID:0000000014631444

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition
P31A5	COMMUNICATION ERROR (CAN communication data error)	When ECM detected data error of CAN communication.

POSSIBLE CAUSE

- ECM
- Li-ion battery controller
- Traction motor inverter
- HPCM

FAIL-SAFE

Engine Control System
Not applicable

Hybrid Control System
Motor driving

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P31A5 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Proceed to EC-546, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-54, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000014631445

1.CHECK DTC PRIORITY

If DTC P31A5 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-109, "DTC Index".
NO >> GO TO 2.

2.PERFORM ALL DTC READING

With CONSULT

1. Turn ignition switch ON.
2. Perform “All DTC Reading”.

3. Check diagnosis results.

DTC No.	DTC detection control module	Malfunctioning part
P31A5	“ENGINE” only	• ECM • HPCM
	“HV BATTERY” only	• Li-ion battery controller • HPCM
	“MOTOR CONTROL” only	• Traction motor inverter • HPCM
	• “ENGINE” • “MOTOR CONTROL”	HPCM
	• “ENGINE” • “HV BATTERY”	
	• “MOTOR CONTROL” • “HV BATTERY”	
	• “ENGINE” • “HV BATTERY” • “MOTOR CONTROL”	

>> Replace malfunctioning part corresponding to the control module detecting DTC P31A5.

BRAKE PEDAL POSITION SWITCH

Component Function Check

INFOID:0000000014631474

1.CHECK BRAKE PEDAL POSITION SWITCH FUNCTION

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (Approx.)
Connector	+	–			
	Terminal				
E16	140	152	Brake pedal	Slightly depressed	0 V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-548, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631475

1.CHECK BRAKE PEDAL POSITION SWITCH CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (Approx.)
Connector	+	–			
	Terminal				
E16	140	152	Brake pedal	Slightly depressed	0 V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> GO TO 2.

2.CHECK BRAKE PEDAL POSITION SWITCH POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect brake pedal position switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between brake pedal position switch harness connector and ground.

+		–	Voltage
Brake pedal position switch			
Connector	Terminal		
E6	1	Ground	Battery voltage

Is the inspection result normal?

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

3.CHECK BRAKE PEDAL POSITION SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuse block (J/B) harness connector.
3. Check the continuity between brake pedal position switch harness connector and fuse block (J/B) harness connector.

Brake pedal position switch		Fuse block (J/B)		Continuity
Connector	Terminal	Connector	Terminal	
E6	1	M68	16R	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

4.CHECK BRAKE PEDAL POSITION SWITCH INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between brake pedal position switch harness connector and ECM harness connector.

Brake pedal position switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E6	2	E16	140	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.CHECK BRAKE PEDAL POSITION SWITCH

Refer to EC-549, "Component Inspection (Brake Pedal Position Switch)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Replace brake pedal position switch. Refer to BR-57, "Exploded View".

Component Inspection (Brake Pedal Position Switch)

INFOID:0000000014631476

1.CHECK BRAKE PEDAL POSITION SWITCH-1

1. Turn ignition switch OFF.
2. Disconnect brake pedal position harness connector.
3. Check the continuity between brake pedal position switch terminals as per the following conditions.

Brake pedal position switch		Condition		Continuity
Terminal				
1	2	Brake pedal	Fully released	Existed
			Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK BRAKE PEDAL POSITION SWITCH-2

1. Adjust brake pedal position switch installation. Refer to BR-49, "Adjustment".
2. Check the continuity between brake pedal position switch terminals as per the following conditions.

Brake pedal position switch		Condition		Continuity
Terminal				
1	2	Brake pedal	Fully released	Existed
			Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace brake pedal position switch. Refer to BR-57, "Exploded View".

COOLING FAN

Component Function Check

INFOID:0000000014631468

1.CHECK COOLING FAN FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Perform “COOLING FAN (PWM)” in “ACTIVE TEST” mode of “IPDM E/R” using CONSULT.
3. Make sure that cooling fan speed varies according to the percentage.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-551, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631469

1.CHECK COOLING FAN MOTOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connectors.
3. Check the voltage between cooling fan motor harness connector and ground.

+		–	Voltage
Cooling fan control module 1			
Connector	Terminal		
F3	2	Ground	Battery voltage

+		–	Voltage
Cooling fan control module 2			
Connector	Terminal		
F5	2	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK FUSIBLE LINK

Check that the following fusible link is not blown (open).

Fusible letter	Capacity
P	50A
Q	50A

Is the fusible link blown (open)?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Replace the fusible link after repairing the applicable circuit.

3.CHECK COOLING FAN MOTOR GROUND CIRCUIT

Check the continuity between cooling fan motor harness connector and ground.

Cooling fan control module 1		—	Continuity
Connector	Terminal		
F3	1	Ground	Existed

Cooling fan control module 2		—	Continuity
Connector	Terminal		
F5	1	Ground	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. CHECK IPDM E/R POWER SUPPLY AND GROUND CIRCUIT

Refer to PCS-45, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector.

IPDM E/R		Cooling fan control module 1		Continuity
Connector	Terminal	Connector	Terminal	
F42	106	F3	4	Existed

IPDM E/R		Cooling fan control module 2		Continuity
Connector	Terminal	Connector	Terminal	
F42	106	F5	4	Existed

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

Is the inspection result normal?

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

6. CHECK COOLING FAN CONTROL SIGNAL

1. Reconnect IPDM E/R harness connector.
2. Check the voltage between IPDM E/R harness connector and ground

+		–	Condition	Voltage (Approx.)
IPDM E/R				
Connector	Terminal			
F42	106	Ground	Ignition switch OFF	0 – 1 V
			Ignition switch ON	1.3 V

Is the inspection result normal?

YES >> Replace cooling fan assembly. Refer to CO-19, "Removal and Installation".
NO >> Replace IPDM E/R. Refer to PCS-46, "Removal and Installation".

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000014631461

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred from BCM via the CAN communication through IPDM E/R to ECM.

Component Function Check

INFOID:0000000014631462

1. CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Select “LOAD SIGNAL” and check indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Rear window defogger switch	ON	On
		OFF	Off

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-553, "Diagnosis Procedure".

2. CHECK LIGHTING SWITCH FUNCTION

With CONSULT

Check “LOAD SIGNAL” indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Lighting switch	ON at 2nd position	On
		OFF	Off

Is the inspection result normal?

YES >> GO TO 3.
NO >> Proceed to EC-553, "Diagnosis Procedure".

3. CHECK A/C FAN SWITCH FUNCTION

With CONSULT

Select “HEATER FAN SW” and check indication under the following conditions.

Monitor item	Condition		Indication
HEATER FAN SW	A/C fan switch	ON	On
		OFF	Off

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-553, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631463

1. INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or A/C fan). Refer to EC-553, "Component Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2.
Headlamp>>GO TO 3.
A/C fan>> GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Check rear window defogger system. Refer to DEF-20, "Work Flow".

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Check headlamp system. Refer to EXL-79, "Work Flow" (Halogen headlamp) or EXL-207, "Work Flow" (LED headlamp).

