SECTION EC
ENGINE CONTROL SYSTEM

CONTENTS

VK56VD FOR USA AND CANADA

PRECAUTION

PRECAUTIONS

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

INFOID:0000000009008757

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 “SRS AIR BAG” and “SEAT BELT” of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see “SRS AIR BAG”.**
- **Never 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:

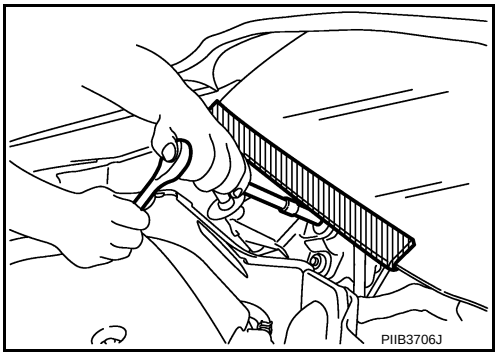
Always observe the following items for preventing accidental activation.

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Procedure without Cowl Top Cover

INFOID:0000000009008758

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 Xenon Headlamp Service

INFOID:0000000009008759

WARNING:

Comply with the following warnings to prevent any serious accident.

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

CAUTION:

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

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

INFOID:0000000009008760

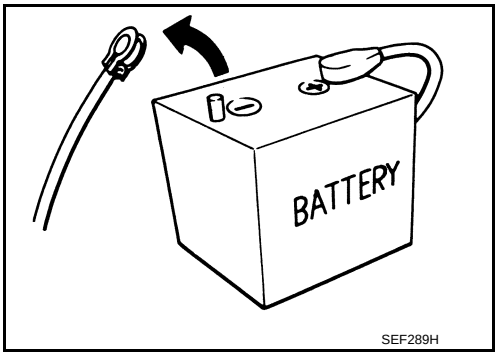
The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:
- **Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.**
- **Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to EC-60, "Diagnosis Description".**
- **Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.**
- **Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

General Precautions

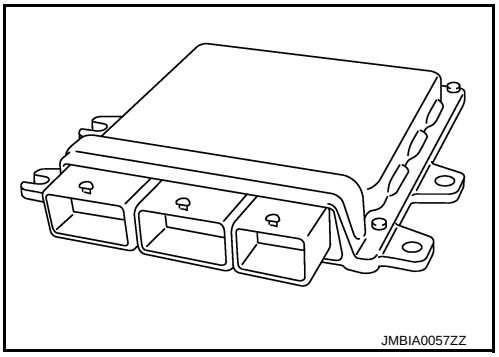
INFOID:0000000009008761

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

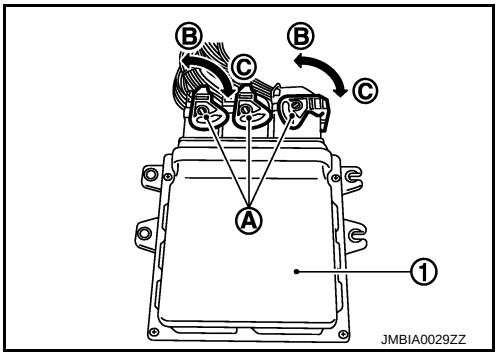


SEF289H

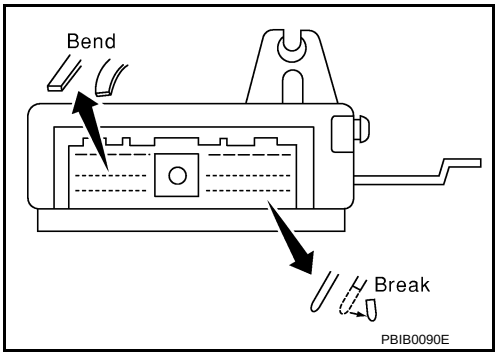
- **Never disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- **If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.**
- **Diagnostic trouble codes**
- **1st trip diagnostic trouble codes**
- **Freeze frame data**
- **1st trip freeze frame data**
- **System readiness test (SRT) codes**
- **Test values**

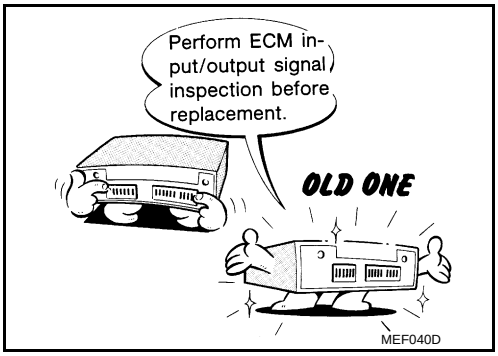

JMBIA0057ZZ

- **When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.**
- ECM (1)
- Loosen (C)

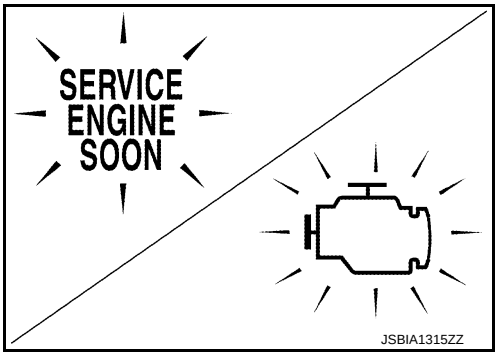


- **When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break).**
  Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and check that ECM functions properly. Refer to EC-81, "Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Never clean mass air flow sensor with any type of detergent.**
- **Never disassemble electric throttle control actuator.**
- **Even a slight leakage in the air intake system can cause serious incidents.**
- **Never shock or jar the camshaft position sensor, crankshaft position sensor.**

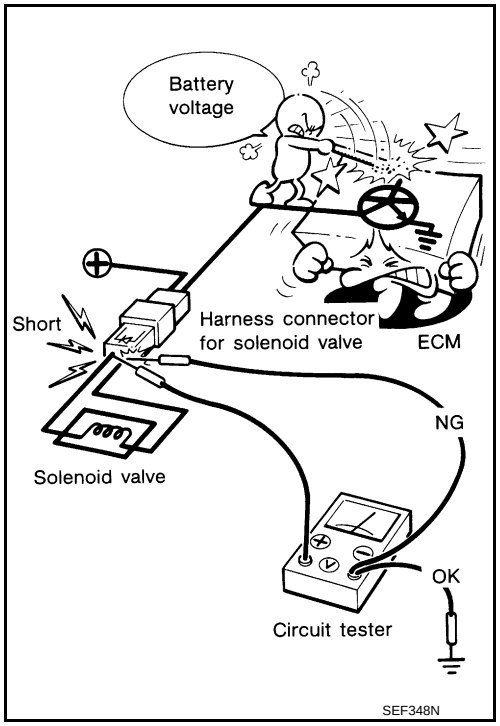




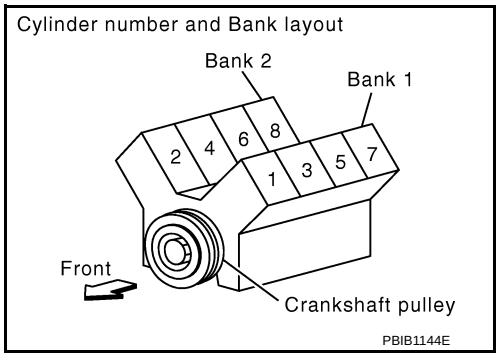
- **After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Component Function Check.**
  The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.



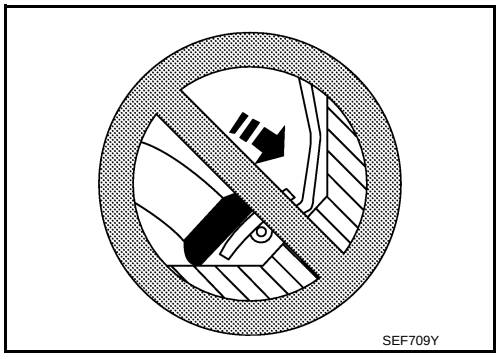
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



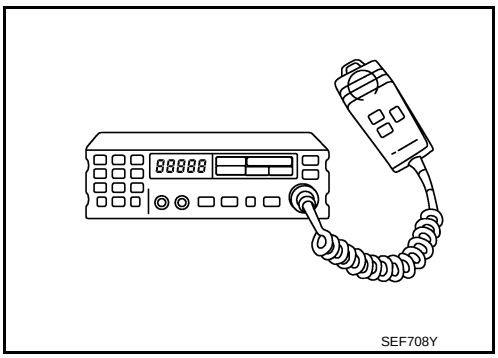
- **B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.**
- **Never operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



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



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

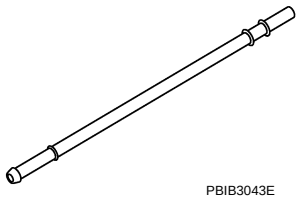


PREPARATION

PREPARATION

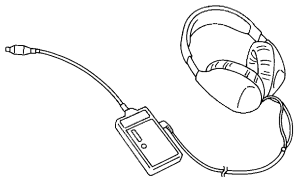
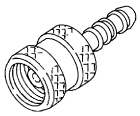
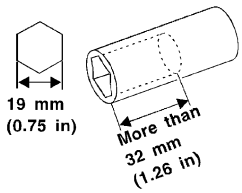
Special Service Tools

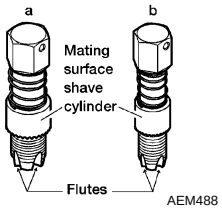
INFOID:0000000009008762

Tool number (Kent-Moore No.) Tool name	Description
KV10118400 (—) Fuel tube adapter  PBIB3043E	Measures fuel pressure

Commercial Service Tools

INFOID:0000000009008763

Tool name (Kent-Moore No.)	Description
Leak detector i.e.: (J-41416)  S-NT703	Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBD)  S-NT704	Applies positive pressure through EVAP service port
Fuel filler cap adapter i.e.: (MLR-8382)  S-NT815	Checks fuel tank vacuum relief valve opening pressure
Socket wrench  S-NT705	Removes and installs engine coolant temperature sensor

Tool name (Kent-Moore No.)		Description
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)		Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)		Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

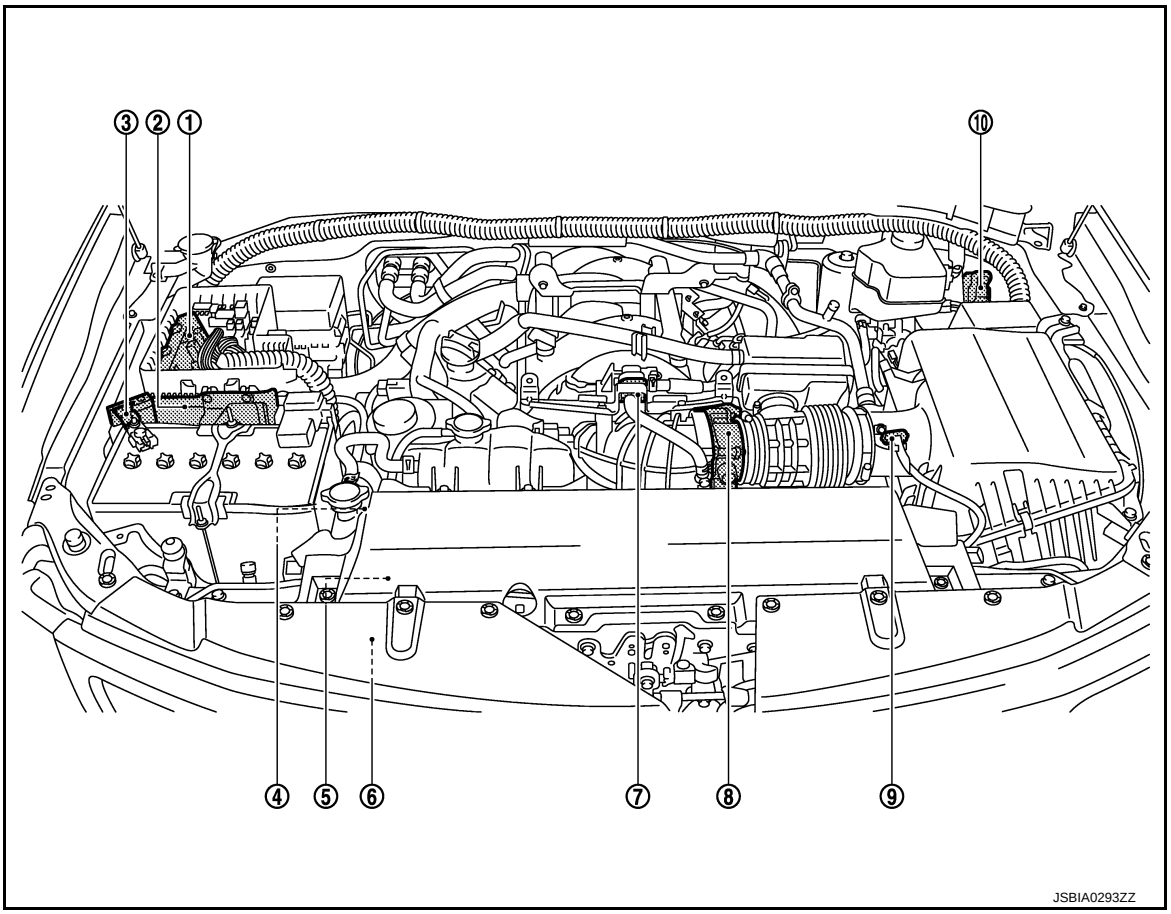
SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

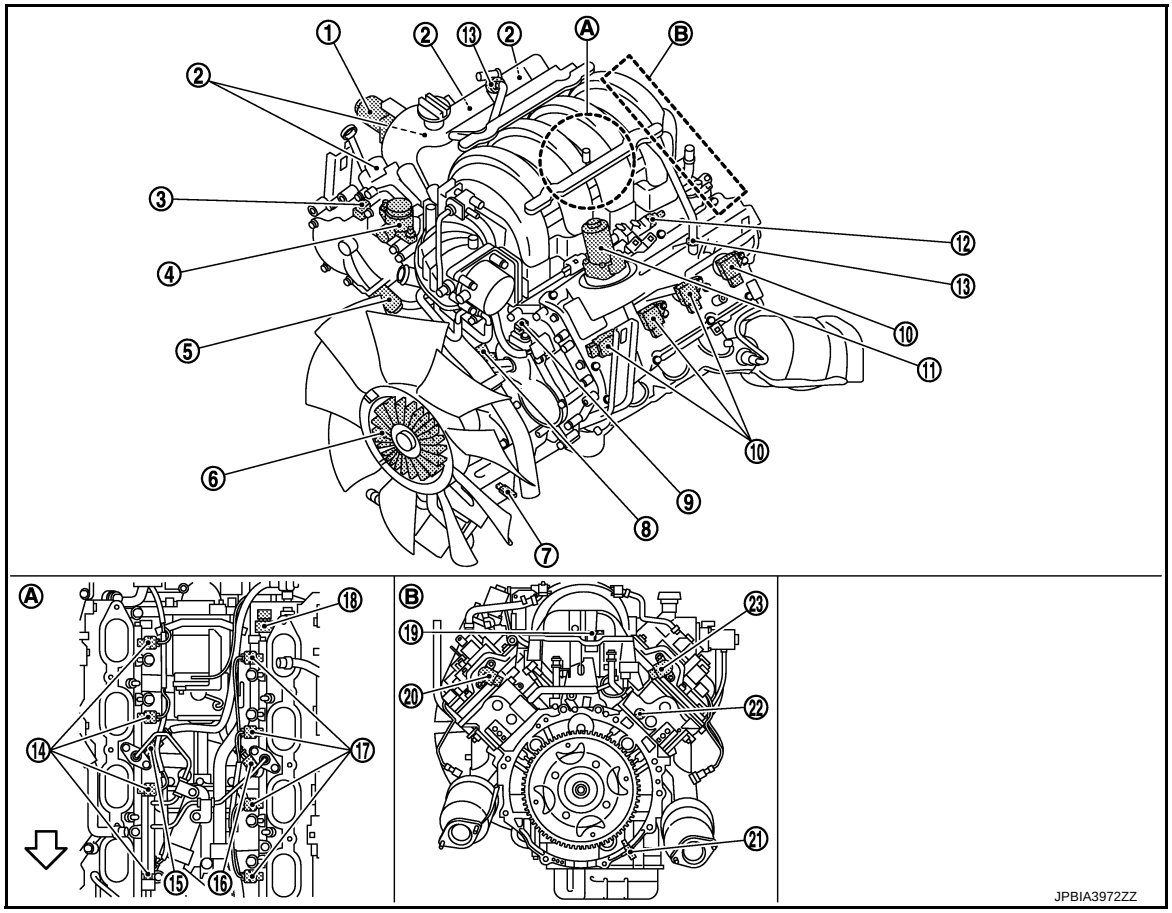
INFOID:0000000009008764

ENGINE ROOM COMPARTMENT



1. IPDM E/R
2. ECM
3. Battery current sensor (with battery temperature sensor)
4. Power steering pressure sensor
5. Alternator
6. Refrigerant pressure sensor
7. EVAP canister purge volume control solenoid valve
8. Electric throttle control actuator
9. Mass air flow sensor (with intake air temperature sensor)
10. VVEL control module

ENGINE COMPARTMENT

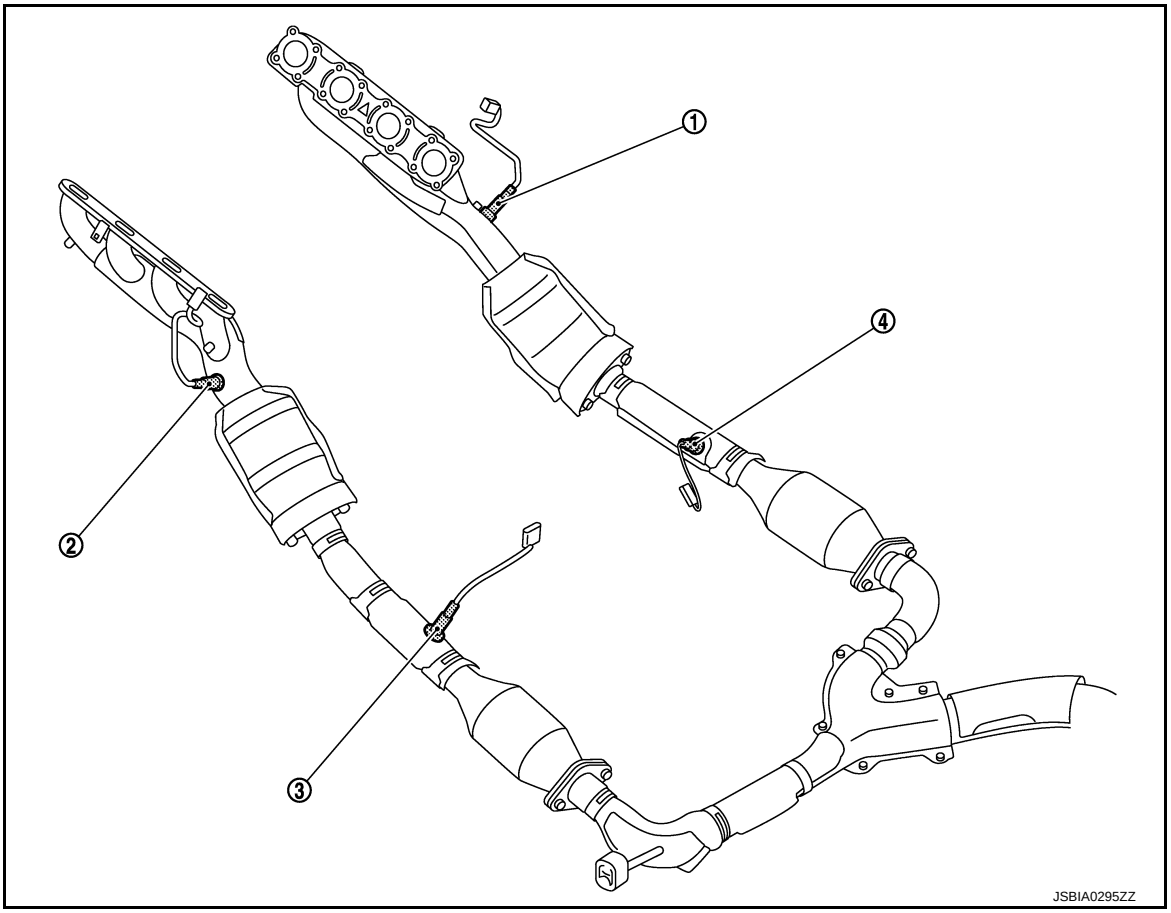


1. VVEL actuator motor (bank 2)
2. Ignition coil (with power transistor) and spark plug (bank 2)
3. Camshaft position sensor (bank 2)
4. High pressure fuel pump
5. Intake valve timing control solenoid valve (bank 2)
6. Electric-viscous fan assembly
7. Engine oil temperature sensor
8. Intake valve timing control solenoid valve (bank 1)
9. Camshaft position sensor (bank 1)
10. Ignition coil (with power transistor) and spark plug (bank 1)
11. VVEL actuator motor (bank 1)
12. Low fuel pressure sensor
13. Positive crankcase ventilation (PCV) valve
14. Fuel injector (bank 2)
15. Knock sensor (bank 2)
16. Knock sensor (bank 1)
17. Fuel injector (bank 1)
18. Fuel rail pressure sensor
19. Manifold absolute pressure sensor
20. VVEL control shaft position sensor (bank 1)
21. Crankshaft position sensor
22. Engine coolant temperature sensor
23. VVEL control shaft position sensor (bank 2)

A. Top view of the engine (View with intake manifold is removed)
B. Rear view of the engine

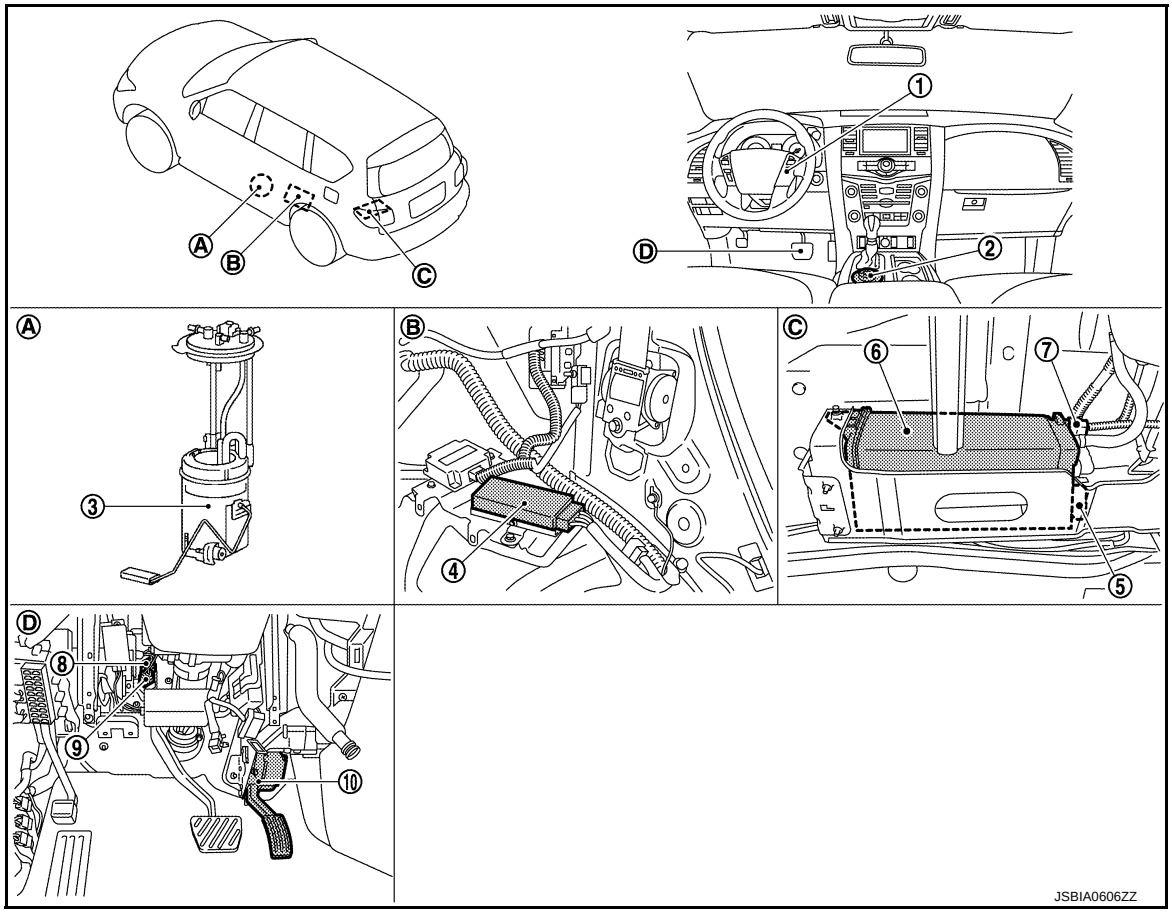
⇦ : Engine front

EXHAUST COMPARTMENT



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

BODY COMPARTMENT



1. ASCD steering switch
   ICC steering switch
2. Snow mode switch
3. Fuel level sensor unit and fuel pump assembly (with fuel tank temperature sensor)
4. Fuel pump control module (FPCM)
5. EVAP canister vent control valve
6. EVAP canister
7. EVAP control system pressure sensor
8. Stop lamp switch
9. ASCD brake switch
   ICC brake switch
10. Accelerator pedal position sensor

Component Description

INFOID:0000000009008765

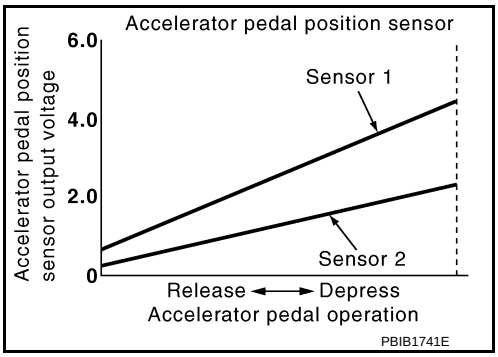
Component	Reference
ECM	EC-30, "ECM"
Malfunction indicator lamp (MIL)	EC-37, "Malfunction Indicator Lamp (MIL)"
Ignition coil with power transistor	EC-36, "Ignition Coil With Power Transistor"
Accelerator pedal position sensor	EC-28, "Accelerator Pedal Position Sensor"
Mass air flow sensor	EC-38, "Mass Air Flow Sensor (With Intake Air Temperature Sensor)"
Intake air temperature sensor	
Electric throttle control actuator	EC-30, "Electric Throttle Control Actuator"
Throttle control motor relay	
Throttle control motor	
Throttle position sensor	
Crankshaft position sensor	EC-30, "Crankshaft Position Sensor"
Camshaft position sensor	EC-29, "Camshaft Position Sensor"
Engine coolant temperature sensor	EC-32, "Engine Coolant Temperature Sensor"

Component	Reference
High pressure fuel pump	EC-35, "High Pressure Fuel Pump"
Low pressure fuel pump	EC-37, "Low Pressure Fuel Pump"
Fuel pump control module (FPCM)	EC-34, "Fuel Pump Control Module"
Fuel rail pressure sensor	EC-34, "Fuel Rail Pressure Sensor"
Low fuel pressure sensor	EC-37, "Low Fuel Pressure Sensor"
Fuel injector	EC-33, "Fuel Injector"
Fuel level sensor	EC-33, "Fuel Level Sensor"
Fuel tank temperature sensor	EC-34, "Fuel Tank Temperature Sensor"
A/F sensor 1	EC-28, "Air Fuel Ratio (A/F) Sensor 1"
A/F sensor 1 heater	
Heated oxygen sensor 2	EC-34, "Heated Oxygen Sensor 2"
Heated oxygen sensor 2 heater	
Manifold absolute pressure sensor	EC-38, "Manifold Absolute Pressure Sensor"
Knock sensor	EC-37, "Knock Sensor"
Engine oil temperature sensor	EC-32, "Engine Oil Temperature Sensor"
Power steering pressure sensor	EC-38, "Power Steering Pressure (PSP) Sensor"
Electrically-controlled cooling fan coupling	EC-31, "Electrically-controlled cooling fan coupling"
Intake valve timing control solenoid valve	EC-36, "Intake Valve Timing Control Solenoid Valve"
VVEL control module	EC-39, "VVEL Control Module"
VVEL actuator motor relay	EC-39, "VVEL Actuator Motor Relay"
VVEL actuator motor	EC-39, "VVEL Actuator Motor"
VVEL control shaft position sensor	EC-39, "VVEL Control Shaft Position Sensor"
EVAP control system pressure sensor	EC-33, "EVAP Control System Pressure Sensor"
EVAP canister vent control valve	EC-33, "EVAP Canister Vent Control Valve"
EVAP canister purge volume control solenoid valve	EC-33, "EVAP Canister Purge Volume Control Solenoid Valve"
Battery current sensor (with battery temperature sensor)	EC-29, "Battery Current Sensor (With Battery Temperature Sensor)"
Refrigerant pressure sensor	EC-39, "Refrigerant Pressure Sensor"
Stop lamp switch	EC-28, "ASCD Brake Switch & Stop Lamp Switch"
ASCD brake switch	
ASCD steering switch	EC-28, "ASCD Steering Switch"
Information display	EC-58, "AUTMATIC SPEED CONTROL DEVICE (ASCD) : Switch Name and Function"
Stop lamp switch	EC-36, "ICC Brake Switch & Stop Lamp Switch"
ICC brake switch	
ICC steering switch	EC-36, "ICC Steering Switch"

Accelerator Pedal Position Sensor

INFOID:0000000009008766

The accelerator pedal position (APP) sensor is installed on the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



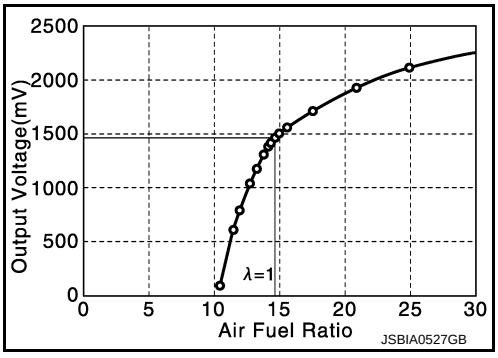
Air Fuel Ratio (A/F) Sensor 1

INFOID:0000000009008767

DESCRIPTION

The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.
The sensor is capable of precise measurement λ = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.
The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 760°C (1,400°F).



A/F SENSOR 1 HEATER

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

ASCD Brake Switch & Stop Lamp Switch

INFOID:0000000009008768

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

ASCD Steering Switch

INFOID:0000000009008769

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

ASCD Indicators

INFOID:0000000009008770

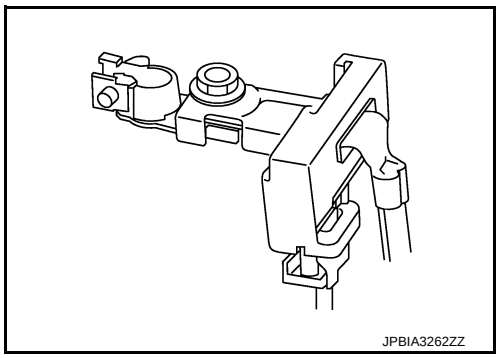
ASCD operation status is indicated by CRUISE indicator in combination meter.
ECM transmits the ASCD status signal to the combination meter via CAN communication according to ASCD operation.

Battery Current Sensor (With Battery Temperature Sensor)

INFOID:0000000009008771

OUTLINE

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator.
Based on sensor signals, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-6, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description".


JPBIA3262ZZ

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

BATTERY CURRENT SENSOR

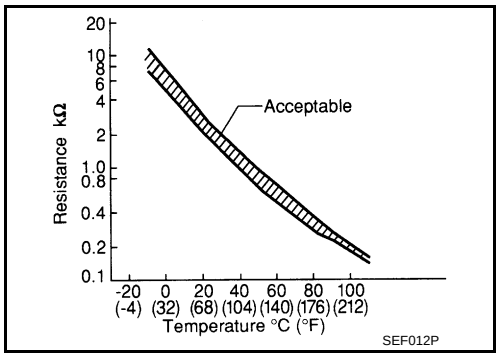
The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery.

BATTERY TEMPERATURE SENSOR

Battery temperature sensor is integrated in battery current sensor.
The sensor measures ambient temperature around the battery.
The electrical resistance of the thermistor decreases as temperature increases.
<Reference data>

Temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.333	1.9 - 2.1
90 (194)	0.969	0.222 - 0.258

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

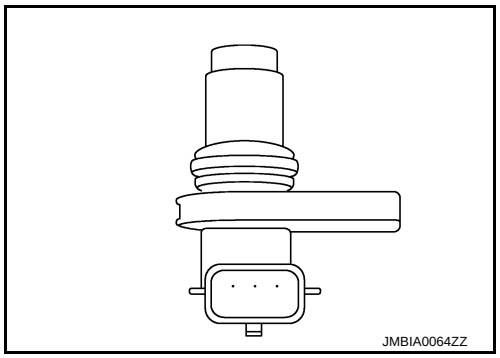


SEF012P

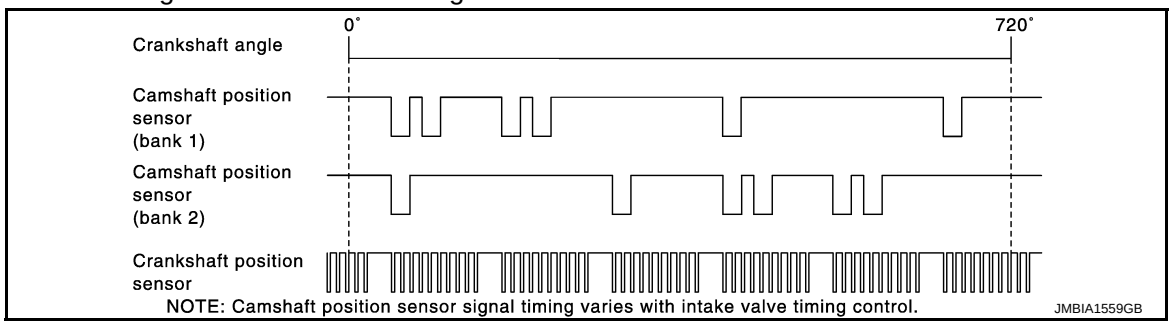
Camshaft Position Sensor

INFOID:0000000009008772

The camshaft position (CMP) sensor senses the protrusion of the signal plate installed to the camshaft (INT) front end to identify a particular cylinder. The camshaft position sensor senses the piston position.
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.
When the crankshaft position sensor system becomes inoperative, the camshaft position sensor provides various controls of engine parts instead, utilizing timing of cylinder identification signals.


JMBIA0064ZZ

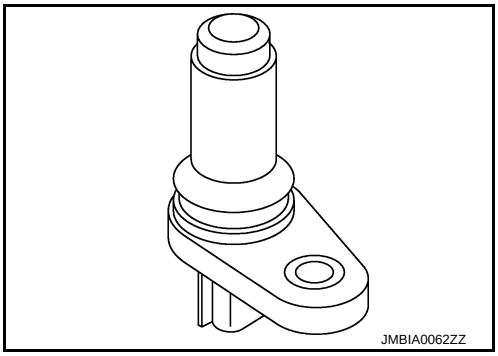
ECM receives the signals as shown in the figure.



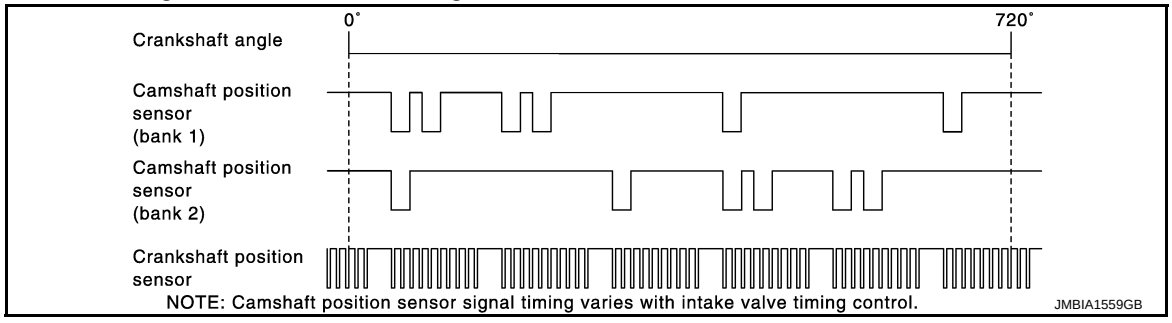
Crankshaft Position Sensor

INFOID:0000000009008773

The crankshaft position (CKP) sensor senses the protrusion of the signal plate installed to the drive plate to identify fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.



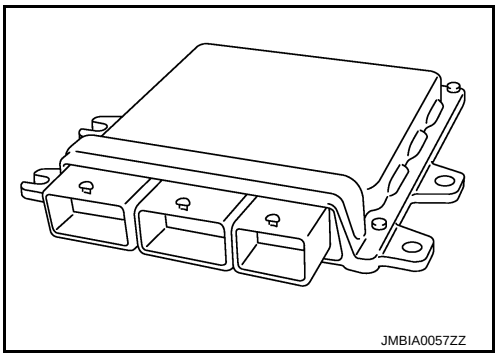
ECM receives the signals as shown in the figure.



ECM

INFOID:0000000009008774

- ECM (Engine Control Module) controls the engine.
- The ECM consists of a microcomputer and connectors for transmitting/receiving signals and for supplying power. Furthermore, the ECM is equipped with an injector driver unit and actuates the fuel injector at a high voltage (approximately 70 V at the maximum).
- ECM is equipped with ECM temperature sensors. If ECM is overheated, ECM controls output torque to prevent damage to itself.
- Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.

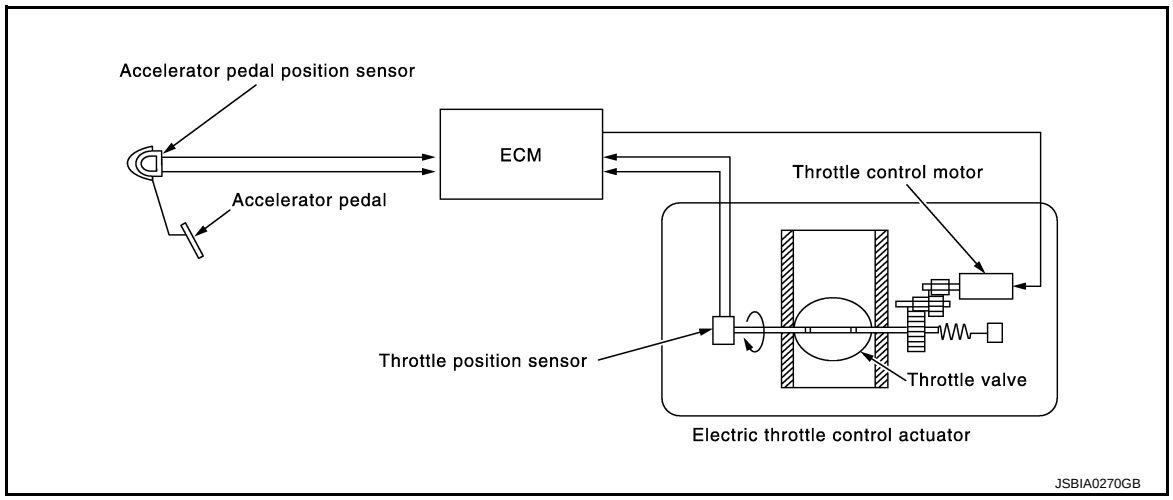


Electric Throttle Control Actuator

INFOID:0000000009008775

OUTLINE

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

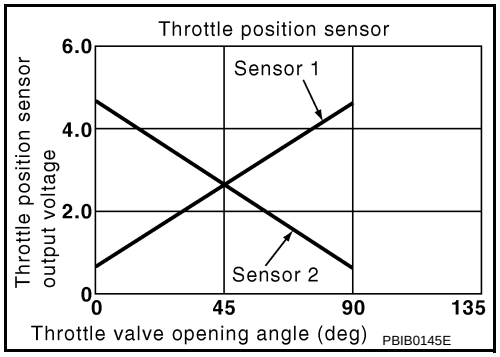


THROTTLE CONTROL MOTOR

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

THROTTLE POSITION SENSOR

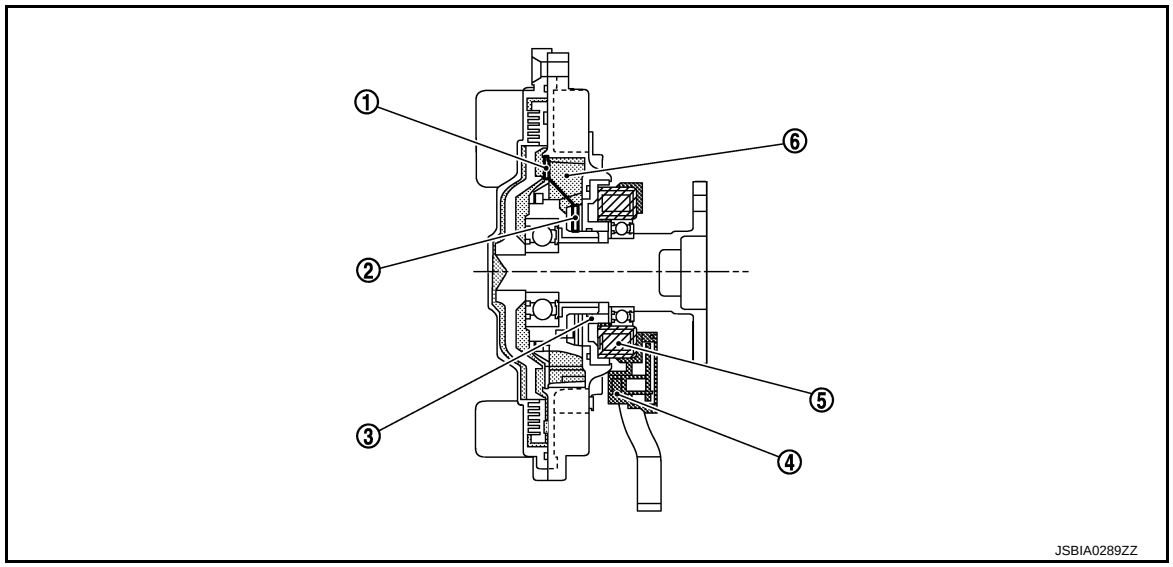
The throttle position (TP) sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening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



Electrically-controlled cooling fan coupling

INFOID:0000000009008776

Electrically-controlled cooling fan coupling is integrated with a fan coupling, fan coupling driver, and fan speed sensor, mounted to the fan pulley, and actuated by the drive belt to rotate the cooling fan at a speed suitable for a driving condition.

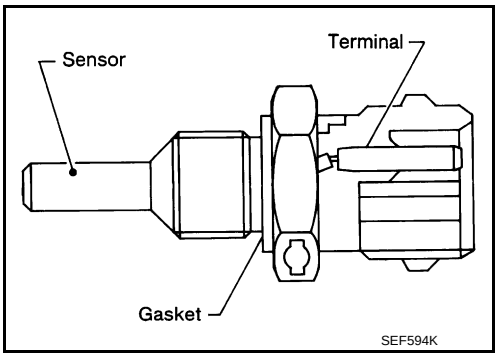


1. Valve
2. Armature
3. Magnet Loop Element
4. Fan speed sensor
5. Coil
6. Silicon oil

Engine Coolant Temperature Sensor

INFOID:0000000009008777

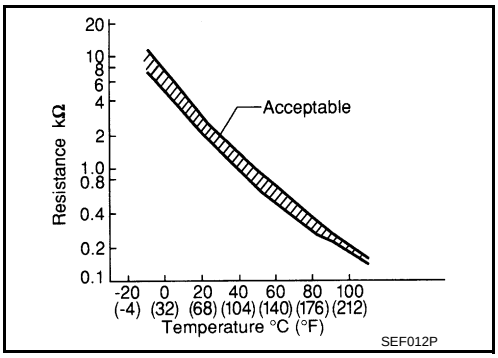
The engine coolant temperature (ECT) sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature.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



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.35 - 2.73
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

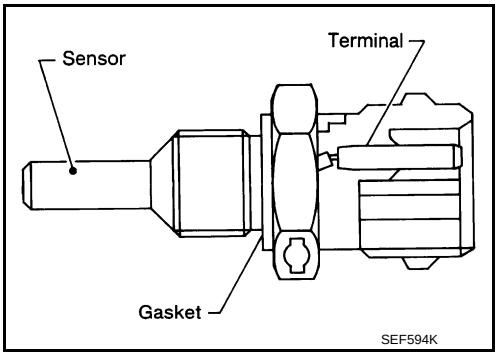
*: These data are reference values and are measured between ECM terminals.



Engine Oil Temperature Sensor

INFOID:0000000009008778

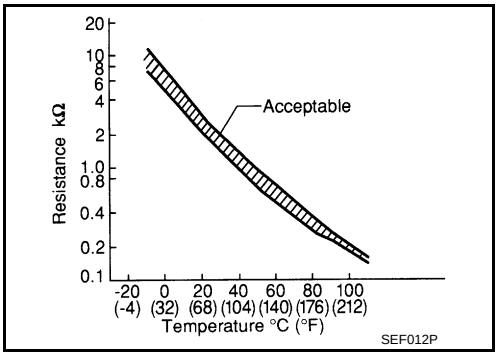
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance 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	2.35 - 2.73
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153

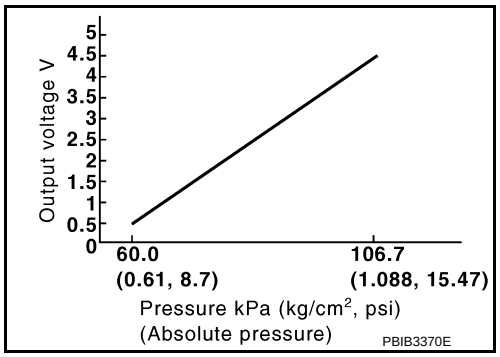
*: These data are reference values and are measured between ECM terminals.