>> INSPECTION END

4.CHECK A/C FAN SYSTEM

Check A/C fan system. Refer to HAC-55, "Work Flow".

>> INSPECTION END

FUEL INJECTOR

Component Function Check

INFOID:0000000014631446

1.INSPECTION START

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

Does engine start?

YES >> GO TO 2.
NO >> Proceed to EC-555, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

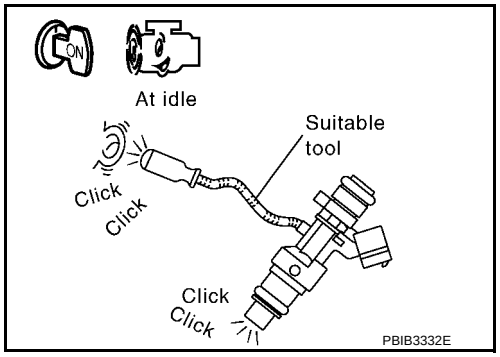
With CONSULT

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
2. Check that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Let engine idle.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-555, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631447

1.CHECK FUSE

1. Turn ignition switch OFF.
2. Check that the following fuse is not blowing.

Fuse No.	Capacity
#62	10 A
#63	15 A

Is the fuse blown (open)?

YES >> Replace the fuse after repairing the applicable circuit.
NO >> GO TO 2.

2.CHECK FUEL INJECTOR DRIVER POWER SUPPLY

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

+		–	Voltage
ECM			
Connector	Terminal		
F51	4	Ground	Battery voltage
	5		

Is the inspection result normal?

YES >> GO TO 9.

NO >> GO TO 3.

3.CHECK FUEL INJECTOR DRIVER POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect fuel injector relay harness connector.
4. Check the continuity between ECM harness connector and fuel injector relay harness connector.

ECM		Fuel injector relay		Continuity
Connector	Terminal	Connector	Terminal	
F51	4	F63	5	Existed
	5		7	

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK FUEL INJECTOR RELAY POWER SUPPLY (CONTACT SIDE)

Check the voltage between fuel injector relay harness connector and ground.

+		–	Voltage
Fuel injector relay			
Connector	Terminal		
F63	3	Ground	Battery voltage
	6		

Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble diagnosis for power supply circuit.

5.CHECK FUEL INJECTOR RELAY POWER SUPPLY (EXCITATION COIL SIDE)

1. Install all removed parts.
2. Turn ignition switch ON.
3. Check the voltage between fuel injector relay harness connector and ground.

+		–	Voltage
Fuel injector relay			
Connector	Terminal		
F63	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.CHECK FUEL INJECTOR RELAY POWER SUPPLY CIRCUIT (EXCITATION COIL SIDE)

1. Turn ignition switch OFF.
2. Disconnect fuel injector relay harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between IPDM E/R harness connector and fuel injector relay harness connector.

IPDM E/R		Fuel injector relay		Continuity
Connector	Terminal	Connector	Terminal	
F35	66	F63	2	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

7. CHECK FUEL INJECTOR RELAY GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector relay harness connector.
3. Check the continuity between fuel injector relay harness connector and ground.

Fuel injector relay		—	Continuity
Connector	Terminal		
F63	1	Ground	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8. CHECK FUEL INJECTOR RELAY

Refer to EC-558, "Component Inspection (Fuel Injector Relay)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Replace fuel injector relay.

9. CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace malfunctioning part.

10. CHECK FUEL INJECTOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

Fuel injector			ECM		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F11	1	F51	1	Existed
		2		8	
2	F12	1		7	
		2		2	
3	F13	1		7	
		2		3	
4	F14	1		1	
		2		6	

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace malfunctioning part.

11. CHECK FUEL INJECTOR

Refer to EC-558, "Component Inspection (Fuel Injector)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Replace malfunctioning fuel injector. Refer to EM-54, "Removal and Installation".

Component Inspection (Fuel Injector)

INFOID:0000000014631448

1. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check the resistance between fuel injector terminals.

Fuel injector		Condition		Resistance
Terminal				
1	2	Temperature [°C (°F)]	10 – 60 (50 – 140)	1.44 – 1.73 Ω

Is the inspection result normal?

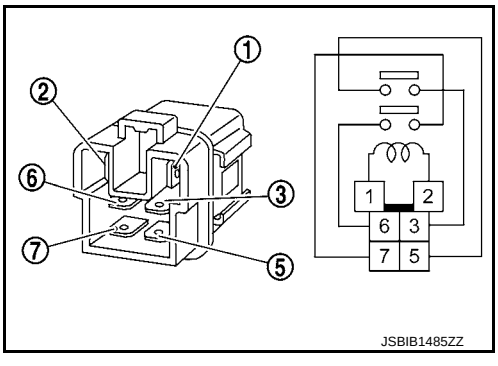
YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector. Refer to EM-54, "Removal and Installation".

Component Inspection (Fuel Injector Relay)

INFOID:0000000014631449

1. CHECK FUEL INJECTOR RELAY

1. Turn ignition switch OFF.
2. Remove fuel injector relay. Refer to EC-17, "Component Parts Location".
3. Check the continuity between fuel injector relay terminals as per the following conditions.



Fuel injector relay		Condition	Continuity
+	–		
Terminal			
3	5	12 V direct current supply between terminals 1 and 2	Existed
		No current supply	Not existed

Fuel injector relay		Condition	Continuity
+	–		
Terminal			
6	7	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 fuel injector relay.

HIGH PRESSURE FUEL PUMP

Component Function Check

INFOID:0000000014631453

1.CHECK HIGH PRESSURE FUEL PUMP FUNCTION

With CONSULT

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.
3. Select “FUEL PRES SEN V” in “DATA MONITOR” mode of “ENGINE” using CONSULT and check the indication as per the following conditions.

Monitor item	Condition		Indication
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Engine speed: idle	0.820 – 1.140 V
		Revving engine from idle to 4,000 rpm quickly	0.820 – 2.900 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-560, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631454

1.CHECK FUSE

1. Turn ignition switch OFF.
2. Check that the following fuse is not blowing.

Fuse No.	Capacity
#61	10 A

Is the fuse blown (open)?

YES >> Replace the fuse after repairing the applicable circuit.
NO >> GO TO 2.

2.CHECK HIGH PRESSURE FUEL PUMP POWER SUPPLY

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

+		–	Voltage
ECM			
Connector	Terminal		
F51	47	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK HIGH PRESSURE FUEL PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect high pressure fuel pump relay harness connector.
4. Check the continuity between ECM harness connector and high pressure fuel pump relay harness connector.

ECM		High pressure fuel pump relay		Continuity
Connector	Terminal	Connector	Terminal	
F51	47	H2	5	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4. CHECK HIGH PRESSURE FUEL PUMP RELAY POWER SUPPLY (CONTACT SIDE)

Check the voltage between high pressure fuel pump relay harness connector and ground.

+		–	Voltage
High pressure fuel pump relay			
Connector	Terminal		
H2	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform the trouble diagnosis for power supply circuit.

5. CHECK HIGH PRESSURE FUEL PUMP RELAY POWER SUPPLY (EXCITATION COIL SIDE)

1. Install all removed parts.
2. Turn ignition switch ON.
3. Check the voltage between high pressure fuel pump relay harness connector and ground.

+		–	Voltage
High pressure fuel pump relay			
Connector	Terminal		
H2	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6. CHECK HIGH PRESSURE FUEL PUMP RELAY POWER SUPPLY CIRCUIT (EXCITATION COIL SIDE)

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Disconnect high pressure fuel pump relay harness connector.
4. Check the continuity between IPDM E/R harness connector and high pressure fuel pump relay harness connector.

IPDM E/R		High pressure fuel pump relay		Continuity
Connector	Terminal	Connector	Terminal	
F35	66	H2	1	Existed

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

Is the inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

7. CHECK HIGH PRESSURE FUEL PUMP RELAY GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump relay harness connector.
3. Check the continuity between high pressure fuel pump relay harness connector and ground.

High pressure fuel pump relay		—	Continuity
Connector	Terminal		
H2	2	Ground	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8. CHECK HIGH PRESSURE FUEL PUMP RELAY

Refer to EC-563, "Component Inspection (High Pressure Fuel Pump Relay)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Replace high pressure fuel pump relay.

9. CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace malfunctioning part.

10. CHECK HIGH PRESSURE FUEL PUMP CIRCUIT

1. Disconnect high pressure fuel pump relay harness connector.
2. Check the continuity between ECM harness connector and high pressure fuel pump harness connector.

ECM		High pressure fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
F51	48	F64	1	Existed
	49		2	

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace malfunctioning part.

11. CHECK HIGH PRESSURE FUEL PUMP

Refer to EC-563, "Component Inspection (High Pressure Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

12. CHECK HIGH PRESSURE FUEL PUMP INSTALLATION

1. Turn ignition switch OFF.
2. Check high pressure fuel pump for improper attachment or looseness.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or replace malfunctioning part.

13. CHECK CAMSHAFT

1. Remove camshaft. Refer to EM-77, "Removal and Installation".
2. Check camshaft. Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Replace camshaft. Refer to EM-77, "Removal and Installation".

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000014631455

1. CHECK HIGH PRESSURE FUEL PUMP-

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump harness connector.
3. check the resistance between high pressure fuel pump terminals as per the following conditions.

High pressure fuel pump Terminal		Condition		Resistance
1	2	Temperature [°C (°F)]	20 – 30 (68 – 86)	0.46 – 0.51 Ω

Is the inspection result normal?

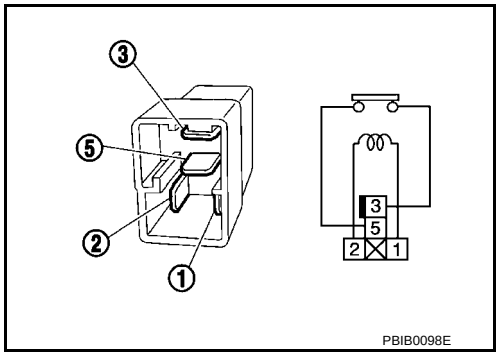
YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-49, "Removal and Installation".

Component Inspection (High Pressure Fuel Pump Relay)

INFOID:0000000014631456

1. CHECK HIGH PRESSURE FUEL PUMP RELAY

1. Turn ignition switch OFF.
2. Remove high pressure fuel pump relay. Refer to EC-17, "Component Parts Location".
3. Check the continuity between high pressure fuel pump relay terminals.



+	–	Condition	Continuity
High pressure fuel pump relay Terminal			
3	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 high pressure fuel pump relay.

IGNITION SIGNAL

Component Function Check

INFOID:0000000014631457

1.INSPECTION START

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine.

Does the engine start?

YES-1 >> With CONSULT: GO TO 2.
YES-2 >> Without CONSULT: GO TO 3.
NO >> Proceed to EC-564, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION-1

With CONSULT

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
2. Check that each circuit produces a momentary engine speed drop.

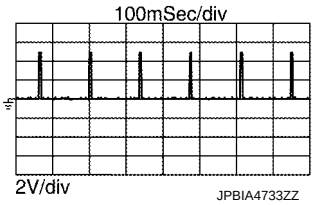
Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-564, "Diagnosis Procedure".

3.CHECK IGNITION SIGNAL FUNCTION-2

Without CONSULT

1. Let engine idle.
2. Read the voltage signal between ECM harness connector terminals with an oscilloscope.

ECM				Voltage signal
+		–		
Connector	Terminal	Connector	Terminal	
F52	95	E16	152	
	96			
	101			
	104			

NOTE:
The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-564, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631458

1.CHECK IGNITION COIL POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

+			–	Voltage
Ignition coil				
Cylinder	Connector	Terminal		
1	F47	3	Ground	Battery voltage
2	F46	3		
3	F48	3		
4	F49	3		

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK FUSE

1. Turn ignition switch OFF.
2. Pull out No. 35 fuse (15 A) and check that the fuse is not blowing.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace the fuse after repairing the applicable circuit.

3.CHECK CONDENSER POWER SUPPLY

1. Reinsert the pulled out fuse.
2. Disconnect condenser harness connector.
3. Turn ignition switch ON.
4. Check the voltage between joint connector-F01 harness connector and ground.

+		–	Voltage
Joint connector-F01			
Connector	Terminal		
F8	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 4.

4.CHECK CONDENSER POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and joint connector-F01 harness connector.

IPDM E/R		Joint connector-F01		Continuity
Connector	Terminal	Connector	Terminal	
F35	66	F8	1	Existed

4. 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 IPDM E/R POWER SUPPLY AND GROUND CIRCUIT

Check IPDM E/R power supply and ground circuit. Refer to PCS-45, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-46, "Removal and Installation".
NO >> Repair or replace error-detected parts.

6.CHECK IGNITION COIL POWER SUPPLY CIRCUIT

1. Check the continuity between ignition coil harness connector and joint connector-F01 harness connector.

Ignition coil			Joint connector-F01		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F47	3	F8	2	Existed
2	F46	3		3	
3	F48	3		4	
4	F49	3		5	

2. Check harness for short to ground.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace error-detected parts.

7. CHECK IGNITION COIL GROUND

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

+			–	Continuity
Ignition coil				
Cylinder	Connector	Terminal		
1	F47	2	Ground	Existed
2	F46	2		
3	F48	2		
4	F49	2		

Is the inspection result normal?

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

8. CHECK CONDENSER GROUND CIRCUIT

1. Disconnect condenser harness connector.
2. Check the continuity between joint connector-F01 harness connector and ground.

+		–	Voltage
Joint connector-F01			
Connector	Terminal		
F8	6	Ground	Existed

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace error-detected parts.

9. CHECK IGNITION COIL GROUND CIRCUIT

Check the continuity between ignition coil harness connector and joint connector-F01 harness connector.

Ignition coil			Joint connector-F01		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F47	2	F8	7	Existed
2	F46	2		8	
3	F48	2		9	
4	F49	2		10	

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace error-detected parts.