EVAP Control System Pressure Sensor

INFOID:0000000009008779

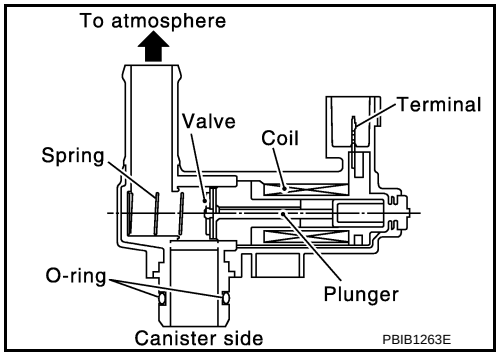
The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



EVAP Canister Vent Control Valve

INFOID:0000000009008780

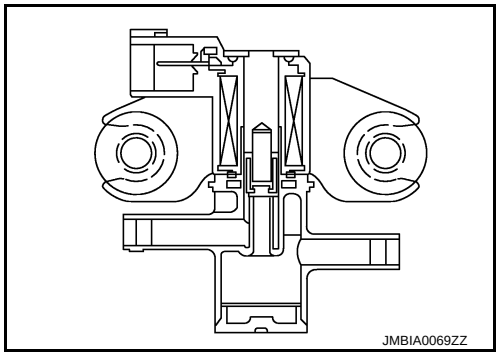
The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability 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 Canister Purge Volume Control Solenoid Valve

INFOID:0000000009008781

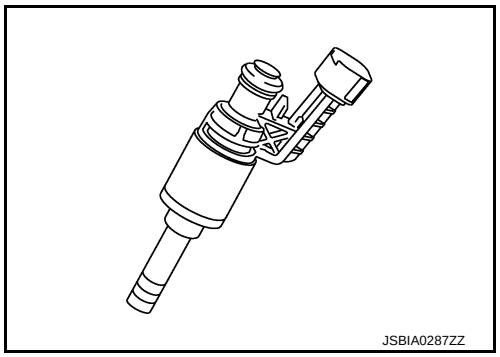
The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through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



Fuel Injector

INFOID:0000000009008782

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 Level Sensor

INFOID:0000000009008783

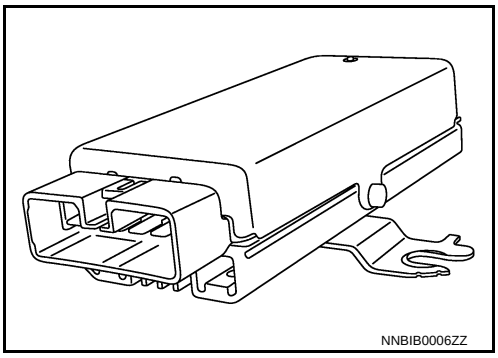
The fuel level sensor is mounted in the fuel level sensor unit.

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

Fuel Pump Control Module

INFOID:0000000009008784

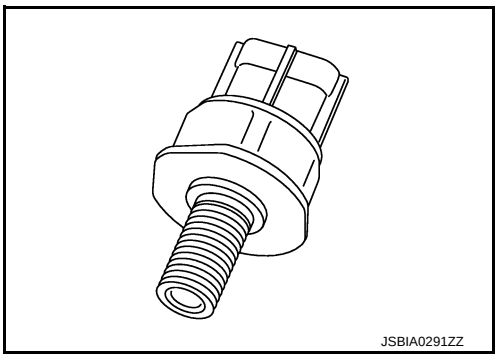
The fuel pump control module (FPCM) controls the discharging volume of the fuel pump by transmitting the FPCM control signals (Low/Mid/High) depending on driving conditions.



Fuel Rail Pressure Sensor

INFOID:0000000009008785

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.



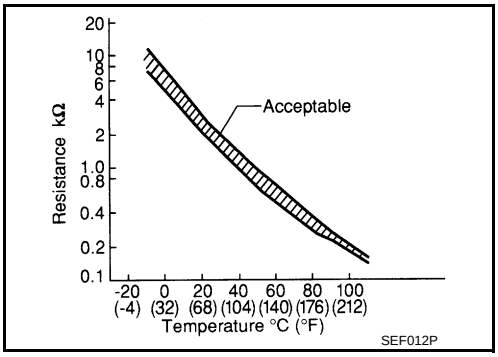
Fuel Tank Temperature Sensor

INFOID:0000000009008786

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

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

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

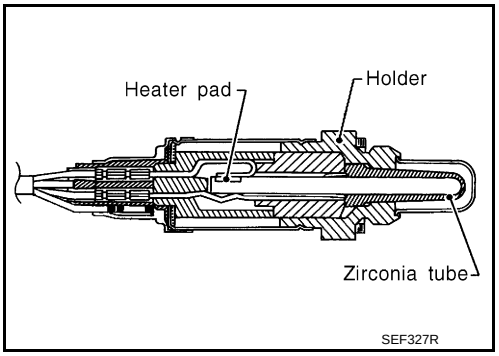


Heated Oxygen Sensor 2

INFOID:0000000009008787

DESCRIPTION

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



HEATED OXYGEN SENSOR 2 HEATER

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

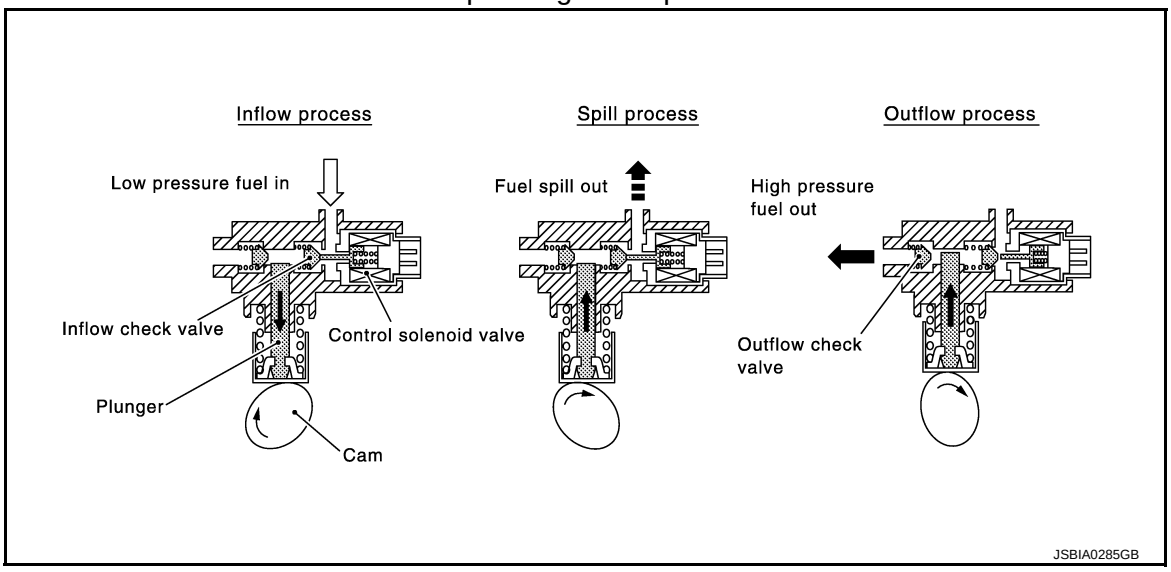
Engine speed	Heated oxygen sensor 2 heater
Above 3,600 rpm	OFF
Below 3,600 rpm after the following conditions are met. • Engine: After warming up • Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	ON

High Pressure Fuel Pump

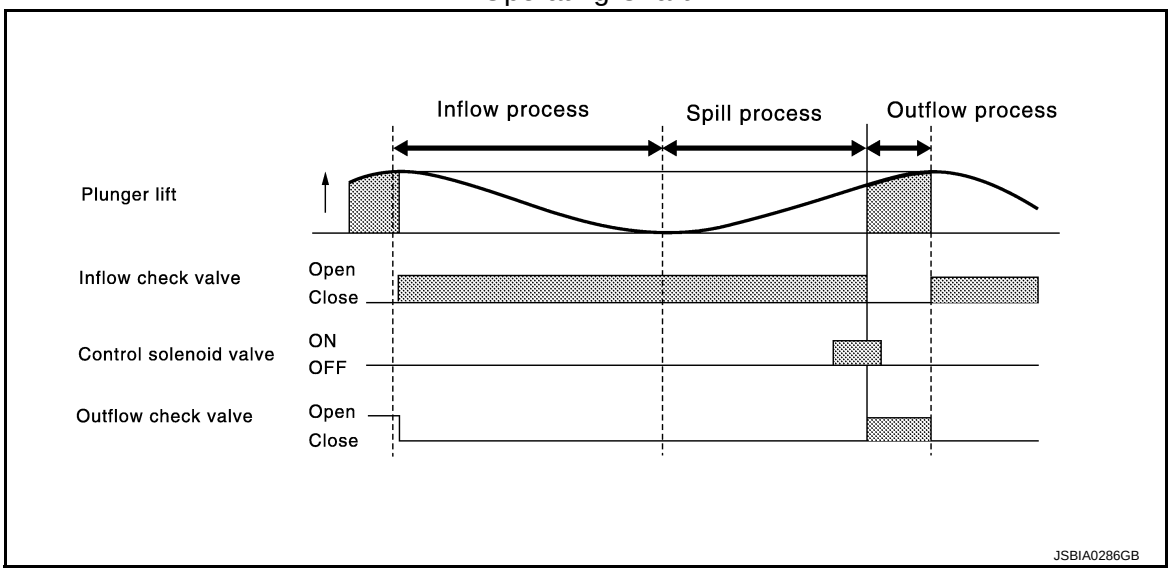
INFOID:0000000009008788

The high pressure fuel pump is installed at the front of the engine bank 2 side and activated by the camshaft.
ECM controls the high pressure fuel pump control solenoid valve built into the high pressure fuel pump and adjusts the amount of discharge by changing the suction timing of the low pressure fuel.

Operating Description



Operating Chart



ICC Brake Switch & Stop Lamp Switch

INFOID:0000000009008789

Stop lamp switch and ICC brake switch are installed to brake pedal bracket.
When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON.
ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).
ECM transmits ICC brake switch signal to ADAS control unit via CAN communication line.

ICC Steering Switch

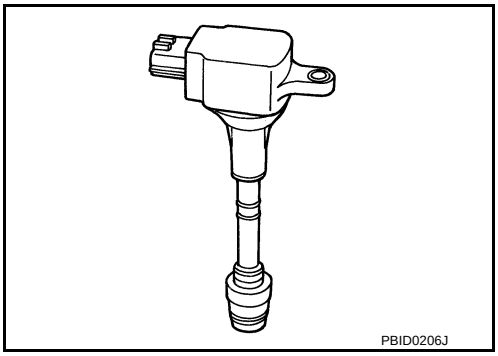
INFOID:0000000009008790

ICC steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
ECM transmits ICC steering switch signal to ADAS control unit via CAN communication line.

Ignition Coil With Power Transistor

INFOID:0000000009008791

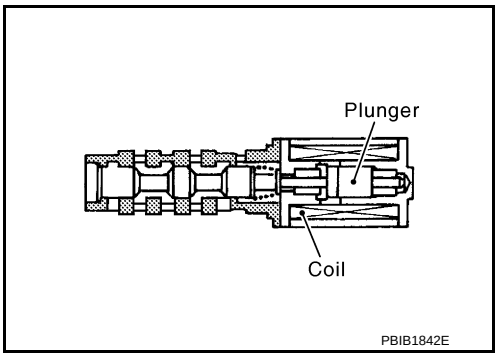
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.



Intake Valve Timing Control Solenoid Valve

INFOID:0000000009008792

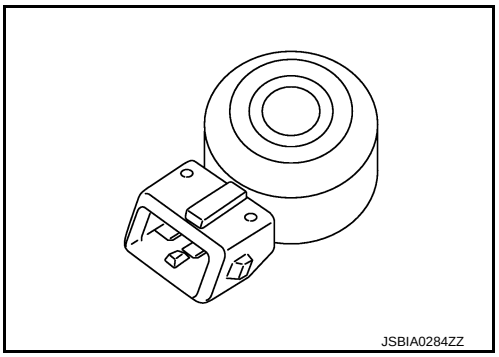
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



Knock Sensor

INFOID:0000000009008793

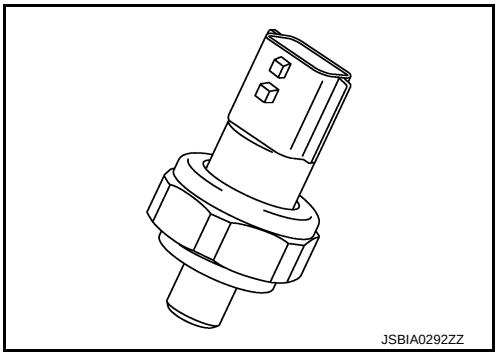
The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.


JSBIA0284ZZ

Low Fuel Pressure Sensor

INFOID:0000000009008794

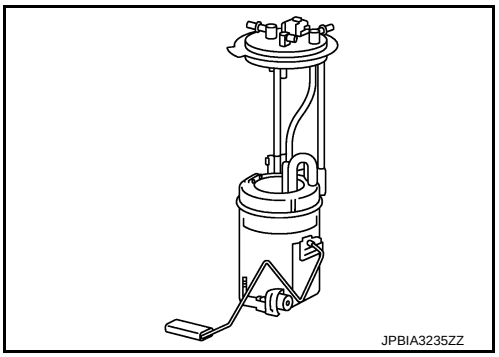
The low fuel pressure sensor is installed to low fuel pressure piping and measures the low fuel pressure. The sensor transmits voltage signal to the ECM. As the pressure increases, the voltage rises.


JSBIA0292ZZ

Low Pressure Fuel Pump

INFOID:0000000009008795

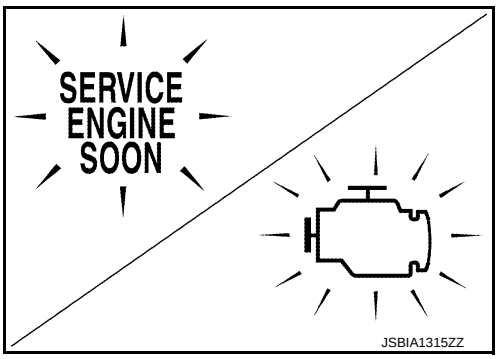
The low pressure fuel pump is integrated with a fuel pressure regulator and a fuel filter. This pump is build into the fuel tank.
ECM controls the low pressure fuel pump via FPCM.


JPBIA3235ZZ

Malfunction Indicator Lamp (MIL)

INFOID:0000000009008796

The Malfunction Indicator Lamp (MIL) is located on the combination meter.
The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MIL should turn off. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.
For details, refer to EC-60, "Diagnosis Description".

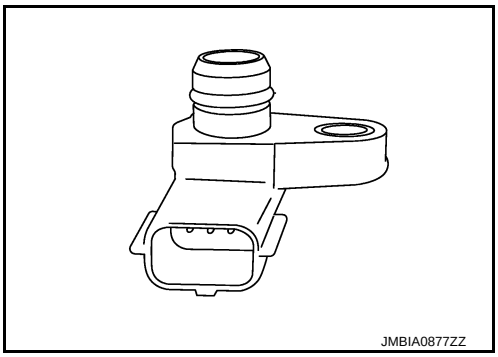


JSBIA1315ZZ

Manifold Absolute Pressure Sensor

INFOID:0000000009008797

The manifold absolute pressure (MAP) sensor is installed on the intake manifold collector. Detects intake manifold pressure, and transmits a voltage signal to the ECM.
The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.

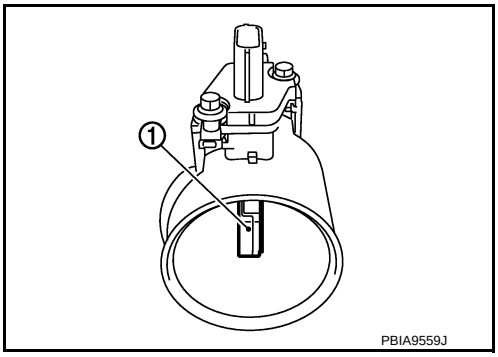


Mass Air Flow Sensor (With Intake Air Temperature Sensor)

INFOID:0000000009008798

MASS AIR FLOW SENSOR

The mass air flow (MAF) sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss.
Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



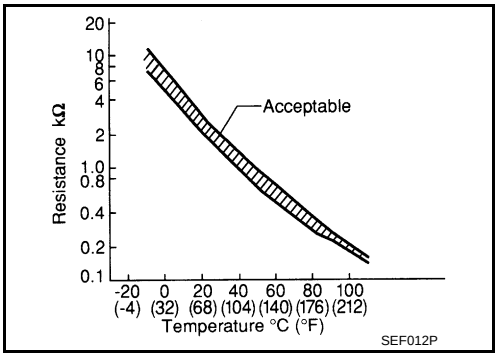
INTAKE AIR TEMPERATURE SENSOR

The intake air temperature (IAT) sensor is built-into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.

<Reference data>

Intake air temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.3	1.94 - 2.06
80 (176)	1.2	0.293 - 0.349

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



Power Steering Pressure (PSP) Sensor

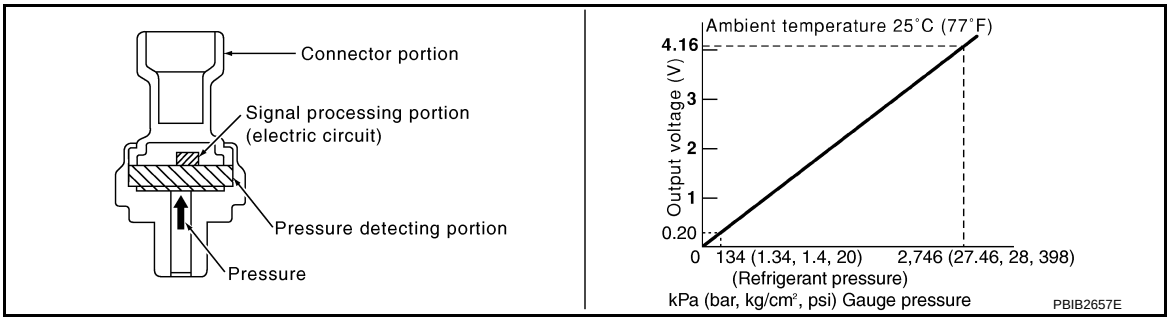
INFOID:0000000009008799

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load.
This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

Refrigerant Pressure Sensor

INFOID:0000000009008800

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



VVEL Actuator Motor

INFOID:0000000009008801

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

VVEL Actuator Motor Relay

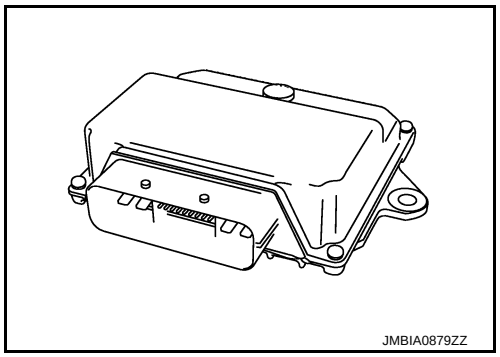
INFOID:0000000009008802

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

VVEL Control Module

INFOID:0000000009008803

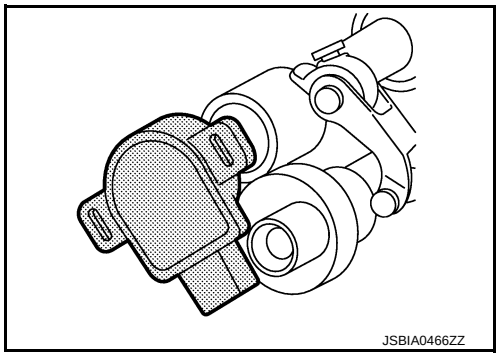
The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.



VVEL Control Shaft Position Sensor

INFOID:0000000009008804

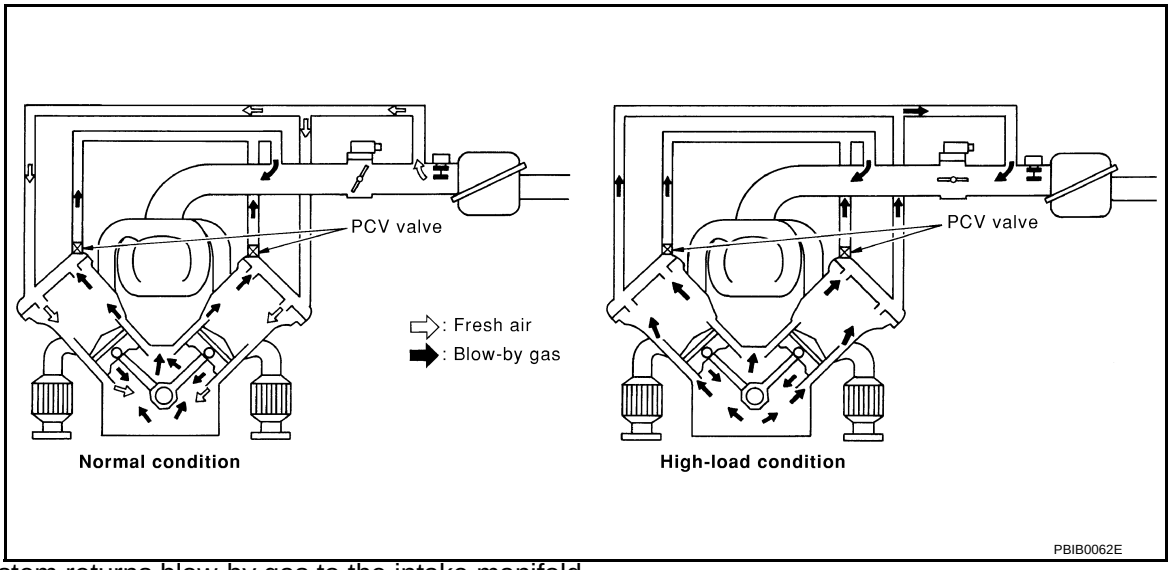
VVEL control shaft position sensor detects the control shaft position angle.
A magnet is installed to the tip of the control shaft.
The magnetic field changes as the control shaft rotates. This changes output voltage of the VVEL control shaft position sensor.
VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.



STRUCTURE AND OPERATION

Positive Crankcase Ventilation

INFOID:0000000009008805



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

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

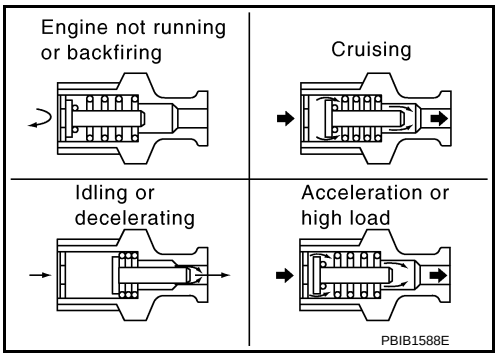
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

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

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

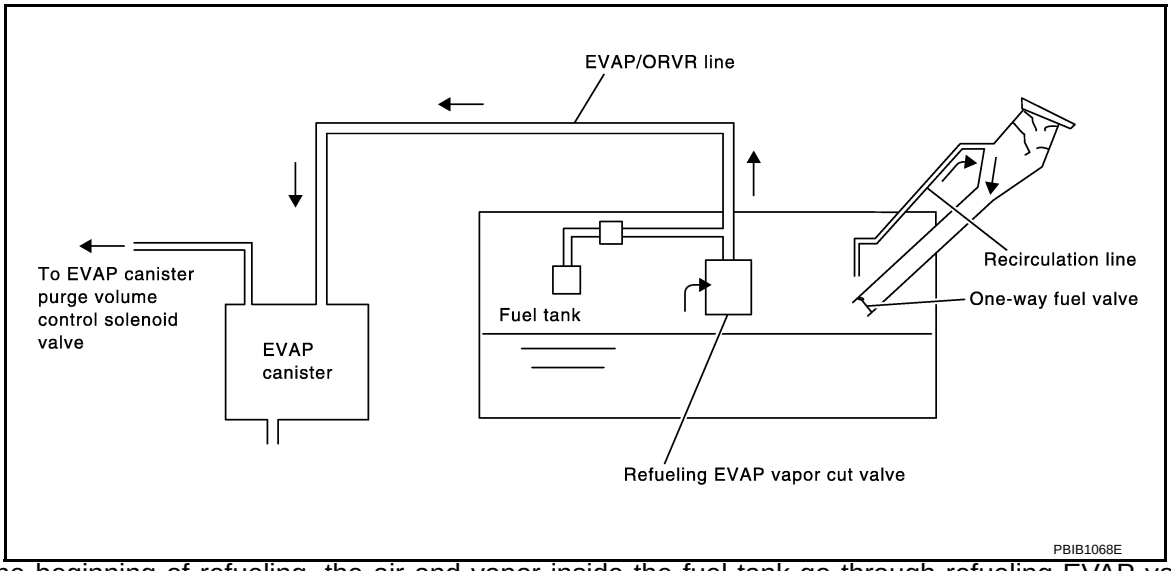
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

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



On Board Refueling Vapor Recovery (ORVR)

INFOID:0000000009008806



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

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

WARNING:

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

- **Put a "CAUTION: FLAMMABLE" sign in workshop.**
- **Never smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Always furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

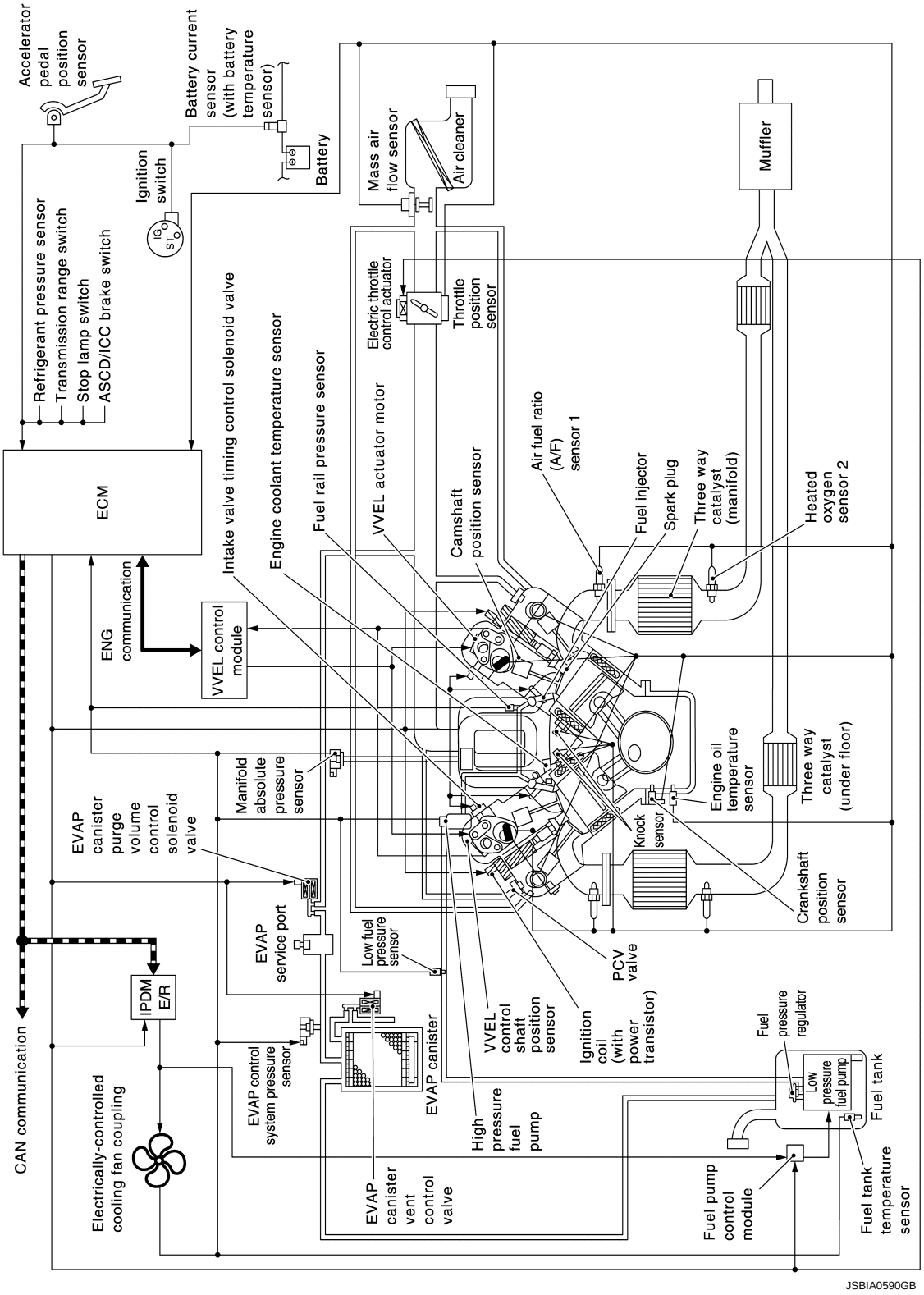
- **Before removing fuel line parts, carry out the following procedures:**
- **Put drained fuel in an explosion-proof container and put lid on securely.**
- **Release fuel pressure from fuel line. Refer to EC-168, "Work Procedure".**
- **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Never kink or twist hose and tube when they are installed.**
- **Never tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connections.**
- **Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

SYSTEM

ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : System Diagram

INFOID:0000000009008807



ENGINE CONTROL SYSTEM : System Description

INFOID:0000000009008808

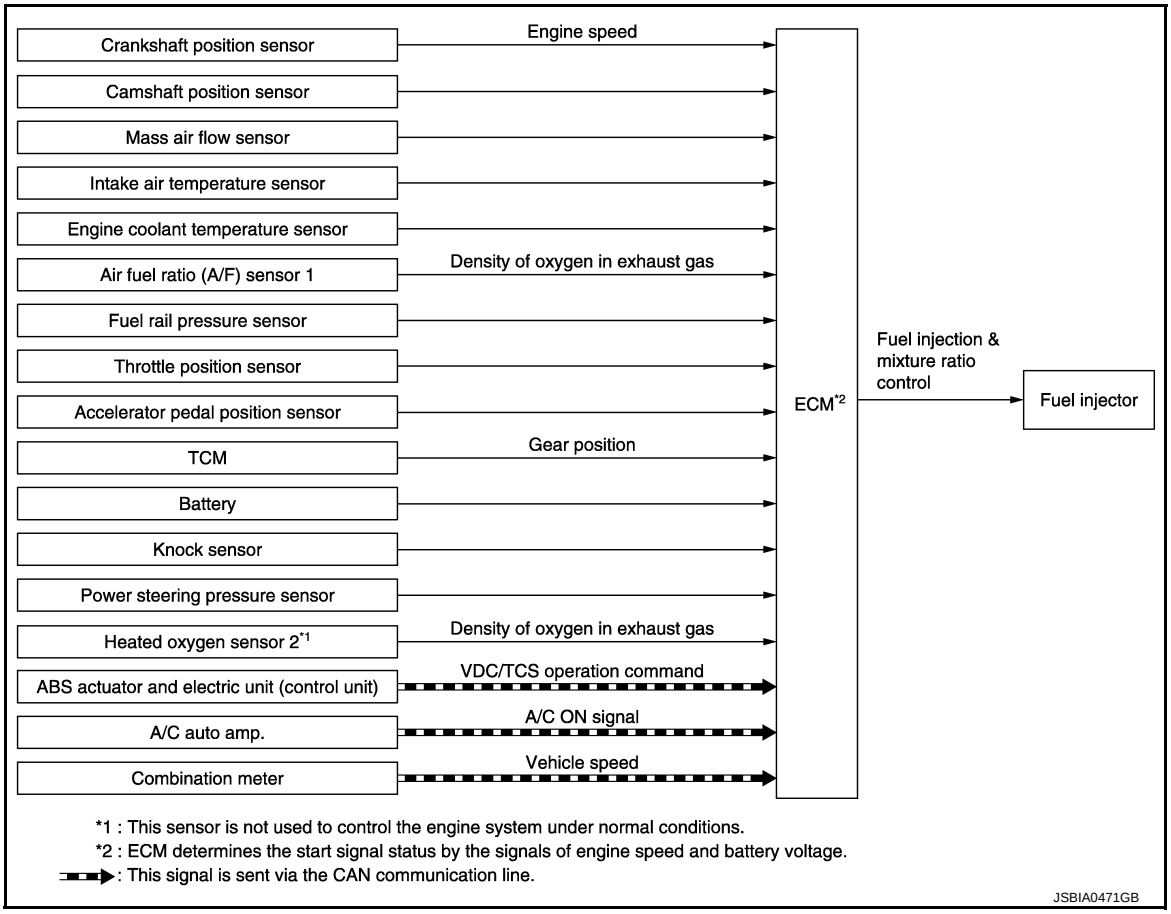
ECM controls the engine by various functions.

Function	Reference
Fuel injection control	EC-43, "DIRECT INJECTION GASOLINE SYSTEM : System Description"
Fuel pressure control	EC-46, "FUEL PRESSURE CONTROL : System Description"
Cooling fan control	EC-48, "COOLING FAN CONTROL : System Description"
Electric ignition control	EC-49, "ELECTRIC IGNITION SYSTEM : System Description"
Intake valve timing control	EC-50, "INTAKE VALVE TIMING CONTROL : System Description"
VVEL (Variable Valve Event & Lift)	EC-51, "VVEL SYSTEM : System Description"
Evaporative emission	EC-52, "EVAPORATIVE EMISSION SYSTEM : System Description"
Air conditioning cut control	EC-55, "AIR CONDITIONING CUT CONTROL : System Description"
ASCD (Auto speed control device)	EC-56, "AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description"
Power generation voltage variable control	CHG-6, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description"

DIRECT INJECTION GASOLINE SYSTEM

DIRECT INJECTION GASOLINE SYSTEM : System Diagram

INFOID:0000000009008809



DIRECT INJECTION GASOLINE SYSTEM : System Description

INFOID:0000000009008810

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

The adoption of the direct fuel injection method enables more accurate adjustment of fuel injection quantity by injecting atomized high-pressure fuel directly into the cylinder. This method allows high-powered engine, low fuel consumption, and emissions-reduction.

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

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

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

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

FUEL INJECTION CONTROL

Stratified-charge Combustion

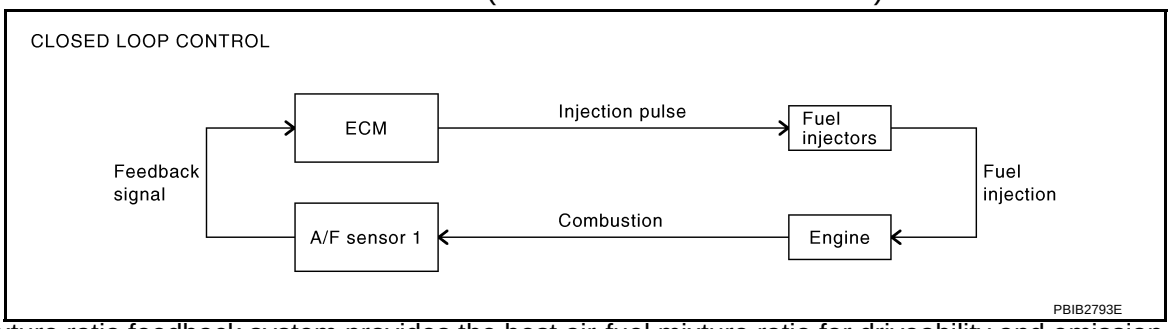
Stratified-charge combustion is a combustion method which enables extremely lean combustion by injecting fuel in the latter half of a compression process, collecting combustible air-fuel around the spark plug, and forming fuel-free airspace around the mixture.

Right after a start with the engine cold, the catalyst warm-up is accelerated by stratified-charge combustion.

Homogeneous Combustion

Homogeneous combustion is a combustion method that fuel is injected during intake process so that combustion occurs in the entire combustion chamber, as is common with conventional methods.
As for a start except for starts with the engine cold, homogeneous combustion occurs.

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to EC-28, "Air Fuel Ratio (A/F) Sensor 1". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

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

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

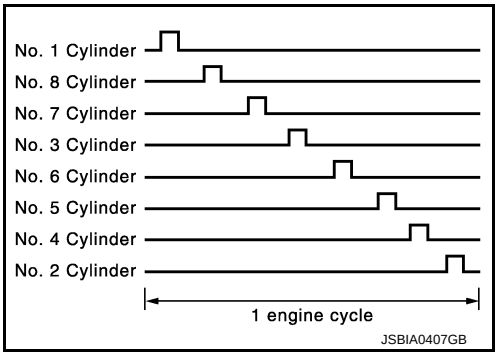
MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes “short-term fuel trim” and “long-term fuel trim”.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long-term fuel trim” is overall fuel compensation carried out over time to compensate for continual deviation of the “short-term fuel trim” from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING

Sequential Direct Injection Gasoline System

Fuel is injected into each cylinder during each engine cycle according to the ignition order.



STRATIFIED-CHARGE START CONTROL

The use of the stratified-charge combustion method enables emissions-reduction when starting the engine with engine coolant temperature between 5°C (41°F) and 40°C (104°F).

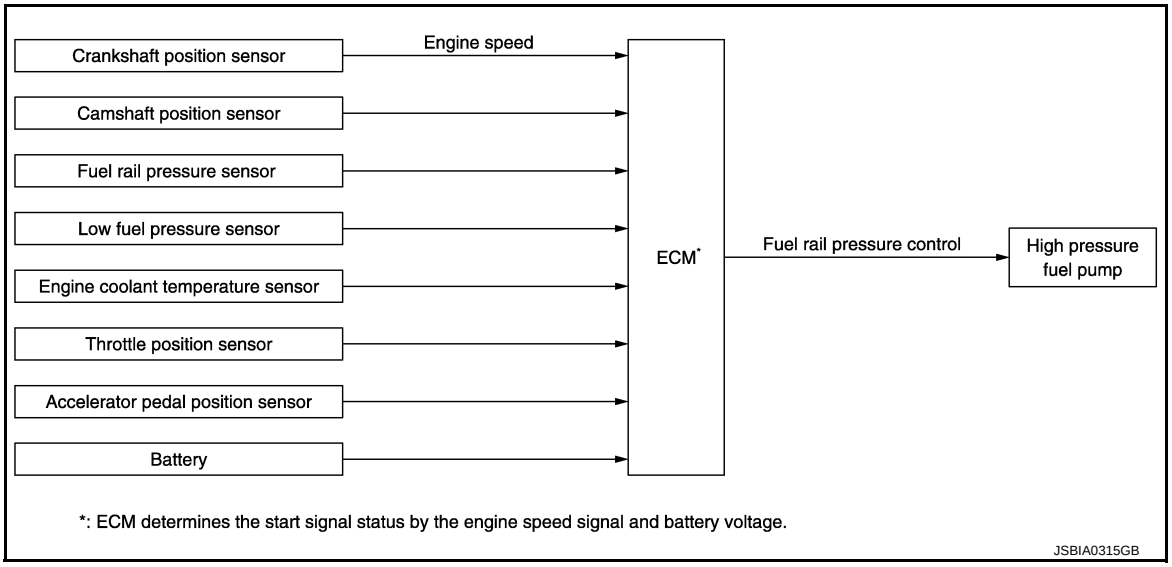
FUEL SHUT-OFF

Fuel to each cylinder is shut-off during deceleration, operation of the engine at excessively high speed or operation of the vehicle at excessively high speed.

FUEL PRESSURE CONTROL

FUEL PRESSURE CONTROL : System Diagram

INFOID:0000000009008811



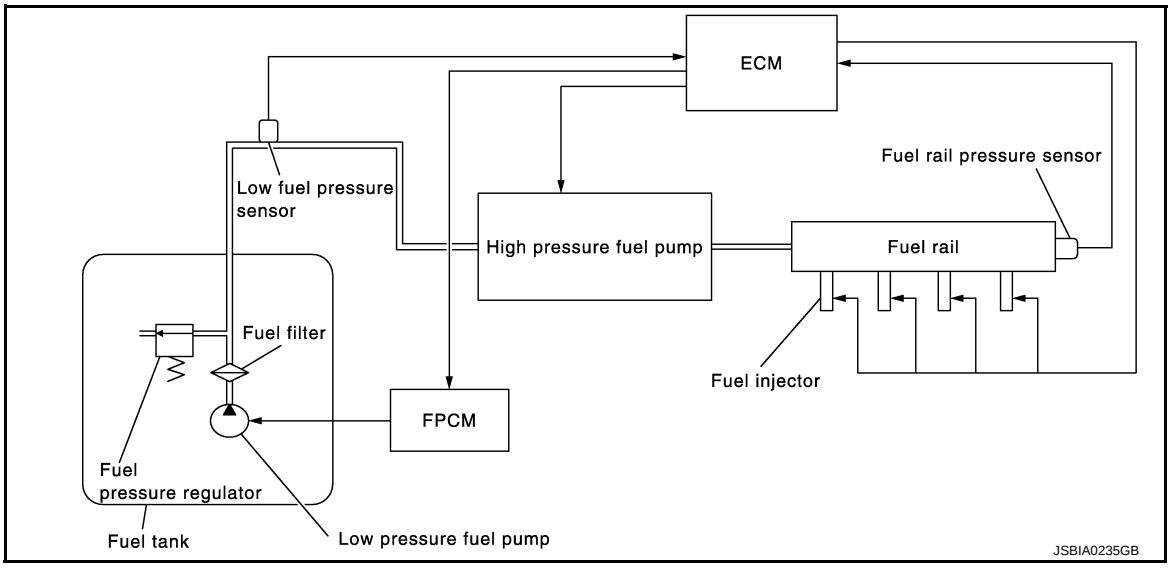
FUEL PRESSURE CONTROL : System Description

INFOID:0000000009008812

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed	Fuel injection & mixture ratio control	High pressure fuel pump
Camshaft position sensor	Camshaft position		
Fuel rail pressure sensor	Fuel rail pressure		
Low fuel pressure sensor	Low fuel pressure		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage		

SYSTEM DESCRIPTION



Low fuel pressure control

- The low fuel pressure pump is controlled by the fuel pump control module (FPCM) and pumps fuel according to a driving condition. The pumped fuel passes through the fuel filter and is sent to the high pressure fuel pump. FPCM controls the low pressure fuel pump, according to a signal from ECM as shown in the table below.

Conditions	Amount of fuel flow	Supplied voltage
After a laps of 1 second after ignition ON	OFF	0 V
• For 1 second after turning ignition switch ON • Engine is running under low load and low speed conditions	Low	Approximately 8.5 V
• Engine cranking • Engine coolant temperature is below 10°C (50°F) • Engine is running under high load and high speed conditions	High	Battery voltage (11 – 14 V)
Except the above	Mid	Approximately 10 V

- Low fuel pressure is adjusted by the fuel pressure regulator.

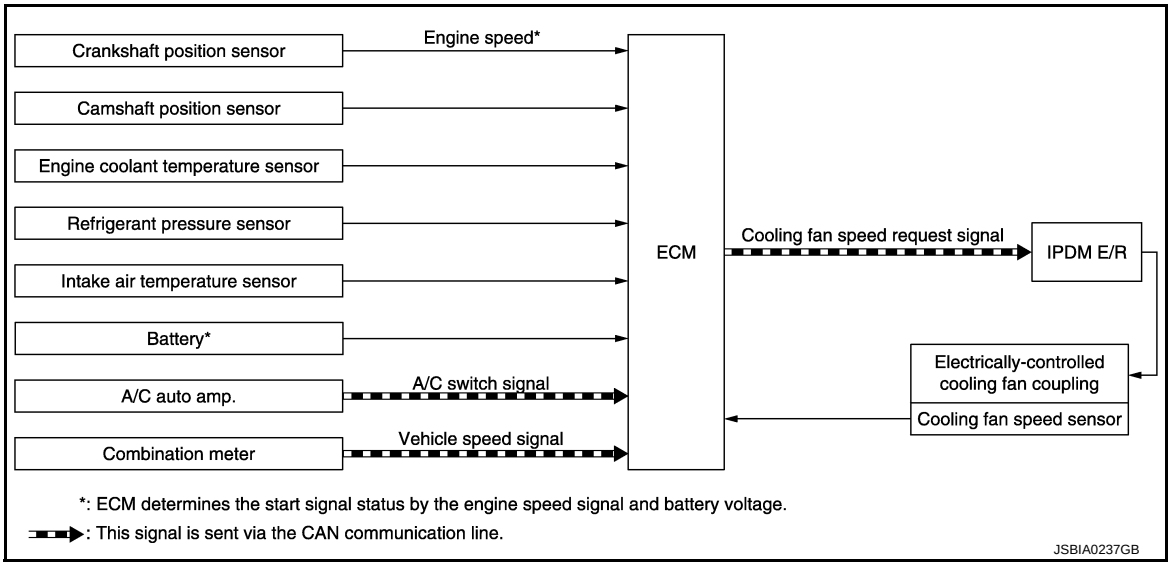
High fuel pressure control

- The high pressure fuel pump raises the pressure of the fuel sent from the low pressure fuel pump. Actuated by the camshaft, the high pressure fuel pump activates the high pressure fuel pump solenoid based on a signal received from ECM, and adjusts the amount of discharge by changing the timing of closing the inlet check valve to control fuel rail pressure.

COOLING FAN CONTROL

COOLING FAN CONTROL : System Diagram

INFOID:0000000009008813



COOLING FAN CONTROL : System Description

INFOID:0000000009008814

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*1	Cooling fan speed request signal*2	IPDM E/R ↓ Electrically-controlled cooling fan coupling
Camshaft position sensor	Camshaft position		
Engine coolant temperature sensor	Engine coolant temperature		
Refrigerant pressure sensor	Refrigerant pressure		
Intake air temperature sensor	Intake air temperature		
Battery	Battery voltage		
Combination meter	Vehicle speed signal*2		
BCM	A/C switch signal*2		
Cooling fan speed sensor	Cooling fan speed		

*1: The ECM determines the engine speed by the signals of crankshaft position and camshaft position.