10. CHECK IGNITION SIGNAL CIRCUIT

1. 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	
1	F47	1	F52	96	Existed
2	F46	1		95	
3	F48	1		104	
4	F49	1		101	

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace error-detected parts.

11. CHECK IGNITION COIL WITH POWER TRANSISTOR

Check ignition coil with power transistor. Refer to EC-567, "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-61, "Removal and Installation".

12. CHECK JOINT CONNECTOR-F01

Check joint connector-F01. Refer to EC-568, "Component Inspection (Joint Connector-F01)"

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace joint connector-F01.

Component Inspection (Ignition Coil With Power Transistor)

INFOID:0000000014631459

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-1

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check the resistance between ignition coil terminals as per the following.

Ignition coil		Condition		Resistance
+	–			
Terminal				
1	2	Temperature	25°C (77°F)	Except 0 or ∞ Ω
	3			Except 0 Ω
2	3			

Is the inspection result normal?

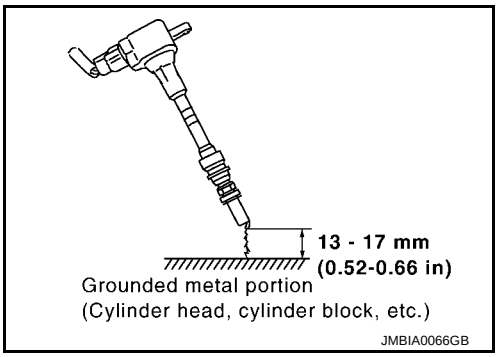
YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-61, "Removal and Installation".

2. CHECK IGNITION COIL WITH POWER TRANSISTOR-2

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Reconnect all harness connectors disconnected.

2. Remove fuel pump fuse (No.44) in IPDM E/R to release fuel pressure. Refer to PG-118, "IPDM E/R Terminal Arrangement".
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
4. Start engine.
5. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-61, "Removal and Installation".
9. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
10. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
11. Connect spark plug and harness connector to ignition coil.
12. 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.
13. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
14. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **During the operation, always stay 0.5 m (19.7 in) or more away from the spark plug and the ignition coil. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

NOTE:
When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-61, "Removal and Installation".

Component Inspection (Joint Connector-F01)

INFOID:0000000014631460

1. CHECK JOINT CONNECTOR-F01-1

1. Turn ignition switch OFF.
2. Disconnect joint connector-F01 harness connector.
3. Check resistance between joint connector-F01 terminals as per the following.

Joint connector-F01		Condition		Resistance
+	–			
Terminal				
1	6	Temperature	25°C (77°F)	Above 1 MΩ

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace joint connector-F01.

2. CHECK JOINT CONNECTOR-F01-2

Check the continuity between joint connector-F01 terminals as per the following.

Joint connector-F01		Continuity
Terminal		
1	2	Existed
	3	
	4	
	5	
6	7	
	8	
	9	
	10	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace joint connector-F01.

LOW PRESSURE FUEL PUMP

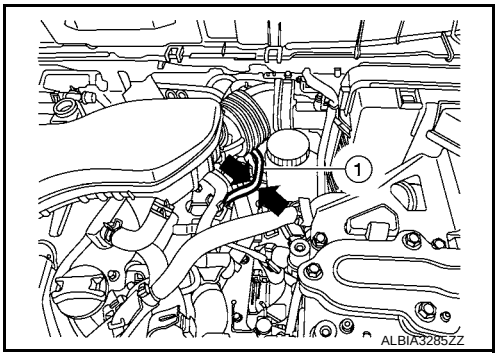
Component Function Check

INFOID:0000000014631450

1.CHECK LOW PRESSURE FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. 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 >> Proceed to EC-570, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631451

1.CHECK FUEL PUMP RELAY POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECM harness connector terminals.

+		–		Voltage
ECM				
Connector	Terminal	Connector	Terminal	
F52	82	E16	152	Battery voltage

Is the inspection result normal?

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

2.CHECK FUEL PUMP RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F52	82	F35	76	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

3.CHECK FUEL PUMP POWER SUPPLY

1. Turn ignition switch OFF.
2. Reconnect ECM harness connector.
3. Disconnect “fuel level sensor unit and fuel pump” harness connector.
4. Turn ignition switch ON.
5. Check the voltage between “fuel level sensor unit and fuel pump” harness connector and ground.

+		–	Voltage
Fuel level sensor unit and fuel pump			
Connector	Terminal		
B103	6	Ground	Battery voltage should exist 1 second after ignition switch is turn ON.

Is the inspection result normal?

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

4.CHECK FUEL PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and IPDM E/R harness connector.

Fuel level sensor unit and fuel pump		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
B103	6	E121	46	Existed

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

Is the inspection result normal?

YES >> Perform trouble diagnosis for power supply circuit.
NO >> Repair or replace malfunctioning part.

5.CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		—	Continuity
Connector	Terminal		
B103	4	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

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

6.CHECK FUEL PUMP

Refer to EC-571, "Component Inspection (Fuel Pump)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-54, "Intermittent Incident".
NO >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".

Component Inspection (Fuel Pump)

INFOID:0000000014631452

1.CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Check the resistance between “fuel level sensor unit and fuel pump” terminals as follows.

Fuel level sensor unit and fuel pump Terminal		Condition		Resistance
4	6	Temperature	25°C (77°F)	0.2 – 5.0 Ω

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace “fuel level sensor unit, fuel filter and fuel pump assembly”. Refer to FL-7, "Removal and Installation".

MALFUNCTION INDICATOR LAMP (MIL)

Component Function Check

INFOID:0000000014631472

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Check that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-573, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631473

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. Refer to EC-109, "DTC Index".

2.CHECK COMBINATION METER FUNCTION

Perform self-diagnosis for combination meter. Refer to MWI-21, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform the trouble diagnosis for the detected DTC.

3.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-54, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-81, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:0000000014679864

1.CHECK ORVR FUNCTION

Check whether the following symptoms are present.
- Fuel odor from EVAP canister is strong.
- Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Are any symptoms present?

YES >> Proceed to EC-574, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000014679865

1.INSPECTION START

Check whether the following symptoms are present.
A: Fuel odor from EVAP canister is strong.
B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Which symptom is present?

A >> GO TO 2.
B >> GO TO 7.

2.CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

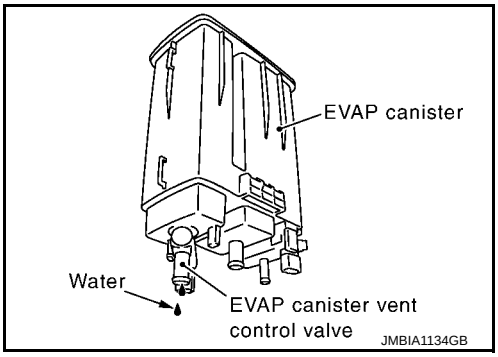
YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-25, "Removal and Installation".

>> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Check refueling EVAP vapor cut valve. Refer to EC-576, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-16, "2WD : Removal and Installation" (2WD models) or FL-16, "2WD : Removal and Installation" (4WD models).

7. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.1 kg (4.6 lb).

Is the inspection result normal?

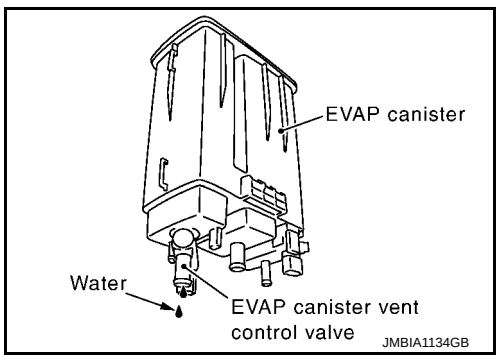
YES >> GO TO 8.
NO >> GO TO 9.

8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister.

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. Refer to FL-25, "Removal and Installation".

>> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

11. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace hoses and tubes.

12. CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace filler neck tube.

13. CHECK REFUELING EVAP VAPOR CUT VALVE

Check refueling EVAP vapor cut valve. Refer to EC-576, "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.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-1

Check one-way valve for clogging.

Is the inspection result normal?

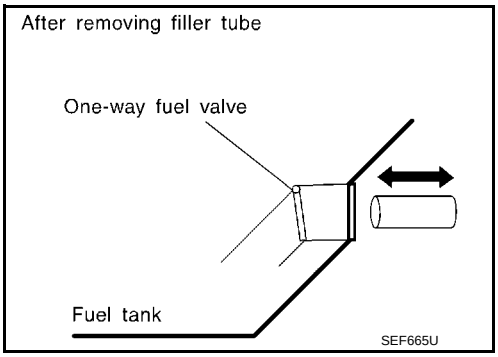
YES >> GO TO 16.
NO >> Repair or replace one-way fuel valve with fuel tank.

16. CHECK ONE-WAY FUEL VALVE-2

1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as 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

INFOID:0000000014679866

1. INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2. CHECK REFUELING EVAP VAPOR CUT VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-16, "2WD : Removal and Installation" (2WD models) or FL-20, "4WD : Removal and Installation" (4WD models).
3. Drain fuel from the tank as follows:

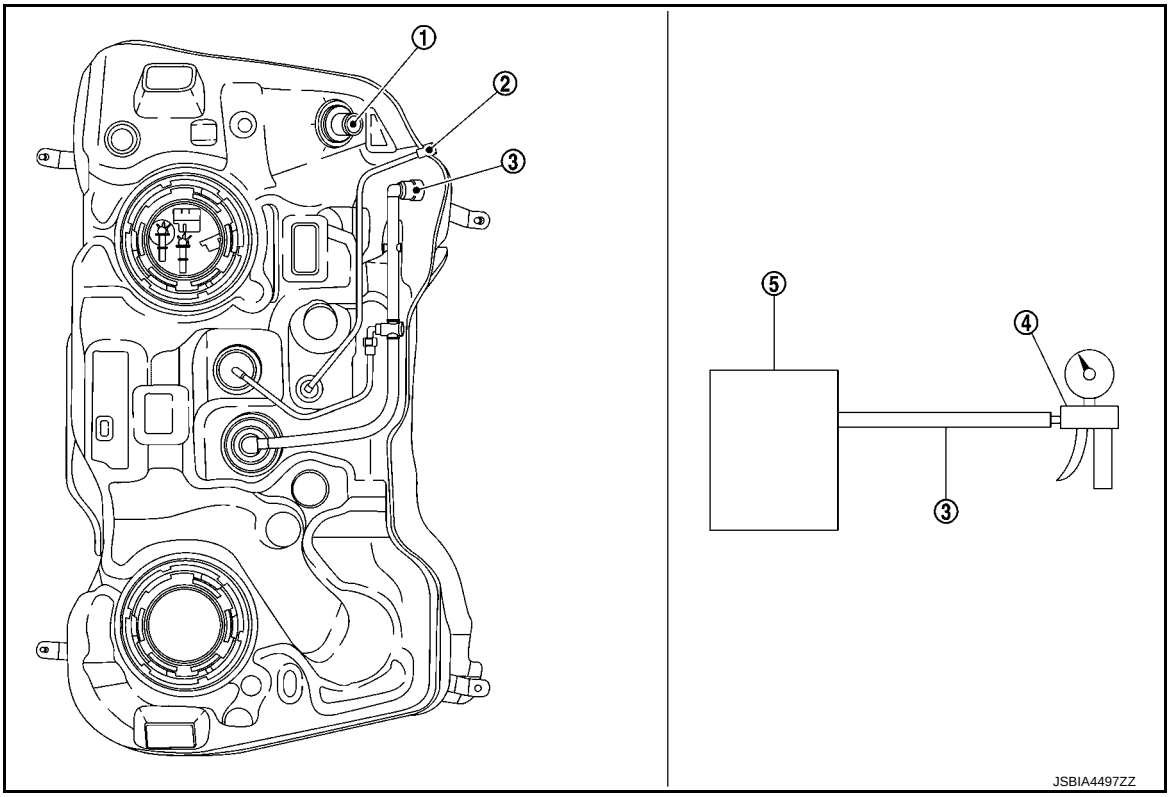
- Remove fuel feed hose located on the fuel gauge retainer.
- Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
- Drain fuel using “FUEL PUMP CONTROL MODULE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.

4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as follows.

- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [−13.3 kPa (−0.136 kg/cm^2, −1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



① Filler tube ② Recirculation line ③ EVAP/ORVR line
④ Vacuum/pressure handy pump ⑤ Fuel tank

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-16, "2WD : Removal and Installation" (2WD models) or FL-20, "4WD : Removal and Installation" (4WD models).