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

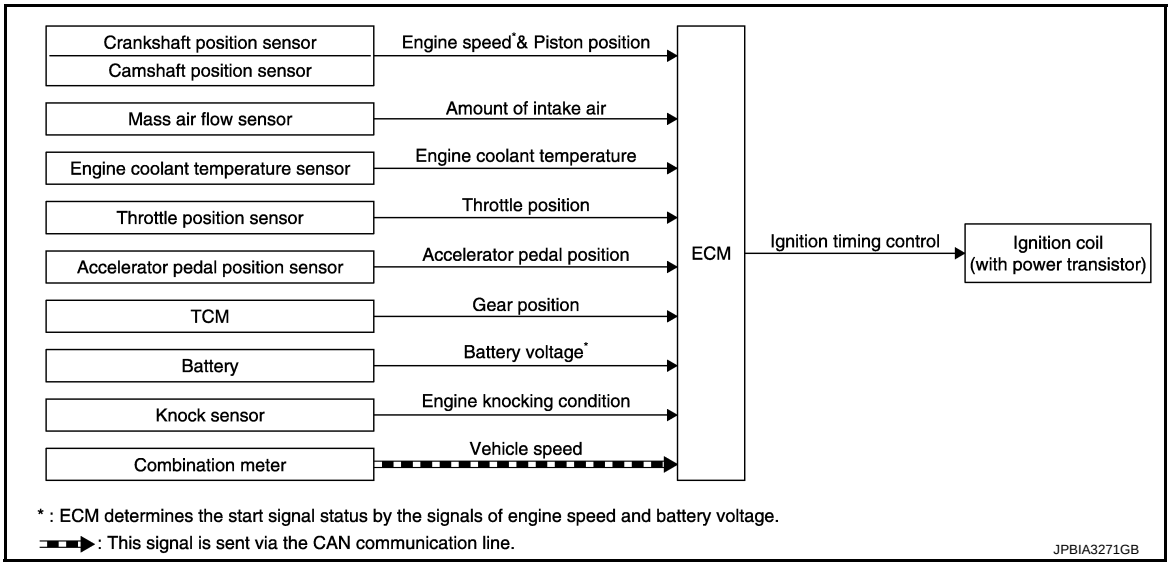
SYSTEM DESCRIPTION

- Based on a signal transmitted from each sensor, ECM calculates a target fan speed responsive to a driving condition. In addition, ECM calculates a fan pulley speed according to an engine speed and transmits a cooling fan request signal to IPDM E/R via the CAN communication line to satisfy the target fan speed. Then, IPDM E/R transmits ON/OFF pulse duty signal to electrically-controlled cooling fan coupling.
  The cooling fan speed sensor detects a cooling fan speed and transmits the detection result to ECM.
- ECM judges the start signal state from the engine speed signal and battery voltage.

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM : System Diagram

INFOID:0000000009008815



ELECTRIC IGNITION SYSTEM : System Description

INFOID:0000000009008816

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

Ignition order: 1 - 8 - 7 - 3 - 6 - 5 - 4 - 2

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

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

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

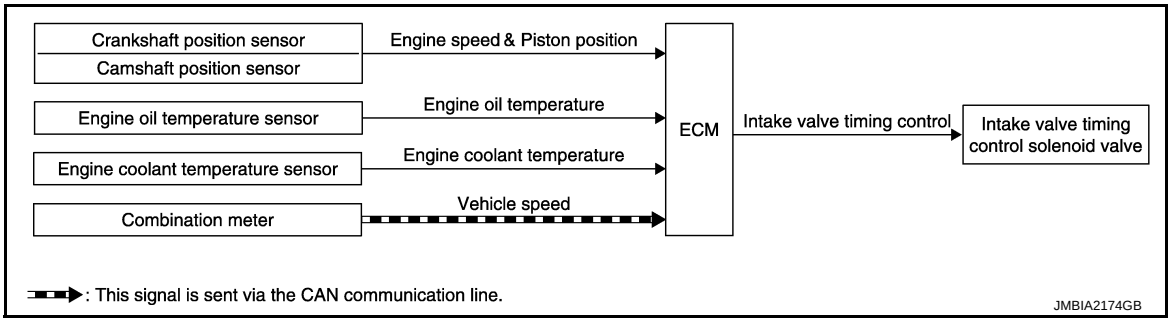
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

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

INTAKE VALVE TIMING CONTROL

INTAKE VALVE TIMING CONTROL : System Diagram

INFOID:0000000009008817



INTAKE VALVE TIMING CONTROL : System Description

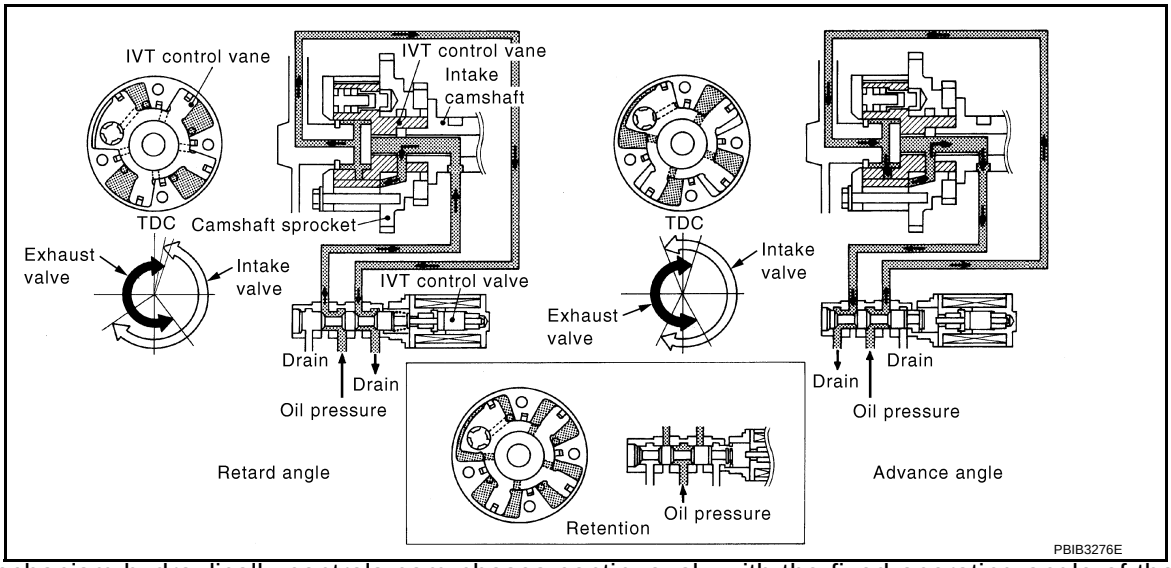
INFOID:0000000009008818

INPUT/OUTPUT SIGNAL CHART

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

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

SYSTEM DESCRIPTION



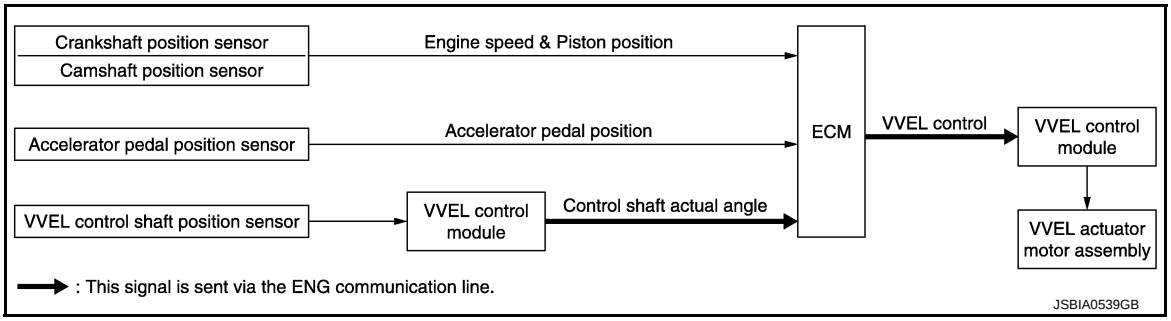
This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

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 control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high speed range.

VVEL SYSTEM

VVEL SYSTEM : System Diagram

INFOID:0000000009008819



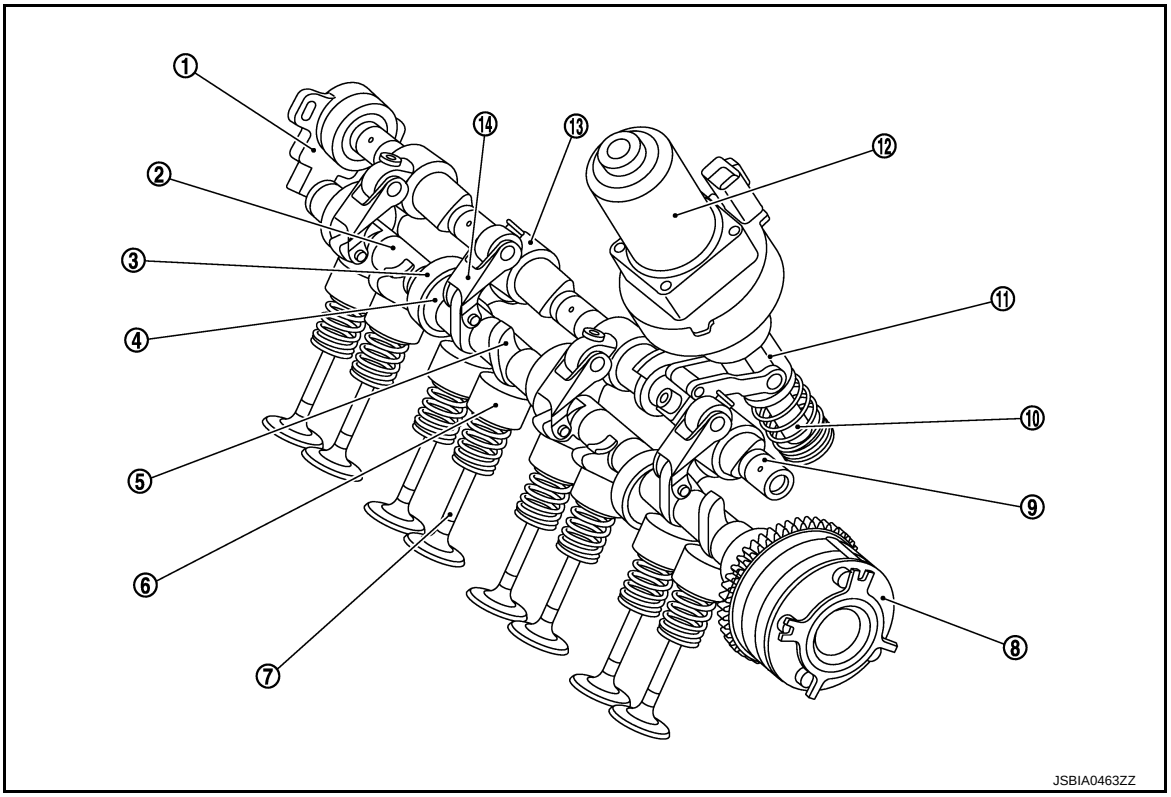
VVEL SYSTEM : System Description

INFOID:0000000009008820

INPUT/OUTPUT SIGNAL CHART

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

SYSTEM DESCRIPTION

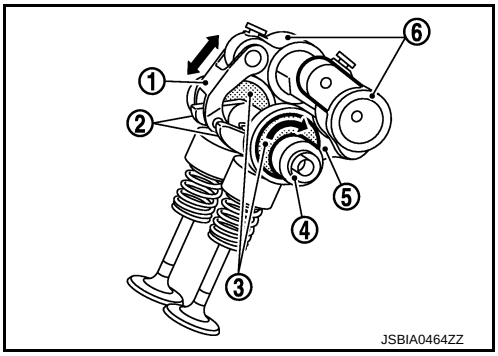


1. VVEL control shaft position sensor
2. Drive shaft
3. Link A
4. Eccentric cam
5. Output cam
6. Valve lifter
7. Intake valve
8. Intake camshaft sprocket
9. Control shaft
10. Ball screw shaft
11. Ball screw nut
12. VVEL actuator motor assembly
13. Rocker arm
14. Link B

VVEL (Variable Valve Event & Lift) is a system that controls valve event and valve lift continuously.
ECM decides the target valve lift according to the driving condition and sends the command signal to the VVEL control module via ENG communication line.

VALVE LIFT OPERATION

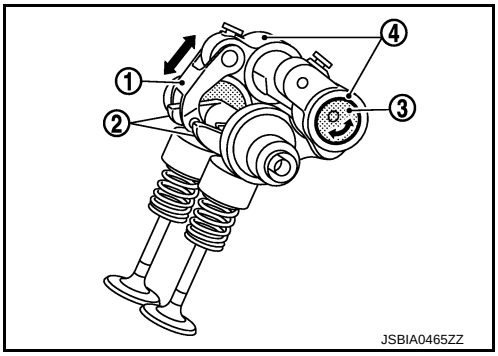
Rotational movement of the drive shaft equipped with eccentric cam is transmitted to output cam via the rocker arm and two kinds of links to depress the intake valve.



1. Link B
2. Output cam
3. Eccentric cam
4. Drive shaft
5. Link A
6. Rocker arm

VARIABLE OPERATION

VVEL control module controls the rotation of the control shaft using the VVEL actuator motor assembly and changes the movement of the output cam by shifting the link supporting point. As a result, valve lift changes continuously to improve engine output and response.

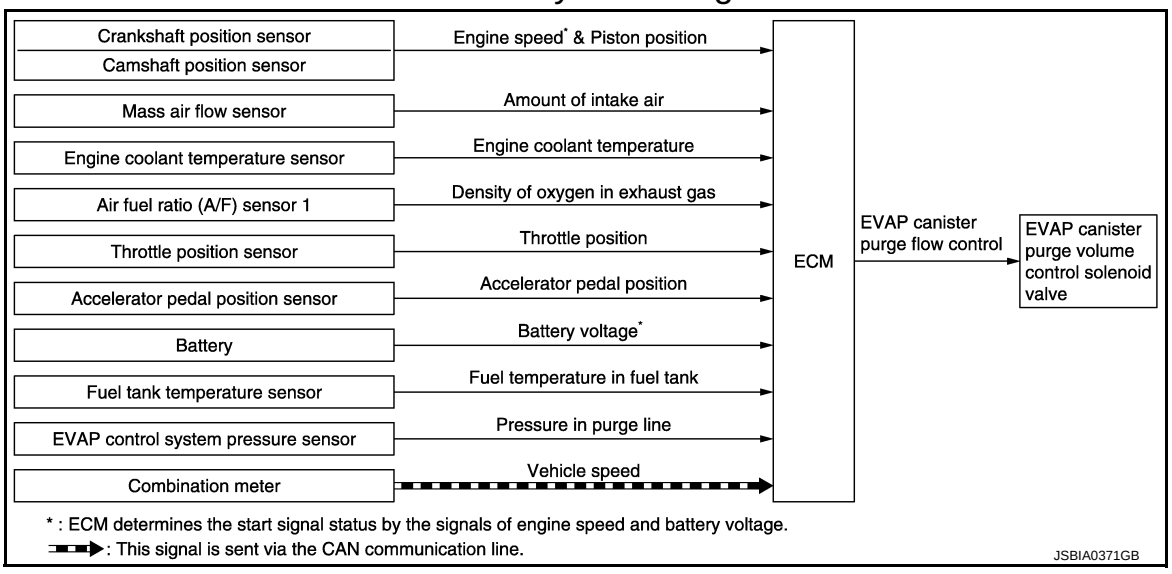


1. Link B
2. Output cam
3. Control shaft
4. Rocker arm

EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM : System Diagram

INFOID:0000000009008821



EVAPORATIVE EMISSION SYSTEM : System Description

INFOID:0000000009008822

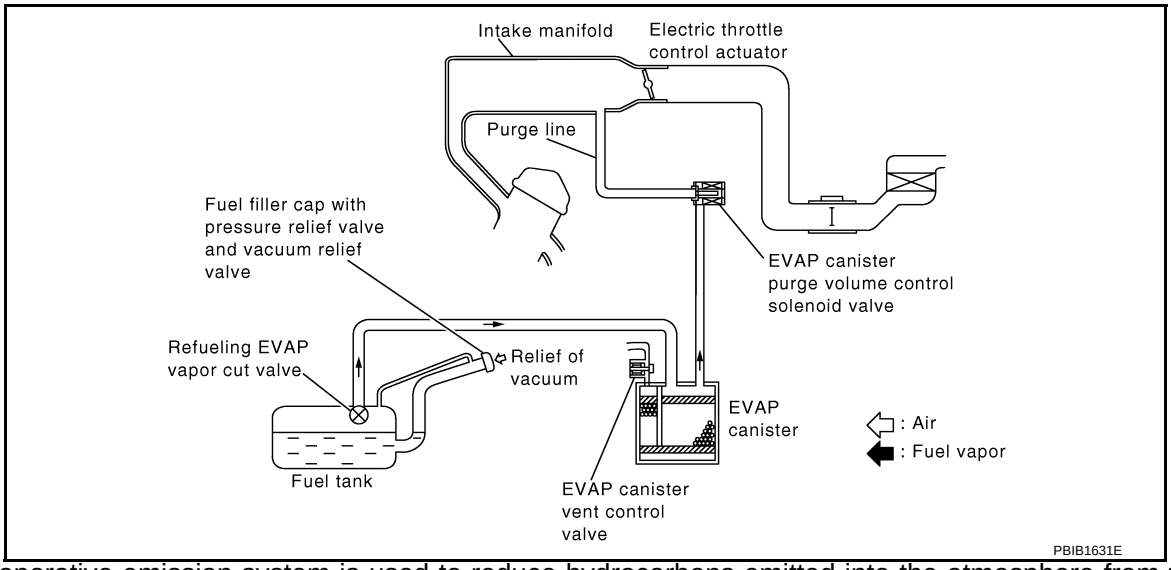
INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

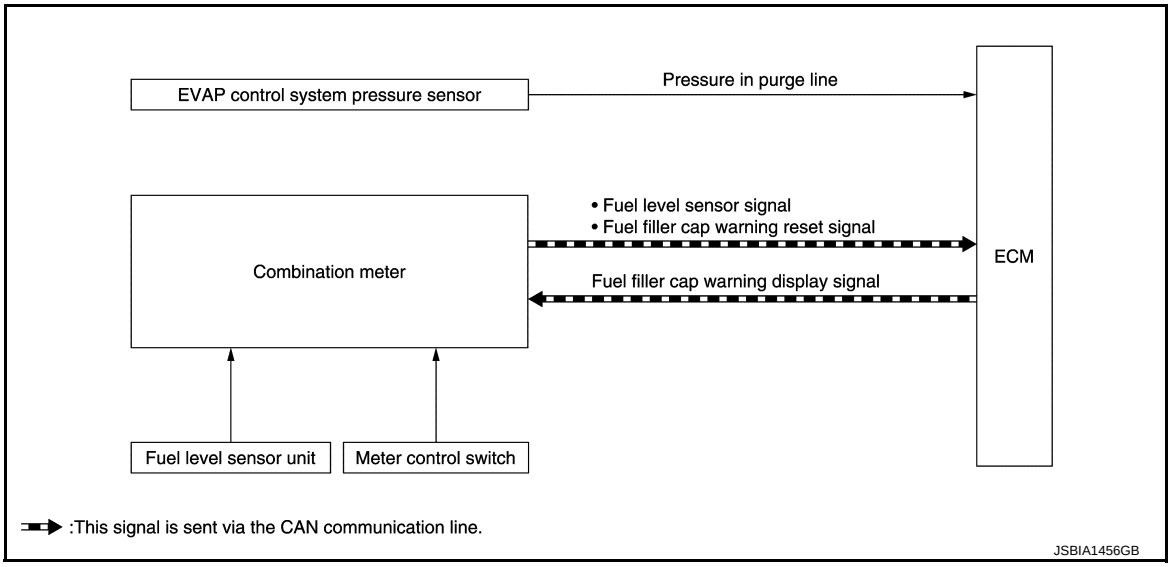
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

FUEL FILLER CAP WARNING SYSTEM

FUEL FILLER CAP WARNING SYSTEM : System Description

INFOID:0000000009008823

SYSTEM DIAGRAM



NOTE:
Meter control switch means trip computer switch.

INPUT/OUTPUT SIGNAL CHART

Input

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

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

Output

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

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

SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.
ECM judges a refueled state, based on a fuel level 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 (trip computer switch) on the combination meter.
  - When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.

• DTC erased by using CONSULT.

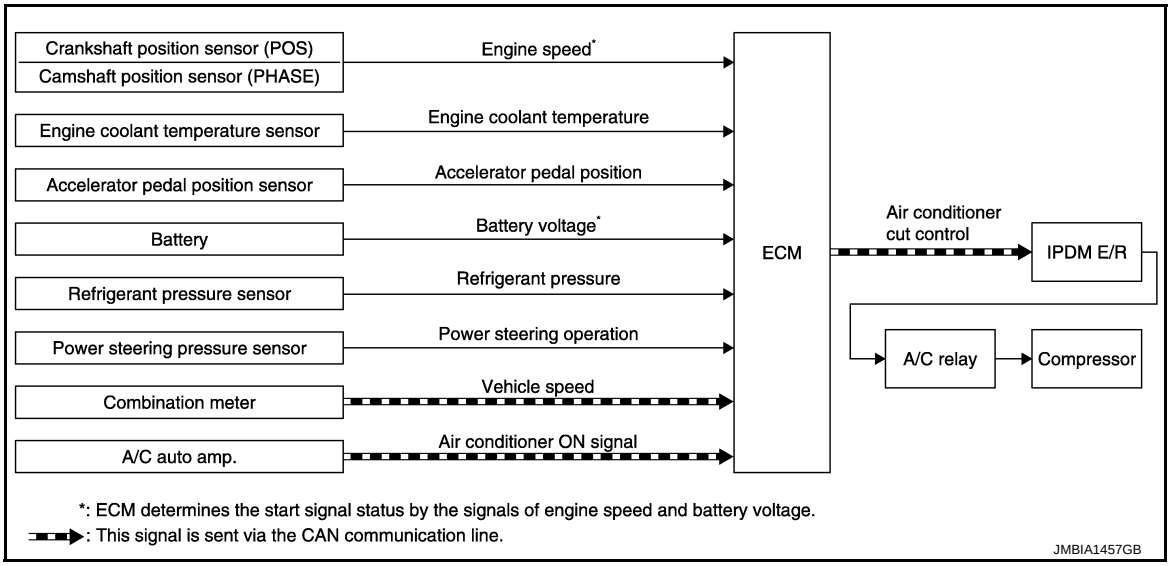
NOTE:

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.

AIR CONDITIONING CUT CONTROL

AIR CONDITIONING CUT CONTROL : System Diagram

INFOID:0000000009008824



AIR CONDITIONING CUT CONTROL : System Description

INFOID:0000000009008825

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

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

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

• When refrigerant pressure is excessively low or high.

ALTERNATOR POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

ALTERNATOR POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description

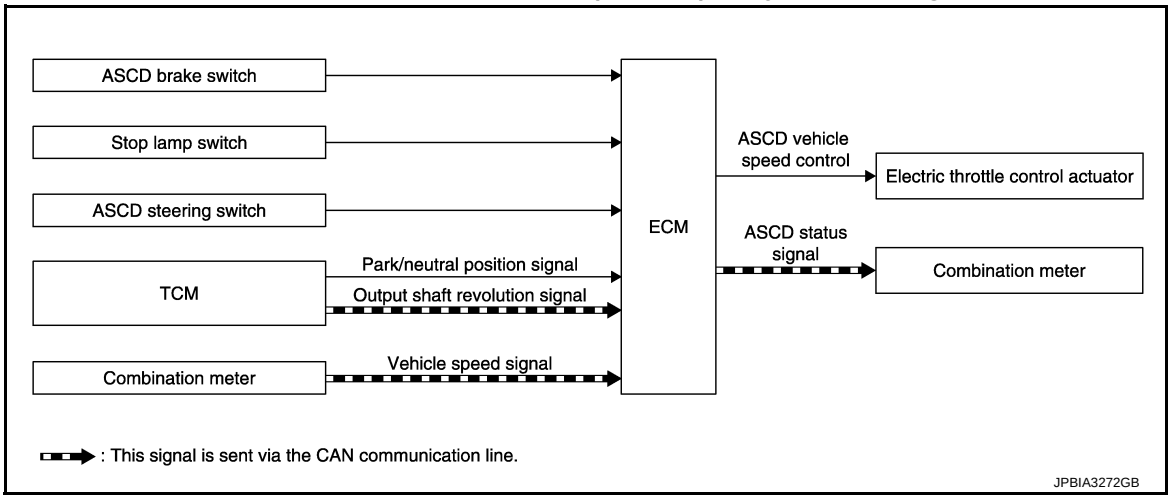
INFOID:0000000009008826

The alternator power generation voltage variable control system controls the amount of power generation, according to a battery loaded condition. ECM judges a battery condition, according to a signal received from the battery current sensor which detects a charge/discharge current. ECM then transmits a signal to IPDM E/R to command power generation via CAN communication. IPDM E/R transmits a power generation control signal to the alternator so that the system can control the amount of power generation. The voltage of power generation is lowered during battery low-load conditions and boosted under heavy load conditions. In this way, the system reduces the engine load through the adequate power generation control.
For details, refer to CHG-6, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Diagram".

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Diagram

INFOID:0000000009008827



AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description

INFOID:0000000009008828

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD steering switch	ASCD steering switch operation	ASCD vehicle speed control	• Electric throttle control actuator • Combination meter
ASCD brake switch	Brake pedal operation		
Stop lamp switch			
TCM	Park/neutral position signal		
	Output shaft revolution signal*		
Combination meter	Vehicle speed signal*		

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

BASIC ASCD SYSTEM

• Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can be set the vehicle speed in the set speed range.
• ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
• Operation status of ASCD is indicated in combination meter.
• If any malfunction occurs in the ASCD system, it automatically deactivates the ASCD control.

Refer to EC-58, "AUTMATIC SPEED CONTROL DEVICE (ASCD) : Switch Name and Function" for ASCD operating instructions.

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

CAN COMMUNICATION

CAN COMMUNICATION : System Description

INFOID:0000000009008829

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-32, "CAN COMMUNICATION SYSTEM : CAN Communication Signal Chart", about CAN communication for detail.

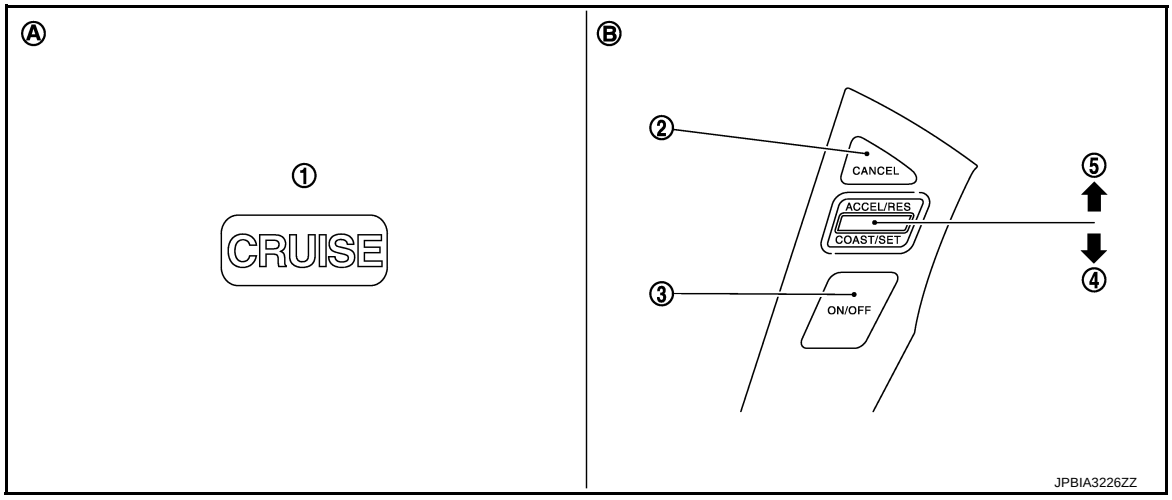
OPERATION

AUTMATIC SPEED CONTROL DEVICE (ASCD)

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

INFOID:0000000009008830

SWITCHES AND INDICATORS



1. CRUISE indicator lamp
2. CANCEL switch
3. ASCD MAIN switch
4. SET/COAST switch
5. RESUME/ACCELERATE switch
A. On the combination meter
B. On the steering wheel

SET SPEED RANGE

ASCD system can be set the following vehicle speed.

Minimum speed (Approx.)	Maximum speed (Approx.)
40 km/h (25 MPH)	143 km/h (88 MPH)

SWITCH OPERATION

Item	Function
CANCEL switch	Cancels the cruise control driving.
RESUME/ACCELERATE switch	• Resumes the set speed. • Increases speed incrementally during cruise control driving.
SET/COAST switch	• Sets desired cruise speed. • Decreases speed incrementally during cruise control driving.
ASCD MAIN switch	Master switch to activate the ASCD system. (CRUISE indicator lamp is turned ON when ASCD system is ON.)

CANCEL CONDITION

- When any of following conditions exist, the cruise operation is canceled.
  - CANCEL switch is pressed
  - ASCD MAIN switch pressed (Set speed is cleared)
  - More than two switches at ASCD steering switch are pressed at the same time (Set speed is cleared)
  - Brake pedal is depressed
  - Selector lever position is changed to N, P or R
  - Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
  - TCS system is operated
- When the ECM detects any of the following conditions, the ECM cancels the cruise operation and informs the driver by blinking CRUISE indicator lamp.

- Engine coolant temperature is slightly higher than the normal operating temperature. Then CRUISE indicator lamp is blinked slowly.
  NOTE:
  Engine coolant temperature decreases to the normal operating temperature, CRUISE indicator lamp stop blinking and the cruise operation is able to work.
- Malfunction for some self-diagnoses regarding ASCD system. CRUISE indicator lamp is blinked quickly.

• When ASCD MAIN switch is turned to OFF during the cruise control driving, all of ASCD operations is canceled and vehicle speed memory is erased.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000009008831

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 control module memory as a DTC. The diagnostic information can be obtained with the diagnostic tool (GST: Generic Scan Tool).

GST (Generic Scan Tool)

INFOID:0000000009008832

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

NOTE:

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

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

INFOID:0000000009008833

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

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminate	Blinking	Illuminate				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-107, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:0000000009008834

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-107, "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-148, "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 - P0308 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items
3	1st trip freeze frame data	

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

DIAGNOSIS DESCRIPTION : Counter System

INFOID:0000000009008835

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.

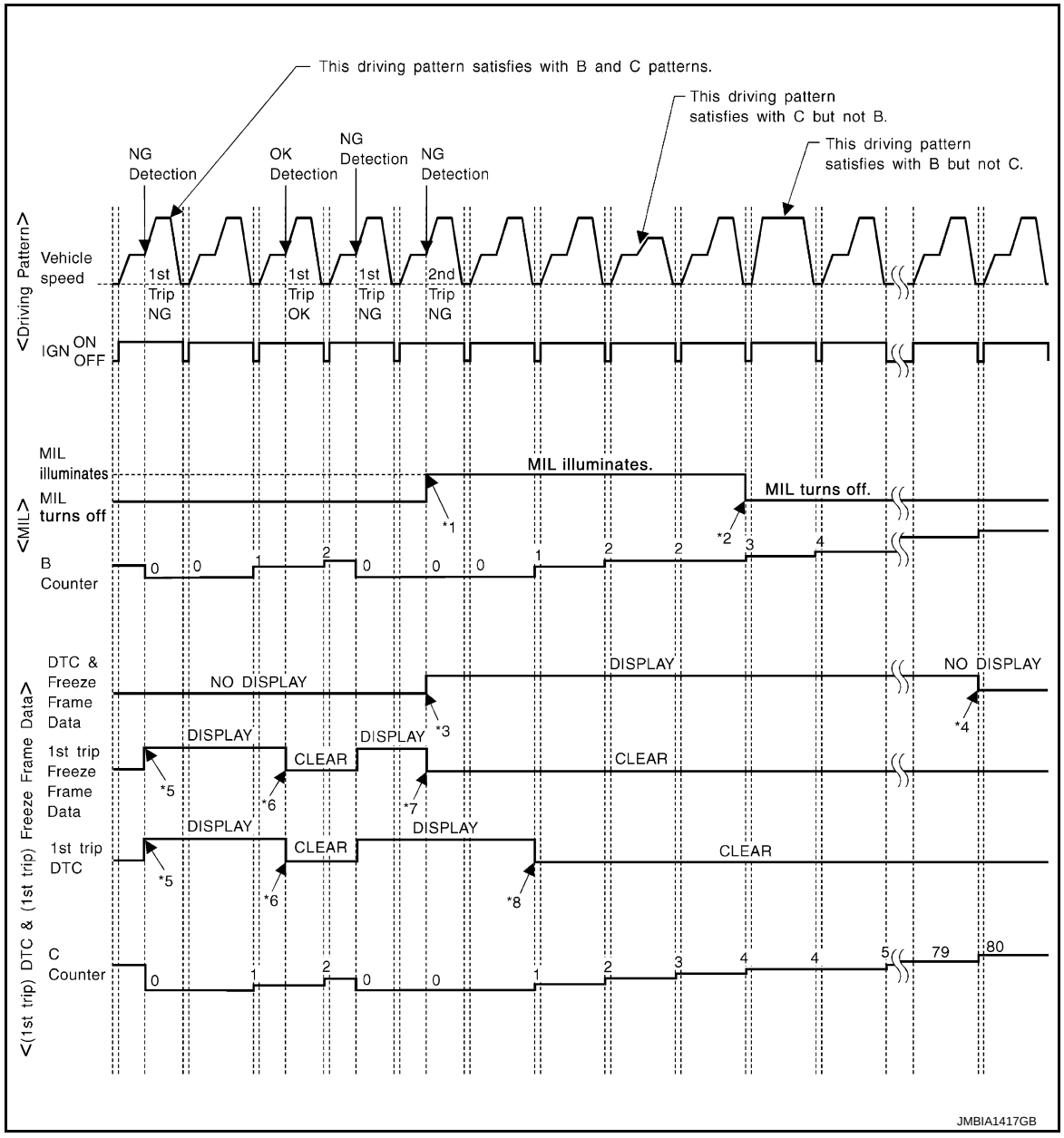
COUNTER SYSTEM CHART

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-65, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern C

Refer to EC-65, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Example:

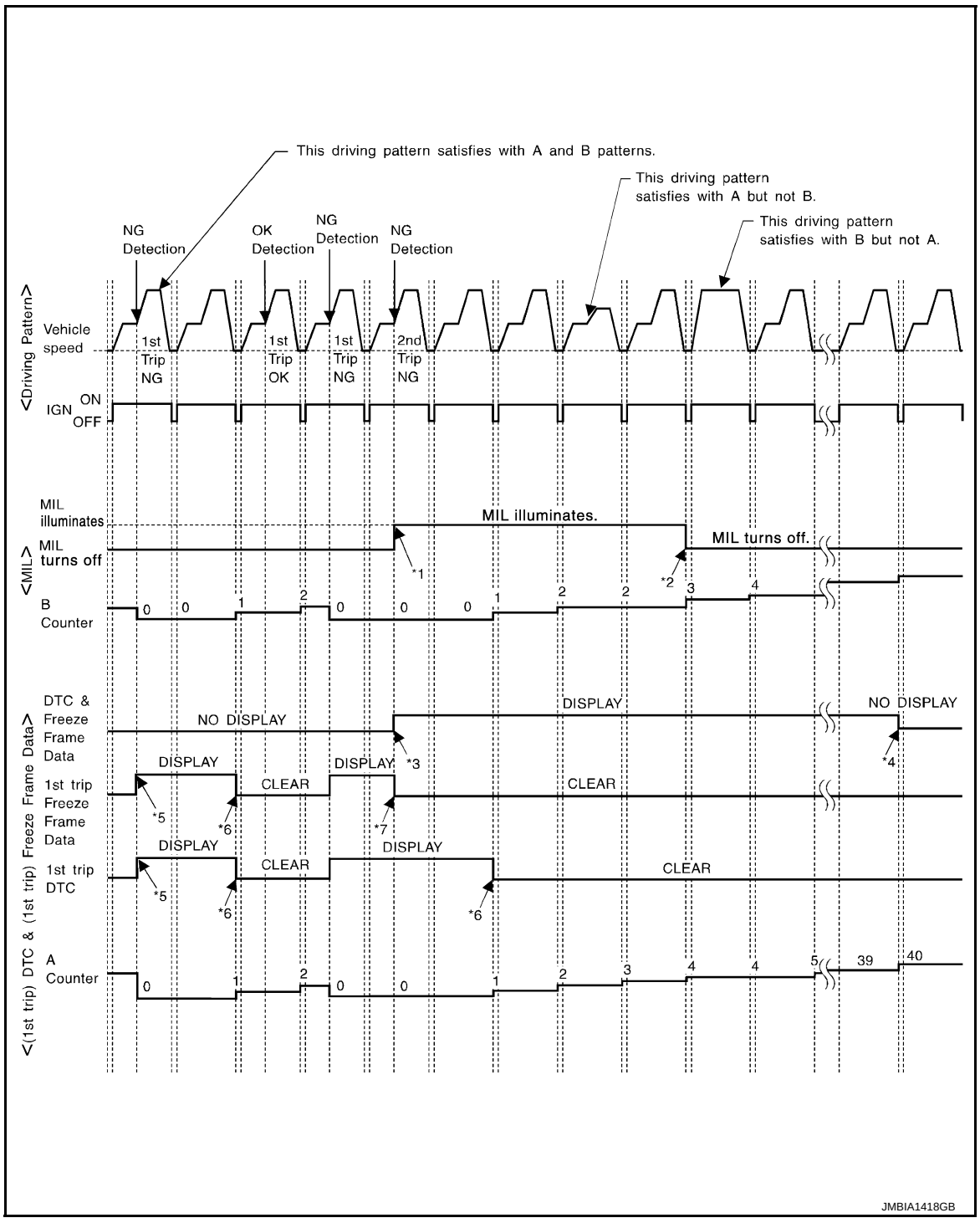
If the stored freeze frame data is as per the following:

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-65, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern B
Refer to EC-65, "DIAGNOSIS DESCRIPTION : Driving Pattern".

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:0000000009008836

CAUTION:
Always drive at a safe speed.

DRIVING PATTERN A

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

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

DRIVING PATTERN B

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

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

DRIVING PATTERN C

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

Calculated load value: (Calculated load value in the freeze frame data) 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:0000000009008837

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:0000000009008838

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

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

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

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

NOTE:

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

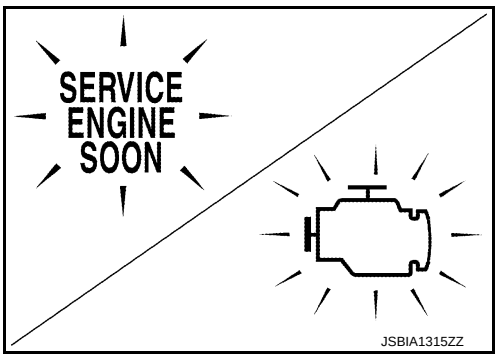
PERMANENT DTC SET TIMING

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:0000000009008839

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



1. The MIL illuminates when ignition switch is turned ON (engine is not running).
   NOTE:
   Check the MIL circuit if MIL does not illuminate. Refer to EC-560, "Component Function Check".
2. When the engine is started, the MIL should go off.
   NOTE:
   If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission-related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).

On Board Diagnosis Function

INFOID:0000000009008840

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Self-diagnostic results	DTCs or 1st trip DTCs stored in ECM can be read.
Accelerator pedal released position learning	ECM can learn the accelerator pedal released position. Refer to EC-161, "Description".
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-162, "Description".
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-163, "Description".
VVEL control shaft position sensor adjustment	The initial position of the VVEL control shaft position sensor can be adjusted. Refer to EC-165, "Description".

BLUB CHECK MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
   If it remains OFF, check MIL circuit. Refer to EC-560, "Diagnosis Procedure".

SRT STATUS MODE

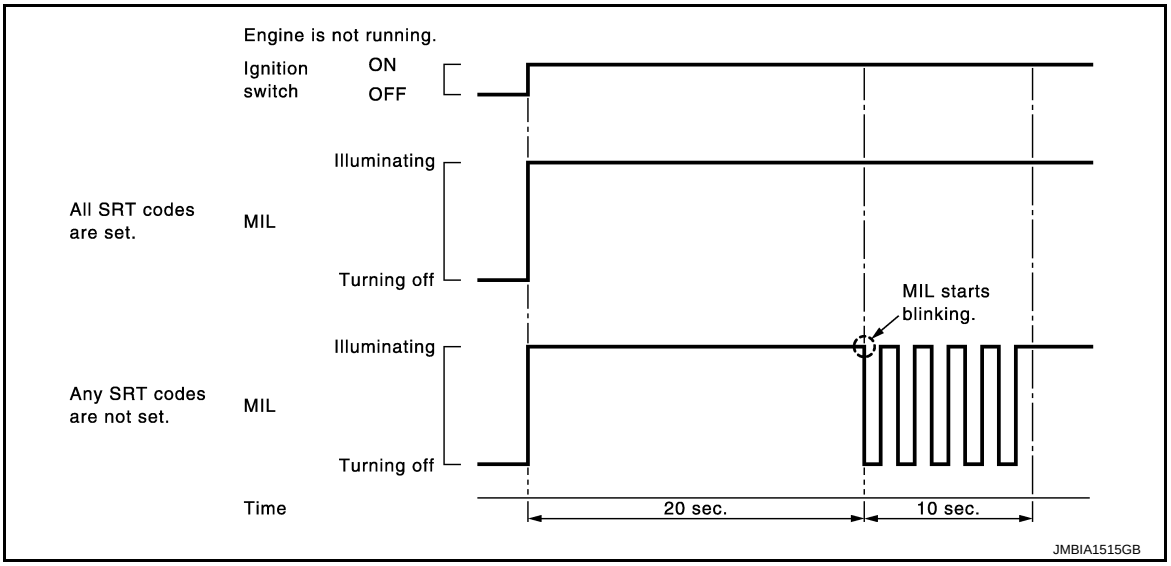
Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to EC-66, "DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code".

Operation Procedure

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

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



MALFUNCTION WARNING MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
   If it remains OFF, check MIL circuit. Refer to EC-560, "Diagnosis Procedure".
3. Start engine and let it idle.
   - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
   - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
   - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

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

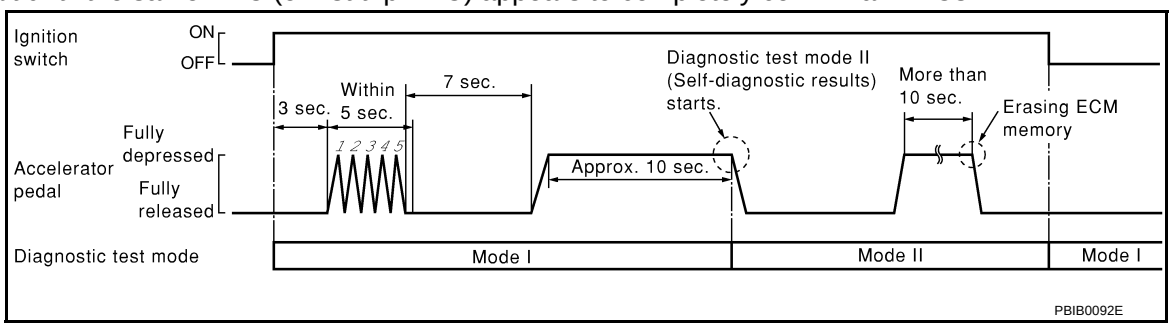
How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- After ignition switch is turned off, ECM is always released from the “Self-diagnostic results” mode.

1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.
   - Fully depress the accelerator pedal.
   - Fully release the accelerator pedal.
3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.
   NOTE:
   Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.
4. Fully release the accelerator pedal.
   ECM has entered to Self-diagnostic results mode.