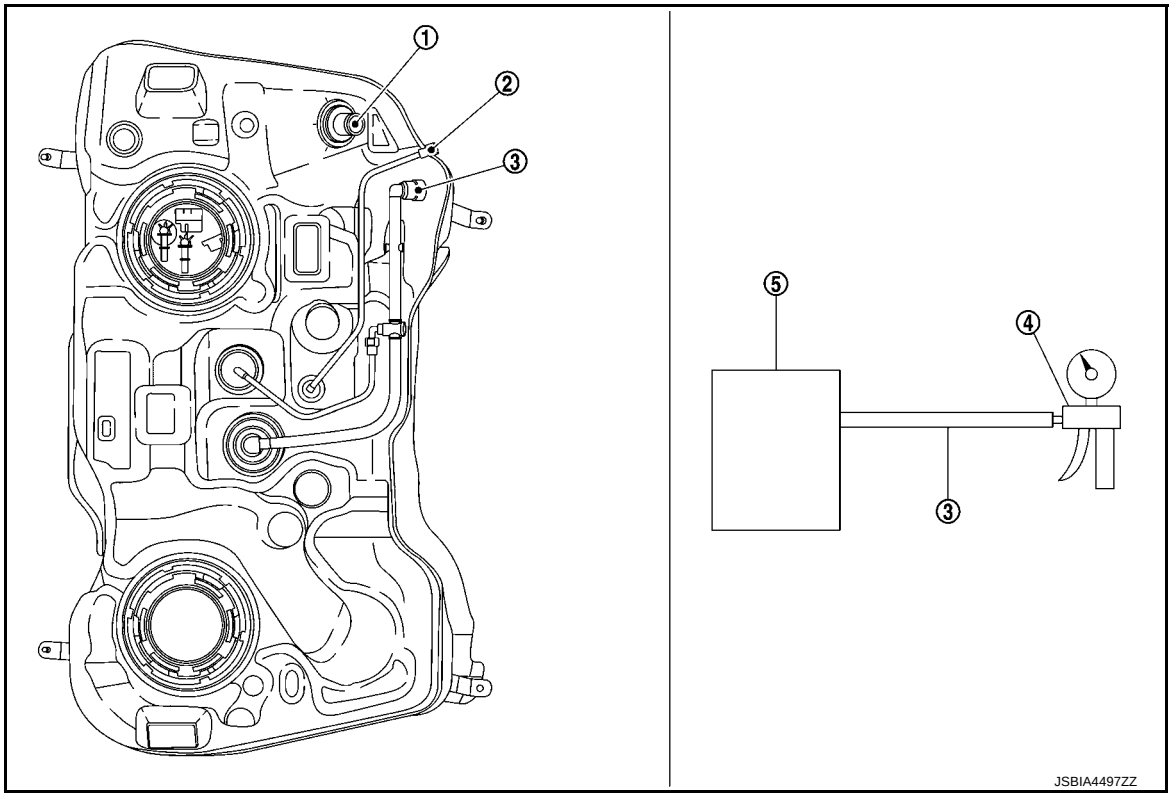
3. CHECK REFUELING EVAP VAPOR CUT VALVE

Without CONSULT

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-16, "2WD : Removal and Installation" (2WD models) or FL-20, "4WD : Removal and Installation" (4WD models).
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/cm^2, −1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



① Filler tube ② Recirculation line ③ EVAP/ORVR line
④ Vacuum/pressure handy pump ⑤ Fuel tank

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:0000000014631466

1.CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and warm it up to normal operating temperature.
3. Turn A/C switch and blower fan switch ON.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage
Connector	+	–	
	Terminal		
F51	12	13	1.0 – 4.0 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-579, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000014631467

1.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY-1

1. Turn ignition switch OFF.
2. Disconnect refrigerant pressure sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between refrigerant pressure sensor harness connector terminals.

Refrigerant pressure sensor			Voltage (Approx.)
Connector	+	–	
	Terminal		
F204	1	3	5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY-2

Check the voltage between refrigerant pressure sensor harness connector and ground.

+		–	Voltage (Approx.)
Refrigerant pressure sensor			
Connector	Terminal		
F204	1	Ground	5 V

Is the inspection result normal?

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

3.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F204	1	F51	29	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part.

4.CHECK SENSOR POWER SUPPLY 2

Refer to EC-582, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Perform the trouble diagnosis for ECM power supply circuit. Refer to EC-184, "Diagnosis Procedure".
NO >> Repair or replace malfunctioning part.

5.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F204	3	F51	13	Existed

4. Also check harness for short to power.

Is the inspection result normal?

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

6.CHECK ECM GROUND CIRCUIT

1. Check the continuity between ECM harness connector and ground.

ECM		—	Continuity
Connector	Terminal		
F51	9	Ground	Existed
	10		
	50		
F52	60		
	110		
E16	147		
	149		
	152		

2. Also check harness for short to power.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Repair or replace malfunctioning part.

7.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F204	2	F51	12	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace malfunctioning part.

8. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-54, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to HA-47, "REFRIGERANT PRESSURE SENSOR : Removal and Installation".
NO >> Repair or replace malfunctioning part.

SENSOR POWER SUPPLY 2 CIRCUIT

Description

INFOID:0000000014631464

ECM supplies a voltage of 5 V to some of the sensors systematically divided into 2 groups, respectively. Accordingly, when a short circuit develops in a sensor power source, a malfunction may occur simultaneously in the sensors belonging to the same group as the short-circuited sensor.

Sensor power supply 1

- Crankshaft position sensor 1
- Exhaust valve timing control position sensor
- Intake manifold runner control valve position sensor
- Throttle position sensor

NOTE:
If sensor power supply 1 circuit is malfunctioning, DTC P0643 is displayed.

Sensor power supply 2

- Mass air flow sensor
- Refrigerant pressure sensor
- Fuel rail pressure sensor
- Crankshaft position sensor 2
- Camshaft position sensor
- Engine oil pressure sensor

Diagnosis Procedure

INFOID:0000000014631465

1.CHECK SENSOR POWER SUPPLY 2 CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

+		–		
ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F51	26	Mass air flow sensor	F22	1
	29	Fuel rail pressure sensor	F56	1
		Engine oil pressure sensor	F54	3
		Refrigerant pressure sensor	F204	1
F52	66	Crankshaft position sensor 2	F58	1
		Camshaft position sensor	F44	1

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK COMPONENTS

Check the following.

- Mass air flow sensor (Refer to EC-240, "Component Inspection".)
- Fuel rail pressure sensor (Refer to EC-317, "Component Inspection".)
- Engine oil pressure sensor (Refer to EC-427, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-579, "Diagnosis Procedure".)
- Crankshaft position sensor 2 (Refer to EC-361, "Component Inspection".)
- Camshaft position sensor (Refer to EC-353, "Component Inspection (CMP Sensor)".)

Is the inspection result normal?

YES >> Proceed to GI-54, "Intermittent Incident".
NO >> Replace malfunctioning part.

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM

Symptom Table

INFOID:0000000014631477

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-570
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-162
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-555
	Fuel level sensor circuit														EC-410, EC-412, EC-414
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-591
	Fuel rail pressure sensor circuit	1	1	2	2	2		2	2			2			EC-314, EC-319
	High pressure fuel pump circuit			4		3									EC-560
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-594
	Incorrect idle speed adjustment						1	1	1	1		1			EC-589
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-516, EC-521
	Intake manifold runner control valve circuit				4	4									EC-496
	Intake manifold runner control valve position sensor circuit				4	4									EC-500
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-590
	Ignition circuit	1	1	2	2	2		2	2			2			EC-564
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-184

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Main power supply and ground circuit	1	1	1	2	2		2	2			2			EC-184
Engine outlet coolant temperature sensor circuit				3		3			3					EC-248, EC-250, EC-257
Air fuel ratio (A/F) sensor 1 circuit														EC-264, EC-267, EC-270, EC-293, EC-509
Throttle position sensor circuit						2			2					EC-253, EC-332, EC-483, EC-484, EC-523
Accelerator pedal position sensor circuit			3	2	1									HBC-233, HBC-237, HBC-241
Knock sensor circuit			2								3			EC-343
Engine oil temperature sensor circuit			4		2						3			EC-323, EC-327
Crankshaft position sensor 1 circuit	2	2												EC-345
Camshaft position sensor (PHASE) circuit	3	2												EC-350
Vehicle speed signal circuit		2	3		3						3			EC-416
ECM	2	2	3	3	3	3	3	3	3	3	3			—
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-212
Intake valve timing intermediate lock control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-432
Exhaust valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-215
Exhaust valve timing control position sensor circuit	5	5	5	5	5		5	5			5			EC-354
Engine cooling electric water pump circuit	5	5	5	5	5		5	5		3	5		5	EC-491, EC-538, EC-540, EC-544

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine inlet coolant temperature sensor											5			EC-526, EC-528
PNP signal circuit			3		3		3	3			3			HBC-138
Refrigerant pressure sensor circuit		2				3			3		4			EC-579
Electrical load signal circuit							3							EC-553
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-107
ABS actuator and electric unit (control unit)			4											BRC-73

1 - 6: The numbers refer to the order of inspection.