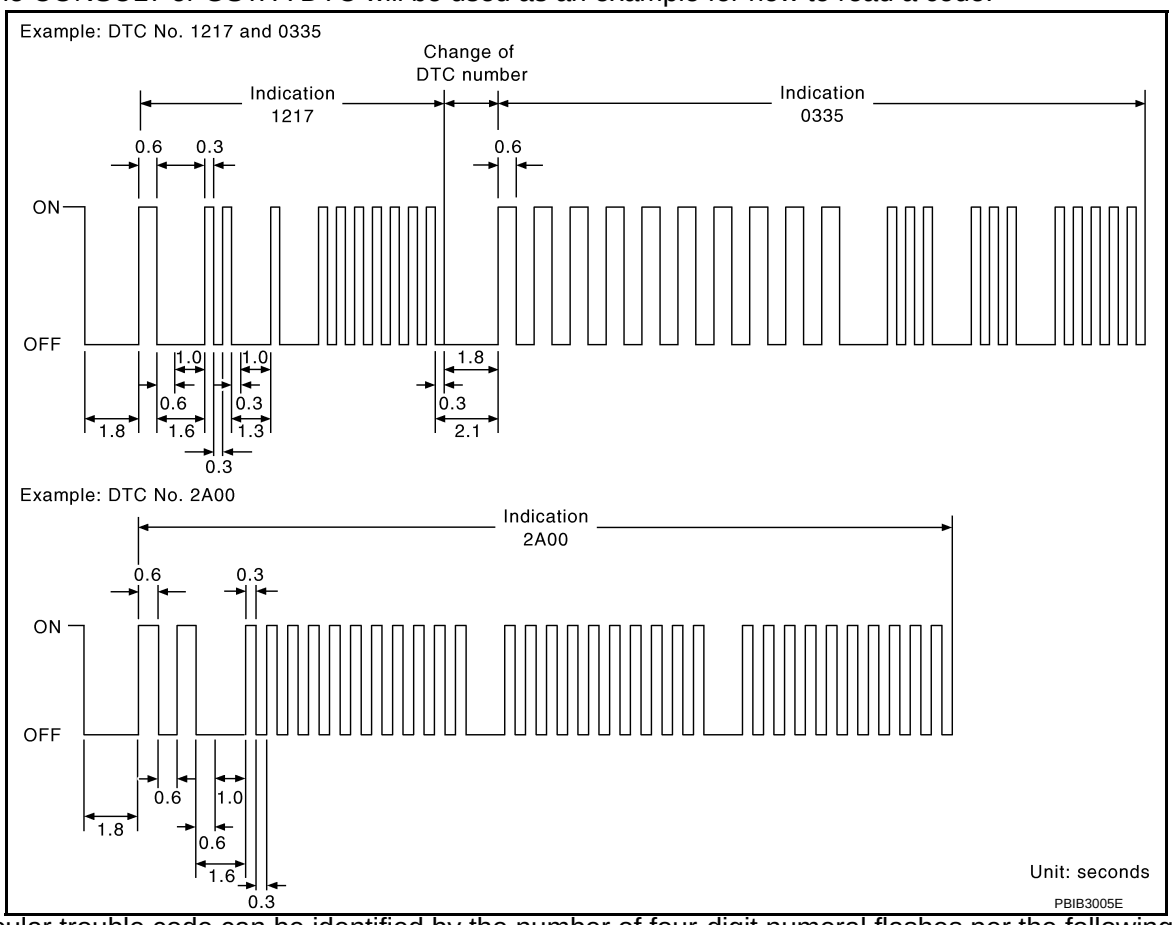
NOTE:
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

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

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



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

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

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

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

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

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

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to EC-107, "DTC Index".

How to Erase Self-diagnostic Results

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

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

NOTE:

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

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

CONSULT Function

INFOID:0000000009008841

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	The status of system monitoring tests and the self-diagnosis status/results can be confirmed.

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

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

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-107, "DTC Index".

How to Read DTC and 1st Trip DTC

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

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

How to Erase DTC and 1st Trip DTC

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see EC-107, "DTC Index"), skip step 1.

1. Erase DTC in TCM. Refer to TM-63, "Diagnosis Description".
2. Select “ENGINE” with CONSULT.
3. Select “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	• The engine control component part/control system has a trouble code the is displayed as PXXXX. (Refer to EC-107, "DTC Index".)
CAL/LD VALUE [%]	• The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	• The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRM-B1 [%]	• “Long-term fuel trim” at the moment a malfunction is detected is displayed. • 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 [%]	
ENGINE SPEED [rpm]	• The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	• The vehicle speed at the moment a malfunction is detected is displayed.
INT MANI PRES [kPa]	• These items are displayed but are not applicable to this model.
ABSOL TH·P/S [%]	• The throttle valve opening angle at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	• The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	• The intake air temperature at the moment a malfunction is detected is displayed.
FUEL SYS-B1	• “Fuel injection system status” at the moment a malfunction is detected is displayed. • One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop
FUEL SYS-B2	
COMBUST CONDITION	• These items are displayed but are not applicable to this model.
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.

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

DATA MONITOR MODE

NOTE:

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

Monitored Item

For reference values of the following items, refer to EC-81, "Reference Value".

×: Applicable

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor and camshaft position sensor.	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated. • When engine is running, specification range is indicated in “SPEC”.
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, specification range is indicated in “SPEC”.
A/F ALPHA-B1 A/F ALPHA-B2	%	• 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, specification range is indicated in “SPEC”.
COOLAN TEMP/S	°C or °F	• The engine coolant temperature (determined by the signal voltage of the engine 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.
A/F SEN1 (B1) A/F SEN1 (B2)	V	• The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed.	
HO2S2 (B1) HO2S2 (B2)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	RICH/LEAN	• Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
BATTERY VOLT	V	• The power supply voltage of ECM is displayed.	
ACCEL SEN 1 ACCEL SEN 2	V	• The accelerator pedal position sensor signal voltage is displayed.	• ACCEL SEN 2 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal.
TP SEN 1-B1 TP SEN 2-B1	V	• The throttle position sensor signal voltage is displayed.	• TP SEN 2-B1 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal.
FUEL T/TMP SE	°C or °F	• The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
EVAP SYS PRES	V	• The signal voltage of EVAP control system pressure sensor is displayed.	

Monitored item	Unit	Description	Remarks
FUEL LEVEL SE	V	• The signal voltage of the fuel level sensor is displayed.	
START SIGNAL	ON/OFF	• Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS	ON/OFF	• Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
PW/ST SIGNAL	ON/OFF	• [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated.	
LOAD SIGNAL	ON/OFF	• Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	• Indicates [ON/OFF] condition from the blower fan ON signal.	
BRAKE SW	ON/OFF	• Indicates [ON/OFF] condition from the stop lamp switch signal.	
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.
COMBUSTION	—	• These items are displayed but are not applicable to this model.	
CAL/LD VALUE	%	• “Calculated load value” indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g/s	• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
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.	
INT/V SOL (B2)			
AIR COND RLY	ON/OFF	• The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
VENT CONT/V	ON/OFF	• The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open	
THRTL RELAY	ON/OFF	• Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	

Monitored item	Unit	Description	Remarks
A/F S1 HTR (B1)	%	• Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. • The current flow to the heater becomes larger as the value increases.	
A/F S1 HTR (B2)			
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
HO2S2 HTR (B2)			
ALT DUTY SIG	ON/OFF	• The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive.	
I/P PULLY SPD	rpm	• Indicates the engine speed computed from the input speed sensor signal.	
VEHICLE SPEED	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN	YET/CMPLT	• Displays the condition of Idle Air Volume Learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL	km or mile	• Distance traveled while MIL is activated.	
SNOW MODE SW	ON/OFF	• Indicates [ON/OFF] condition from the snow mode switch signal.	
ENG OIL TEMP	°C or °F	• The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	• Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW	ON/OFF	• Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	• Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2	ON/OFF	• Indicates [ON/OFF] condition of stop lamp switch signal.	
DIST SW	ON/OFF	• Indicates [ON/OFF] condition from DISTANCE switch signal.	
CRUISE LAMP	ON/OFF	• Indicates [ON/OFF] condition of CRUISE indicator determined by the ECM according to the input signals.	
AC EVA TEMP	°C or °F	• Indicates A/C evaporator temperature sent from A/C auto amp.	
AC EVA TARGET	°C or °F	• Indicates target A/C evaporator temperature sent from A/C auto amp.	
FAN DUTY	%	• Indicates a command value for cooling fan. The value is calculated by ECM based on input signals.	
ALT DUTY	%	• Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	

Monitored item	Unit	Description	Remarks
BAT CUR SEN	mV	• The signal voltage of battery current sensor is displayed.	
A/F ADJ-B1	—	• Indicates the correction of a factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal.	
A/F ADJ-B2			
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
FUEL PRES SEN	MPa	• Indicates the fuel rail pressure computed by ECM according to the input signals	
FUEL INJ B1	msec	• ECM-calculated injection pulse width of the fuel injector on the Bank 1 side.	
FUEL INJ B2	msec	• ECM-calculated injection pulse width of the fuel injector on the Bank 2 side.	
INT/V TIM (B1)	°CA	• Indicates [°CA] of intake camshaft advance angle.	
INT/V TIM (B2)			
MAP SENSOR	V	• The signal voltage from the manifold absolute pressure (MAP) sensor is displayed.	
EVAP LEAK DIAG	YET/CMPLT	• Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully.	
EVAP DIAG READY	ON/OFF	• Indicates the ready condition of EVAP leak diagnosis. ON: Diagnosis has been ready condition. OFF: Diagnosis has not been ready condition.	
VVEL LEARN	YET/DONE	• Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been performed successfully.	
VVEL SEN LEARN-B1	V	• Indicates the VVEL learning value.	
VVEL SEN LEARN-B2			
VVEL POSITION SEN-B1	V	• The VVEL control shaft position sensor signal voltage is displayed.	
VVEL POSITION SEN-B2			
VVEL TIM-B1	deg	• Indicates [deg] of VVEL control shaft angle.	
VVEL TIM-B2			
FPCM	HI/MID/LOW/OFF	• The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signals) is indicated.	
BAT TEMP SEN	V	• The signal voltage from the battery temperature sensor is displayed.	
COOLING FAN SPD	rpm	• Displays a cooling fan speed from a signal of electrically-controlled cooling fan coupling.	
THRTL STK CNT B1*	—	—	

Monitored item	Unit	Description	Remarks
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 DIAG1(B2)	INCMP/CMPLT	• Indicates DTC P0159 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.	
HO2 S2 DIAG2(B2)	INCMP/CMPLT	• Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
FUEL INJ TIMG	deg	• Indicates the fuel injection timing computed by ECM according to the input signals.	
H/P FUEL PUMP DEG	deg	• Displays ECM-calculated fuel discharge position of the high pressure fuel pump.	
FUEL PRES SEN V	mV	• The signal voltage of FRP sensor is displayed.	
L/FUEL PRES SEN	MPa	• Displays a pressure value calculated from a low fuel pressure sensor voltage.	
L/FUEL PRES SEN V	mV	• The signal voltage of low fuel pressure sensor is displayed.	
ECM TEMP 1	°C or °F	• Displays a temperature calculated from a signal of ECM temperature sensor 1.	
ECM TEMP 2	°C or °F	• Displays a temperature calculated from a signal of ECM temperature sensor 2.	
FUEL PUMP DUTY	%	• The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signals) is indicated.	
A/F SEN1 DIAG(B1)*	INCMP/CMPLT	• Indicates DTC P0133 self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG(B2)*	INCMP/CMPLT	• Indicates DTC P0153 self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	

*: The item is indicated, but not used.

NOTE:

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

WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
IDLE AIR VOL LEARN	• THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
EVAP SYSTEM CLOSE	CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. • IGN SW ON • ENGINE NOT RUNNING • AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). • NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM • FUEL TANK TEMP. IS MORE THAN 0°C (32°F). • WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” • WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER THE CONDITION EXCEPT ABOVE, CONSULT 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
FUEL PRESSURE RELEASE	• FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
SELF-LEARNING CONT	• THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing mixture ratio self-learning value
TARGET IDLE RPM ADJ*	• IDLE CONDITION	When setting target idle speed
VIN REGISTRATION	• IN THIS MODE, VIN IS REGISTERED IN ECM.	When registering VIN in ECM
TARGET IGN TIM ADJ*	• IDLE CONDITION	When adjusting target ignition timing
CLSD THL POS LEARN	• IGNITION ON AND ENGINE STOPPED.	When learning the throttle valve closed position
VVEL POS SEN ADJ PREP	• USE THIS ITEM ONLY WHEN REPLACING VVEL ACTUATOR SUB ASSEMBLY. • IGNITION ON AND ENGINE STOPPED.	When adjusting VVEL control shaft position sensor
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)
VENT CONTROL/V	• Ignition switch: ON (Engine stopped) • Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connectors • Solenoid valve
ENG COOLANT TEMP	• Engine: Return to the original non-standard condition • Change the engine coolant temperature using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original non-standard condition • 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
FUEL/T TEMP SEN	• Change the fuel tank temperature using CONSULT.		
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 • Solenoid valve
FAN DUTY CONTROL*	• Ignition switch: ON • Change duty ratio using CONSULT.	Cooling fan speed changes.	• Harness and connectors • Cooling fan motor • Cooling fan relay • Cooling fan control module • IPDM E/R
ALTERNATOR DUTY	• Engine: Idle • Change duty ratio using CONSULT.	Battery voltage changes.	• Harness and connectors • IPDM E/R • Alternator
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch OFF • Selector lever: P or N • Cut off each injector signal one at a time using CONSULT.	Engine runs rough or stops.	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil
IGNITION TIMING	• Engine: Return to the original non-standard condition • Timing light: Set • Retard the ignition timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.
V/T ASSIGN ANGLE	• Engine: Return to the original non-standard condition • Change intake valve timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve
FPCM	• Engine: Return to the original trouble condition • Select “LOW”, “MID” and “HI” with CONSULT.	Fuel pump speed changes or stops.	• Harness and connectors • Fuel pump control module (FPCM)

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

DTC WORK SUPPORT MODE

Test mode	Test item	Corresponding DTC No.	Reference page
HO2S2	HO2S2 (B1) P1146	P0138	EC-277
	HO2S2 (B1) P1147	P0137	EC-271
	HO2S2 (B1) P0139	P0139	EC-285
	HO2S2 (B2) P1166	P0158	EC-277
	HO2S2 (B2) P1167	P0157	EC-271
	HO2S2 (B2) P0159	P0159	EC-285
A/F SEN1	A/F SEN1 (B1) P1278/P1279	P0133	EC-266
	A/F SEN1 (B1) P1276	P0130	EC-256
	A/F SEN1 (B2) P1288/P1289	P0153	EC-266
	A/F SEN1 (B2) P1286	P0150	EC-256

Test mode	Test item	Corresponding DTC No.	Reference page
EVAPORATIVE SYSTEM	EVP V/S LEAK P0456/P1456*	P0456	EC-378, "DTC Logic"
	PURG VOL CN/V P1444	P0443	EC-349, "DTC Logic"
	PURG FLOW P0441	P0441	EC-344, "DTC Logic"

*: DTC P1456 does not apply but appears in DTC Work Support Mode screens.

SRT & P-DTC MODE

SRT STATUS Mode

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

PERMANENT DTC STATUS Mode

How to display permanent DTC status

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

NOTE:

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

CAUTION:

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

PERMANENT DTC & SRT CONFIRMATION : PERMANENT DTC STATUS

CAUTION:
Turn ignition switch from ON to OFF twice to update the information on the status screen.

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

The previous trip information is displayed.

JSBIA0062GB

NOTE:

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

SRT WORK SUPPORT Mode

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

PERMANENT DTC WORK SUPPORT Mode

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

NOTE:

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

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

INFOID:0000000009008842

VALUES ON THE DIAGNOSIS TOOL

NOTE:

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

For outlines of following items, refer to EC-71, "CONSULT Function".

CONSULT MONITOR ITEM

Monitor Item	Condition		Values/Status
ENG SPEED	• Run engine and compare CONSULT value with the tachometer indication.		Almost the same speed as the tachometer indication
MAS A/F SE-B1	See EC-183, "Description".		
B/FUEL SCHDL	See EC-183, "Description".		
A/F ALPHA-B1	See EC-183, "Description".		
A/F ALPHA-B2	See EC-183, "Description".		
COOLANT TEMP/S	• Ignition switch: ON		Indicates engine coolant temperature
A/F SEN1 (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V
A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V
HO2S2 (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		0 - 0.3 V ⇔ Approx. 0.6 - 1.0 V
HO2S2 (B2)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		0 - 0.3 V ⇔ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ⇔ RICH
HO2S2 MNTR (B2)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ⇔ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.2 - 4.8 V

Monitor Item	Condition		Values/Status
ACCEL SEN 2*1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.2 - 4.8 V
TP SEN 1-B1	• 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 T/TMP SE	• Ignition switch: ON		Indicates fuel tank temperature
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 - 4.8 V
FUEL LEVEL SE	• Ignition switch: ON		Depending on fuel level of fuel tank
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
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
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
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	• Engine: After warming up, idle the engine	Heater fan switch: ON	ON
		Heater fan switch: OFF	OFF
BRAKE SW	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
IGN TIMING	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	1 - 4°BTDC
		2,000 rpm	25 - 45°BTDC
COMBUSTION	—		These items are displayed but are not applicable to this model.
CAL/LD VALUE	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	5 - 35%
		2,500 rpm	5 - 35%
MASS AIRFLOW	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	2.0 - 6.0 g/s
		2,500 rpm	7.0 - 20.0 g/s
PURG VOL C/V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
		2,000 rpm	5%

Monitor Item	Condition		Values/Status
INT/V SOL (B1)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 0 - 50%
INT/V SOL (B2)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 0 - 50%
AIR COND RLY	• Engine: After warming up, idle the engine	A/C switch: OFF	OFF
		A/C switch: ON (Compressor operates)	ON
VENT CONT/V	• Ignition switch: ON		OFF
THRTL RELAY	• Ignition switch: ON		ON
A/F S1 HTR (B1)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
A/F S1 HTR (B2)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
HO2S2 HTR (B1)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B2)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
ALT DUTY SIG	• Power generation voltage variable control: Operating		ON
	• Power generation voltage variable control: Not operating		OFF
I/P PULLY SPD	• Vehicle speed: More than 20 km/h (12 MPH)		Almost the same speed as the tachometer indication
VEHICLE SPEED	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as the speedometer indication
IDL A/V LEARN	• Engine: Running	Idle air volume learning has not been performed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	• Ignition switch: ON	Vehicle has traveled after MIL has illuminated.	0 - 65,535 km (0 - 40,723 miles)
SNOW MODE SW	• Ignition switch: ON	Snow mode switch: ON	ON
		Snow mode switch: OFF	OFF
ENG OIL TEMP	• Engine: After warming up		More than 70°C (158°F)
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	• Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	• Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF

Monitor Item	Condition		Values/Status
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1 (ASCD/ICC brake switch)	• Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
DIST SW	• Ignition switch: ON	DISTANCE switch: Pressed	ON
		DISTANCE switch: Released	OFF
CRUISE LAMP	• Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
AC EVA TEMP	• Engine: Running		Indicates A/C evaporator temperature sent from “unified meter and A/C amp.”.
AC EVA TARGET	• Engine: Running		Indicates target A/C evaporator temperature sent from “unified meter and A/C amp.”.
FAN DUTY	• Engine: Running		0 - 100%
ALT DUTY	• Engine: Idle		0 - 80%
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged*2 • Selector lever: P or N position • A/C switch: OFF • No load		Approx. 2,600 - 3,500 mV
A/F ADJ-B1	• Engine: Running		–0.330 - 0.330
A/F ADJ-B2	• Engine: Running		–0.330 - 0.330
P/N POSI SW	• Ignition switch: ON	Selector lever: P or N	ON
		Selector lever: Except above position	OFF
INT/A TEMP SE	• Ignition switch: ON		Indicates intake air temperature
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0 V
FUEL PRES SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 2.74 Mpa
		2,000 rpm	Approx. 3.0 Mpa
FUEL INJ B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.4 msec
		2,000 rpm	Approx. 1.0 msec
FUEL INJ B2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.4 msec
		2,000 rpm	Approx. 1.0 msec
INT/V TIM (B1)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 30°CA
INT/V TIM (B2)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 30°CA

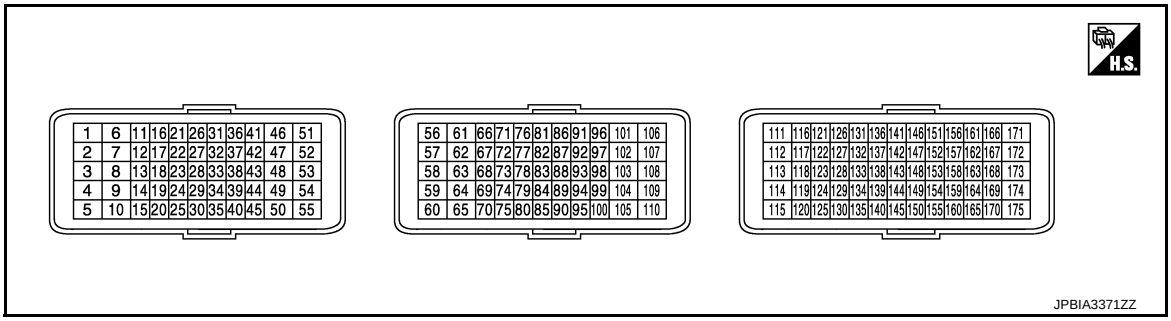
Monitor Item	Condition		Values/Status
MAP SENSOR	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.0 V
		2,000 rpm	Approx. 1.35 V
EVAP LEAK DIAG	• Ignition switch: ON		Indicates the condition of EVAP leak diagnosis.
EVAP DIAG READY	• Ignition switch: ON		Indicates the ready condition of EVAP leak diagnosis.
VVEL LEARN	• Ignition switch: OFF → ON (After warming up)	VVEL learning has not been performed yet.	YET
		VVEL learning has already been performed successfully.	DONE
VVEL SEN LEARN-B1	• VVEL learning has already been performed successfully		Approx. 0.30 - 0.80 V
VVEL SEN LEARN-B2	• VVEL learning has already been performed successfully		Approx. 0.30 - 0.80 V
VVEL POSITION SEN-B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0.25 - 1.50 V
		When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V
VVEL POSITION SEN-B2	• Engine: After warming up • Selector lever: P or N position • Air conditioner switch: OFF • No load	Idle	Approx. 0.25 - 1.50 V
		When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V
VVEL TIM-B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0 - 23 deg
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg
VVEL TIM-B2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0 - 23 deg
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg
FPCM	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	• Engine: Cranking	HI
		• Revving engine from idle to 4,000 rpm quickly	MID
		• Engine: Idle • Engine coolant temperature: More than 10°C (50°F)	LOW
BAT TEMP SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Indicates the temperature around the battery.
COOLING FAN SPD	• Engine speed: Idle • Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Water temp: Less than 98°C	Approx. 100 – 200 rpm
		Water temp: More than 98°C	Approx. 600 – 700 rpm
THRTL STK CNT B1	**NOTE:** The item is indicated, but not used.		—
HO2 S2 DIAG1(B1)	DTC P0139 self-diagnosis (delayed response) has not been performed yet.		INCMP
	DTC P0139 self-diagnosis (delayed response) has already been performed successfully.		CMPLT
HO2 S2 DIAG1(B2)	DTC P0159 self-diagnosis (delayed response) has not been performed yet.		INCMP
	DTC P0159 self-diagnosis (delayed response) has already been performed successfully.		CMPLT

Monitor Item	Condition		Values/Status
HO2 S2 DIAG2(B1)	DTC P0139 self-diagnosis (slow response) has not been performed yet.		INCMP
	DTC P0139 self-diagnosis (slow response) has already been performed successfully.		CMPLT
HO2 S2 DIAG2(B2)	DTC P0159 self-diagnosis (slow response) has not been performed yet.		INCMP
	DTC P0159 self-diagnosis (slow response) has already been performed successfully.		CMPLT
FUEL INJ TIMG	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 16 deg
		2,000 rpm	Approx. –170 deg
H/P FUEL PUMP DEG	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 211.0 deg
		2,000 rpm	Approx. 206.0 deg
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 820 – 1.220 mV
		Revving engine from idle to 4,000 rpm quickly	Approx. 820 – 3.060 mV
L/FUEL PRES SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0.45 MPa
		2,000 rpm	Approx. 0.45 MPa
L/FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 3250 mV
		3,000 rpm	Approx. 3100 mV
ECM TEMP 1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Indicates the temperature of ECM internal circuit 1.
ECM TEMP 2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Indicates the temperature of ECM internal circuit 2.
FUEL PUMP DUTY	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Engine speed: Idle	30 - 40%
A/F SEN1 DIAG2(B1)	**NOTE:** The item is indicated, but not used.		—
A/F SEN1 DIAG2(B2)	**NOTE:** The item is indicated, but not used.		—

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

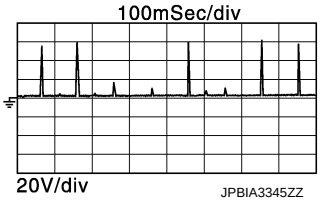
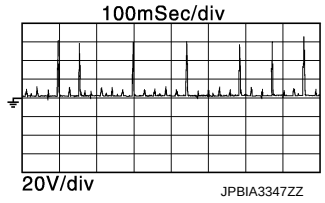
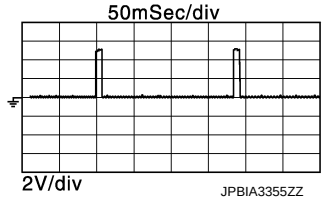
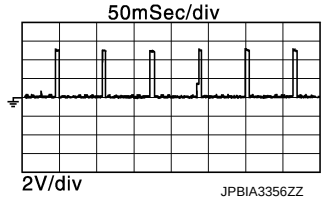
*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

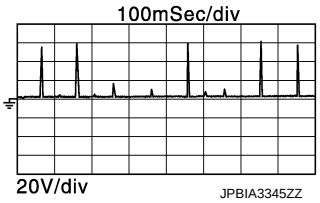
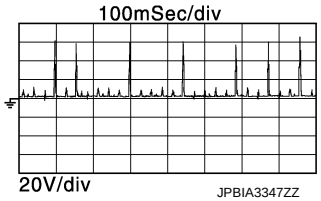
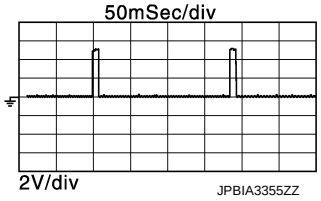
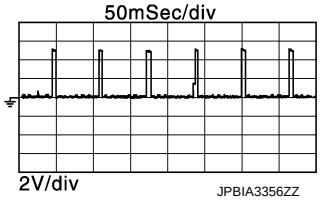
TERMINAL LAYOUT

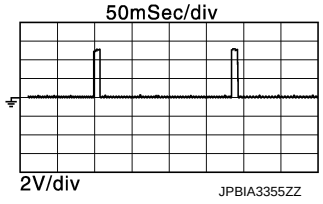
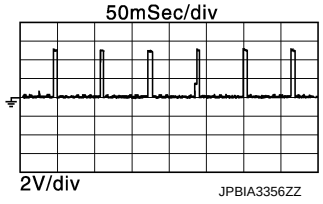
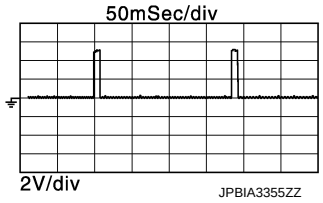
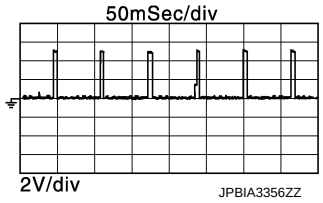


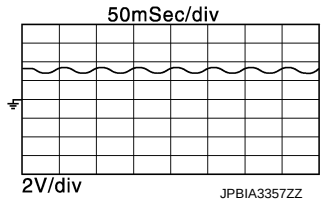
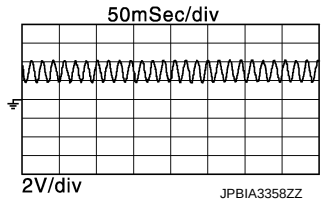
PHYSICAL VALUES

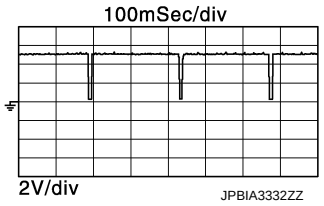
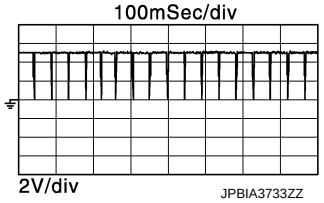
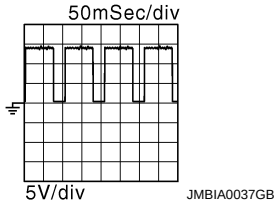
NOTE:
- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT.

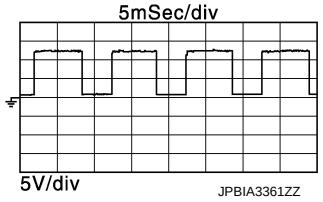
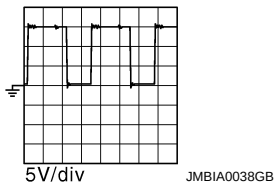
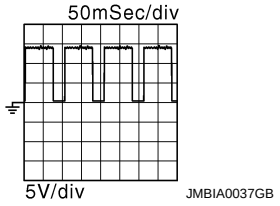
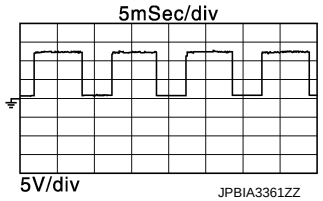
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (R) 2 (R)	175 (B)	Fuel injector No. 8 (HI) Fuel injector No. 5 (HI)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
3 (G) 4 (G)	175 (B)	Fuel injector No. 3 (LO) Fuel injector No. 2 (LO)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
5 (B/R)	—	ECM ground	—	—	—

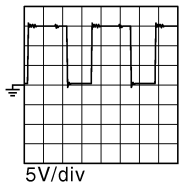
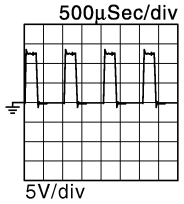
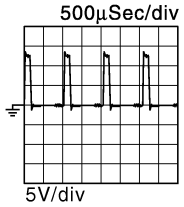
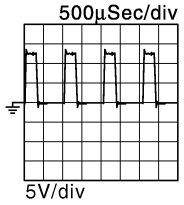
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
6 (R) 7 (R)	175 (B)	Fuel injector No. 3 (HI) Fuel injector No. 2 (HI)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
8 (G) 9 (G)	175 (B)	Fuel injector No. 8 (LO) Fuel injector No. 5 (LO)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
10 (B)	—	ECM ground	—	—	—
11 (BR)	175 (B)	PNP signal	Input	[Ignition switch: ON] • Selector lever: P or N position	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON] • Selector lever: Except above position	0 V

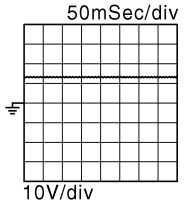
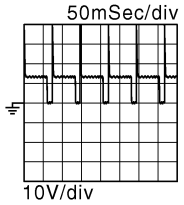
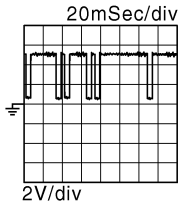
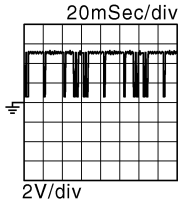
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
12 (Y) 13 (L/B) 14 (BR/ Y) 15 (LG/ R)	175 (B)	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0.1 - 0.4 V★ 
17 (P/L) 18 (Y/R) 19 (G/Y) 20 (O)	175 (B)	Ignition signal No. 5 Ignition signal No. 6 Ignition signal No. 7 Ignition signal No. 8	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0.1 - 0.4 V★ 
21 (G/O)	25 (LG)	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.
22 (BR/ W)	25 (LG)	Mass air flow sensor	Input	[Engine is running] • Warm-up condition • Idle speed	0.7 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.4 - 1.9 V

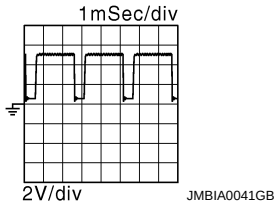
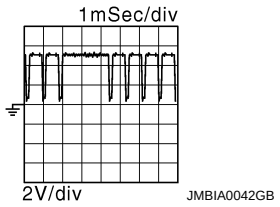
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
23 (V)	45 (L/O)	Low fuel pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	2.4 - 3.6 V 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.4 - 3.6 V 
25 (LG)	—	Sensor ground [Mass air flow sensor/ Intake air temperature sensor]	—	—	—
27 (P)	45 (L/O)	Sensor power supply (Power steering pressure sensor/ Low fuel pressure sensor/ Electrically-controlled cooling fan coupling)	—	[Ignition switch: ON]	5 V
28 (SB)	40 (W/L)	Sensor power supply (Fuel rail pressure sensor/Engine oil pressure sensor)	—	[Ignition switch: ON]	5 V
29 (W)	35 (—)	Knock sensor (bank 1)	Input	[Engine is running] • Idle speed	2.0 V*1
31 (V/W)	40 (W/L)	Fuel rail pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	0.82 - 1.22 V
				[Engine is running] • Warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 - 3.06 V
32 (R)	40 (W/L)	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine coolant temperature.
33 (W)	35 (—)	Knock sensor (bank 2)	Input	[Engine is running] • Idle speed	2.0 V*1
35 (—)	—	Sensor ground (Knock sensor)	—	—	—

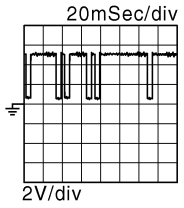
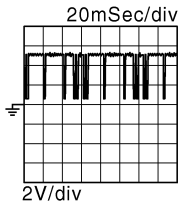
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
37 (V)	175 (B)	Cooling fan speed	Input	[Ignition switch: ON] • Engine stopped	5 V
				[Engine is running] • Idle speed • After warm-up condition	BATTERY VOLTAGE (11 - 14 V)★  JPBIA3332ZZ
				[Engine is running] • Idle speed • Before warm-up condition	BATTERY VOLTAGE (11 - 14 V)★  JPBIA3733ZZ
39 (P/B)	45 (L/O)	Power steering pressure sensor	Input	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5 V
				[Engine is running] • Steering wheel: Not being turned	0.4 - 0.8 V
40 (W/L)	—	Sensor ground (Fuel rail pressure sensor/Engine coolant temperature sensor/Engine oil temperature sensor)	—	—	—
42 (L/Y)	40 (W/L)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine oil temperature.
45 (L/O)	—	Sensor ground (Power steering pressure sensor/ Low fuel pressure sensor/ Electrically-controlled cooling fan coupling)	—	—	—
46 (SB)	175 (B)	Fuel injector driver power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: OFF]	1.5 V
47 (G)	175 (B)	Heated oxygen sensor 2 heater (bank 1)	Input	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	10 V★  JMBIA0037GB
				[Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)

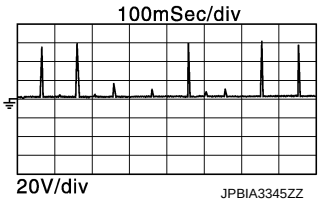
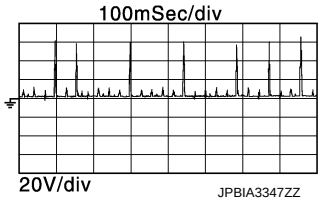
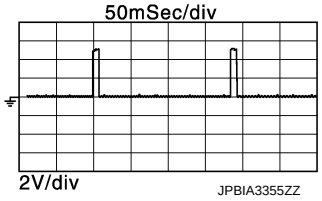
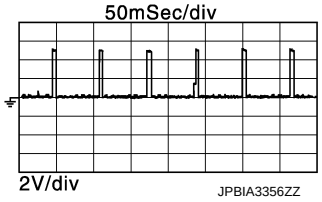
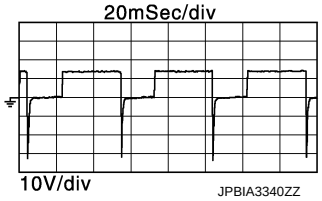
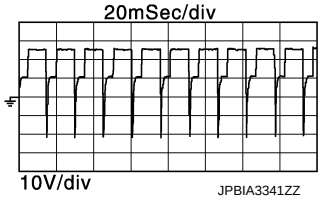
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
48 (L/W)	175 (B)	A/F sensor 1 heater (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★ 
49 (LG/ B)	175 (B)	Intake valve timing control solenoid valve (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★ 
51 (R)	175 (B)	Fuel injector driver power supply	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: OFF]	1.5 V
52 (L/R)	175 (B)	Heated oxygen sensor 2 heater (bank 2)	Output	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	10 V★ 
				[Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
53 (SB)	175 (B)	A/F sensor 1 heater (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★ 

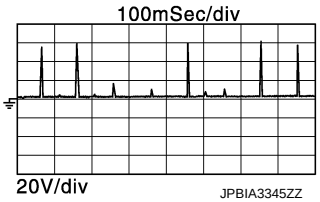
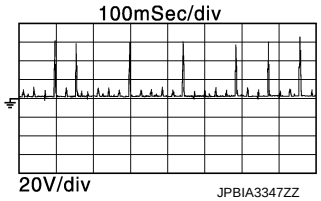
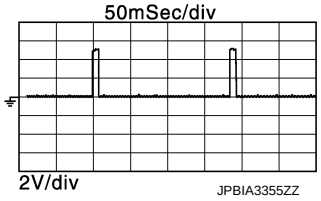
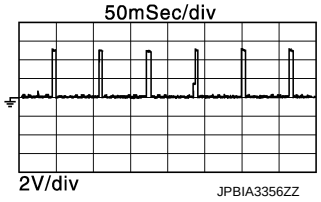
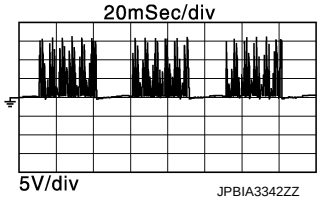
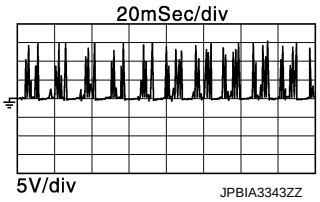
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
54 (G/R)	175 (B)	Intake valve timing control solenoid valve (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★  JMBIA0038GB
57 (W)	175 (B)	Throttle control motor (Open)	Output	[Ignition switch: ON] • Engine: Stopped • Selector lever: D • Accelerator pedal: Fully depressed	0 - 14 V★  JMBIA0031GB
				[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	0 - 14 V★  JMBIA0032GB
60 (B)	—	Shield	—	—	—
63 (R)	175 (B)	Throttle control motor (Close)	Output	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: In the middle of releasing operation	0 - 14 V★  JMBIA0031GB

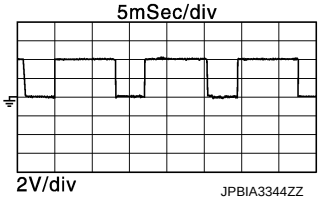
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
64 (V/W)	175 (B)	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)★  JMBIA0039GB
				[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★  JMBIA0040GB
67 (V)	175 (B)	Manifold absolute pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.5 V
68 (BR/ W)	—	Sensor ground [Camshaft position sensor (bank 1)]	—	—	—
70 (W/L)	—	Sensor ground (Manifold absolute pressure sensor)	—	—	—
73 (P)	99 (LG/ B)	Camshaft position sensor (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★  JMBIA0045GB
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★  JMBIA0046GB
74 (L)	175 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	2.5 V
76 (W/ G)	98 (G/ W)	Sensor power supply (Crankshaft position sensor)	—	[Ignition switch: ON]	5 V
77 (Y/R)	68 (BR/ W)	Sensor power supply [Camshaft position sensor (bank 1)]	—	[Ignition switch: ON]	5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
78 (L/R)	175 (B)	A/F sensor 1 (bank 2)	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.2 - 2.8V Output voltage varies with air fuel ratio.
79 (B)	97 (W)	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	Less than 4.75 V
				[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	More than 0.36 V
80 (L/W)	175 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	3.0 V
81 (G)	97 (W)	Sensor power supply [Throttle position sensor (bank 1)]	—	[Ignition switch: ON]	5 V
83 (LG/ R)	99 (LG/ B)	Sensor power supply [Camshaft position sensor (bank 2)]	—	[Ignition switch: ON]	5 V
85 (GR/ R)	70 (W/L)	Sensor power supply (Manifold absolute pressure sensor)	—	[Ignition switch: ON]	5 V
86 (R/ W)	98 (G/ W)	Crankshaft position sensor	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	4.0 - 5.0 V★ 
87 (L/W)	100 (R)	Heated oxygen sensor 2 (bank 2)	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
88 (B)	175 (B)	A/F sensor 1 (bank 1)	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.2 - 2.8 V Output voltage varies with air fuel ratio.
90 (W)	175 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	3.0 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
91 (R)	97 (W)	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	More than 0.36 V
				[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	Less than 4.75 V
94 (R)	175 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	2.0 V
95 (L/R)	68 (BR/ W)	Camshaft position sensor (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★  JMBIA0045GB
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★  JMBIA0046GB
96 (W/ R)	100 (R)	Heated oxygen sensor 2 (bank 1)	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
97 (W)	—	Sensor ground [Throttle position sensor (bank 1)]	—	—	—
98 (G/ W)	—	Sensor ground (Crankshaft position sensor)	—	—	—
99 (LG/ B)	—	Sensor ground [Camshaft position sensor (bank 2)]	—	—	—
100 (R)	—	Sensor ground (Heated oxygen sensor 2)	—	—	—

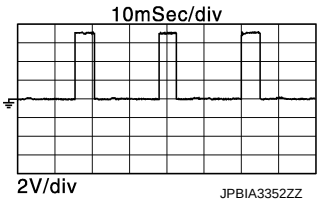
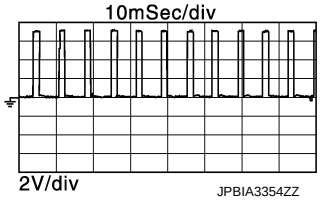
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
101 (R) 102 (R)	175 (B)	Fuel injector No. 1 (HI) Fuel injector No. 6 (HI)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
103 (G) 104 (G)	175 (B)	Fuel injector No. 7 (LO) Fuel injector No. 4 (LO)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
105 (L/W)	175 (B)	High pressure fuel pump (HI)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
106 (R) 107 (R)	175 (B)	Fuel injector No. 7 (HI) Fuel injector No. 4 (HI)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
108 (G) 109 (G)	175 (B)	Fuel injector No. 1 (LO) Fuel injector No. 6 (LO)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
110 (L/B)	175 (B)	High pressure fuel pump (LO)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
111 (R)	175 (B)	Fuel injector driver power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
112 (SB)	175 (B)	Fuel injector driver power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
113 (G)	—	—	—	—	—
114 (B)	—	ECM ground	—	—	—
115 (B)	—	ECM ground	—	—	—
120 (Y)	175 (B)	EVAP canister vent control valve	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
122 (BR/ W)	175 (B)	VVEL actuator motor relay abort signal (VVEL control module)	Input	[Ignition switch: ON]	0 V
123 (V/R)	175 (B)	Throttle control motor relay	Output	[Ignition switch: ON → OFF]	0 - 1.0 V ↓ BATTERY VOLTAGE (11 - 14 V) ↓ 0 V
				[Ignition switch: ON]	0 - 1.0 V
125 (GR)	175 (B)	Fuel pump control module (FPCM)	Output	[When cranking engine]	0 - 0.5 V
				[Engine is running] • Warm-up condition	0 - 4.0 V★ 
126 (O)	129 (P/L)	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released	0.25 - 0.5 V
				[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	2.0 - 2.5 V
128 (Y)	130 (R)	ASCD steering switch	Input	[Ignition switch: ON] • ASCD steering switch: OFF	4 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1 V
				[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	2 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
128 (Y)	175 (B)	ICC steering switch	Input	[Ignition switch: ON] • ICC steering switch: OFF	4.2 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.9 V
				[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3.7 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	3.2 V
				[Ignition switch: ON] • DISTANCE switch: Pressed	2.6 V
				[Ignition switch: ON] • DYNAMIC DRIVER ASSISTANCE switch: Pressed	1.0 V
129 (P/L)	—	Sensor ground (Accelerator pedal position sensor 2)	—	—	—
130 (R)	—	Sensor ground (ASCD steering switch/ICC steering switch)	—	—	—
131 (L/W)	129 (P/L)	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5 V
133 (SB)	150 (R)	Sensor power supply (Refrigerant pressure sensor/ Battery current sensor/EVAP control system pressure sensor)	—	[Ignition switch: ON]	5 V
134 (V/W)	175 (B)	Fuel temperature sensor	Input	[Engine is running] • Warm-up condition	2.8 V
136 (W/ R)	140 (R/Y)	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released	0.5 - 1.0 V
				[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	4.2 - 4.8 V
137 (W/ G)	140 (R/Y)	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5 V
138 (V)	150 (R)	Battery current sensor	Input	[Engine is running] • Battery: Fully charged*2 • Idle speed	2.6 - 3.5 V
139 (G)	175 (B)	Battery temperature sensor	Input	[Engine is running] • Battery temperature: 25°C • Idle speed	3.3 V
140 (R/Y)	—	Sensor ground (Accelerator pedal position sensor 1)	—	—	—
141 (SB)	175 (B)	Ignition switch	Input	[Ignition switch: OFF]	0 V
				[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
142 (R/ W)	175 (B)	Fuel pump control module (FPCM) check	Input	[When cranking engine]	0 V
				[Engine is running] • Warm-up condition • Idle speed	9 V
143 (L/Y)	150 (R)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	1.8 - 4.8 V
144 (O/B)	150 (R)	Refrigerant pressure sensor	Input	[Engine is running] • Warm-up condition • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0 V
146 (L)	—	CAN communication line	—	—	—
147 (G/Y)	175 (B)	ASCD/ICC brake switch	Input	[Ignition switch: ON] • Brake pedal: Slightly depressed	0 V
				[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)
150 (R)	—	Sensor ground (Refrigerant pressure sensor/ Battery current sensor/EVAP control system pressure sensor)	—	—	—
151 (P)	—	CAN communication line	—	—	—
156 (L)	175 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
158 (W/B)	175 (B)	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	0 V
				[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
161 (R/ W)	—	ENG communication line	—	—	—
163 (L/G)	175 (B)	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: OFF] • A few seconds after turning ignition switch OFF	0 - 1.5 V
				[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
165 (GR/ R)	—	**NOTE:** Not used	—	—	—
166 (W)	—	ENG communication line	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
169 (G/B)	175 (B)	Engine speed signal output	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 7.0 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0 - 7.0 V★ 
171 (W)	175 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
172 (W)	175 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
173 (O)	175 (B)	Throttle control motor power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
174 (B)	—	ECM ground	—	—	—
175 (B)	—	ECM ground	—	—	—

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

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

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Fail-safe

INFOID:0000000009008843

NON DTC RELATED ITEM

Detected items	Engine operating condition in fail-safe mode	Remarks	Reference page
Malfunction indicator circuit	Engine speed will not rise more than 2,500 rpm due to the fuel cut	When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction.	EC-560

DTC RELATED ITEM

DTC No.	Detected items	Engine operating condition in fail-safe mode
U0113 U1003 U1024	Can communication circuit	VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
P0011 P0021	Intake valve timing control	The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.
P0087	FRP control system	• Engine torque is limited. • VVEL value is maintained at a fixed angle.
P0088		Engine speed is limited.
P008A	Low fuel pressure control system	Engine torque is limited.
P0090	FRP control system	• Engine torque is limited. • VVEL value is maintained at a fixed angle.
P0102 P0103	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT displays the engine coolant temperature decided by ECM.
		Condition: Just as ignition switch is turned ON or START — Engine coolant temperature decided (CONSULT display): 40°C (104°F)
		Condition: Approx. 4 minutes or more after engine starting — Engine coolant temperature decided (CONSULT display): 80°C (176°F)
		Condition: Except as shown above — Engine coolant temperature decided (CONSULT display): 40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.
P0190	FRP sensor	• Engine speed is limited. • High pressure fuel pump is activated at maximum discharge pressure.
P0201 P0202 P0203 P0204 P0205 P0206 P0207 P0208	Injector	• Engine torque is limited. • Fuel injection shut-off of malfunction cylinder. • Mixture ratio feedback control does not function. • Idle engine speed is increased.
P0500	Vehicle speed sensor	The cooling fan operates (Highest) while engine is running.
P0524	Engine oil pressure	The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function. Engine speed will not rise more than 2,400 rpm due to the fuel cut.
P0605	ECM	(When ECM calculation function is malfunctioning:) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ECM deactivates ASCD operation.
P0607	ECM	VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th>Engine operating condition in fail-safe mode</th></tr>
<tr><td rowspan="2">P062B</td><td rowspan="2">ECM</td><td>Type1
• Engine torque is limited.
• Idle engine speed is increased.
• Fuel injector power supply shut-off.
• High fuel pressure limitation.</td></tr>
<tr><td>Type2
• Engine torque is limited.
• Fuel injection shut-off of malfunction cylinder.
• Mixture ratio feedback control does not function.
• Idle engine speed is increased.</td></tr>
<tr><td>P0643</td><td>Sensor power supply</td><td>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1087
P1088</td><td>VVEL control function</td><td>VVEL of normal bank is controlled at VVEL angle of abnormal bank.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P1089
P1092</td><td>VVEL control shaft position sensor</td><td>VVEL value is maintained at a fixed angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut</td></tr>
<tr><td>P1197</td><td>Out of gas</td><td>• Engine torque is limited.
• VVEL value is maintained at a fixed angle.</td></tr>
<tr><td>P1608</td><td>VVEL control shaft position sensor</td><td>VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="2">P1090
P1093</td><td rowspan="2">VVEL actuator motor</td><td>VVEL of normal bank is controlled at VVEL angle of abnormal bank.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P1091</td><td>VVEL actuator motor relay</td><td>VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P1197</td><td>Out of gas</td><td>• Engine torque is limited.
• VVEL value is maintained at a fixed angle.</td></tr>
<tr><td>P2101</td><td>Electric throttle control function</td><td>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P2118</td><td>Throttle control motor</td><td>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td rowspan="3">P2119</td><td rowspan="3">Electric throttle control actuator</td><td>(When electric throttle control actuator does not function properly due to the return spring malfunction:)
ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.</td></tr>
<tr><td>(When throttle valve opening angle in fail-safe mode is not in specified range:)
ECM controls the electric throttle control actuator because of regulating the throttle opening to 20 degrees or less.</td></tr>
<tr><td>(When ECM detects the throttle valve is stuck open:)
While the vehicle is being driven, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in the N or P position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1290
P2100
P2103</td><td>Throttle control motor relay</td><td>ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1606</td><td>VVEL control module</td><td>VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="4">P1805</td><td rowspan="4">Brake switch</td><td colspan="2">ECM controls the electric throttle control actuator by regulating the throttle opening to a small range.
Therefore, acceleration will be poor.</td></tr>
<tr><td>Vehicle condition</td><td>Driving condition</td></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
</table>

DTC No.	Detected items	Engine operating condition in fail-safe mode
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.
P2539	Low fuel pressure sensor	Engine torque is limited.