(continued on next table)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FL-16, FL-20
	Fuel piping			5	5	5		5	5			5			FL-6
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Air	Air duct		5	5		5		5	5			5			EM-29
	Air cleaner														EM-25
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5			5		5			5					EM-29
	Electric throttle control actuator														EM-32
	Air leakage from intake manifold/Collector/Gasket														EM-32
Cranking	12V battery	1	1	1		1		1	1					1	PG-119
	Signal plate	6										1			EM-116
	Transmission range switch	4													TM-121
	Clutch 1	2	2	3		2		3	4	3		4			HBC-101, TM-90
	Clutch 2		2	3		2		5	4	3		4			HBC-101, TM-90
	Traction motor	2	2	3		2	3	3	4	3		4			TMS-52
	HPCM	1	2	3		2	3	3	4	3		4		3	HBC-101
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-95
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-125
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM-76
	Camshaft														EM-83
	Intake valve timing control														EM-65
	Exhaust valve timing control														EM-65
	Intake valve												3		EM-95
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-37, EX-7
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-40, EM-43, LU-14, LU-16
	Oil level (Low)/Filthy oil														LU-10
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-13, CO-13
	Thermostat									5					CO-25
	Engine cooling electric water pump													5	CO-21
	Water gallery														CO-6
	Cooling fan									5					CO-19
	Coolant level (Low)/Contaminated coolant														CO-10

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

Description

INFOID:0000000014631478

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the status of that the engine speed is above 2,500 rpm under no load (at 0 km/h and the selector lever position is P or N) takes more than the specified time, 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 falls below 2,000 rpm.

NOTE:

This function is different from deceleration control listed under direct injection gasoline system, EC-47, "DIG (DIRECT INJECTION GASOLINE) SYSTEM : System Description".

Fuel cut when the accelerator pedal is fully depressed.

When starts the engine with fully depressing the accelerator pedal, in order to eliminate the spark plug fouling, performs fuel cut while cranking and prevent the engine from starting. The fuel cut continues until the accelerator pedal is released.

PERIODIC MAINTENANCE

IDLE SPEED

Inspection

INFOID:0000000014631479

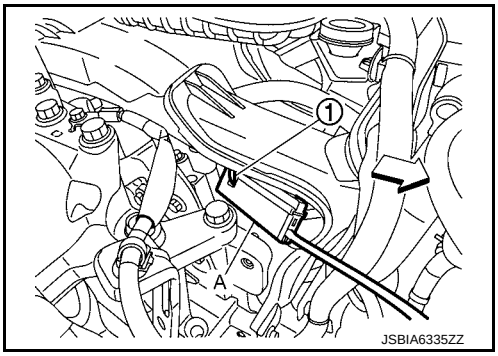
1. CHECK IDLE SPEED

With CONSULT

1. Perform INSPECTION MODE 1. Refer to HBC-113, "Description".
2. Start engine and warm engine up to the normal operating temperature.
3. Check idle speed in “DATA MONITOR” mode of “ENGINE” using CONSULT.

Without CONSULT

1. Perform INSPECTION MODE 1. Refer to HBC-113, "Description".
2. Start engine and warm engine up to the normal operating temperature.
3. Attach induction type (current detection type) rev counter (A) to loop wire ① as shown and check idle speed.



⇦ : Vehicle front

>> INSPECTION END

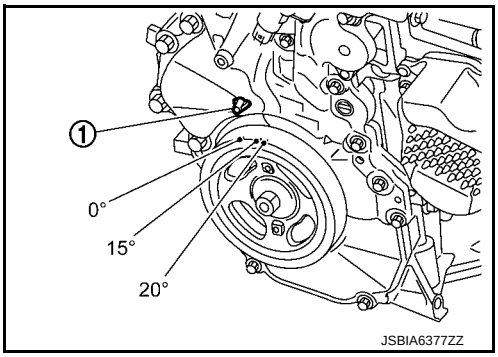
IGNITION TIMING

Inspection

INFOID:0000000014631480

1. CHECK IGNITION TIMING

1. Perform INSPECTION MODE 1. Refer to HBC-113, "Description".
2. Start engine and warm engine up to the normal operating temperature.
3. Attach timing light to wire loop as shown.
4. Check ignition timing.



① : Timing indicator

>> INSPECTION END

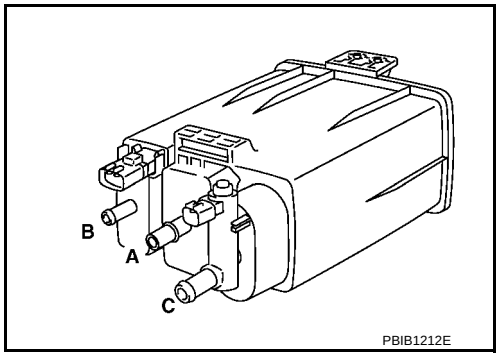
EVAPORATIVE EMISSION SYSTEM

Inspection

INFOID:0000000014631481

1.CHECK EVAP CANISTER

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.



>> INSPECTION END

EVAP LEAK CHECK

Inspection

INFOID:0000000014948859

CAUTION:

- **Do not use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

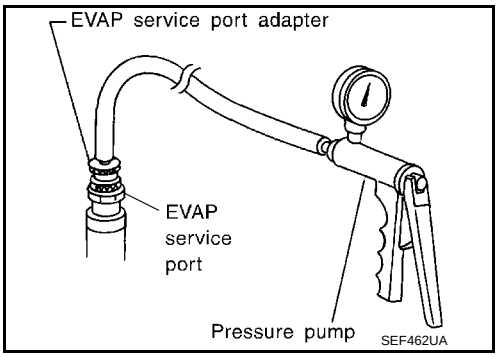
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter [commercial service tool: (J-41413-OBD)] to the EVAP service port may cause a leak.