DTC Inspection Priority Chart

INFOID:0000000009008844

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

Priority	Detected items (DTC)
1	• U0100 CAN communication line • U0101 CAN communication line • U0113 U1003 CAN communication line • U1001 CAN communication line • U1024 VVEL CAN communication line • P0101 P0102 P0103 Mass air flow sensor • P010A Manifold absolute pressure sensor • P0111 P0112 P0113 P0127 Intake air temperature sensor • P0116 P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0196 P0197 P0198 Engine oil temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor • P0340 P0345 Camshaft position sensor • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0527 Cooling fan speed sensor • P0605 P0607 P0611 P062B ECM • P0643 Sensor power supply • P0705 P0850 Transmission range switch • P1089 P1092 P1608 VVEL control shaft position sensor • P1197 Out of gas* • P1220 Fuel pump control module (FPCM) • P1423 P1424 Cold start control • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1556 P1557 Battery temperature sensor • P1606 P1607 VVEL control module • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor • P2539 P2541 P2542 Low fuel pressure sensor

Priority	Detected items (DTC)
2	• P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 P2096 P2097 P2098 P2099 Air fuel ratio (A/F) sensor 1 • P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 • P0190 - P0193 FRP sensor • P0441 EVAP control system purge flow monitoring • P0443 P0444 P0445 EVAP canister purge volume control solenoid valve • P0447 P0448 EVAP canister vent control valve • P0451 P0452 P0453 EVAP control system pressure sensor • P0550 Power steering pressure sensor • P0603 ECM power supply • P0710 P0717 P0720 P0729 P0730 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1715 P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches • P1087 P1088 VVEL system • P1090 P1093 VVEL actuator motor • P1091 VVEL actuator motor relay • P1217 Engine over temperature (OVERHEAT) • P1650 Starter motor relay 2 • P1651 Starter motor relay • P2101 Electric throttle control function • P2118 Throttle control motor • P1805 Brake switch • P2100 P2103 Throttle control motor relay • P2101 Electric throttle control function
3	• P0011 P0021 Intake valve timing control • P0087, P0088, P0090 FRP control system • P008A Low fuel pressure control system • P008B Low fuel pressure control system • P0171 P0172 P0174 P0175 Fuel injection system function • P0201 - P0208 Injector • P0300 - P0308 Misfire • P0420 P0430 Three way catalyst function • P0456 EVAP control system (VERY SMALL LEAK) • P0506 P0507 Idle speed control system • P050A P050B P050E Cold start control • P0524 Engine oil pressure • P100A P100B VVEL system • P1148 P1168 Closed loop control • P1212 TCS communication line • P1564 ASCD steering switch / ICC steering switch • P1652 Starter motor system communication • P2119 Electric throttle control actuator • P1564 ASCD steering switch / ICC steering switch • P1568 ICC command value • P1572 ASCD brake switch / ICC brake switch • P1574 ASCD vehicle speed sensor / ICC vehicle speed sensor

NOTE:

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

DTC Index

INFOID:0000000009008845

×:Applicable —: Not applicable

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
U0100	0100	LOST COMM (ECM A)	—	1	×	B	TM-103
U0101	0101	LOST COMM (TCM)	—	1	×	B	EC-193
U0113	0113	CAN COMM CIRCUIT	—	1	×	B	EC-195
U1001	1001*4	CAN COMM CIRCUIT	—	1 or 2	—	—	EC-194

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
U1003	1003	CAN COMM CIRCUIT	—	2	—	—	EC-195
U1024	1024	VVEL CAN COMM CIRCUIT	—	1	×	B	EC-197
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	**Blinking*6**	—	**—**
P0011	0011	INT/V TIM CONT-B1	×	2	×	B	EC-199
P0021	0021	INT/V TIM CONT-B2	×	2	×	B	
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	B	EC-203
P0032	0032	A/F SEN1 HTR (B1)	—	2	×	B	
P0037	0037	HO2S2 HTR (B1)	—	2	×	B	EC-206
P0038	0038	HO2S2 HTR (B1)	—	2	×	B	
P0051	0051	A/F SEN1 HTR (B2)	—	2	×	B	EC-203
P0052	0052	A/F SEN1 HTR (B2)	—	2	×	B	
P0057	0057	HO2S2 HTR (B2)	—	2	×	B	EC-206
P0058	0058	HO2S2 HTR (B2)	—	2	×	B	
P0075	0075	INT/V TIM V/CIR-B1	—	2	×	B	EC-209
P0081	0081	INT/V TIM V/CIR-B2	—	2	×	B	
P0087	0087	LOW FUEL PRES	—	2	×	A or B	EC-211
P0088	0088	HIGH FUEL PRES	—	2	×	A or B	EC-215
P008A	008A	LOW FUEL PRES SYS	—	2	×	B	EC-218
P008B	008B	LOW FUEL PRES SYS	—	2	×	B	EC-220
P0090	0090	FUEL PUMP	—	2	×	B	EC-221
P0101	0101	MAF SEN/CIRCUIT-B1	—	2	×	B	EC-224
P0102	0102	MAF SEN/CIRCUIT-B1	—	1	×	B	EC-229
P0103	0103	MAF SEN/CIRCUIT-B1	—	1	×	B	
P010A	010A	ABSL PRES SEN/CIRC	—	2	×	B	EC-234
P0111	0111	IAT SENSOR1 B1	—	2	×	A	EC-237
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	B	EC-239
P0113	0113	IAT SEN/CIRCUIT-B1	—	2	×	B	
P0116	0116	ECT SEN/CIRC	—	2	×	A	EC-241
P0117	0117	ECT SEN/CIRC	—	1	×	B	EC-244
P0118	0118	ECT SEN/CIRC	—	1	×	B	
P0122	0122	TP SEN 2/CIRC-B1	—	1	×	B	EC-246
P0123	0123	TP SEN 2/CIRC-B1	—	1	×	B	
P0125	0125	ECT SENSOR	—	2	×	B	EC-249
P0127	0127	IAT SENSOR-B1	—	2	×	B	EC-251
P0128	0128	THERMSTAT FNCTN	—	2	×	A	EC-253
P0130	0130	A/F SENSOR1 (B1)	×	2	×	A	EC-256
P0131	0131	A/F SENSOR1 (B1)	—	2	×	B	EC-260
P0132	0132	A/F SENSOR1 (B1)	—	2	×	B	EC-263
P0133	0133	A/F SENSOR1 (B1)	×	2	×	A	EC-266
P0137	0137	HO2S2 (B1)	×	2	×	A	EC-271
P0138	0138	HO2S2 (B1)	×	2	×	A	EC-277

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
P0139	0139	HO2S2 (B1)	×	2	×	A	EC-285
P0150	0150	A/F SENSOR1 (B2)	×	2	×	A	EC-256
P0151	0151	A/F SENSOR1 (B2)	—	2	×	B	EC-260
P0152	0152	A/F SENSOR1 (B2)	—	2	×	B	EC-263
P0153	0153	A/F SENSOR1 (B2)	×	2	×	A	EC-266
P0157	0157	HO2S2 (B2)	×	2	×	A	EC-271
P0158	0158	HO2S2 (B2)	×	2	×	A	EC-277
P0159	0159	HO2S2 (B2)	×	2	×	A	EC-285
P0171	0171	FUEL SYS-LEAN-B1	—	2	×	B	EC-291
P0172	0172	FUEL SYS-RICH-B1	—	2	×	B	EC-295
P0174	0174	FUEL SYS-LEAN-B2	—	2	×	B	EC-291
P0175	0175	FUEL SYS-RICH-B2	—	2	×	B	EC-295
P0181	0181	FTT SENSOR	—	2	×	A and B	EC-299
P0182	0182	FTT SEN/CIRCUIT	—	2	×	B	EC-303
P0183	0183	FTT SEN/CIRCUIT	—	2	×	B	EC-303
P0190	0190	FUEL PRES SEN/CIRC	—	1	×	B	EC-305
P0191	0191	FRP SENSOR A	—	2	×	A	EC-309
P0192	0192	FRP SEN/CIRC	—	2	×	B	EC-305
P0193	0193	FRP SEN/CIRC	—	2	×	B	EC-305
P0196	0196	EOT SENSOR	—	2	×	A and B	EC-313
P0197	0197	EOT SEN/CIRC	—	2	×	B	EC-317
P0198	0198	EOT SEN/CIRC	—	2	×	B	
P0201	0201	INJECTOR CIRC-CYL1	—	2	×	B	EC-319
P0202	0202	INJECTOR CIRC-CYL2	—	2	×	B	
P0203	0203	INJECTOR CIRC-CYL3	—	2	×	B	
P0204	0204	INJECTOR CIRC-CYL4	—	2	×	B	
P0205	0205	INJECTOR CIRC-CYL5	—	2	×	B	
P0206	0206	INJECTOR CIRC-CYL6	—	2	×	B	
P0207	0207	INJECTOR CIRC-CYL7	—	2	×	B	
P0208	0208	INJECTOR CIRC-CYL8	—	2	×	B	
P0222	0222	TP SEN 1/CIRC-B1	—	1	×	B	EC-320
P0223	0223	TP SEN 1/CIRC-B1	—	1	×	B	
P0300	0300	MULTI CYL MISFIRE	—	1 or 2	×	B	EC-323
P0301	0301	CYL 1 MISFIRE	—	1 or 2	×	B	
P0302	0302	CYL 2 MISFIRE	—	1 or 2	×	B	
P0303	0303	CYL 3 MISFIRE	—	1 or 2	×	B	
P0304	0304	CYL 4 MISFIRE	—	1 or 2	×	B	
P0305	0305	CYL 5 MISFIRE	—	1 or 2	×	B	
P0306	0306	CYL 6 MISFIRE	—	1 or 2	×	B	
P0307	0307	CYL 7 MISFIRE	—	1 or 2	×	B	
P0308	0308	CYL 8 MISFIRE	—	1 or 2	×	B	

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
P0327	0327	KNOCK SEN/CIRC-B1	—	2	—	—	EC-329
P0328	0328	KNOCK SEN/CIRC-B1	—	2	—	—	
P0332	0332	KNOCK SEN/CIRC-B2	—	2	—	B	
P0333	0333	KNOCK SEN/CIRC-B2	—	2	—	B	
P0335	0335	CKP SEN/CIRCUIT	—	2	×	B	EC-331
P0340	0340	CMP SEN/CIRC-B1	—	2	×	B	EC-335
P0345	0345	CMP SEN/CIRC-B2	—	2	×	B	
P0420	0420	TW CATALYST SYS-B1	×	2	×	A	EC-339
P0430	0430	TW CATALYST SYS-B2	×	2	×	A	
P0441	0441	EVAP PURG FLOW/MON	×	2	×	A	EC-344
P0443	0443	PURG VOLUME CONT/V	—	2	×	A	EC-349
P0444	0444	PURG VOLUME CONT/V	—	2	×	B	EC-353
P0445	0445	PURG VOLUME CONT/V	—	2	×	B	
P0447	0447	VENT CONTROL VALVE	—	2	×	B	EC-356
P0448	0448	VENT CONTROL VALVE	—	2	×	B	EC-360
P0451	0451	EVAP SYS PRES SEN	—	2	×	A	EC-364
P0452	0452	EVAP SYS PRES SEN	—	2	×	B	EC-368
P0453	0453	EVAP SYS PRES SEN	—	2	×	B	EC-373
P0456	0456	EVAP VERY SML LEAK	×*8	2	×	A	EC-378
P0460	0460	FUEL LEV SEN SLOSH	—	2	×	A	EC-384
P0461	0461	FUEL LEVEL SENSOR	—	2	×	B	EC-385
P0462	0462	FUEL LEVL SEN/CIRC	—	2	×	B	EC-387
P0463	0463	FUEL LEVL SEN/CIRC	—	2	×	B	EC-387
P0500	0500	VEH SPEED SEN/CIRC*5	—	2	×	B	EC-388
P0506	0506	ISC SYSTEM	—	2	×	B	EC-390
P0507	0507	ISC SYSTEM	—	2	×	B	EC-392
P050A	050A	COLD START CONTROL	—	2	×	A	EC-394
P050B	050B	COLD START CONTROL	—	2	×	A	EC-394
P050E	050E	COLD START CONTROL	—	2	×	A	EC-394
P0524	0524	ENGINE OIL PRESSURE	—	2	×	B	EC-396
P0527	0527	COOLING FAN SPD SEN	—	2	—	—	EC-399
P0550	0550	PW ST P SEN/CIRC	—	2	—	—	EC-403
P0603	0603	ECM BACK UP/CIRCUIT	—	2	×	B	EC-406
P0605	0605	ECM	—	1 or 2	× or —	B	EC-408
P0607	0607	ECM	—	1	×	B	EC-410
P0611	0611	FIC MODULE	—	2	×	B	EC-411
P062B	062B	ECM	—	2	×	B	EC-412
P0643	0643	SENSOR POWER/CIRC	—	1	×	B	EC-413
P0705	0705	T/M RANGE SENSOR A	—	2	×	B	TM-108
P0710	0710	FLUID TEMP SENSOR*7	—	2	×	B	TM-109
P0717	0717	INPUT SPEED SENSOR A	—	2	×	B	TM-112
P0720	0720	OUTPUT SPEED SENSOR*5	—	2	×	B	TM-113

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
P0729	0729	6GR INCORRECT RATIO*7	—	2	×	B	TM-117
P0730	0730	INCORRECT GR RATIO	—	2	×	B	TM-119
P0731	0731	1GR INCORRECT RATIO*7	—	2	×	B	TM-121
P0732	0732	2GR INCORRECT RATIO*7	—	2	×	B	TM-123
P0733	0733	3GR INCORRECT RATIO*7	—	2	×	B	TM-125
P0734	0734	4GR INCORRECT RATIO*7	—	2	×	B	TM-127
P0735	0735	5GR INCORRECT RATIO*7	—	2	×	B	TM-129
P0740	0740	TORQUE CONVERTER	—	2	×	B	TM-131
P0744	0744	TORQUE CONVERTER	—	2	×	B	TM-132
P0745	0745	PC SOLENOID A	—	2	×	B	TM-134
P0750	0750	SHIFT SOLENOID A	—	2	×	B	TM-135
P0775	0775	PC SOLENOID B	—	2	×	B	TM-136
P0780	0780	SHIFT	—	1	×	B	TM-137
P0795	0795	PC SOLENOID C	—	2	×	B	TM-139
P0850	0850	P-N POS SW/CIRCUIT	—	2	×	B	EC-415
P100A	100A	VVEL SYSTEM-B1	—	2	×	B	EC-418
P100B	100B	VVEL SYSTEM-B2	—	2	×	B	EC-418
P1087	1087	VVEL SYSTEM-B1	—	1	×	B	EC-422
P1088	1088	VVEL SYSTEM-B2	—	1	×	B	EC-422
P1089	1089	VVEL POS SEN/CIRC-B1	—	1	×	B	EC-423
P1090	1090	VVEL ACTR MOT-B1	—	1	×	B	EC-426
P1091	1091	VVEL ACTR MOT PWR	—	1 or 2	×	B	EC-429
P1092	1092	VVEL POS SEN/CIRC-B2	—	1	×	B	EC-423
P1093	1093	VVEL ACTR MOT-B2	—	1	×	B	EC-426
P1148	1148	CLOSED LOOP-B1	—	1	×	A	EC-432
P1168	1168	CLOSED LOOP-B2	—	1	×	A	EC-432
P1197	1197	FUEL RUN OUT	—	2	—	—	EC-433
P1212	1212	TCS/CIRC	—	2	—	—	EC-435
P1217	1217	ENG OVER TEMP	—	1	×	B	EC-436
P1220	1220	FPCM	—	1	—	—	EC-439
P1225	1225	CTP LEARNING-B1	—	2	—	—	EC-442
P1226	1226	CTP LEARNING-B1	—	2	—	—	EC-443
P1423	1423	COLD START CONTROL	—	2	×	A	EC-444
P1424	1424	COLD START CONTROL	—	2	×	A	EC-444
P1550	1550	BAT CURRENT SENSOR	—	2	—	—	EC-446
P1551	1551	BAT CURRENT SENSOR	—	2	—	—	EC-450
P1552	1552	BAT CURRENT SENSOR	—	2	—	—	EC-450
P1553	1553	BAT CURRENT SENSOR	—	2	—	—	EC-454
P1554	1554	BAT CURRENT SENSOR	—	2	—	—	EC-458
P1556	1556	BAT TMP SEN/CIRC	—	2	—	—	EC-462
P1557	1557	BAT TMP SEN/CIRC	—	2	—	—	EC-462

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
P1564	1564	ASCD SW	—	1	—	—	EC-465 (with ASCD) EC-468 (with ICC)
P1568	1568	ICC COMMAND VALUE	—	1	—	—	EC-471
P1572	1572	ASCD BRAKE SW	—	1	—	—	EC-472 (with ASCD) EC-477 (with ICC)
P1574	1574	ASCD VHL SPD SEN	—	1	—	—	EC-483 (with ASCD) EC-485 (with ICC)
P1606	1606	VVEL CONTROL MODULE	—	1 or 2	× or —	B	EC-487
P1607	1607	VVEL CONTROL MODULE	—	1	×	B	EC-488
P1608	1608	VVEL SENSOR POWER/CIRC	—	1	×	B	EC-489
P1610	1610	LOCK MODE	—	2	—	—	SEC-51
P1611	1611	ID DISCORD IMMU-ECM	—	2	—	—	SEC-52
P1612	1612	CHAIN OF ECM-IMMU	—	2	—	—	SEC-53
P1613	1613	ECM INT CIRC-IMMU	—	2	—	—	SEC-46
P1614	1614	CHAIN OF IMMU-KEY	—	2	—	—	SEC-54
P1615	1615	DIFFERENCE OF KEY	—	2	—	—	SEC-46
P1650	1650	STR MTR RELAY 2	—	2	×	B	EC-491
P1651	1651	STR MTR RELAY	—	2	×	B	EC-494
P1652	1652	STR MTR SYS COMM	—	1	×	B	EC-496
P1715	1715	IN PULY SPEED	—	2	—	—	EC-498
P1730	1730	INTERLOCK	—	2	×	B	TM-143
P1734	1734	7GR INCORRECT RATIO*7	—	2	×	B	TM-145
P1805	1805	BRAKE SW/CIRCUIT	—	2	—	—	EC-499
P2096	2096	POST CAT FUEL TRIM SYS B1	—	2	×	A	EC-502
P2097	2097	POST CAT FUEL TRIM SYS B1	—	2	×	A	EC-502
P2098	2098	POST CAT FUEL TRIM SYS B2	—	2	×	A	EC-502
P2099	2099	POST CAT FUEL TRIM SYS B2	—	2	×	A	EC-502
P2100	2100	ETC MOT PWR-B1	—	1	×	B	EC-506
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	B	EC-508
P2103	2103	ETC MOT PWR	—	1	×	B	EC-506
P2118	2118	ETC MOT-B1	—	1	×	B	EC-512
P2119	2119	ETC ACTR-B1	—	1	×	B	EC-514
P2122	2122	APP SEN 1/CIRC	—	1	×	B	EC-516
P2123	2123	APP SEN 1/CIRC	—	1	×	B	EC-516
P2127	2127	APP SEN 2/CIRC	—	1	×	B	EC-519
P2128	2128	APP SEN 2/CIRC	—	1	×	B	EC-519

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*9	Reference page
CONSULT GST*2	ECM*3						
P2135	2135	TP SENSOR-B1	—	1	×	B	EC-523
P2138	2138	APP SENSOR	—	1	×	B	EC-526
P2539	2539	LOW FUEL PRES SEN	—	2	×	B	EC-531
P2541	2541	LOW FUEL PRES SEN	—	2	×	B	EC-531
P2542	2542	LOW FUEL PRES SEN	—	2	×	B	EC-531
P2713	2713	PRESS CONTROL SOL D	—	2	×	B	TM-150
P2722	2722	PRESS CONTROL SOL E	—	2	×	B	TM-151
P2731	2731	PRESS CONTROL SOL F	—	2	×	B	TM-152
P2807	2807	PRESS CONTROL SOL G	—	2	×	B	TM-153

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

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

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

*4: The troubleshooting for this DTC needs CONSULT.

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

*6: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to “How to Display SRT Status”.

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

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

*9: Refer to EC-177, "Description", “HOW TO ERASE PERMANENT DTC”.

Test Value and Test Limit

INFOID:0000000009325845

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

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
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage
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
FUEL SYSTEM	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
			P0171 or P0172	81H	24H	The number of lambda control clamped
			P117A	82H	03H	Cylinder A/F imbalance monitoring
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	80H	2FH	Long term fuel trim
			P0174 or P0175	81H	24H	The number of lambda control clamped
			P117B	82H	03H	Cylinder A/F imbalance monitoring

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

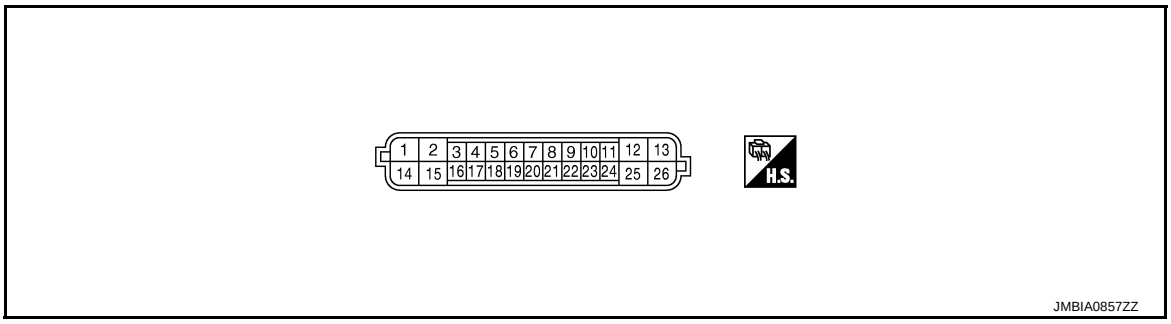
Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A2H	No. 1 cylinder misfire	P0301	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current 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

VVEL CONTROL MODULE

Reference Value

INFOID:0000000009008847

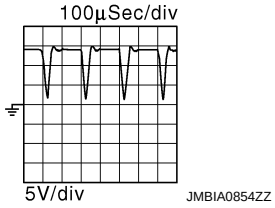
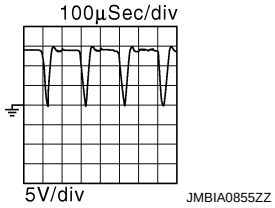
TERMINAL LAYOUT

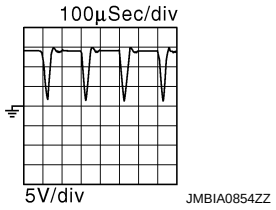
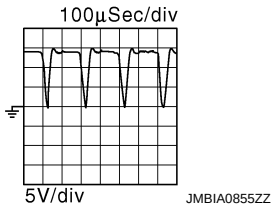


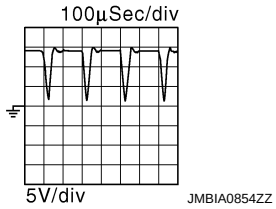
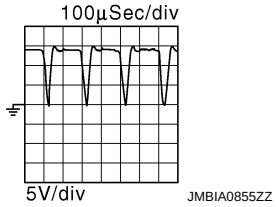
PHYSICAL VALUES

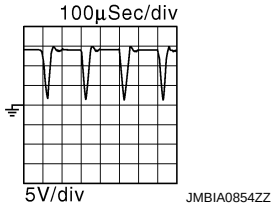
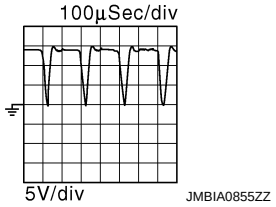
NOTE:

- VVEL control module is located under the battery. Temporarily remove the battery to check voltage of the terminals.
- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT.

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (R)	14 (B)	VVEL actuator motor power supply (bank 2)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
2 (L/W)	14 (B)	VVEL actuator motor (High lift) (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0 - 14 V★ 
3 (W)	6 (R)	VVEL control shaft position sensor 1 (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	0.25 - 1.40 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
4 (L/W)	—	Sensor ground [VVEL control shaft position sensor 1 (bank 2)]	—	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
5 (L/R)	4 (L/W)	VVEL control shaft position sensor 1 (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	0.25 - 1.40 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
6 (R)	—	Sensor ground [VVEL control shaft position sensor 1 (bank 1)]	—	—	—
7 (B)	6 (R)	Sensor power supply [VVEL control shaft position sensor 1 (bank 1)]	—	[Ignition switch: ON]	5 V
8 (W/L)	14 (B)	Power supply for VVEL control module	—	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
9 (L)	4 (L/W)	Sensor power supply [VVEL position sensor 1 (bank 2)]	—	[Ignition switch: ON]	5 V
11 (W)	—	ENG communication line	Input/ Output	—	—
12 (L/W)	14 (B)	VVEL actuator motor (High lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0 - 14 V★ 
13 (R)	14 (B)	VVEL actuator motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
14 (B)	—	VVEL control module ground	—	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
15 (L/B)	14 (B)	VVEL actuator motor (Low lift) (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0 - 14 V★ 
16 (L/R)	19 (L)	VVEL control shaft position sensor 2 (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	3.50 - 4.75 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
17 (O)	—	Sensor ground [VVEL control shaft position sensor 2 (bank 2)]	—	—	—
18 (W/L)	17 (O)	VVEL control shaft position sensor 2 (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	3.50 - 4.75 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
19 (L)	—	Sensor ground [VVEL control shaft position sensor 2 (bank 1)]	—	—	—
20 (L/W)	19 (L)	Sensor power supply [VVEL control shaft position sensor 2 (bank 1)]	—	[Ignition switch: ON]	5 V
21 (BR/ W)	14 (B)	VVEL actuator motor relay abort signal (ECM)	Input	[Engine is running] • Warm-up condition • Idle speed	0 V
22 (W)	17 (O)	Sensor power supply [VVEL control shaft position sensor 2 (bank 2)]	—	[Ignition switch: ON]	5 V
23 (BR/ Y)	14 (B)	VVEL control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON]	0 - 1.0 V
24 (R/W)	—	ENG communication line	Input/ Output	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
25 (L/B)	14 (B)	VVEL control motor (Low lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0 - 14 V★ 

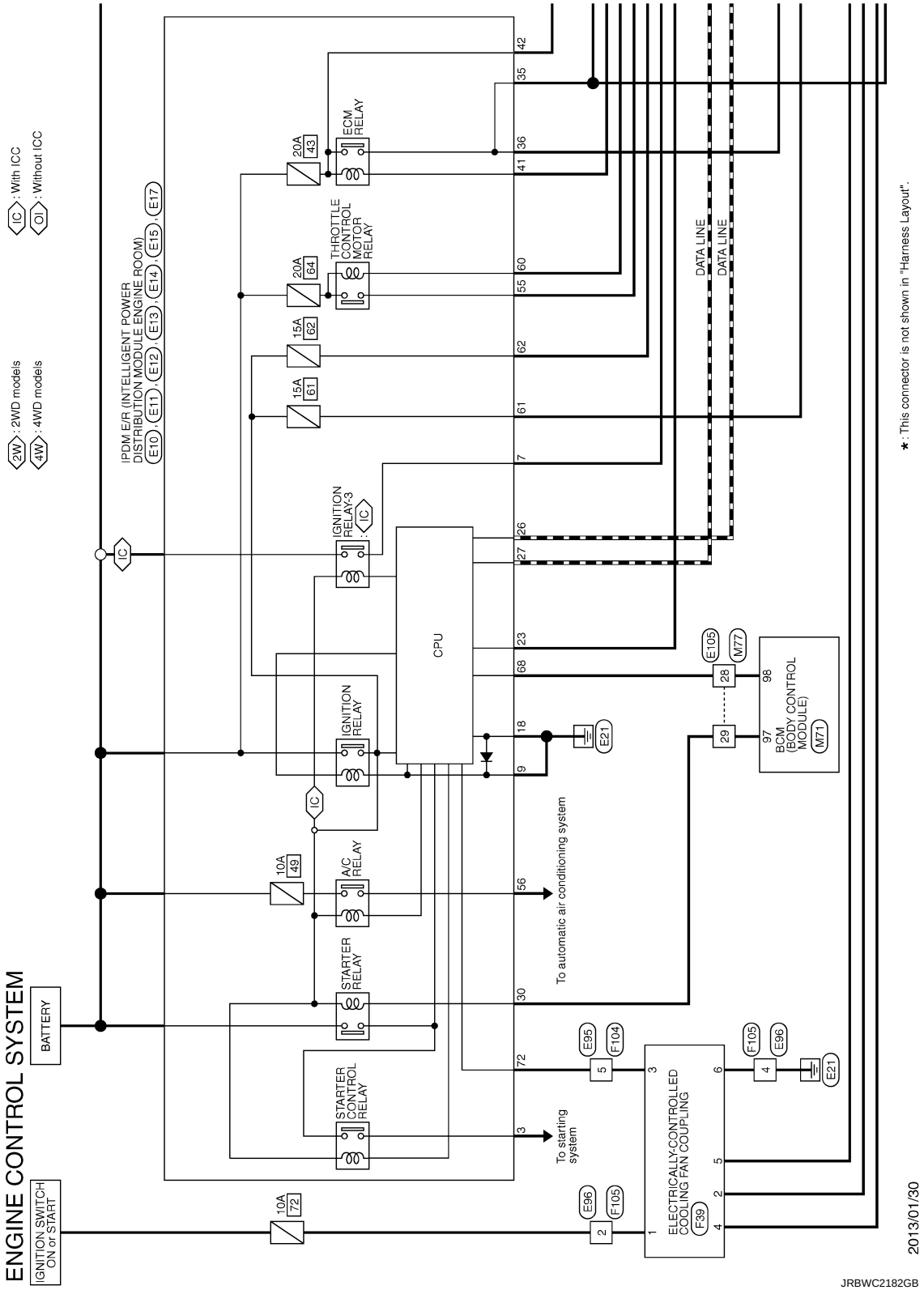
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