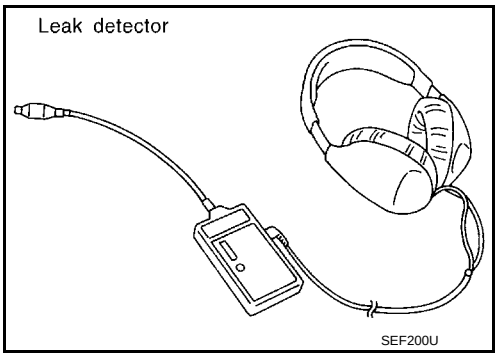
1. EVAP LEAK CHECK

With CONSULT

1. Install EVAP service port adapter [commercial service tool: (J-41413-OBD)] and pressure pump to EVAP service port.

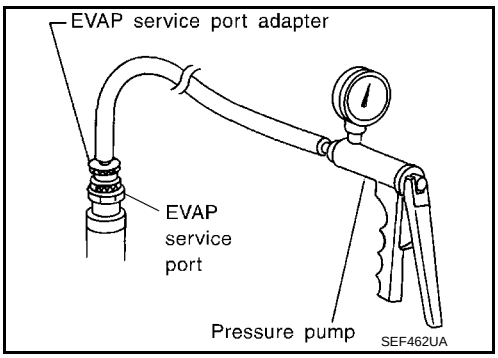


2. Turn ignition switch ON.
3. Select the “EVAP SYSTEM CLOSE” in “WORK SUPPORT” mode of “ENGINE” using CONSULT.
4. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter [commercial service tool: (J-41413-OBD)] and hose with pressure pump.
7. Locate the leak using a leak detector [commercial service tool: (J-41416)]. Refer to EC-63, "EVAPORATIVE EMISSION SYSTEM : System Description".

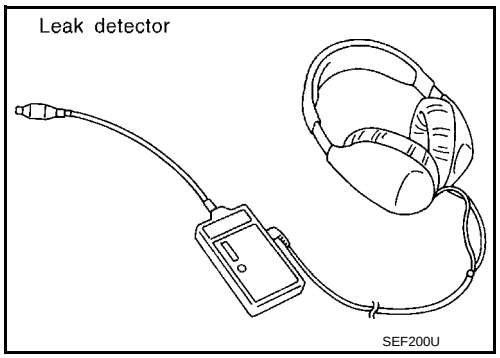


Without CONSULT

1. Install EVAP service port adapter [commercial service tool: (J-41413-OBD)] and pressure pump to EVAP service port.



2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi).
4. Remove EVAP service port adapter [commercial service tool: (J-41413-OBD)] and hose with pressure pump.
5. Locate the leak using a leak detector [commercial service tool: (J-41416)]. Refer to EC-63, "EVAPORATIVE EMISSION SYSTEM : System Description".



>> INSPECTION END

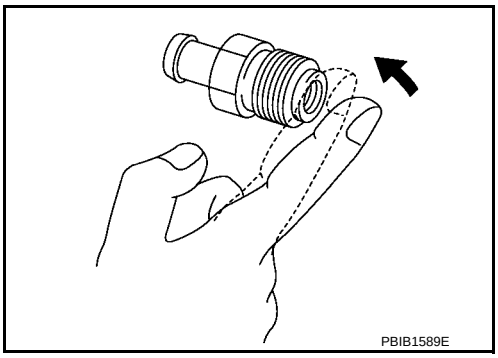
POSITIVE CRANKCASE VENTILATION

Inspection

INFOID:0000000014631482

1.CHECK PCV VALVE

1. Perform INSPECTION MODE 5. Refer to HBC-113, "Description".
2. Start engine and let it idle.
3. Remove PCV valve from the rocker cover. Refer to EM-63, "Exploded View".
4. Connect PCV valve to PCV hose. Refer to EM-32, "Exploded View".
5. Block and unblock the air hole of PCV valve and check if a hissing noise can be heard from the air hole.



Can the hissing noise be heard from the air hole?

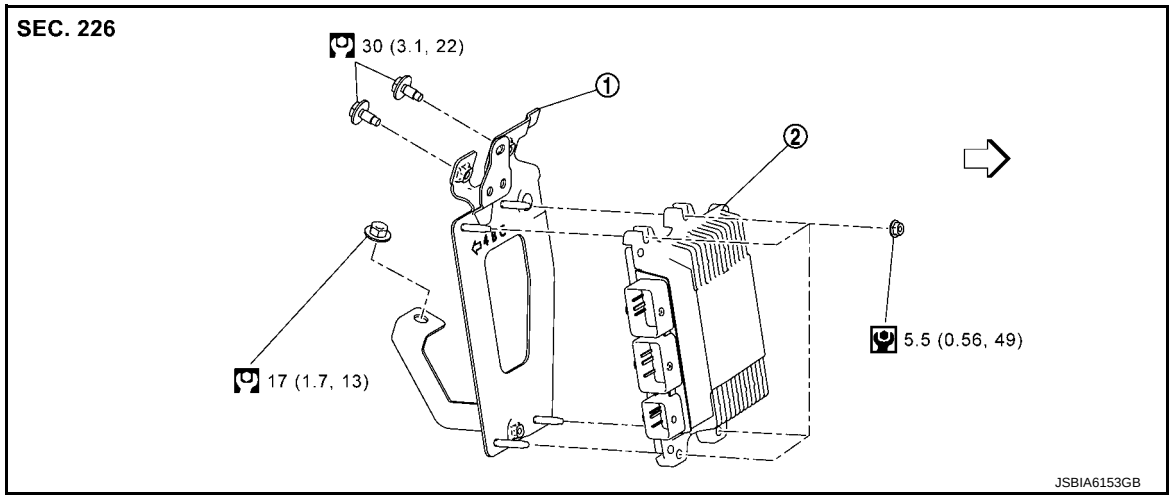
YES >> INSPECTION END
NO >> Replace PCV valve. Refer to EM-63, "Exploded View".

REMOVAL AND INSTALLATION

ECM

Exploded View

INFOID:0000000014631483



1. Bracket
2. ECM
⇦ : Vehicle front

Removal and Installation

INFOID:0000000014631484

CAUTION:
Perform ADDITIONAL SERVICE WHEN REPLACING ECM. Refer to EC-152, "Description".

REMOVAL

1. Remove traction motor inverter. Refer to TMS-132, "Removal and Installation".
2. Remove air duct 1 and resonator duct. Refer to EM-29, "Exploded View".
3. Disconnect harness connectors from ECM.
4. Disconnect harness connectors from TCM.
5. Remove bolts and nut and remove ECM bracket.
6. Remove nuts and remove ECM.

INSTALLATION

Install in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000014631485

Condition		Specification
No load (in P position)	INSPECTION MODE 1	1,000 ± 50 rpm

Ignition Timing

INFOID:0000000014631486

Condition		Specification
No load (in P position)	INSPECTION MODE 1	14 ± 5° BTDC
	INSPECTION MODE 5	27 +3°/–8° BTDC

Calculated Load Value

INFOID:0000000014631487

Condition	Specification (Using CONSULT or GST)
At idle	5 – 35 %
At 2,500 rpm	5 – 35 %

Mass Air Flow Sensor

INFOID:0000000014631488

Supply voltage	Approx. 5 V
Output frequency at idle	Approx. 5,500 Hz*
Mass air flow (Using CONSULT or GST)	1.0 – 4.0 g/s at idle* 2.0 – 12.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.