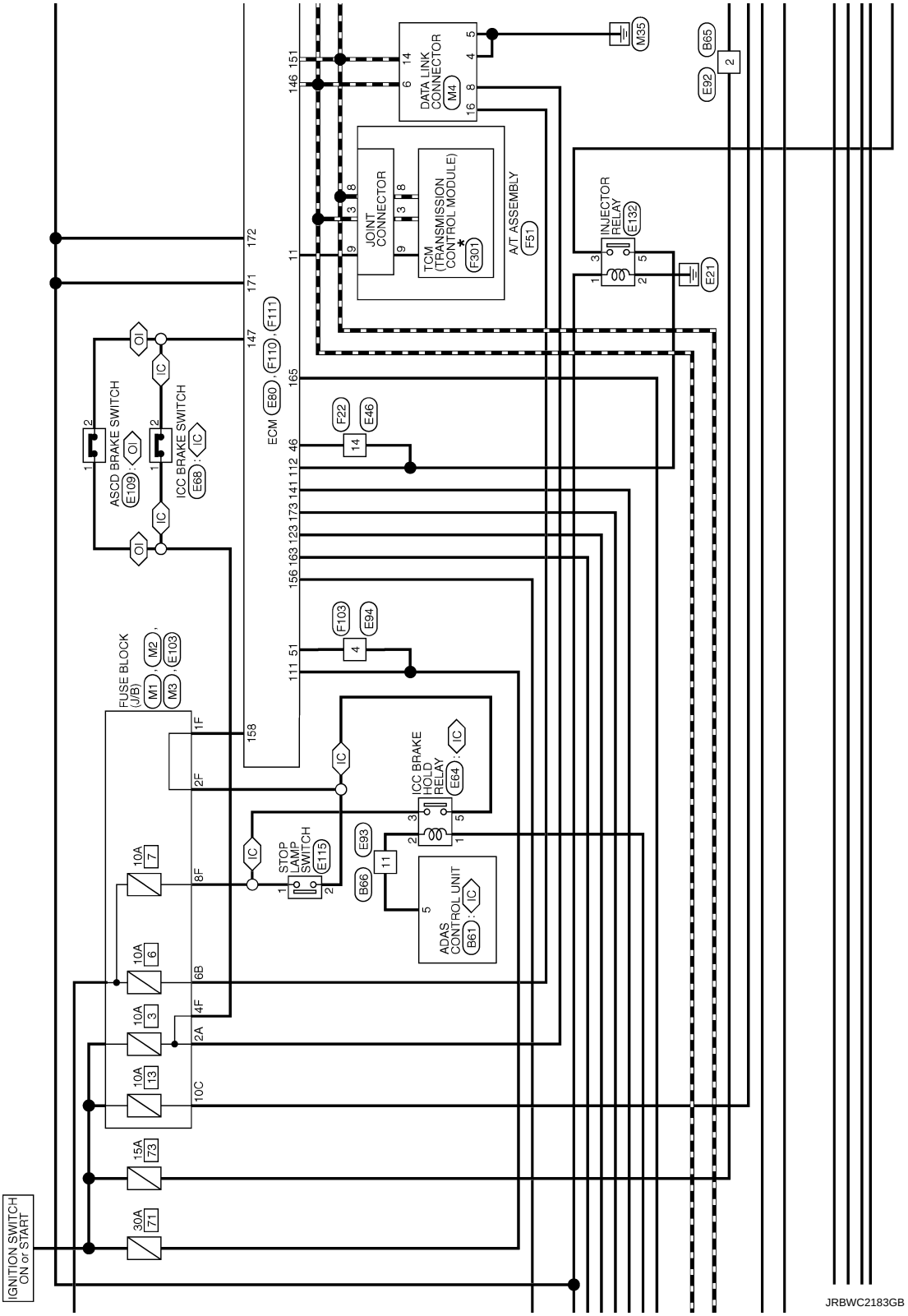
WIRING DIAGRAM

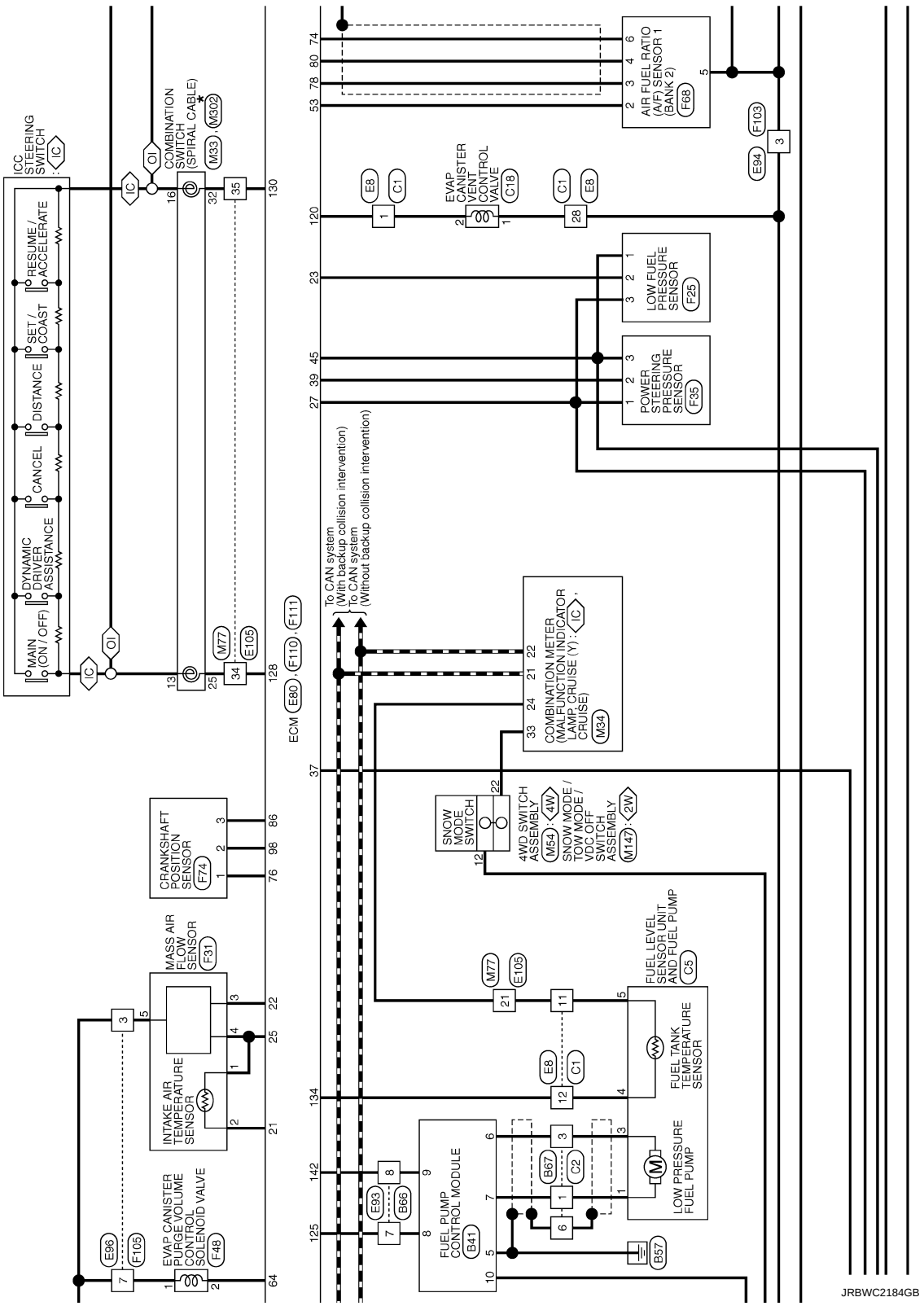
ENGINE CONTROL SYSTEM

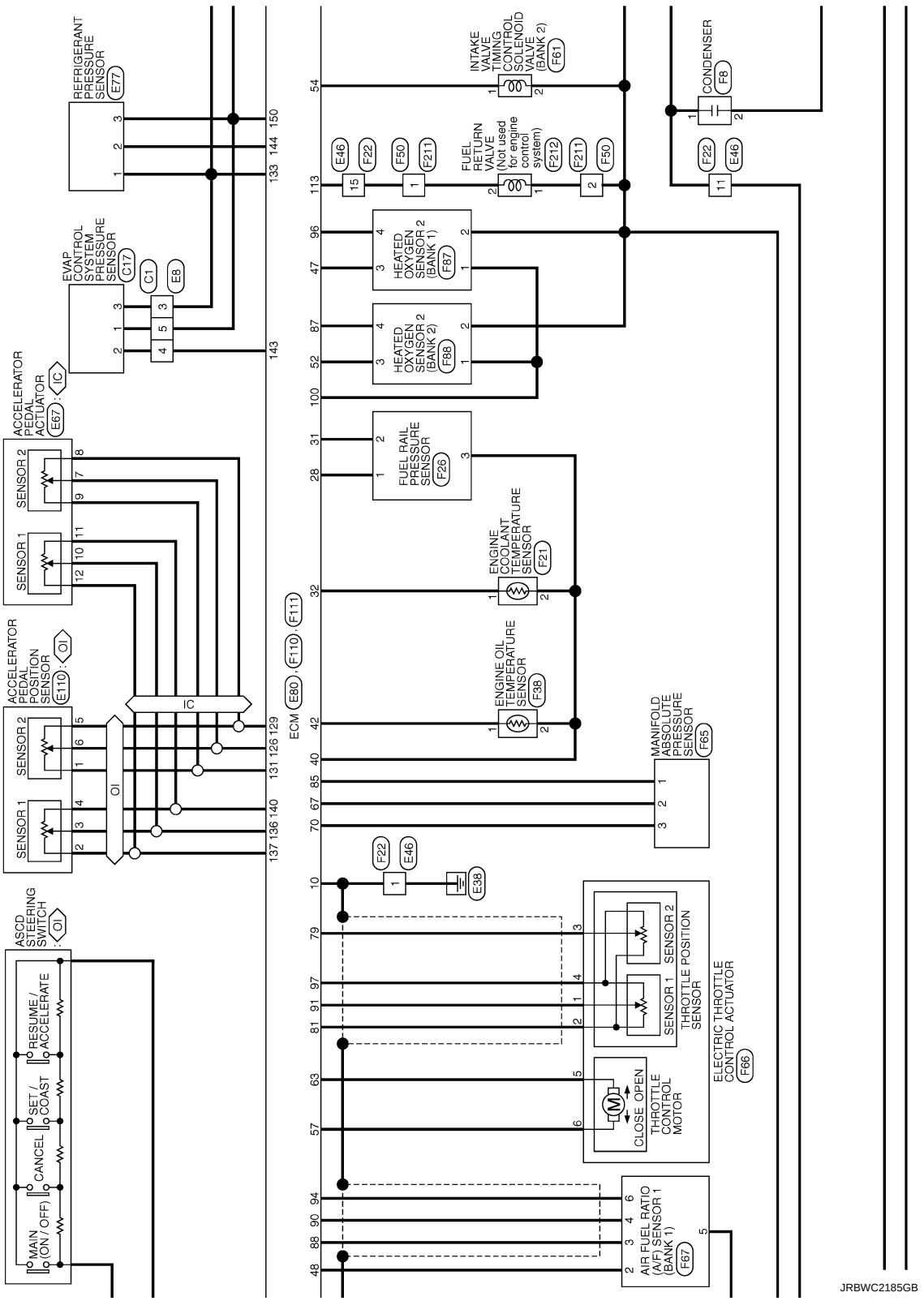
Wiring Diagram

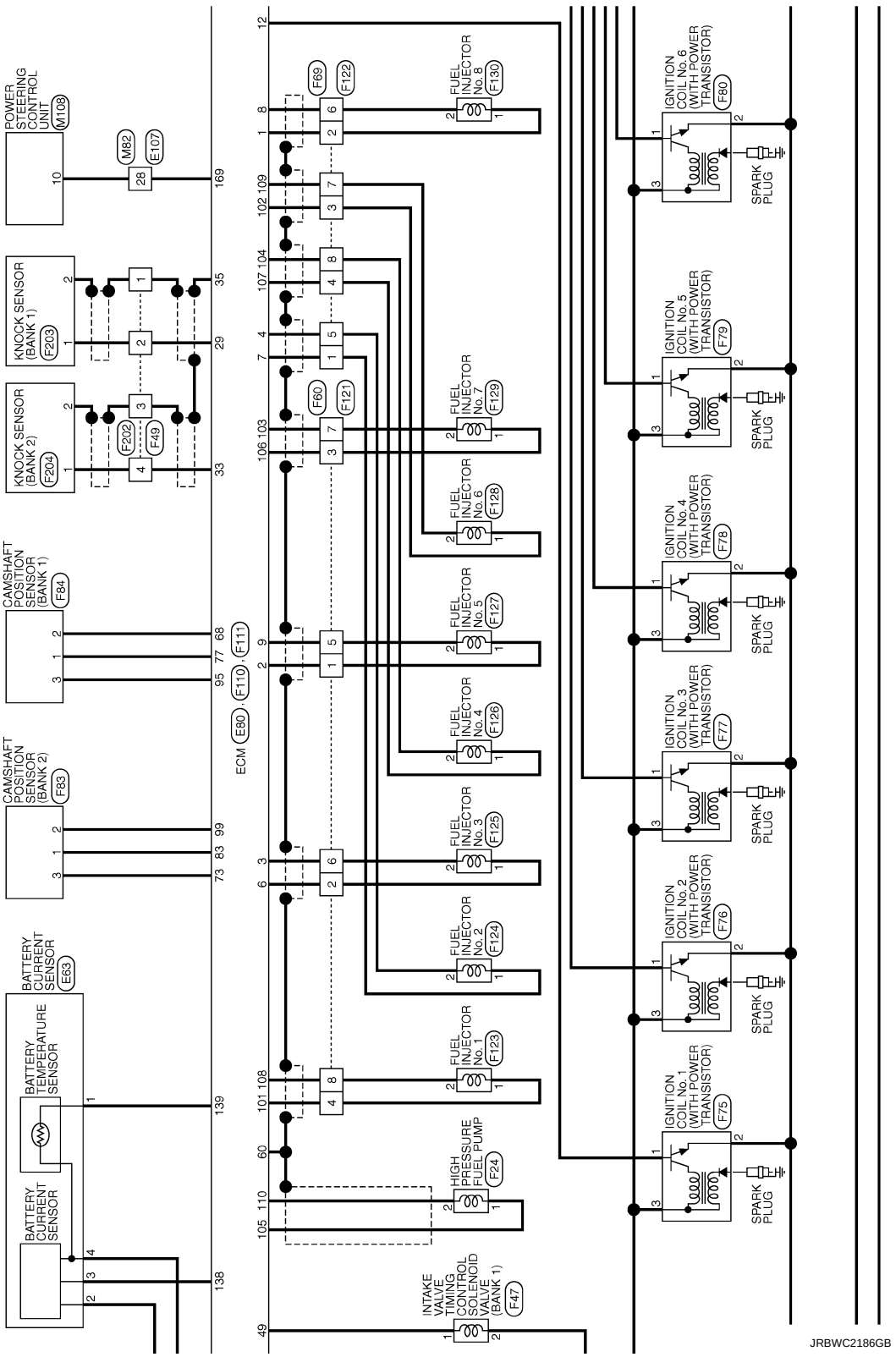
INFOID:0000000009008848

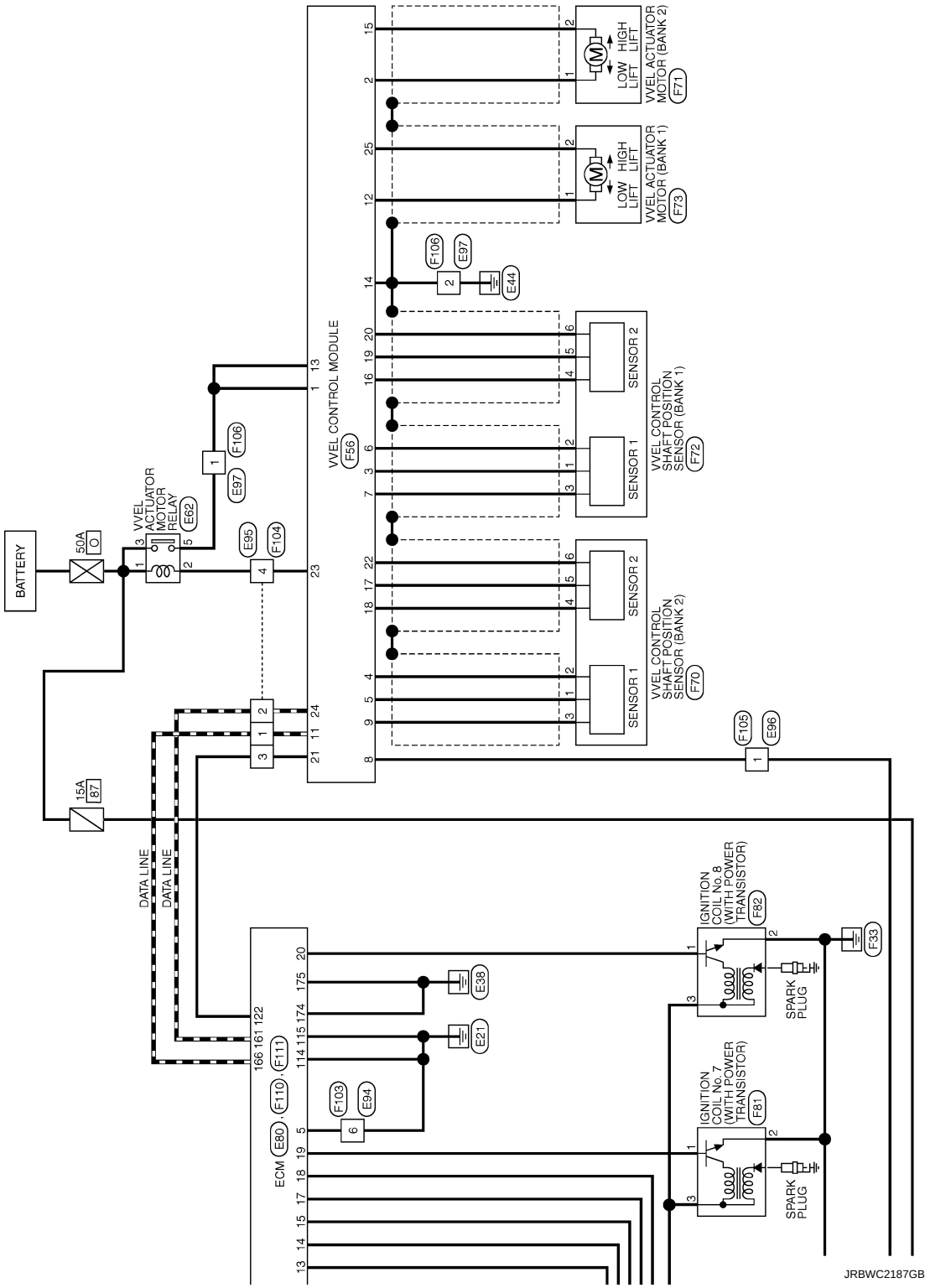


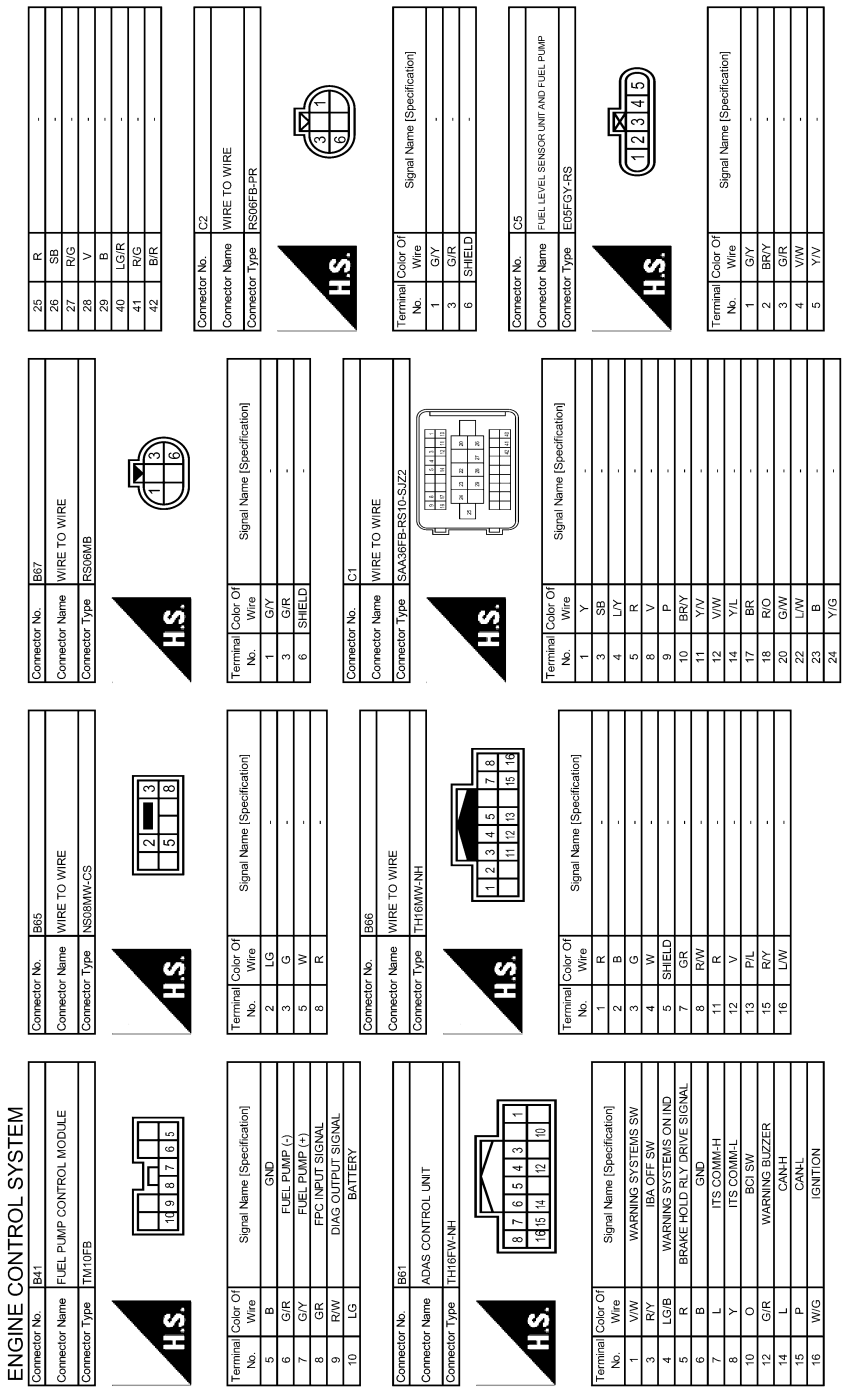

DATA LINK CONNECTOR
M4
M35
B65
E92
2
JOINT CONNECTOR
TCM (TRANSMISSION CONTROL MODULE)
F301
A/T ASSEMBLY
F51
INJECTOR RELAY
E132
E21
ECM
E80
F111
F110
F22
E46
ASCD BRAKE SWITCH
E109
ICC BRAKE SWITCH
E68
FUSE BLOCK (J/B)
M1
M2
M3
E103
F103
E94
ICC BRAKE HOLD RELAY
E64
STOP LAMP SWITCH
E115
E93
B66
ADAS CONTROL UNIT
B61
10A 7
10A 6
10A 3
10A 13
15A 73
30A 71
IGNITION SWITCH ON or START
JRBWC2183GB


ICC STEERING SWITCH
MAIN (ON / OFF)
DYNAMIC DRIVER ASSISTANCE
CANCEL
DISTANCE
SET / COAST
RESUME / ACCELERATE
COMBINATION SWITCH (SPIRAL CABLE)
ECM
To CAN system (With backup collision intervention)
To CAN system (Without backup collision intervention)
COMBINATION METER (MALFUNCTION INDICATOR LAMP, CRUISE (Y) : IC, CRUISE) M34
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2) F68
EVAP CANISTER VENT CONTROL VALVE C18
LOW FUEL PRESSURE SENSOR F25
POWER STEERING PRESSURE SENSOR F35
SNOW MODE SWITCH
4WD SWITCH ASSEMBLY M54 : 4W
SNOW MODE / TOW MODE / VDC OFF SWITCH ASSEMBLY M147 : 2W
CRANKSHAFT POSITION SENSOR F74
MASS AIR FLOW SENSOR F31
INTAKE AIR TEMPERATURE SENSOR
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE F48
FUEL PUMP CONTROL MODULE B41
FUEL LEVEL SENSOR UNIT AND FUEL PUMP C5
FUEL TANK TEMPERATURE SENSOR
LOW PRESSURE FUEL PUMP
JRBWC2184GB


REFRIGERANT PRESSURE SENSOR E77
EVAP CONTROL SYSTEM PRESSURE SENSOR C17
C1
E8
ACCELERATOR PEDAL ACTUATOR E67 : IC
SENSOR 2
SENSOR 1
ACCELERATOR PEDAL POSITION SENSOR E110 : OI
IC
OI
ECM E80 F110 F111
ASCD STEERING SWITCH : OI
MAIN (ON / OFF)
CANCEL
SET / COAST
RESUME / ACCELERATE
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) F61
FUEL RETURN VALVE (Not used for engine control system) F212
HEATED OXYGEN SENSOR 2 (BANK 1) F87
HEATED OXYGEN SENSOR 2 (BANK 2) F88
FUEL RAIL PRESSURE SENSOR F26
ENGINE COOLANT TEMPERATURE SENSOR F21
ENGINE OIL TEMPERATURE SENSOR F38
MANIFOLD ABSOLUTE PRESSURE SENSOR F65
CONDENSER F8
E46 F22 F50 F211
E38
THROTTLE POSITION SENSOR
SENSOR 1 SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR F66
THROTTLE CONTROL MOTOR
CLOSE OPEN
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1) F67
JRBWC2185GB


POWER STEERING CONTROL UNIT M108
KNOCK SENSOR (BANK 1) F203
KNOCK SENSOR (BANK 2) F204
CAMSHAFT POSITION SENSOR (BANK 1) F84
CAMSHAFT POSITION SENSOR (BANK 2) F83
BATTERY CURRENT SENSOR E63
BATTERY TEMPERATURE SENSOR
BATTERY CURRENT SENSOR
ECM E80
FUEL INJECTOR No.1 F123
FUEL INJECTOR No.2 F124
FUEL INJECTOR No.3 F125
FUEL INJECTOR No.4 F126
FUEL INJECTOR No.5 F127
FUEL INJECTOR No.6 F128
FUEL INJECTOR No.7 F129
FUEL INJECTOR No.8 F130
HIGH PRESSURE FUEL PUMP F24
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1) F47
IGNITION COIL No.1 (WITH POWER TRANSISTOR) F75
IGNITION COIL No.2 (WITH POWER TRANSISTOR) F76
IGNITION COIL No.3 (WITH POWER TRANSISTOR) F77
IGNITION COIL No.4 (WITH POWER TRANSISTOR) F78
IGNITION COIL No.5 (WITH POWER TRANSISTOR) F79
IGNITION COIL No.6 (WITH POWER TRANSISTOR) F80
SPARK PLUG
JRBWC2186GB


BATTERY
50A
15A
87
VVEL ACTUATOR MOTOR RELAY
E62
F106
E97
E95
F104
VVEL CONTROL MODULE
F56
VVEL ACTUATOR MOTOR (BANK 2)
F71
VVEL ACTUATOR MOTOR (BANK 1)
F73
LOW LIFT
HIGH LIFT
VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
F72
VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
F70
SENSOR 1
SENSOR 2
E44
F105
E96
DATA LINE
DATA LINE
ECM
E80
F110
F111
E38
E21
F103
E94
IGNITION COIL No.8 (WITH POWER TRANSISTOR)
F82
IGNITION COIL No.7 (WITH POWER TRANSISTOR)
F81
SPARK PLUG
F33
JRBWC2187GB



JRBWC3492GB

ENGINE CONTROL SYSTEM

Connector No.	C17
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Type	E03FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	GND
2	L/Y	PRESSURE SIGNAL
3	SB	VCC 5V

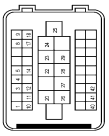
Connector No.	C18
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Type	E02FB-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	-
2	Y	-

Connector No.	E8
Connector Name	WIRE TO WIRE
Connector Type	SAA36MB-RS10-SJZ2

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
3	SB	-
4	L/Y	-
5	R	-
8	V	-
9	P	-
10	BR/Y	-
11	Y/V	-
12	V/W	-
14	Y/L	-
17	BR	-
18	R/O	-
20	G/W	-
22	L/W	-
23	B	-
24	Y/G	-
25	R	-
26	SB	-
27	R/G	-
28	V	-
29	B	-
40	LG/R	-
41	R/G	-
42	B/R	-

Connector No.	E10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
3	R	-
4	L	-
5	P/L	-
7	W/G	-
8	W	-

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FB-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
9	B	-
14	L	-

Connector No.	E12
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS06FBR-CS

H.S.

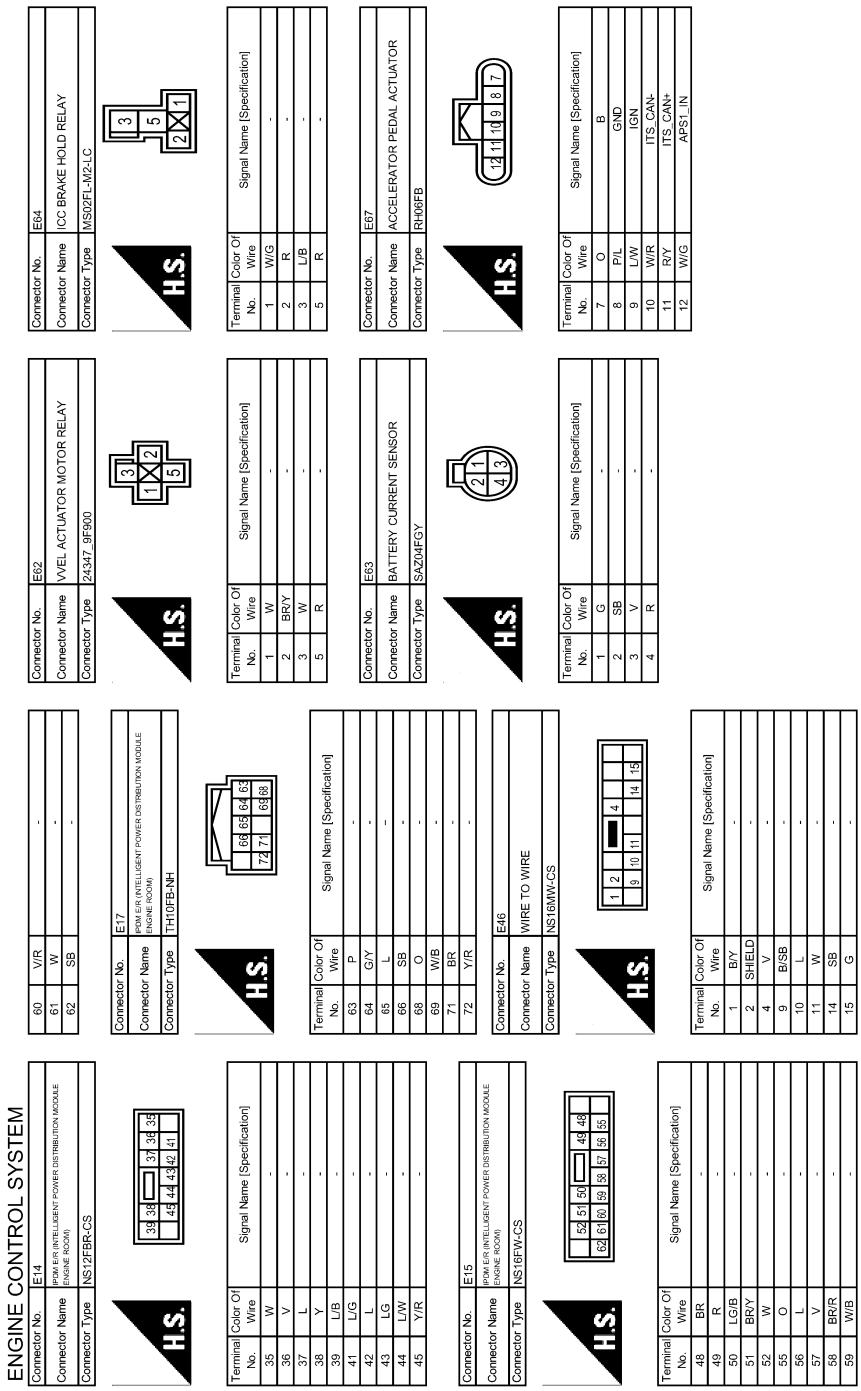
Terminal No.	Color Of Wire	Signal Name [Specification]
18	B	-
19	V	-
20	W	-
21	L	-

Connector No.	E13
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH12FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
23	GR/R	-
24	W/G	-
25	L/Y	-
26	P	-
27	L	-
30	R/W	-
32	LG	-
33	R	-
34	G	-

JRBWC3493GB



JRBWC3494GB

ENGINE CONTROL SYSTEM

Connector No.	E68
Connector Name	ICC BRAKE SWITCH
Connector Type	M02FBR-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	G/Y	-

Connector No.	E77
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	-
2	O/B	-
3	R	-

Connector No.	E80
Connector Name	ECM
Connector Type	MAB55FB-MEB10-LH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
111	R	FUEL INJECTOR DRIVER POWER SUPPLY
112	SB	FUEL INJECTOR DRIVER POWER SUPPLY
113	G	-
114	B	ECM GROUND
115	B	ECM GROUND
120	Y	EVAP CANISTER VENT CONTROL VALVE
122	BR/W	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL (VVEL CONTROL MODULE)
123	V/R	THROTTLE CONTROL MOTOR RELAY
125	GR	FUEL PUMP CONTROL MODULE (FPCM)
126	O	ACCELERATOR PEDAL POSITION SENSOR 2
128	Y	ASCD/ICC STEERING SWITCH
129	P/L	SENSOR GROUND
130	R	SENSOR GROUND
131	L/W	SENSOR POWER SUPPLY
133	SB	SENSOR POWER SUPPLY
134	V/W	FUEL TEMPERATURE SENSOR
136	W/R	ACCELERATOR PEDAL POSITION SENSOR 1
137	W/G	SENSOR POWER SUPPLY
138	V	BATTERY CURRENT SENSOR
139	G	BATTERY TEMPERATURE SENSOR
140	R/Y	SENSOR GROUND
141	SB	IGNITION SWITCH
142	R/W	FUEL PUMP CONTROL MODULE (FPCM) CHECK
143	L/Y	EVAP CONTROL SYSTEM PRESSURE SENSOR
144	O/B	REFRIGERANT PRESSURE SENSOR
146	L	CAN COMMUNICATION LINE
147	G/Y	ASCD/ICC BRAKE SWITCH
150	R	SENSOR GROUND
151	P	CAN COMMUNICATION LINE
156	L	POWER SUPPLY FOR ECM (BACK-UP)
158	W/B	STOP LAMP SWITCH
161	R/W	ECM COMMUNICATION LINE
163	L/G	ECM RELAY (SELF SHUT-OFF)
165	GR/R	-
166	W	ECM COMMUNICATION LINE
169	G/B	ENGINE SPEED SIGNAL OUTPUT
171	W	POWER SUPPLY FOR ECM
172	W	POWER SUPPLY FOR ECM
173	O	THROTTLE CONTROL MOTOR POWER SUPPLY
174	B	ECM GROUND
175	B	ECM GROUND

Connector No.	E92
Connector Name	WIRE TO WIRE
Connector Type	NS08FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	LG	-
3	G	-
5	W	-
8	R	-

Connector No.	E93
Connector Name	WIRE TO WIRE
Connector Type	TH16FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	B	-
3	G	-
4	W	-
5	SHIELD	-
7	GR	-
8	R/W	-
11	R	-
12	V	-
13	P/L	-
15	R/Y	-
16	L/W	-

Connector No.	E94
Connector Name	WIRE TO WIRE
Connector Type	M06MW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/Y	-
2	R	-
3	V	-
4	R	-
5	G/R	-
6	B/R	-

Connector No.	E95
Connector Name	WIRE TO WIRE
Connector Type	RH08MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R/W	-
3	BR/W	-
4	BR/Y	-
5	Y/R	-

JRBWC3495GB

ENGINE CONTROL SYSTEM

Connector No.	E96
Connector Name	WIRE TO WIRE
Connector Type	RS08MGY-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/L	-
2	L/W	-
3	GR	-
4	B/R	-
5	R	-
6	L	-
7	W	-

Connector No.	E97
Connector Name	WIRE TO WIRE
Connector Type	X02MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	B	-

Connector No.	E103
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
10F	G	-
14F	Y	-
15F	G	-
1F	W/B	-
2F	R	-
4F	G	-
6F	Y/G	-
8F	L/B	-
9F	Y	-

Connector No.	E105
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L/W	-
3	R/B	-
4	L	-
5	Y	-
7	W/G	-
8	P/B	-
9	W/B	-
10	G	-
11	L	-
12	P	-

13	P/B	-
14	BR	-
15	L/B	-
16	SB	-
18	BR	-
19	Y/G	-
20	BR/Y	-
21	Y/V	-
22	L	-
23	Y	-
24	L/W	-
28	O	-
29	R/W	-
30	L/B	-
31	Y	-
32	GR/R	-
34	Y	-
35	R	-
36	B/R	-
37	G/Y	-
38	G	-
40	SB	-
41	W/R	-
42	R	-
43	V	-
51	L/O	-
52	BR/W	-
53	BR/Y	-
54	GR/L	-
60	W	-
61	B	-
62	R	-
63	G	-
64	SHIELD	-
91	BR	-
92	L/W	-
94	Y/B	-
95	G/R	-
97	R	-
98	G/B	-
100	W/R	-

Connector No.	E107
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
4	V/W	-
5	G/R	-
6	P	-
9	GR/L	-
10	Y/R	-
11	L/R	-
12	W/G	-
13	BR/Y	-
14	LG	-
15	BR/W	-
16	B/Y	-
17	W/B	-
18	GR/R	-
20	W/R	-
21	B	-
22	R/L	-
23	G/R	-
24	R/W	-
25	W/L	-
26	R	-
27	L	-
28	G/B	-
35	G	-
36	Y	-
37	R	-
38	G/Y	-
39	O	-
40	W	-
41	R	-
42	B	-
43	G	-
44	SHIELD	-
46	B	-
47	W	-
48	SHIELD	-

JRBWC3496GB

ENGINE CONTROL SYSTEM

49	W	-
50	SHIELD	-
51	Y/R	-
52	GR	-
53	LG/B	-
54	LG/R	-
55	R/G	-
56	B/R	-
57	SB	-
60	G	-
61	B	-
62	W	-
63	R	-
64	SHIELD	-
65	L/Y	-
66	V	-
67	B/W	-
91	G/R	-
95	SB	-
96	G/R	-
97	GR/L	-
98	G/W	-
99	R/Y	-
100	L	-

Connector No.	E109
Connector Name	ASCD BRAKE SWITCH
Connector Type	M02FBR-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	G/Y	-

Connector No.	E110
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	AEY06FB-RH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	SENSOR POWER SUPPLY
2	W/G	SENSOR POWER SUPPLY
3	W/R	ACCELERATOR PEDAL POSITION SENSOR 1
4	R/Y	SENSOR GROUND
5	P/L	SENSOR GROUND
6	O	ACCELERATOR PEDAL POSITION SENSOR 2

Connector No.	E115
Connector Name	STOP LAMP SWITCH
Connector Type	M04FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/B	-
2	R	-
3	G	-
4	L/R	-

Connector No.	E132
Connector Name	INJECTOR RELAY
Connector Type	MS02FL-M2-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	B	-
3	G	-
5	SB	-

Connector No.	F8
Connector Name	CONDENSER
Connector Type	M02FW-GY-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	B	-

Connector No.	F21
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS

H.S.

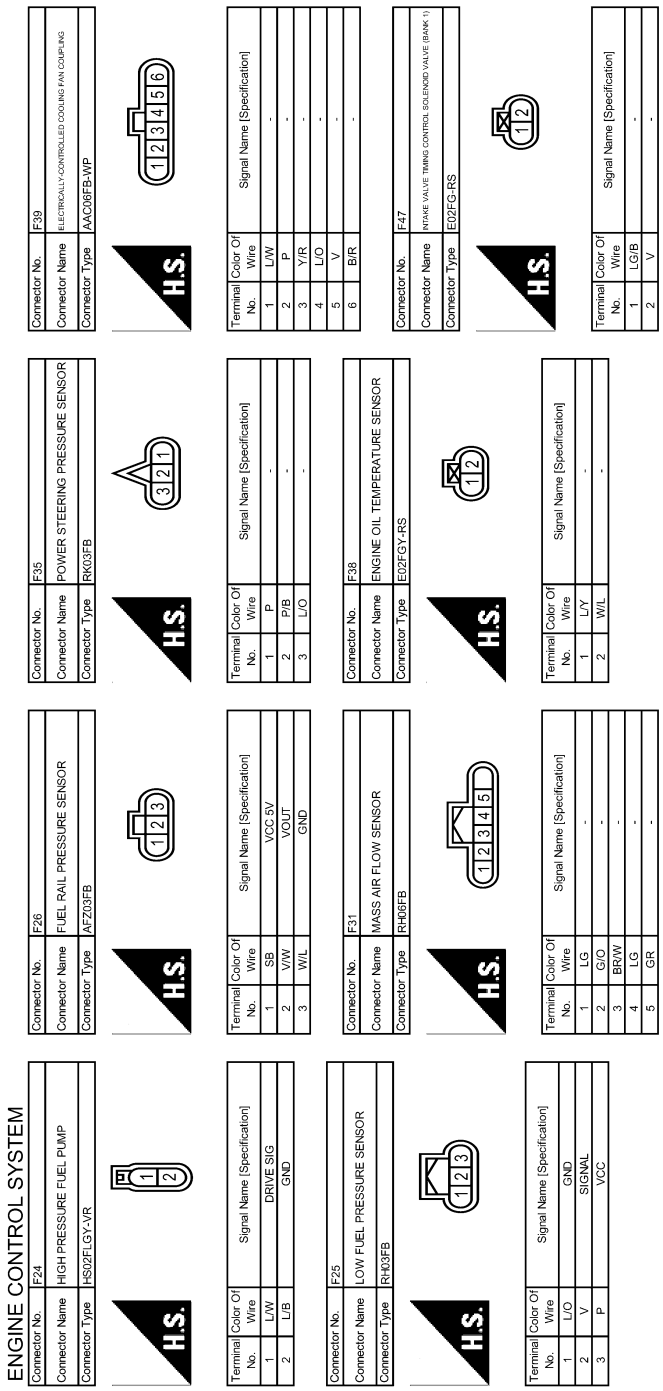
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	SIGNAL
2	W/L	GND

Connector No.	F22
Connector Name	WIRE TO WIRE
Connector Type	NS16FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	SHIELD	-
4	V	-
9	B	-
10	L/W	-
11	W	-
14	SB	-
15	G	-

JRBWC3497GB



JRBWC3498GB

ENGINE CONTROL SYSTEM

Connector No.	F48
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	HS02FL

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	V/W	-

Connector No.	F49
Connector Name	WIRE TO WIRE
Connector Type	RS04FB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	SHIELD	-
2	W	-
3	SHIELD	-
4	W	-

Connector No.	F50
Connector Name	WIRE TO WIRE
Connector Type	RS02MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	V	-

Connector No.	F51
Connector Name	A/T ASSEMBLY
Connector Type	RK10FG

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	IGNITION POWER SUPPLY
2	P	BATTERY POWER SUPPLY
3	L	CAN-H
4	SB	K-LINE
5	B	GROUND
6	V	IGNITION POWER SUPPLY
7	R	BACK-UP LAMP RELAY
8	P	CAN-L
9	BR	STARTER RELAY
10	B	GROUND

Connector No.	F56
Connector Name	VVEL CONTROL MODULE
Connector Type	RH18FB-AJZ8-RH-S

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 2)
2	L/W	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK2)
3	W	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)
4	L/W	SENSOR GROUND
5	L/R	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)
6	R	SENSOR GROUND
7	B	SENSOR POWER SUPPLY
8	W/L	POWER SUPPLY FOR VVEL CONTROL MODULE
9	L	SENSOR POWER SUPPLY
11	W	ENG COMMUNICATION LINE
12	L/W	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 1)
13	R	VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 1)
14	B	VVEL CONTROL MODULE GROUND
15	L/B	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 2)
16	L/R	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)
17	O	SENSOR GROUND
18	W/L	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)
19	L	SENSOR GROUND
20	L/W	SENSOR POWER SUPPLY
21	BR/W	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL (ECM)
22	W	SENSOR POWER SUPPLY
23	BR/Y	VVEL CONTROL MOTOR RELAY
24	R/W	ENG COMMUNICATION LINE
25	L/B	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 1)

Connector No.	F60
Connector Name	WIRE TO WIRE
Connector Type	RS08FB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	R	-
3	R	-
4	R	-
5	G	-
6	G	-
7	G	-
8	G	-

Connector No.	F61
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
Connector Type	E02FG-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/R	-
2	V	-

JRBWC3499GB

ENGINE CONTROL SYSTEM

Connector No.	F65
Connector Name	MANIFOLD ABSOLUTE PRESSURE SENSOR
Connector Type	R4I03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR/R	-
2	V	-
3	W/L	-

Connector No.	F66
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Type	HS06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	INPUT
2	G	OUTPUT1
3	B	OUTPUT2
4	W	GND
5	R	MOTOR2 (CLOSE)
6	W	MOTOR1 (OPEN)

Connector No.	F67
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
Connector Type	AFZ06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	L/W	-
3	B	-
4	W	-
5	V	-
6	R	-

Connector No.	F68
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
Connector Type	AFZ06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	SB	-
3	L/R	-
4	L/W	-
5	V	-
6	L	-

Connector No.	F69
Connector Name	WIRE TO WIRE
Connector Type	RS08FB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	R	-
3	R	-
4	R	-
5	G	-
6	G	-
7	G	-
8	G	-

Connector No.	F70
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
Connector Type	RH06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/R	-
2	L/W	-
3	L	-
4	W/L	-
5	O	-
6	W	-

Connector No.	F71
Connector Name	VVEL ACTUATOR MOTOR (BANK 2)
Connector Type	X02FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	-
2	L/B	-

Connector No.	F72
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
Connector Type	RH06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R	-
3	B	-
4	L/R	-
5	L	-
6	L/W	-

JRBWC3500GB

ENGINE CONTROL SYSTEM

Connector No.	F73
Connector Name	VVEL ACTUATOR MOTOR (BANK 1)
Connector Type	X02FB

H.S.

1 2

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	-
2	L/B	-

Connector No.	F74
Connector Name	CRANKSHAFT POSITION SENSOR
Connector Type	RH03FB

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/G	-
2	G/W	-
3	R/W	-

Connector No.	F75
Connector Name	IGNITION COIL No. 1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
2	B	-
3	W	-

Connector No.	F76
Connector Name	IGNITION COIL No. 2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/B	-
2	B	-
3	W	-

Connector No.	F77
Connector Name	IGNITION COIL No. 3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR/Y	-
2	B	-
3	W	-

Connector No.	F78
Connector Name	IGNITION COIL No. 4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG/R	-
2	B	-
3	W	-

Connector No.	F79
Connector Name	IGNITION COIL No. 5 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P/L	-
2	B	-
3	W	-

Connector No.	F80
Connector Name	IGNITION COIL No. 6 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y/R	-
2	B	-
3	W	-

JRBWC3501GB

ENGINE CONTROL SYSTEM

Connector No.	F81
Connector Name	IGNITION COIL No. 7 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/Y	-
2	B	-
3	W	-

Connector No.	F82
Connector Name	IGNITION COIL No. 8 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	O	-
2	B	-
3	W	-

Connector No.	F83
Connector Name	CAMSHAFT POSITION SENSOR (BANK 2)
Connector Type	RH03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG/R	-
2	LG/B	-
3	P	-

Connector No.	F84
Connector Name	CAMSHAFT POSITION SENSOR (BANK 1)
Connector Type	RH03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y/R	-
2	BR/W	-
3	L/R	-

Connector No.	F87
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 1)
Connector Type	AFZ04FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	V	-
3	G	-
4	W/R	-

Connector No.	F88
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 2)
Connector Type	AFZ04FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	V	-
3	L/R	-
4	L/W	-

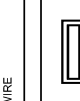
Connector No.	F103
Connector Name	WIRE TO WIRE
Connector Type	M06FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/Y	-
2	R	-
3	V	-
4	R	-
5	G/R	-
6	B/R	-

Connector No.	F104
Connector Name	WIRE TO WIRE
Connector Type	RH08FB

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R/W	-
3	BR/W	-
4	BR/Y	-
5	Y/R	-

JRBWC3502GB

ENGINE CONTROL SYSTEM

Connector No.	F105
Connector Name	WIRE TO WIRE
Connector Type	RS08FGY-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/L	-
2	L/W	-
3	GR	-
4	B/R	-
5	R	-
6	L	-
7	W	-

Connector No.	F106
Connector Name	WIRE TO WIRE
Connector Type	X02FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	B	-

Connector No.	F110
Connector Name	ECM
Connector Type	MAB35FBR-MEB20-LH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
57	W	THROTTLE CONTROL MOTOR (OPEN)
60	B	SHIELD
63	R	THROTTLE CONTROL MOTOR (CLOSE)
64	V/W	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
67	V	MANIFOLD ABSOLUTE PRESSURE SENSOR
68	BR/W	SENSOR GROUND
70	W/L	SENSOR GROUND
73	P	CAMSHAFT POSITION SENSOR (BANK 2)
74	L	A/F SENSOR 1 (BANK 2)
76	W/G	SENSOR POWER SUPPLY
77	Y/R	SENSOR POWER SUPPLY
78	L/R	A/F SENSOR 1 HEATER (BANK 2)
79	B	THROTTLE POSITION SENSOR 2
80	L/W	A/F SENSOR 1 (BANK 2)
81	G	SENSOR POWER SUPPLY
83	LG/R	SENSOR POWER SUPPLY
85	GR/R	SENSOR POWER SUPPLY
86	R/W	CRANKSHAFT POSITION SENSOR
87	L/W	HEATED OXYGEN SENSOR 2 (BANK 2)
88	B	A/F SENSOR 1 (BANK 1)
90	W	A/F SENSOR 1 (BANK 1)
91	R	THROTTLE POSITION SENSOR 1
94	R	A/F SENSOR 1 (BANK 1)
95	L/R	CAMSHAFT POSITION SENSOR (BANK 1)
96	W/R	HEATED OXYGEN SENSOR 2 (BANK 1)
97	W	SENSOR GROUND
98	G/W	SENSOR GROUND
99	LG/B	SENSOR GROUND
100	R	SENSOR GROUND
101	R	FUEL INJECTOR NO. 1 (HI)
102	R	FUEL INJECTOR NO. 6 (HI)
103	G	FUEL INJECTOR NO. 7 (LO)
104	G	FUEL INJECTOR NO. 4 (LO)
105	L/W	HIGH PRESSURE FUEL PUMP (HI)
106	R	FUEL INJECTOR NO. 7 (HI)
107	R	FUEL INJECTOR NO. 4 (HI)
108	G	FUEL INJECTOR NO. 1 (LO)
109	G	FUEL INJECTOR NO. 6 (LO)
110	L/B	HIGH PRESSURE FUEL PUMP (LO)

Connector No.	F111
Connector Name	ECM
Connector Type	MAB35FB-MEB20-LH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	FUEL INJECTOR NO. 8 (HI)
2	R	FUEL INJECTOR NO. 5 (HI)
3	G	FUEL INJECTOR NO. 3 (LO)
4	G	FUEL INJECTOR NO. 2 (LO)
5	B/R	ECM GROUND
6	R	FUEL INJECTOR NO. 3 (HI)
7	R	FUEL INJECTOR NO. 2 (HI)
8	G	FUEL INJECTOR NO. 8 (LO)
9	G	FUEL INJECTOR NO. 5 (LO)
10	B	ECM GROUND
11	BR	PNP SIGNAL
12	Y	IGNITION SIGNAL NO. 1
13	L/B	IGNITION SIGNAL NO. 2
14	BR/Y	IGNITION SIGNAL NO. 3
15	LG/R	IGNITION SIGNAL NO. 4
17	P/L	IGNITION SIGNAL NO. 5
18	Y/R	IGNITION SIGNAL NO. 6
19	G/Y	IGNITION SIGNAL NO. 7
20	O	IGNITION SIGNAL NO. 8
21	G/O	INTAKE AIR TEMPERATURE SENSOR
22	BR/W	MASS AIR FLOW SENSOR
23	V	LOW FUEL PRESSURE SENSOR
25	LG	SENSOR GROUND
27	P	SENSOR POWER SUPPLY
28	SB	SENSOR POWER SUPPLY
29	W	KNOCK SENSOR (BANK 1)
31	V/W	FUEL RAIL PRESSURE SENSOR
32	R	ENGINE COOLANT TEMPERATURE SENSOR
33	W	KNOCK SENSOR (BANK 2)
35	SHIELD	SHIELD
37	V	COOLING FAN SPEED
39	P/B	POWER STEERING PRESSURE SENSOR
40	W/L	SENSOR GROUND
42	L/Y	ENGINE OIL TEMPERATURE SENSOR
45	L/O	SENSOR GROUND
46	SB	FUEL INJECTOR DRIVER POWER SUPPLY
47	G	HEATED OXYGEN SENSOR 2 HEATER (BANK 1)
48	L/W	A/F SENSOR 1 HEATER (BANK 1)
49	LG/B	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
51	R	FUEL INJECTOR DRIVER POWER SUPPLY
52	L/R	HEATED OXYGEN SENSOR 2 HEATER (BANK 2)
53	SB	A/F SENSOR 1 HEATER (BANK 2)
54	G/R	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)

Connector No.	F121
Connector Name	WIRE TO WIRE
Connector Type	RS08MB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	-
2	BR	-
3	G	-
4	W	-
5	O	-
6	LG	-
7	Y	-
8	R	-

JRBWC3503GB

ENGINE CONTROL SYSTEM

Connector No.	F122
Connector Name	WIRE TO WIRE
Connector Type	RS08MB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
2	R	-
3	V	-
4	GR	-
5	L	-
6	G	-
7	W	-
8	SB	-

Connector No.	F123
Connector Name	FUEL INJECTOR No. 1
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R	-

Connector No.	F124
Connector Name	FUEL INJECTOR No. 2
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
2	L	-

Connector No.	F125
Connector Name	FUEL INJECTOR No. 3
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR	-
2	LG	-

Connector No.	F126
Connector Name	FUEL INJECTOR No. 4
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	-
2	SB	-

Connector No.	F127
Connector Name	FUEL INJECTOR No. 5
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	-
2	O	-

Connector No.	F128
Connector Name	FUEL INJECTOR No. 6
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	-
2	W	-

Connector No.	F129
Connector Name	FUEL INJECTOR No. 7
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	Y	-

JRBWC3504GB

ENGINE CONTROL SYSTEM

Connector No.	F130
Connector Name	FUEL INJECTOR No. 8
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	G	-

Connector No.	F202
Connector Name	WIRE TO WIRE
Connector Type	RS04MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	SHIELD	-
2	W	-
3	SHIELD	-
4	W	-

Connector No.	F203
Connector Name	KNOCK SENSOR (BANK 1)
Connector Type	BS02FGY_B-AHY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	SHIELD	-

Connector No.	F204
Connector Name	KNOCK SENSOR (BANK 2)
Connector Type	BS02FGY_B-AHY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	SHIELD	-

Connector No.	F211
Connector Name	WIRE TO WIRE
Connector Type	RS02FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	V	-

Connector No.	F212
Connector Name	FUEL RETURN VALVE
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	-
2	G	-

Connector No.	F301
Connector Name	TCM (TRANSMISSION CONTROL MODULE)
Connector Type	SP10FG

H.S.

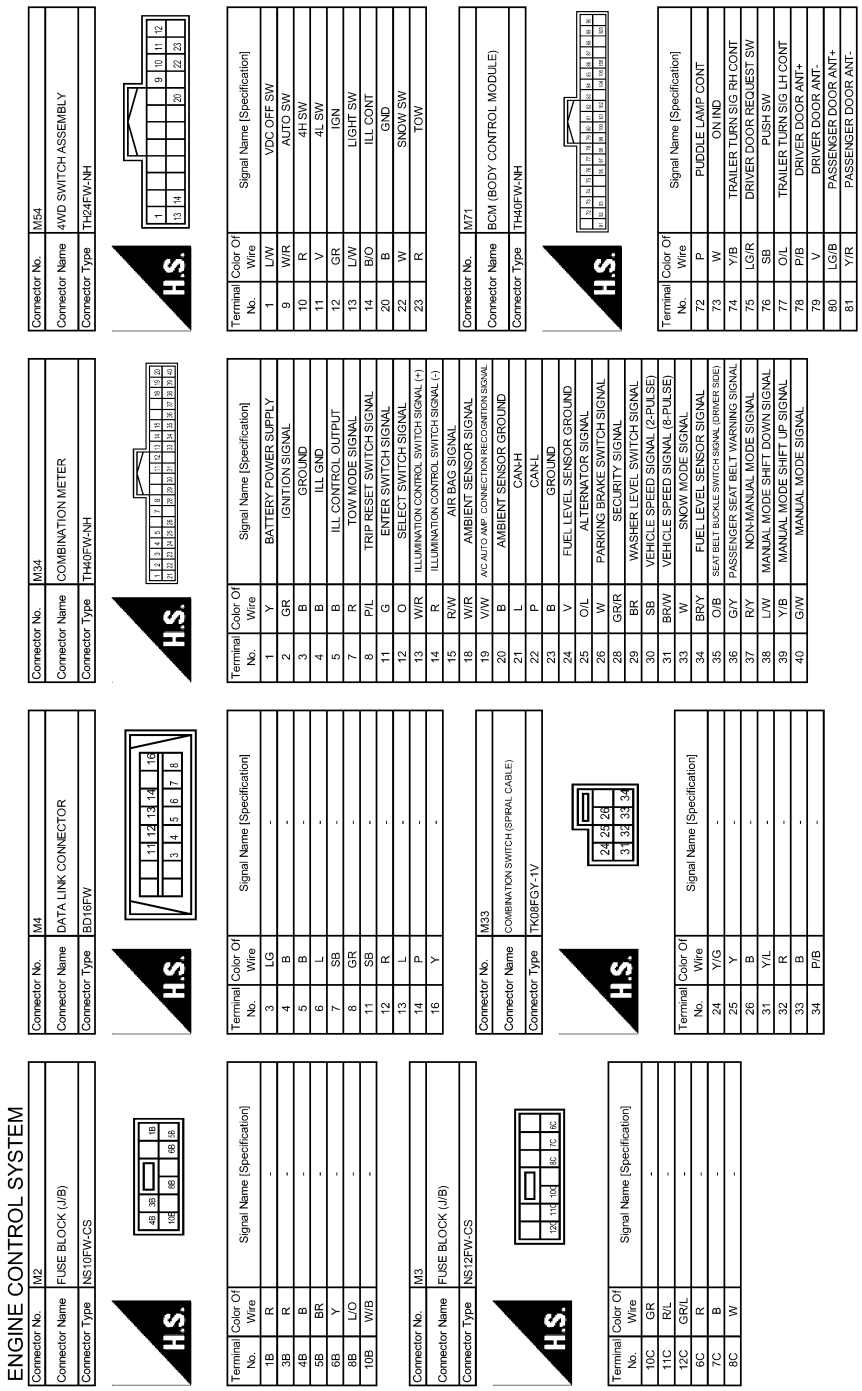
Terminal No.	Color Of Wire	Signal Name [Specification]
1	-	IGNITION POWER SUPPLY
2	-	BATTERY POWER SUPPLY
3	-	CAN-H
4	-	K-LINE
5	-	GROUND
6	-	IGNITION POWER SUPPLY
7	-	BACK-UP LAMP RELAY
8	-	CAN-L
9	-	STARTER RELAY
10	-	GROUND

Connector No.	M1
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FW-M2

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1A	Y	-
2A	GR	-
3A	W	-
4A	Y/G	-
5A	V	-
6A	L/W	-
7A	LG	-
8A	W	-

JRBWC3505GB



JRBWC3506GB

ENGINE CONTROL SYSTEM

82	W/G	BACK DOOR ANT+
83	B/W	BACK DOOR ANT-
84	BR	ROOM ANT1+
85	Y	ROOM ANT1-
86	W	ROOM ANT2+
87	B	ROOM ANT2-
88	V	LAGGAGE ROOM ANT+
89	G	LAGGAGE ROOM ANT-
90	Y	PUSH-BTN IGN SW ILL PWR
91	O	LOCK IND
92	L	LOW SIDE PUSH LED
93	GR/R	I-KEY WARN BUZZER
96	BR	ACC RELAY CONT
97	R/W	STARTER RELAY CONT
98	O	IGN RELAY (IPDM E/R) CONT
99	R	IGN RELAY (F/B) CONT
100	P/L	PASSENGER DOOR REQUEST SW
101	W/B	IGN PWR SPLY 2
102	BR	SHIFT N/P
104	R/B	A/T SHIFT SELECT PWR SPLY
105	O/L	STOP LAMP SW 2
106	Y/G	BLWR FAN MTR RELAY CONT
109	L/W	ACC IND

Connector No.	M77
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	L/W	-
3	R/B	-
4	L	-
5	Y	-
6	SB	-
7	W/G	-
8	P/B	-
9	W/B	-
10	G	-
11	L	-
12	P	-
13	P/B	-
14	BR	-
15	O/L	-
16	SB	-
18	BR	-
19	Y/G	-
20	BR/Y	-
21	V	-
22	L	-
23	Y	-
24	L/W	-
28	O	-
29	R/W	-
30	O/L	-
31	Y	-
32	GR/R	-
34	Y	-
35	R	-
36	B/O	-
37	G/Y	-
38	G	-
40	SB	-
41	W/R	-
42	R	-
43	V	-
51	L/O	-
52	BR/W	-
53	BR/Y	-
54	GR/L	-
60	W	-
61	B	-
62	G	-
63	R	-
64	SHIELD	-
91	BR	-
92	L/W	-
94	Y/B	-
95	L/R	-
97	R	-
98	O/L	-
100	W/B	-

Connector No.	M82
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
4	V/W	-
5	G/R	-
6	P	-
9	GR/L	-
10	Y/R	-
11	L/R	-
12	W/G	-
13	BR/Y	-
14	LG	-
15	BR/W	-
16	B/Y	-
17	W/B	-
18	GR/R	-
20	W/R	-
21	B	-
22	R/L	-
23	G/R	-
24	R/W	-
25	W/L	-
26	R	-
27	L	-
28	B/SB	-
35	G	-
36	Y	-
37	R	-
38	G/Y	-
39	O	-
40	W	-
41	R	-
42	B	-
43	G	-
44	SHIELD	-
46	B	-
47	W	-
48	SHIELD	-
49	W	-
50	SHIELD	-
51	Y/R	-
52	G/R	-
53	LG/B	-
54	LG/R	-
55	R/G	-
56	B/O	-
57	SB	-
60	G	-
61	B	-
62	W	-
63	R	-
64	SHIELD	-
65	L/Y	-
66	V	-
67	B/W	-
91	G/R	-
95	SB	-
96	G/R	-
97	GR/L	-
98	G/W	-
99	P	-
100	L	-

Connector No.	M108
Connector Name	POWER STEERING CONTROL UNIT
Connector Type	TH12FW-NH

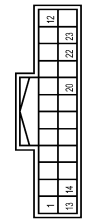
H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	EPS SOL SUPLLY
3	GR	IGN
5	L	EPS SOL GND
6	B	GND
8	SB	VEHICLE SPEED (2P)
10	B/SB	ENG TACHO

JRBWC3507GB

ENGINE CONTROL SYSTEM

Connector No.	M147
Connector Name	SNOW MODE / TOW MODE / VDC OFF SWITCH ASSEMBLY
Connector Type	TH24FW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	VDC OFF SW
12	GR	IGN
13	L/W	LIGHT SW
14	B/O	ILL CONT
20	B	GND
22	W	SNOW SW
23	R	TOW

Connector No.	M302
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY

Terminal No.	Color Of Wire	Signal Name [Specification]
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-

JRBWC3508GB

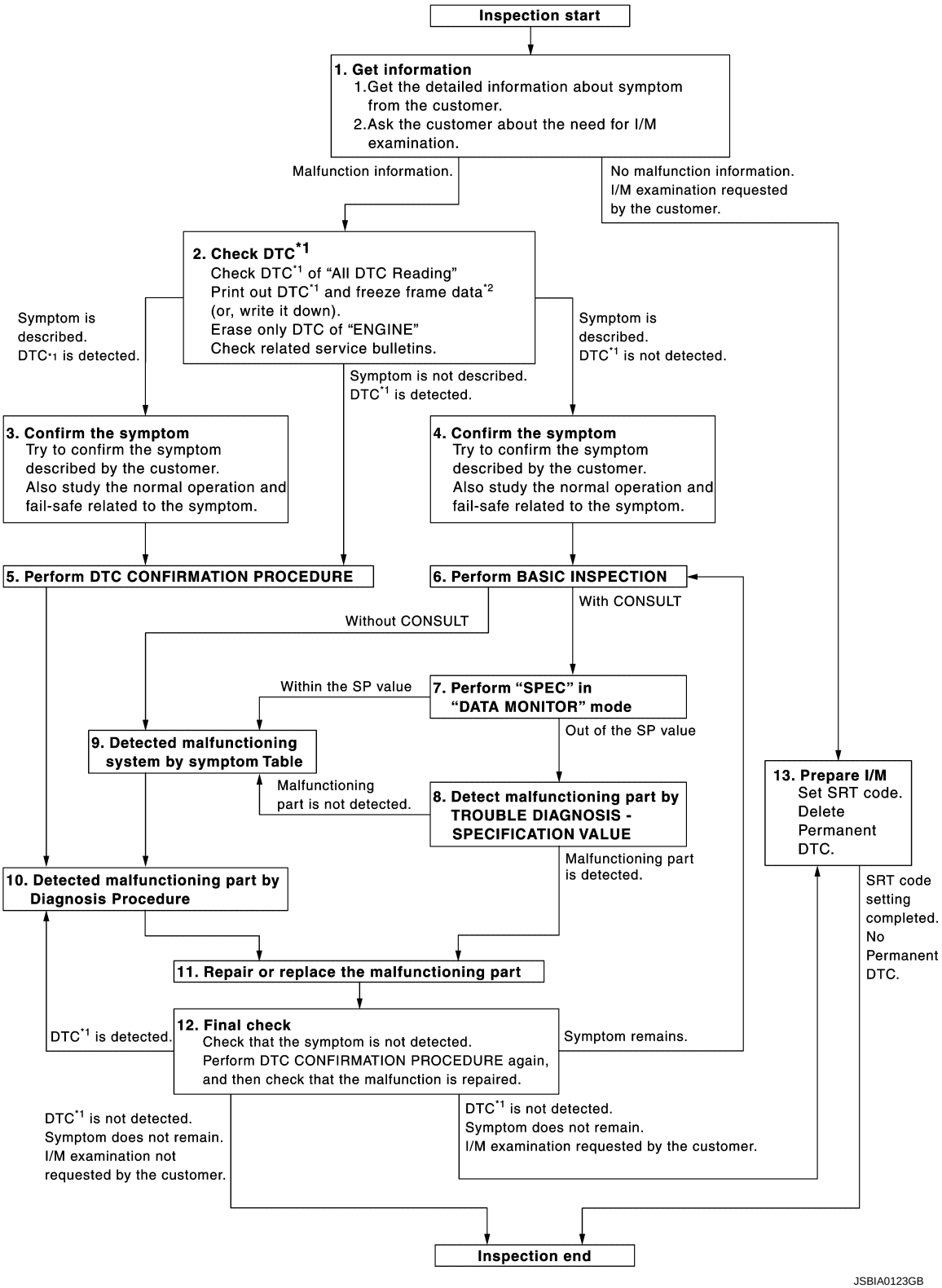
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000009008849

OVERALL SEQUENCE



JSBIA0123GB

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

DETAILED FLOW

1.GET INFORMATION FOR SYMPTOM

1. Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the “Diagnostic Work Sheet”. (Refer to EC-151, "Diagnostic Work Sheet".)
2. Ask if the customer requests I/M examination.

Malfunction information, obtained>>GO TO 2.
No Malfunction information, but a request for I/M examination>>GO TO 13.

2.CHECK DTC

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

- Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
- Erase only DTC of “ENGINE”.
  - ⊗ With CONSULT: Refer to “How to Erase DTC and 1st Trip DTC” in EC-71, "CONSULT Function".
  - ⊗ Without CONSULT: Refer to “How to Erase Self-diagnostic Results” in EC-68, "On Board Diagnosis Function".
- Turn ignition switch OFF.
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-571, "Symptom Table".)

3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

Symptom is described, DTC is detected>>GO TO 3.
Symptom is described, DTC is not detected>>GO TO 4.
Symptom is not described, DTC is detected>>GO TO 5.

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).
Also study the normal operation and fail-safe related to the symptom. Refer to EC-576, "Description" and EC-102, "Fail-safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail-safe related to the symptom. Refer to EC-576, "Description" and EC-102, "Fail-safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.
If two or more DTCs are detected, refer to EC-105, "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-43, "Intermittent Incident".

6.PERFORM BASIC INSPECTION

Perform EC-153, "Work Procedure".

Do you have CONSULT?

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

7.PERFORM SPEC IN DATA MONITOR MODE

With CONSULT

Make sure that “MAS A/F SE-B1”, “B/FUEL SCHDL”, “A/F ALPHA-B1” and “A/F ALPHA-B2” are within the SP value using CONSULT “SPEC” in “DATA MONITOR” mode of “ENGINE”. Refer to EC-183, "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-184, "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-571, "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-46, "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-81, "Reference Value".

11.REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it.
   - With CONSULT: Refer to “How to Erase DTC and 1st Trip DTC” in EC-71, "CONSULT Function".
   - Without CONSULT: Refer to “How to Erase Self-diagnostic Results” in EC-68, "On Board Diagnosis Function".

>> GO TO 12.

12.FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then make sure that the malfunction have been completely repaired.
When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and make sure that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.
YES-2 >> Symptom remains: GO TO 6.
NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (⊗ With CONSULT: Refer to “How to Read DTC and 1st Trip DTC” in EC-71, "CONSULT Function", ⊗ Without CONSULT: Refer to “How to Read Self-diagnostic Results” in EC-68, "On Board Diagnosis Function").
NO-2 >> I/M examination, requested from the customer: GO TO 13.

13. PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to EC-171, "Description".
2. Erase permanent DTCs. Refer to EC-177, "Description".

>> INSPECTION END.

Diagnostic Work Sheet

INFOID:0000000009008850

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

BASIC INSPECTION

Work Procedure

INFOID:0000000009008851

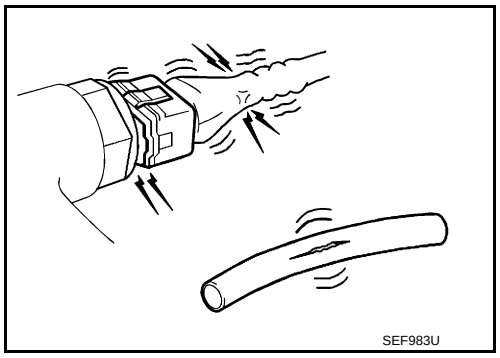
1.INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:

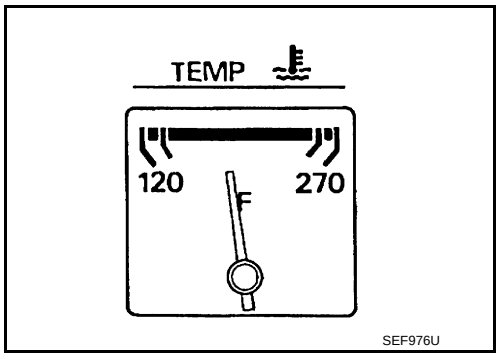
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leakage
- Air cleaner clogging
- Gasket

3. Check that electrical or mechanical loads are not applied.

- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.



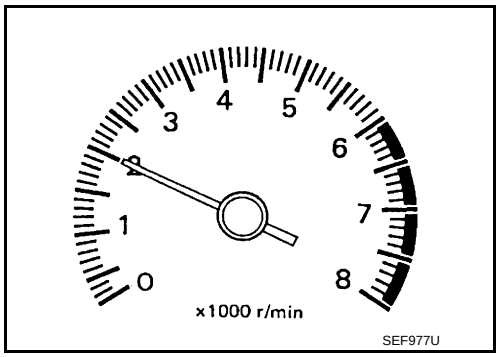
4. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
   Check that engine stays below 1,000 rpm.



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

Are any DTCs detected?

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



2.REPAIR OR REPLACE

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

>> GO TO 3

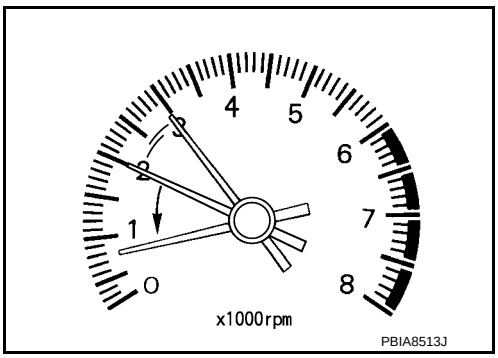
3.CHECK IDLE SPEED

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

2. Rev engine between 2,000 and 3,000 rpm 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.
3. Check idle speed.
   For procedure, refer to EC-577, "Inspection".
   For specification, refer to EC-585, "Idle Speed".

Is the inspection result normal?

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



4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-161, "Work Procedure".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-162, "Work Procedure".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-163, "Work Procedure".

Is Idle Air Volume Learning carried out successfully?

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

7. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-577, "Inspection".
   For specification, refer to EC-585, "Idle Speed".

Is the inspection result normal?

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

8. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor and circuit. Refer to EC-335, "DTC Logic".
- Check crankshaft position sensor and circuit. Refer to EC-331, "DTC Logic".

Is the inspection result normal?

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

9. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-49, "ECM : Work Procedure".

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.
   For procedure, refer to EC-578, "Inspection".

For specification, refer to EC-585, "Ignition Timing".

Is the inspection result normal?

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

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-161, "Work Procedure".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-162, "Work Procedure".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-163, "Work Procedure".

Is Idle Air Volume Learning carried out successfully?

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

14. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-577, "Inspection".
   For specification, refer to EC-585, "Idle Speed".

Is the inspection result normal?

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

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
   For procedure, refer to EC-578, "Inspection".
   For specification, refer to EC-585, "Ignition Timing".

Is the inspection result normal?

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

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-64, "Removal and Installation".

Is the inspection result normal?

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

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor and circuit. Refer to EC-335, "DTC Logic".
- Check crankshaft position sensor and circuit. Refer to EC-331, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 18.
NO >> Repair or replace malfunctioning part. Then GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)

2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-49, "ECM : Work Procedure".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, perform EC-157, "Work Procedure".

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING ECM

Description

INFOID:0000000009008852

When replacing ECM, the following procedure must be performed. (For details, refer to EC-157, "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.

BEFORE REPLACEMENT

When replacing ECM, perform “SAVING DATA FOR REPLC CPU” in “WORK SUPPORT” of “ENGINE” by using CONSULT to save current ECM data before replacement.

AFTER REPLACEMENT

After replacing ECM, the following items must be performed:
- Write data after replace CPU
- Accelerator pedal released position learning
- Throttle valve closed position learning
- Idle air volume learning

Work Procedure

INFOID:0000000009008853

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-582, "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-582, "Removal and Installation".

>> GO TO 6.

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

Refer to SEC-49, "ECM : Work Procedure".

>> GO TO 7.

7. CHECK ECM DATA STATUS

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

Is the data saved successfully?

YES >> GO TO 8.
NO >> GO TO 9.

8. WRITE ECM DATA

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

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

>> GO TO 10.

9. PERFORM VIN REGISTRATION

Refer to EC-160, "Work Procedure".

>> GO TO 10.

10. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Perform Accelerator Pedal Released Position Learning. Refer to EC-161, "Work Procedure".

>> GO TO 11.

11. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform Throttle Valve Closed Position Learning. Refer to EC-162, "Work Procedure".

>> GO TO 12.

12. PERFORM IDLE AIR VOLUME LEARNING

Perform Idle Air Volume Learning. Refer to EC-163, "Work Procedure".

>> END

ADDITIONAL SERVICE WHEN REPLACING VVEL CONTROL MODULE

Description

INFOID:0000000009008854

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

Work Procedure

INFOID:0000000009008855

1. PERFORM IDLE AIR VOLUME LEARNING

Perform idle air volume learning. Refer to EC-163, "Work Procedure".

>> END

VIN REGISTRATION

Description

INFOID:0000000009871122

VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced.
NOTE:
Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

Work Procedure

INFOID:0000000009871124

1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to GI-23, "Information About Identification or Model Code".

>> GO TO 2.

2.PERFORM VIN REGISTRATION

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

>> END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description

INFOID:0000000009008858

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected.

Work Procedure

INFOID:0000000009008859

1.START

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

>> END

THROTTLE VALVE CLOSED POSITION LEARNING

Description

INFOID:0000000009008860

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time the harness connector of the electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned.

Work Procedure

INFOID:0000000009008861

1.START

WITH CONSULT

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

WITHOUT CONSULT

1. Start the engine.
   NOTE:
   Engine coolant temperature is 25°C (77°F) or less before engine starts.
2. Warm up the engine.
   NOTE:
   Raise engine coolant temperature until it reaches 65°C (149°F) or more.
3. Turn ignition switch OFF and wait at least 10 seconds.
   Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

>> END

IDLE AIR VOLUME LEARNING

Description

INFOID:0000000009008862

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

Work Procedure

INFOID:0000000009008863

1.PRECONDITIONING

Check that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.
- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 105°C (158 - 221°F)
- Selector lever position: P or N
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not illuminate.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT: Drive vehicle until “ATF TEMP 2” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9 V.
- Without CONSULT: Drive vehicle for 10 minutes.

Will CONSULT be used?

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

2.PERFORM IDLE AIR VOLUME LEARNING

WITH CONSULT
1. Perform Accelerator Pedal Released Position Learning. Refer to EC-161, "Work Procedure".
2. Perform Throttle Valve Closed Position Learning. EC-162, "Work Procedure".
3. Start engine and warm it up to normal operating temperature.
4. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
5. Touch “START” and wait 20 seconds.

Is “CMPLT” displayed on CONSULT screen?

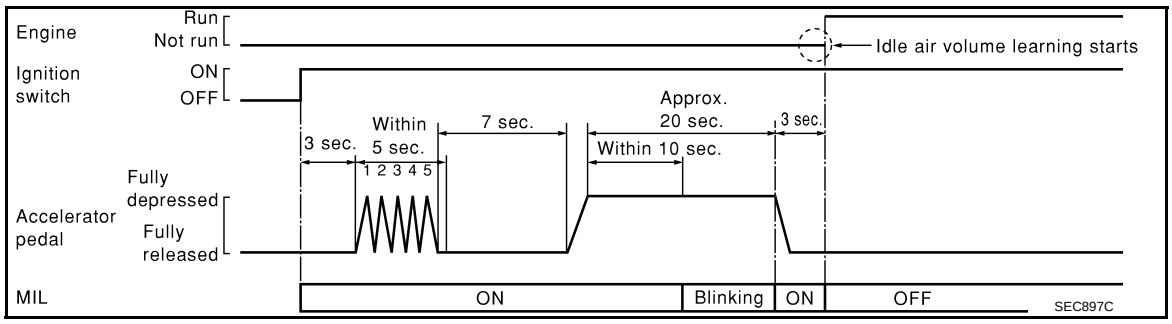
YES >> GO TO 4.
NO >> GO TO 5.

3.PERFORM IDLE AIR VOLUME LEARNING

WITHOUT CONSULT
NOTE:
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform Accelerator Pedal Released Position Learning. Refer to EC-161, "Work Procedure".
2. Perform Throttle Valve Closed Position Learning. EC-162, "Work Procedure".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly 5 times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and turns ON.
8. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.

9. Start engine and let it idle.
10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up engine two or three times and check that idle speed and ignition timing are within the specifications.
For procedure, refer to EC-577, "Inspection" and EC-578, "Inspection".
For specifications, refer to EC-585, "Idle Speed" and EC-585, "Ignition Timing".

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART-I

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART-II

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.
It is useful to perform “TROUBLE DIAGNOSIS - SPECIFICATION VALUE”. Refer to EC-183, "Description".
If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:
- Engine stalls.
- Incorrect idle.

>> INSPECTION END

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Description

INFOID:0000000009008864

VVEL control shaft position sensor adjustment is an operation to adjust the initial position of the VVEL control shaft position sensor.
It must be performed each time VVEL ladder assembly is replaced.

CAUTION:

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

Work Procedure

INFOID:0000000009008865

1. START

Will CONSULT be used?

Will CONSULT be used?

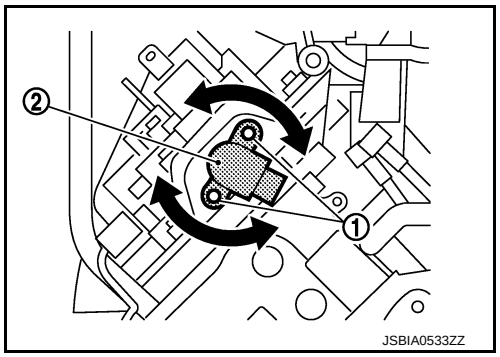
YES >> GO TO 2.
NO >> GO TO 3.

2. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

WITH CONSULT

1. Turn ignition switch ON.
2. Select “VVEL POS SEN ADJ PREP” in “WORK SUPPORT” mode with CONSULT.
3. Touch “Start” and wait a few seconds.
4. Check that “CMPLT” is displayed on CONSULT screen.
5. Select “VVEL POSITION SEN-B1” or “VVEL POSITION SEN-B2” in “DATA MONITOR” mode with CONSULT.
6. Loosen the VVEL control shaft position sensor mounting bolts (1).
7. Turn the VVEL control shaft position sensor (2) clockwise and counterclockwise while monitoring the output voltage of “VVEL POSITION SEN-B1” or “VVEL POSITION SEN-B2” and adjust the output voltage to be within the standard value.

   Voltage: 500 ± 48 mV



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

   : 7.0 N·m (0.71 kg-m, 62 in-lb)

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

   Voltage: 500 ± 48 mV

   NOTE:
   If it varies from the standard value after the mounting bolts are tightened, perform steps 6 to 8 again.
10. Turn ignition switch OFF and wait at least 10 seconds.
11. Start engine and warm it up to normal operating temperature.
12. Turn ignition switch OFF and wait at least 10 seconds.
13. Perform idle air volume learning. Refer to EC-163, "Work Procedure".

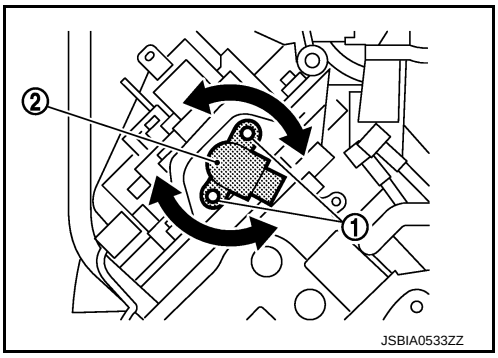
>> INSPECTION END

3. PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

WITHOUT CONSULT

1. Disconnect VVEL control shaft position sensor harness connector.
2. Remove VVEL actuator motor relay.
3. Turn ignition switch ON, wait at least 5 seconds and then turn it OFF.

4. Reconnect all harness connectors disconnected.
5. Install VVEL actuator motor relay.
6. Turn ignition switch ON and wait at least 5 seconds.
7. Loosen the VVEL control shaft position sensor mounting bolts (1).
8. Turn the VVEL control shaft position sensor (2) clockwise and counterclockwise while monitoring the output voltage between the VVEL control module terminals with a tester and adjust the output voltage to be within the standard value.



VVEL control module				Voltage
Bank	Connector	+	–	
		Terminal	Terminal	
1	F56	3	6	500 ± 48 mV
2		5	4	

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

: **7.0 N·m (0.71 kg-m, 62 in-lb)**

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

VVEL control module				Voltage
Bank	Connector	+	–	
		Terminal	Terminal	
1	F56	3	6	500 ± 48 mV
2		5	4	

NOTE:
If it varies from the standard value after the mounting bolts are tightened, perform steps 7 to 9 again.

11. Turn ignition switch OFF and wait at least 10 seconds.
12. Start engine and warm it up to normal operating temperature.
13. Turn ignition switch OFF and wait at least 10 seconds.
14. Perform Idle Air Volume Learning. Refer to EC-163, "Work Procedure".

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description

INFOID:0000000009008866

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

Work Procedure

INFOID:0000000009008867

1.START

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

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

>> END

FUEL PRESSURE

Work Procedure

INFOID:0000000009008868

FUEL PRESSURE RELEASE

WITH CONSULT

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with 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 in IPDM E/R.
   NOTE:
   - For the fuse number, refer to EC-125, "Wiring Diagram".
   - For the fuse arrangement, refer to PG-99, "Fuse, Connector and Terminal Arrangement".
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.

LOW FUEL PRESSURE CHECK

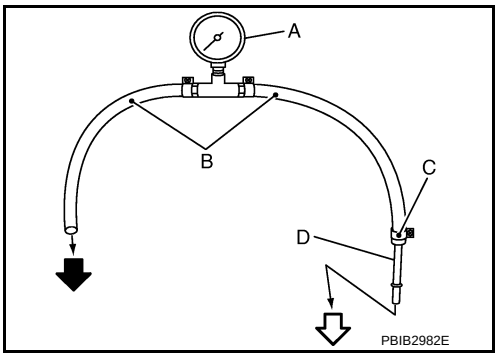
CAUTION:

- **Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.**
- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.**

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out.

1. Release fuel pressure to zero.
2. Prepare fuel hose for fuel pressure check (B) and fuel tube adapter [SST (KV10118400)] (D), then connect fuel pressure gauge (A).



⇦ **To quick connector**

⬅ **To fuel tube (engine side)**

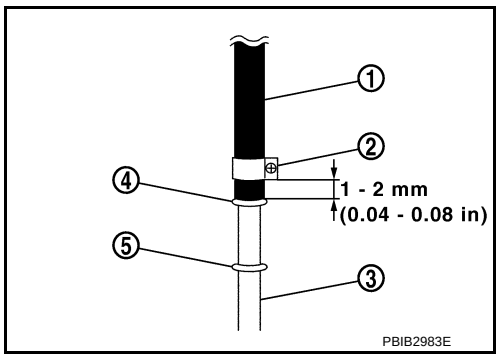
C : Hose clamp

CAUTION:

- **Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).**
- **To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.**
- **Do not use the fuel hose for checking fuel pressure with damage or cracks on it.**
- **Use Pressure Gauge to check fuel pressure.**

3. Disconnect fuel feed hose from fuel tube. Refer to EM-44, "Exploded View".
   CAUTION:
   Do not twist or kink fuel hose because it is plastic hose.

4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.



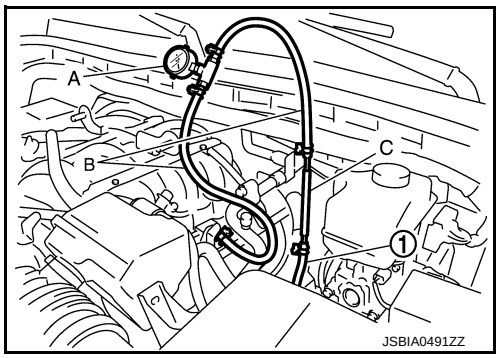
5 : No.2 spool

CAUTION:
- **Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.**
- **Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).**
- **Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.**
- **Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).**
- **When reconnecting fuel line, always use new clamps.**
- **Use a torque driver to tighten clamps.**
- **Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).**

Tightening torque : 1.0 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

- **Make sure that clamp screw does not contact adjacent parts.**

5. Connect fuel tube adapter (C) to fuel feed hose (1) in the same manner as instructed in Step 4.



A : Fuel pressure gauge

B : Fuel hose for fuel pressure check

6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
7. Reinstall the part removed at Step 3.
   NOTE:
   Install the part to allow smooth engine starts.
8. Turn ignition switch ON and check for fuel leakage.
9. Start engine and check for fuel leakage.
10. Read the indication of fuel pressure gauge.
    CAUTION:
    - **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**
    - **During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.**

At idling : Approximately 450 kPa (4.5 bar, 4.6 kg/cm^2, 65 psi)

HIGH FUEL PRESSURE CHECK

NOTE:
Since the fuel pressure gauge kit cannot be connected, follow the method shown below to check high fuel pressure.

WITH CONSULT

1. Start engine.
2. Check “FUEL PRES SEN V” in “DATA MONITOR” mode with CONSULT.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Idle	980 – 1,200 mV
	Revving engine from idle to 4,000 rpm quickly	1,100 – 2,900 mV

⊗WITHOUT CONSULT
1. Start the engine.
2. Check fuel rail pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Fuel rail pressure sensor				
Connector	Terminal			
F26	2	Ground	Engine speed: idle	0.98 – 1.2 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	1.1 – 2.9 V

HOW TO SET SRT CODE

Description

INFOID:0000000009008869

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

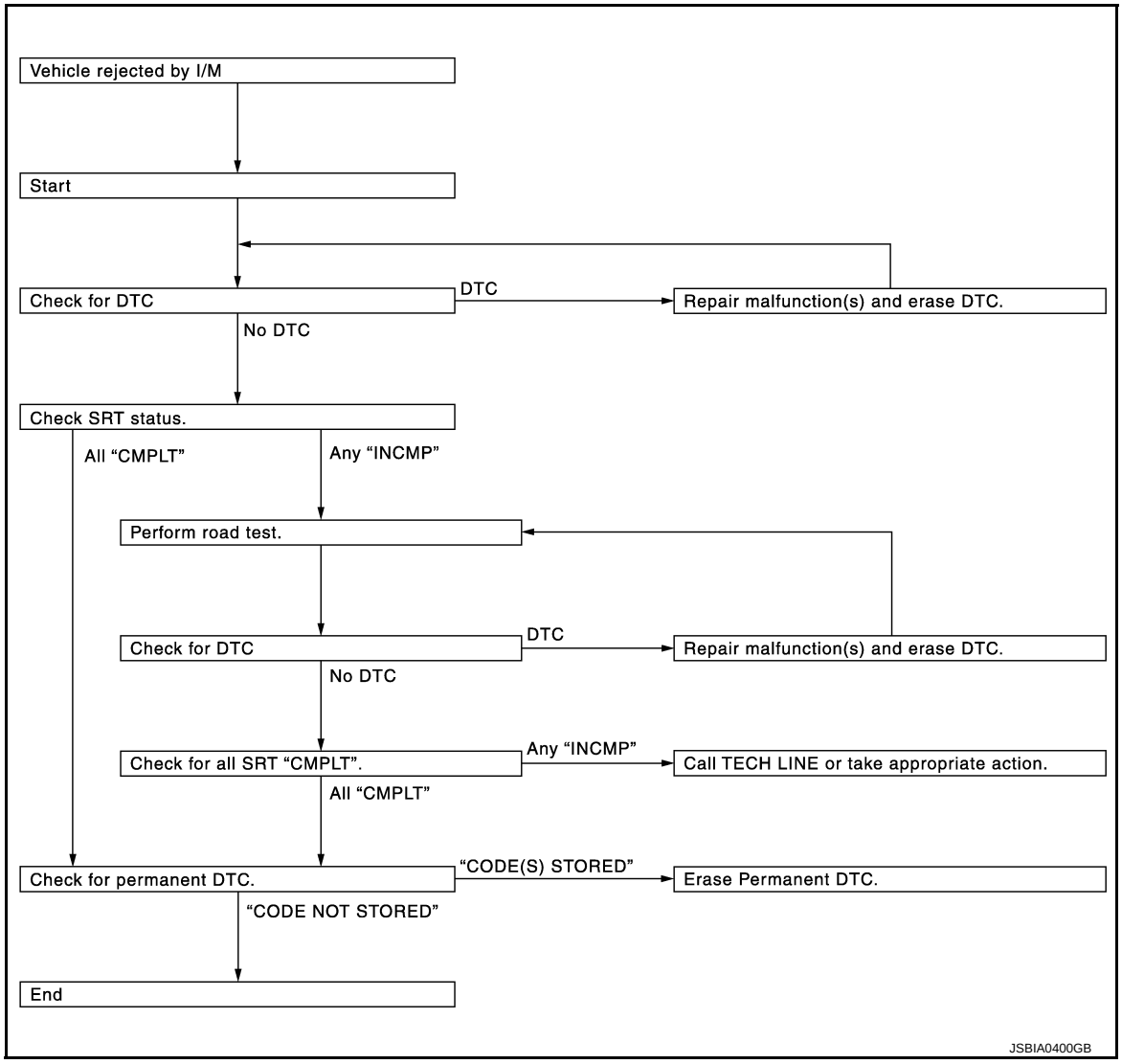
The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item*1 (CONSULT indication)	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	Three way catalyst function	P0420, P0430
EVAP SYSTEM	EVAP control system purge flow monitoring	P0441
	EVAP control system	P0456
HO2S	Air fuel ratio (A/F) sensor 1	P0130, P0133, P0150, P0153
	Heated oxygen sensor 2	P0137, P0157
	Heated oxygen sensor 2	P0138, P0158
	Heated oxygen sensor 2	P0139, P0159
EGR/VVT SYSTEM	Intake value timing control function	P0011, P0021

*1: Though displayed on the CONSULT 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.

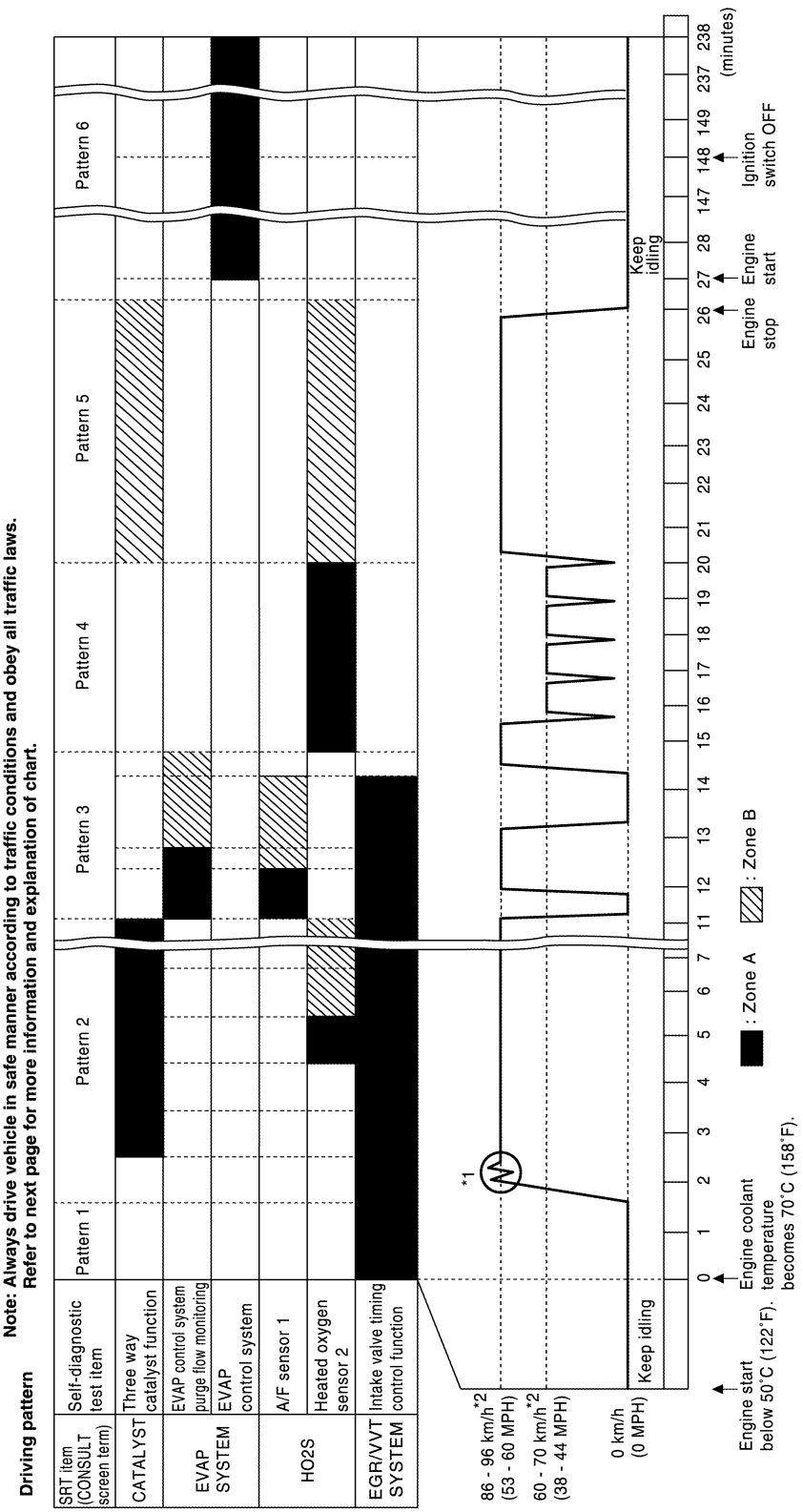


SRT Set Driving Pattern

INFOID:0000000009008870

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 refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.

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

*: Normal conditions refer to the following:

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

Work Procedure

INFOID:0000000009008871

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-107, "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-68, "On Board Diagnosis Function".

WITH GST
Select Service $01 with GST.

Is SRT code(s) set?

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

3.DTC CONFIRMATION PROCEDURE

1. Select “SRT WORK SUPPORT” in “DTC & SRT CONFIRMATION” mode 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-171, "Description".
3. Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-107, "DTC Index".
NO >> GO TO 11.

4.PERFORM ROAD TEST

- Check the “Performance Priority” in the “SRT ITEM” table. Refer to EC-171, "Description".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to EC-172, "SRT Set Driving Pattern".
  In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

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

NOTE:

ECM terminal voltage is follows;

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

- Fuel tank temperature: Less than 4.1 V

Refer to EC-81, "Reference Value".

>> GO TO 6.

6. PATTERN 2

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

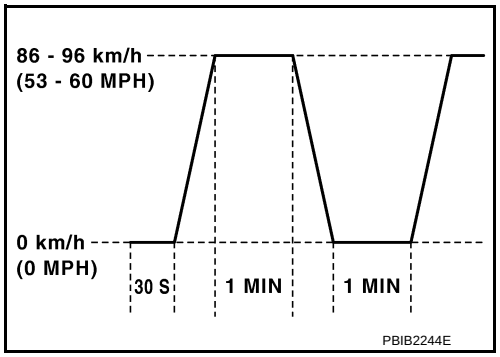
NOTE:

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

>> GO TO 7.

7. PATTERN 3

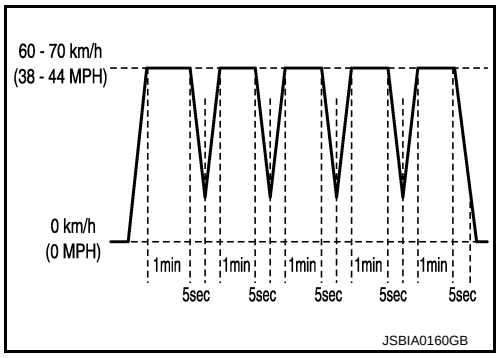
- Operate vehicle following the driving pattern shown in the figure.
- Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).



>> GO TO 8.

8. PATTERN 4

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



>> GO TO 9.

9. PATTERN 5

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

>> GO TO 10.

10. PATTERN 6

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

CAUTION:

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

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

>> GO TO 11.

11. CHECK SRT STATUS

WITH CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode with CONSULT.
WITHOUT CONSULT
Perform “SRT status” mode with EC-68, "On Board Diagnosis Function".
WITH GST
Select Service $01 with GST.

Is SRT(s) set?

YES >> GO TO 12.
NO >> Call TECH LINE or take appropriate action.

12. CHECK PERMANENT DTC

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

With CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode with CONSULT.
With GST
Select Service $0A with GST.

Is permanent DTC(s) detected?

YES >> Go to EC-177, "Description".
NO >> END

HOW TO ERASE PERMANENT DTC

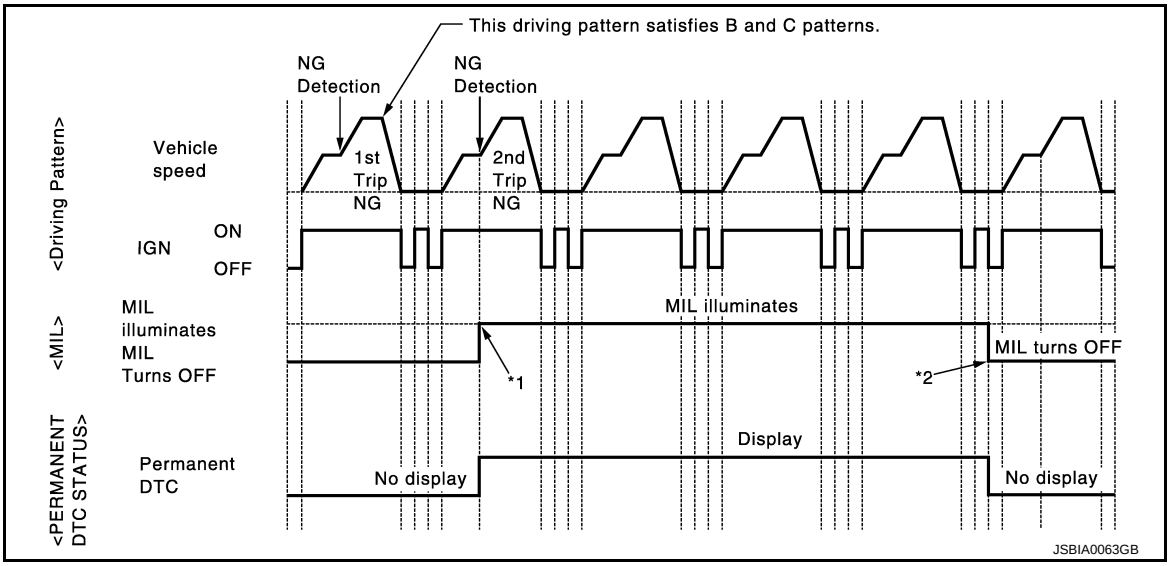
Description

INFOID:0000000009008872

OUTLINE

When a DTC is stored in ECM

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

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

NOTE:

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

×: Applicable —: Not applicable

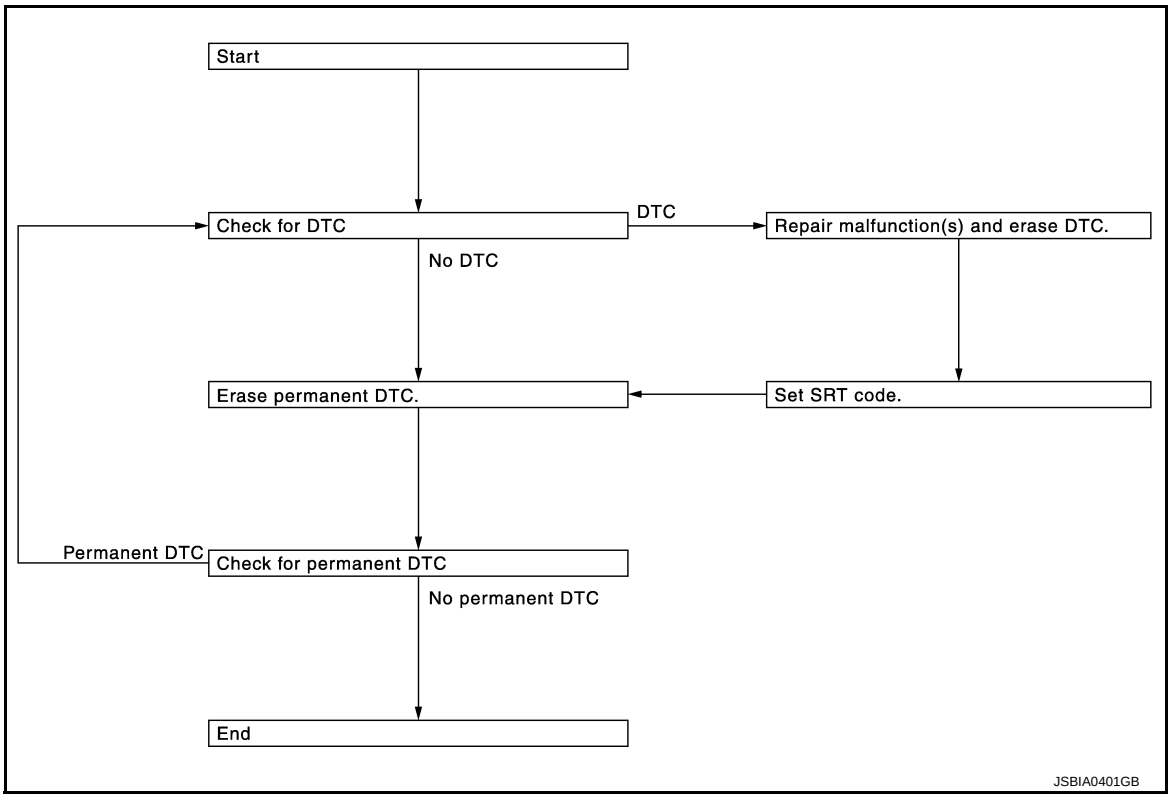
Group*	Perform "DTC CONFIRMATION PROCEDURE" for applicable DTCs.	Driving pattern		Reference
		B	D	
A	×	—	—	EC-178
B	—	×	×	EC-180

*: For group, refer to EC-107, "DTC Index".

PERMANENT DTC ITEM

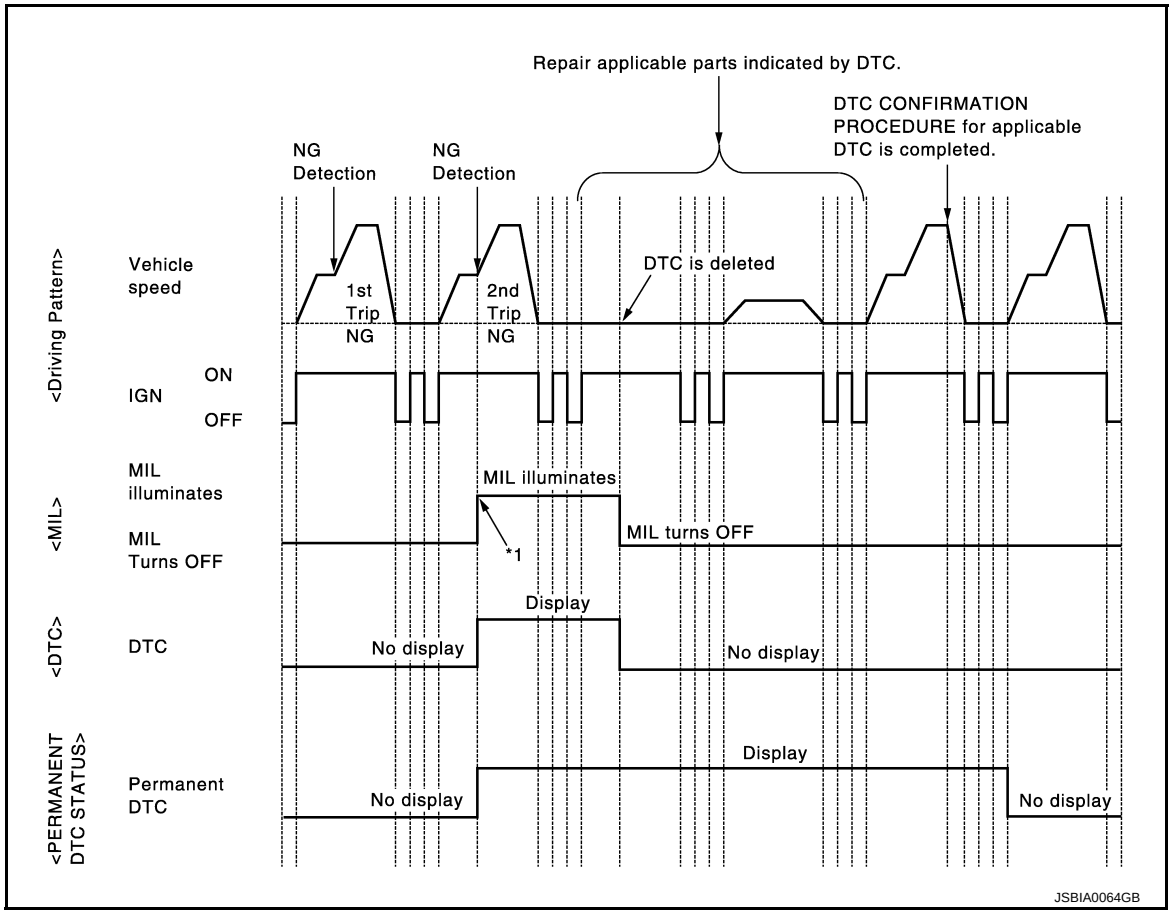
For permanent DTC items, MIL turns ON. Refer to EC-107, "DTC Index".

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:0000000009008873



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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-71, "CONSULT Function", EC-68, "On Board Diagnosis Function".

NO >> GO TO 2.

2.CHECK PERMANENT DTC

With CONSULT

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

With GST

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

Is any permanent DTC detected?

YES >> GO TO 3.

NO >> END

3.PERFORM DTC CONFIRMATION PROCEDURE

Perform “DTC CONFIRMATION PROCEDURE” for DTCs which are the same as permanent DTCs stored in ECM. Refer to EC-71, "CONSULT Function", EC-68, "On Board Diagnosis Function".

>> 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.

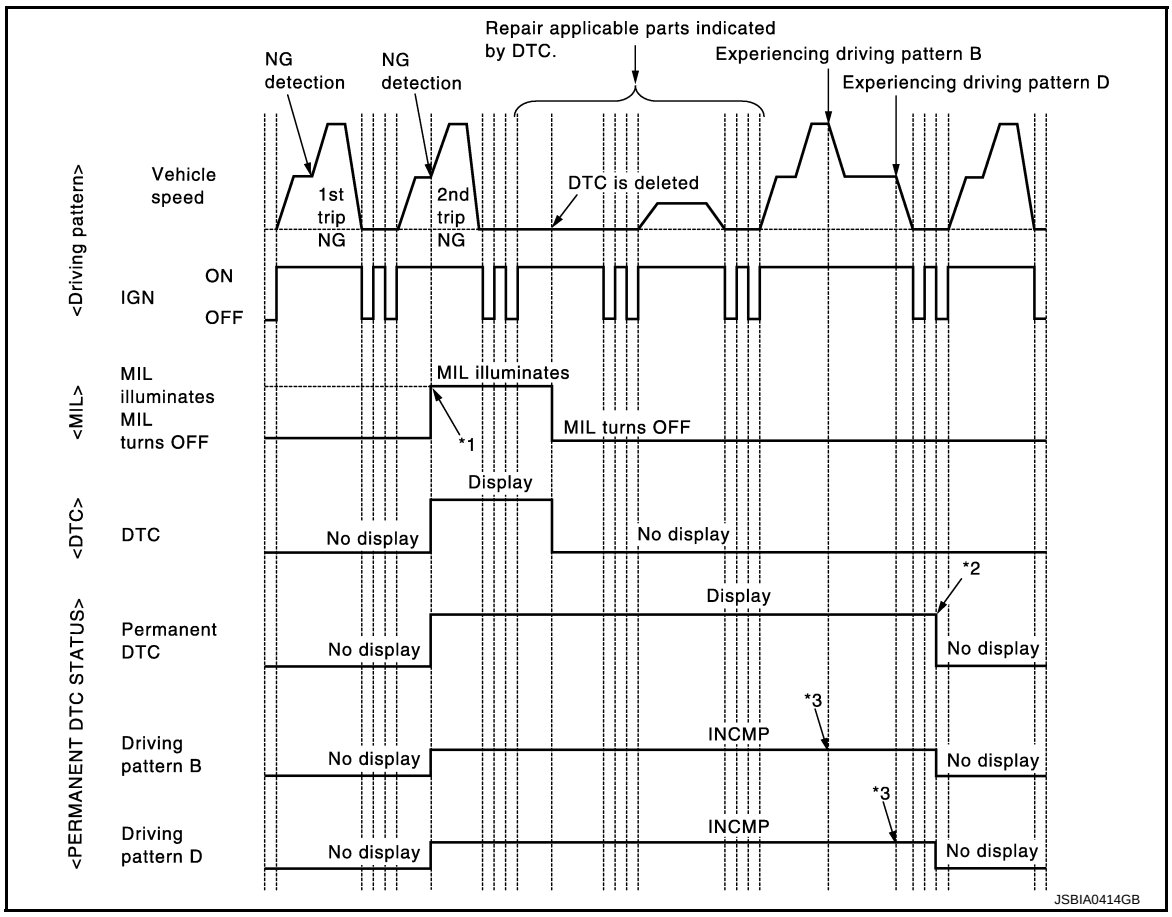
Is any permanent DTC detected?

YES >> GO TO 1.

NO >> END

Work Procedure (Group B)

INFOID:0000000009008874



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

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

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

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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-71, "CONSULT Function", EC-68, "On Board Diagnosis Function".

NO >> GO TO 2.

2.CHECK PERMANENT DTC

With CONSULT

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

With GST

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

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

Is any permanent DTC detected?

YES >> GO TO 3.
NO >> END

3. DRIVE DRIVING PATTERN B

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

With CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Use “PERMANENT DTC WORK SUPPORT” mode with CONSULT to drive the vehicle according to driving pattern B. Refer to EC-71, "CONSULT Function", EC-65, "DIAGNOSIS DESCRIPTION : Driving Pattern".

With GST
1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle according to driving pattern B. Refer to EC-65, "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.**

Drive the vehicle according to driving pattern D. Refer to EC-65, "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:0000000009008875

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” in “DATA MONITOR” mode of CONSULT during normal operation of the Engine Control System. When the value in “SPEC” in “DATA MONITOR” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “SPEC” in “DATA MONITOR” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.
The SP value will be displayed for the following items:
- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1/B2 (The signal voltage of the mass air flow sensor)
- IDLE FUEL PRES MAX/MIN (the signal voltage of the fuel rail pressure sensor)

Component Function Check

INFOID:0000000009008876

1. PRECONDITIONING

Check that all of the following conditions are satisfied.
TESTING CONDITION
- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2, 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle until “ATF TEMP 2” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch and lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle
- Gear position: Neutral (or parking)

>> GO TO 2.

2. PERFORM SPEC IN DATA MONITOR MODE

WITH CONSULT
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform EC-153, "Work Procedure".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, “A/F ALPHA-B2”, “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode with CONSULT.
3. Check that monitor items are within the SP value.

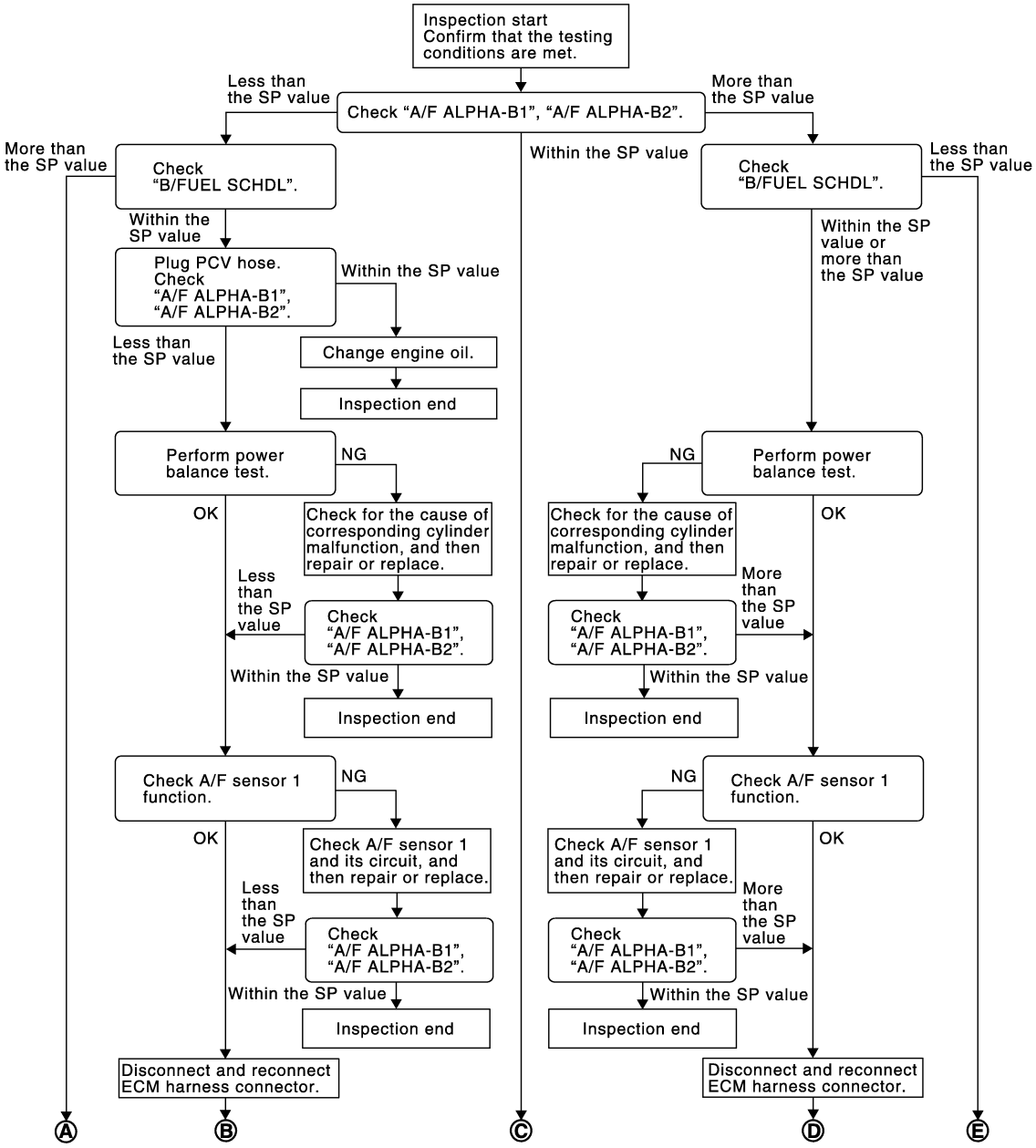
Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Proceed to EC-184, "Diagnosis Procedure".

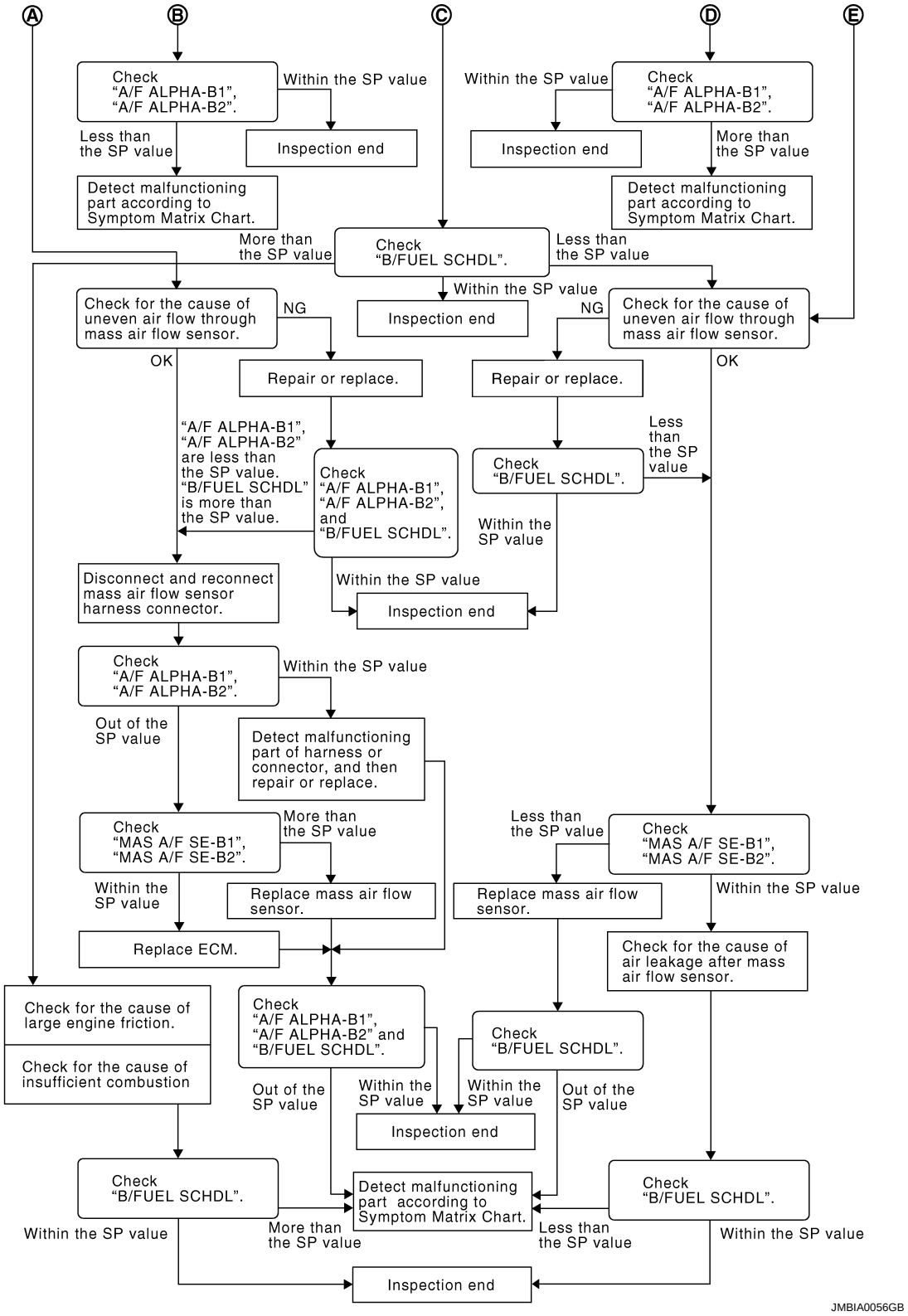
Diagnosis Procedure

INFOID:0000000009008877

OVERALL SEQUENCE



JSBIA0519GB



DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2"

WITH CONSULT

1. Start engine.
2. Check that the testing conditions are met. Refer to EC-183, "Component Function Check".
3. Select "A/F ALPHA-B1" and "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

NOTE:
Check “A/F ALPHA-B1” and “A/F ALPHA-B2” for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

YES >> GO TO 14.
NO-1 >> Less than the SP value: GO TO 2.
NO-2 >> More than the SP value: GO TO 3.

2. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 4.
NO >> More than the SP value: GO TO 16.

3. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 6.
NO-1 >> More than the SP value: GO TO 6.
NO-2 >> Less than the SP value: GO TO 22.

4. CHECK “A/F ALPHA-B1”, “A/F ALPHA-B2”

1. Stop the engine.
2. Disconnect PCV hose, and then plug it.
3. Start engine.
4. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

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

5. CHANGE ENGINE OIL

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

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

>> INSPECTION END

6. PERFORM POWER BALANCE TEST

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

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following below.
- Ignition coil and its circuit (Refer to EC-551, "Component Function Check".)
- Fuel injector and its circuit (Refer to EC-543, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to EM-16, "Inspection".)

Is the inspection result normal?

YES >> Replace fuel injector and then GO TO 8.
NO >> Repair or replace malfunctioning part and then GO TO 8.

8. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> GO TO 9.

9. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.
- For DTC P0130, P0150, refer to EC-256, "DTC Logic".
- For DTC P0131, P0151, refer to EC-260, "DTC Logic".
- For DTC P0132, P0152, refer to EC-263, "DTC Logic".
- For DTC P0133, P0153, refer to EC-266, "DTC Logic".
- For DTC P2096, P2097, P2098, P2099 refer to EC-502, "DTC Logic".

Are any DTCs detected?

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

10. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnosis Procedure according to corresponding DTC.

>> GO TO 11.

11. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> GO TO 12.

12. 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 13.

13. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-571, "Symptom Table".

14. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO-1 >> More than the SP value: GO TO 15.
NO-2 >> Less than the SP value: GO TO 22.

15. DETECT MALFUNCTIONING PART

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 27.

16. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

Is the inspection result normal?

YES >> GO TO 18.
NO >> Repair or replace malfunctioning part, and then GO TO 17.

17. CHECK “A/F ALPHA-B1”, “A/F ALPHA-B2” AND “B/FUEL SCHDL”

Select “A/F ALPHA-B1”, “A/F ALPHA-B2” and “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> “B/FUEL SCHDL” is more, “A/F ALPHA-B1” and “A/F ALPHA-B2” are less than the SP value: GO TO 18.

18. 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 19.

19. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-229, "Diagnosis Procedure". Then GO TO 26.
NO >> GO TO 20.

20. CHECK “MAS A/F SE-B1”

Select “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 21.
NO >> More than the SP value: Replace malfunctioning mass air flow sensor, and then GO TO 26.

21. REPLACE ECM

1. Replace ECM.
2. Perform EC-157, "Work Procedure".

>> GO TO 26.

22. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal in air cleaner element
- Uneven dirt in air cleaner element
- Improper specification in intake air system

Is the inspection result normal?

YES >> GO TO 24.
NO >> Repair or replace malfunctioning part, and then GO TO 23.

23. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Less than the SP value: GO TO 24.

24. CHECK “MAS A/F SE-B1”

Select “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 25.
NO >> Less than the SP value: Replace malfunctioning mass air flow sensor, and then GO TO 27.

25. CHECK INTAKE SYSTEM

Check for the cause of air leakage after the mass air flow sensor. Refer to the following.
- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks in PCV valve
- Disconnection or cracks in EVAP purge hose, stuck open EVAP canister purge volume control solenoid valve
- Malfunctioning seal in rocker cover gasket
- Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts
- Malfunctioning seal in intake air system, etc.

>> GO TO 27.

26. CHECK “A/F ALPHA-B1”, “A/F ALPHA-B2” AND “B/FUEL SCHDL”

Select “A/F ALPHA-B1”, “A/F ALPHA-B2” and “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-571, "Symptom Table".

27. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and then check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-571, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000009008878

1.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

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

ECM		Ground	Continuity
Connector	Terminal		
F111	10	Ground	Existed
E80	174		
	175		

3. Also check harness for short to power.

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and ground

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

3.CHECK ECM POWER SUPPLY CIRCUIT-I

1. Reconnect ECM harness connector.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	141	175	Battery voltage

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- 15 A fuse (No. 62)
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and fuse

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

5.CHECK ECM POWER SUPPLY CIRCUIT-II

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

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	171	175	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.
	172		

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 8.

6. CHECK ECM POWER SUPPLY CIRCUIT-III

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

IPDM E/R		Ground	Voltage
Connector	Terminal		
E15	61	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

8. CHECK ECM POWER SUPPLY CIRCUIT-IV

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

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	163	175	Battery voltage

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 9.

9. CHECK ECM POWER SUPPLY CIRCUIT-V

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E80	163	E14	41	Existed

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and IPDM E/R

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

11. CHECK 20 A FUSE

1. Disconnect 20 A fuse (No. 43) from IPDM E/R.
2. Check 20 A fuse.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace 15 A fuse.

12. CHECK ECM POWER SUPPLY CIRCUIT-VI

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E80	171	E14	35	Existed
	172			

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

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and IPDM E/R

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

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

U0101 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009008879

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U0101	LOST COMM (TCM) (Lost communication with TCM)	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with TCM for 2 seconds or more.	• CAN communication line between TCM and ECM (CAN communication line is open or shorted)

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> EC-193, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008880

Perform the trouble diagnosis for CAN communication system. Refer to LAN-22, "Trouble Diagnosis Flow Chart".

U1001 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009008881

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U1001	CAN COMM CIRCUIT (CAN communication line)	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more.	• Harness or connectors (CAN communication line is open or shorted)

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-194, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008882

Perform the trouble diagnosis for CAN communication system. Refer to LAN-22, "Trouble Diagnosis Flow Chart".

U0113, U1003 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009008883

DTC DETECTION LOGIC

NOTE:
If DTC U0113 or U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.
Refer to EC-410, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U0113	CAN COMM CIRCUIT (Lost communication with VVEL control module)	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with VVEL control module for 2 seconds or more.	• Harness or connectors (VVEL CAN communication line is open or shorted) • ECM • VVEL control module
U1003		When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) with VVEL control module for 2 seconds or more.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Proceed to EC-195, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008884

1.CHECK VVEL CAN COMMUNICATION CIRCUIT

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

ECM		VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	
E80	161	F56	24	Existed
	166		11	

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

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

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

4.REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-583, "Removal and Installation".

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select “SELF DIAGNOSTIC RESULT” mode with CONSULT.
4. Touch “ERASE”.
5. Perform DTC Confirmation Procedure.
   See EC-195, "DTC Logic".

WITH GST
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select Service $04 with GST.
4. Perform DTC Confirmation Procedure.
   See EC-195, "DTC Logic".

Is the DTC U0113 or U1003 displayed again?

YES >> GO TO 6.
NO >> INSPECTION END

6.REPLACE ECM

Replace ECM. Refer to EC-582, "Removal and Installation".

>> INSPECTION END

U1024 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009008885

DTC DETECTION LOGIC

NOTE:
If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.
Refer to EC-410, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U1024	VVEL CAN COMM CIRCUIT (VVEL CAN communication)	• When VVEL control module cannot transmitting or receiving CAN communication signal with ECM for 2 seconds or more. • When detecting error during the initial diagnosis of CAN controller of VVEL control module.	• Harness or connectors (CAN communication line is open or shorted) • ECM • VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to EC-197, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008886

1.CHECK VVEL CAN COMMUNICATION CIRCUIT

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

ECM		VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	
E80	161	F56	24	Existed
	166		11	

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

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

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

4.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-159, "Work Procedure".

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select “SELF DIAGNOSTIC RESULT” mode with CONSULT.
4. Touch “ERASE”.
5. Perform DTC Confirmation Procedure.
   See EC-197, "DTC Logic".

WITH GST
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select Service $04 with GST.
4. Perform DTC Confirmation Procedure.
   See EC-197, "DTC Logic".

Is the DTC U1024 displayed again?

YES >> GO TO 6.
NO >> INSPECTION END

6.REPLACE ECM

1. Replace ECM.
2. Perform additional service when replacing ECM. Refer to EC-157, "Work Procedure".

>> INSPECTION END

P0011, P0021 IVT CONTROL

DTC Logic

INFOID:0000000009008887

DTC DETECTION LOGIC

NOTE:
If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to EC-209, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	Detecting condition	Possible cause
P0011	INT/V TIM CONT-B1 [Intake valve timing control performance (bank 1)]	There is a gap between angle of target and phase-control angle degree.	• Crankshaft position sensor • Camshaft position sensor • Intake valve timing control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control
P0021	INT/V TIM CONT-B2 [Intake valve timing control performance (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

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

ENG SPEED	Less than 2,000 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	P or N position

4. Let engine idle for 25 seconds.
5. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-200, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

WITH CONSULT
1. Select “DATA MONITOR” mode with CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,500 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)

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

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-200, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

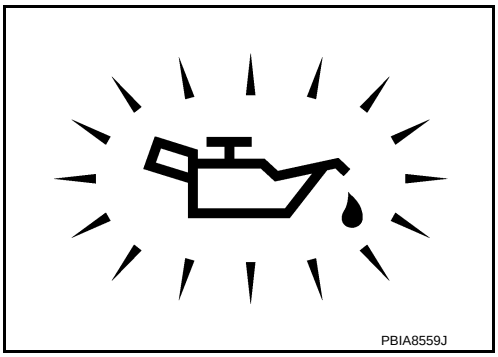
INFOID:0000000009008888

1.CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check that oil pressure warning lamp is not illuminated.

Is oil pressure warning lamp illuminated?

YES >> Go to LU-8, "Inspection".
NO >> GO TO 2.



2.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 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

3.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor. Refer to EM-115, "Exploded View".

4.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".

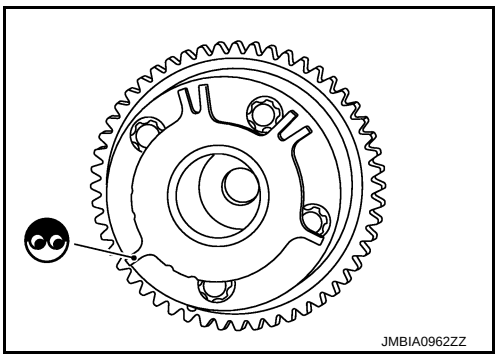
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor. Refer to EM-115, "Exploded View".

5.CHECK CAMSHAFT (INTAKE)

Check the following.

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



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-63, "Exploded View" or EM-80, "Removal and Installation".

6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misalignment.

Are there any service records that may cause timing chain misalignment?

YES >> Check timing chain installation. Refer to EM-80, "Removal and Installation".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000009008889

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as per the following.

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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.

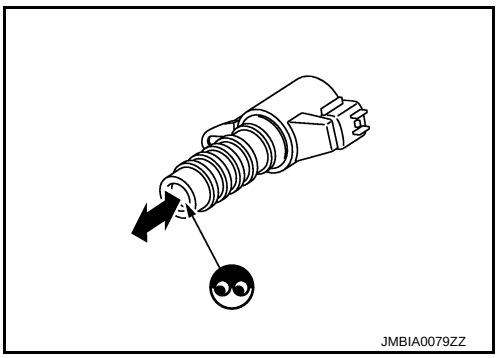
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

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

DTC Logic

INFOID:0000000009008890

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0031	A/F SEN1 HTR (B1) [A/F sensor 1 heater (bank 1) control circuit low]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0032	A/F SEN1 HTR (B1) [A/F sensor 1 heater (bank 1) control circuit high]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater
P0051	A/F SEN1 HTR (B2) [A/F sensor 1 heater (bank 2) control circuit low]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0052	A/F SEN1 HTR (B2) [A/F sensor 1 heater (bank 2) control circuit high]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

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

Diagnosis Procedure

INFOID:0000000009008891

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

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0031, P0032	1	F67	5	Ground	Battery voltage
P0051, P0052	2	F68	5		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- 20 A fuse (No. 43)
- Harness for open or short between A/F sensor 1 and fuse
- Loose or poor connection for each connector and harness

>> Repair or replace harness or connectors.

3.CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0031, P0032	1	F67	2	F110	48	Existed
P0051, P0052	2	F68	2		53	

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK A/F SENSOR 1 HEATER

Refer to EC-204, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

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

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Exploded View".

CAUTION:
- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (A/F Sensor 1 Heater)

INFOID:0000000009008892

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

1. Turn ignition switch OFF.
2. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
3. Check resistance between A/F sensor 1 terminals as per the following.

Terminal	Resistance
2 and 5	2.0 - 3.2 Ω [at 25°C (77°F)]

Terminal	Resistance
2 and 3, 4, 6	∞ Ω (Continuity should not exist)
5 and 3, 4, 6	

Is the inspection result normal?

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

2. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0037, P0038, P0057, P0058 HO2S2 HEATER

DTC Logic

INFOID:0000000009008893

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0037	HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit low]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0038	HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit high]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater
P0057	HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit low]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0058	HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit high]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-206, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008894

1.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) POWER SUPPLY CIRCUIT

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

DTC	HO2S2			Ground	Voltage
	Bank	Connector	Terminal		
P0037, P0038	1	F87	2	Ground	Battery voltage
P0057, P0058	2	F88	2		

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.
- 20 A fuse (No. 43)
- Harness for open or short between heated oxygen sensor 2 and fuse
- Loose or poor connection for each connector and harness

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

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0037, P0038	1	F87	3	F111	47	Existed
P0057, P0058	2	F88	3		52	

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HO2S2 HEATER

Refer to EC-208, "Component Inspection (HO2 Sensor 2 Heater)".

Is the inspection result normal?

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

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Removal and Installation".

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 Sensor 2 Heater)

INFOID:0000000009008895

1.CHECK HEATED OXYGEN SENSOR 2 HEATER

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

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

Is the inspection result normal?

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

2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Removal and Installation".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0075, P0081 IVT CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000009008896

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0075	INT/V TIM V/CIR-B1 [Intake valve timing control solenoid valve (bank 1) circuit]	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve
P0081	INT/V TIM V/CIR-B2 [Intake valve timing control solenoid valve (bank 2) circuit]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-209, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008897

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between IVT control solenoid valve harness connector and ground.

DTC	IVT control solenoid valve			Ground	Voltage
	Bank	Connector	Terminal		
P0075	1	F47	2	Ground	Battery voltage
P0081	2	F61	2		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between IVT control solenoid valve and IPDM E/R
- Loose or poor connection for each connector and harness

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

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

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.
3. Check the continuity between IVT control solenoid valve harness connector and ECM harness connector.

DTC	IVT control solenoid valve			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0075	1	F47	1	F111	49	Existed
P0081	2	F61	1		54	

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK IVT CONTROL SOLENOID VALVE

Refer to EC-210, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning IVT control solenoid valve. Refer to EM-63, "Exploded View".

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000009008898

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as per the following.

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

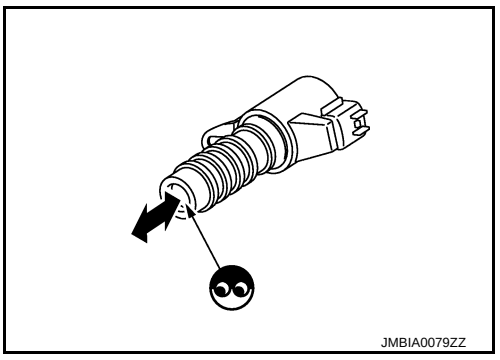
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
NOTE:
Always replace O-ring when intake valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

P0087 FRP CONTROL SYSTEM

DTC Logic

INFOID:0000000009008899

DTC DETECTION LOGIC

NOTE:

- **If DTC P0087 is displayed with DTC P0090 and/or P1197, first perform the trouble diagnosis for DTC P0090 and/or P1197.**
- DTC P0087 may be displayed when running out of gas or air accumulation.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0087	LOW FUEL PRES (High fuel pressure too low)	• Fuel rail pressure does not reach 1.3 MPa (13 bar, 13.3 kg/cm2, 188.5 psi) at engine cold start [water temperature 5°C (41°F) – 40°C (104°F)]. • Fuel rail pressure remains at 8.5 MPa (85 bar, 86.7 kg/cm2, 1232.8 psi) or less for 1 second or more during engine idle condition after cold start [water temperature 5°C (41°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 bar, 27.5 kg/cm2, 392 psi).	• Fuel system • Leakage in fuel line • High pressure fuel pump • Low pressure fuel pump • Damage in lifter

DTC CONFIRMATION PROCEDURE

1.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 2.
NO >> Repair or replace error-detected parts.

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 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.PERFORM 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	**: 5 – 40°C (41 – 104°F)**

WITH GST
Follow the above steps for “WITH CONSULT”.

Is the condition satisfied?

YES >> GO TO 4.
NO >> 1. Satisfy the condition.
2. Retry from step 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

WITH CONSULT
1. Start the engine and let it idle for 10 seconds.
2. Check 1st trip DTC.

WITH GST
Follow the above steps for “WITH CONSULT”.

Is 1st trip DTC detected?

YES >> Proceed to EC-212, "Diagnosis Procedure".
NO >> GO TO 5.

5.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 (104°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-212, "Diagnosis Procedure".
NO >> INSPECTION END.

Diagnosis Procedure

INFOID:0000000009008900

1.BLEED THE FUEL LINE

1. Start the engine, and let the engine run at idle at least for 10 minutes.
2. Perform DTC confirmation procedure of DTC P0087.

Is 1st trip DTC detected?

YES >> GO TO 2.
NO >> GO TO 6.

2.CHECK LOW FUEL PRESSURE

WITH CONSULT
1. Start the engine.
2. Check “L/FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
L/FUEL PRES SEN V	Engine speed: idle	3,000 –3,300 mV
	Engine speed: 3,000 rpm (no load)	

WITHOUT CONSULT
1. Start the engine.
2. Check low fuel pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Low fuel pressure sensor				
Connector	Terminal			
F25	2	Ground	Engine speed: idle	3.0 –3.3 V
			Engine speed: 3,000 rpm (no load)	

Is inspection result normal?

YES >> GO TO 3.
NO >> Check low fuel pressure system. Refer to EC-557, "Diagnosis Procedure".

3. CHECK LOW PRESSURE FUEL LINE FOR INTERNAL LEAKAGE

WITH CONSULT
1. Turn ignition switch OFF.
2. Turn ignition switch ON.
3. Select “L/FUEL PRES SEN” in “DATA MONITOR” of “ECM” with CONSULT.
4. Check the following value 30 minutes after turning the ignition switch ON.

L/FUEL PRES SEN : More than 0.20 MPa

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Connect fuel pressure gauge. Refer to EC-168, "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 (2.1 bar, 2.2 kgf/cm2, 30 psi) or more

Is inspection result normal?

YES >> GO TO 4.
NO >> Replace low pressure fuel pump. Refer to FL-5, "Exploded View".

4. CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-214, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace the error-detected parts.

5. CHECK LIFTER

Check lifter. Refer to EM-44, "Removal and Installation".

Does the lifter top surface have scratches and/or dents?

YES >> Replace the error-detected parts.
NO >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".

6. CHECK LOW PRESSURE FUEL LINE FOR INTERNAL LEAKAGE

WITH CONSULT
1. Turn ignition switch OFF.
2. Turn ignition switch ON.
3. Select “L/FUEL PRES SEN” in “DATA MONITOR” mode of “ECM” using CONSULT.
4. Check the following value 30 minutes after turning the ignition switch ON.

L/FUEL PRES SEN : More than 0.20 MPa

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Connect fuel pressure gauge. Refer to EC-168, "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 (2.1 bar, 2.2 kgf/cm2, 30 psi) or more

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace low pressure fuel pump. Refer to FL-5, "Exploded View".

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000009008901

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.

+	–	Condition		Resistance (Approx.)
High pressure fuel pump Terminal				
1	2	Temperature °C (°F)	20 – 30 (68 - 86)	9 - 11 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

2. CHECK HIGH PRESSURE FUEL PUMP-2

Ⓐ WITH CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check “FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Voltage (Approx.)
FUEL PRES SEN V	Engine speed: idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

Ⓑ WITHOUT CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check FRP sensor signal voltage.

ECM			Condition	Value (Approx.)
Connector	+	–		
	Terminal			
F111	31	40	Engine speed: idle	0.82 – 1.22 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

P0088 FRP CONTROL SYSTEM

DTC Logic

INFOID:0000000009008902

DTC DETECTION LOGIC

NOTE:
If DTC P0088 is displayed with DTC P0090, first perform the trouble diagnosis for DTC P0090.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0088	HIGH FUEL PRES (High fuel pressure too high)	• Fuel rail pressure remains at more than 16.5 MPa (165 bar, 168.3 kg/cm^2, 2392.5 psi) for 1 second or more during engine idle condition after cold start [water temperature 5°C (41°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 bar, 27.5 kg/cm^2, 392 psi)	• Harness or connector (The high pressure fuel pump circuit is open or shorted) • High pressure fuel pump

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

1. 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 “COOLAN TEMP/S” on “DATA MONITOR” mode of “ENGINE” using CONSULT reaches at least 70°C (158°F).
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-221, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Cool the engine until the engine coolant temperature reaches 60°C (140°F) or less.
2. Start the engine and wait at least 40 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-221, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008903

1.CHECK LOW FUEL PRESSURE

WITH CONSULT

1. Start the engine.
2. Check “L/FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
L/FUEL PRES SEN V	Engine speed: idle	3,000 –3,300 mV
	Engine speed: 3,000 rpm (no load)	

WITHOUT CONSULT
1. Start the engine.
2. Check low fuel pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Low fuel pressure sensor				
Connector	Terminal			
F25	2	Ground	Engine speed: idle	3.0 –3.3 V
			Engine speed: 3,000 rpm (no load)	

Is inspection result normal?

YES >> GO TO 2.
NO >> Check low fuel pressure system. Refer to EC-557, "Diagnosis Procedure".

2.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-216, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> GO TO 3.
NO >> Replace error-detected parts.

3.CHECK FUEL LEAKAGE

1. Start the engine.
2. 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-4, "Inspection".
NO >> Replace or replace the error-detected parts.

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000009008904

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.

+	–	Condition		Resistance (Approx.)
High pressure fuel pump Terminal				
1	2	Temperature °C (°F)	20 – 30 (68 - 86)	9 - 11 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

2.CHECK HIGH PRESSURE FUEL PUMP-2

WITH CONSULT
1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check “FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
FUEL PRES SEN V	Engine speed: idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

⊗WITHOUT CONSULT
1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check FRP sensor signal voltage.

ECM			Condition	Value (Approx.)
Connector	+	–		
	Terminal			
F111	31	40	Engine speed: idle	0.82 – 1.22 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

P008A LOW FUEL PRESSURE CONTROL SYSTEM

DTC Logic

INFOID:0000000009008905

DTC DETECTION LOGIC

NOTE:
If DTC P008A is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197. Refer to EC-433, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P008A	Low fuel pressure too low	A condition of low fuel pressure 0.23 MPa (2.3 bar, 2.346 kg/cm^2, 33.35 psi) or less continues for 5 seconds or more after warming up the engine.	• Harness or connectors (The low pressure fuel pump circuit is open or shorted.) • Low pressure fuel pump • Fuel pressure regulator • Low pressure fuel system • Out of gas

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Check that the fuel tank is 1/8 full of fuel.
2. Start the engine and warm it up to the normal operating temperature.
   NOTE:
   When replacing ECM, warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
3. Let the engine at idle for 60 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-434, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008906

1.PERFORM LOW PRESSURE FUEL PUMP COMPONENT FUNCTION CHECK

Refer to EC-557, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform low pressure fuel pump diagnosis. Refer to EC-557, "Diagnosis Procedure".

2.CHECK FUEL LEAKAGE

1. Start the engine.
2. Visually check that the low fuel pressure system has no fuel leakage.

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK LOW PRESSURE FUEL PIPING AND HOSE

1. Turn ignition switch OFF.

2. Check that the low pressure fuel piping and hose have no breakage, bend, and crush. Refer to FL-4, "Inspection".

Is inspection result normal?

YES >> Replace fuel level sensor unit and fuel pump (fuel pressure regulator malfunction). Refer to FL-5, "Removal and Installation".

NO >> Repair or replace error-detected parts.

P008B LOW FUEL PRESSURE CONTROL SYSTEM

DTC Logic

INFOID:0000000009008907

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P008B	Low fuel pressure too high	A condition of low fuel pressure 0.67 MPa (6.7 bar, 6.834 kg/cm^2, 97.15 psi) or more continues for 5 seconds or more after warming up the engine.	• Harness or connectors (The low pressure fuel pump circuit is open or shorted.) • Fuel pressure regulator

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and keep the engine speed at idle for 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-220, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008908

1.CHECK FUEL PUMP CONTROL MODULE (FPCM) SIGNAL

Refer to EC-441, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace FPCM. Refer to EC-584, "Removal and Installation".

2.CHECK FUEL PUMP CONTROL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect FPCM harness connector and fuel level sensor unit and fuel pump harness connector.
3. Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump harness connector.

FPCM		Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
B41	6	C5	3	Existed
	7		1	

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

Is inspection result normal?

YES >> Replace fuel level sensor unit and fuel pump (fuel pressure regulator malfunction). Refer to FL-5, "Removal and Installation".
NO >> Repair or replace error-detected parts.

P0090 HIGH PRESSURE FUEL PUMP

DTC Logic

INFOID:0000000009008909

DTC DETECTION LOGIC

NOTE:

- If DTC P0090 is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197.
- DTC P0090 may be displayed when running out of gas.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0090	FUEL PUMP (High pressure fuel pump circuit)	• Fuel rail pressure remains at 1.5 MPa (15 bar, 15.3 kg/ cm^2, 217.5 psi) or less for 3 seconds or more during engine rev. • Fuel rail pressure remains at 18.5 MPa (185 bar, 188.7 kg/ cm^2, 2682.5 psi) or more for 0.3 seconds or more during engine rev.	• Harness or connectors (The fuel pump circuit is open or shorted.) • High pressure fuel pump

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT

1. Start engine.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode of “ENGNE” using CONSULT.
3. Maintain the following condition for 5 seconds or more at idle.

COOLAN TEMP/S	**: 70°C (104°F) or more**

4. Check 1st trip DTC.

WITH GST

Follow the above steps for “WITH CONSULT”.

Is 1st trip DTC detected?

YES >> Proceed to EC-221, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008910

1.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.

+		–		Value (Approx.)
ECM		High pressure fuel pump		
Connector	Terminal	Connector	Terminal	
F110	110	F24	2	Existed
	105		1	

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

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace the error-detected parts.

2.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-222, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace the error-detected parts.

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000009008911

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.

+	–	Condition		Resistance (Approx.)
High pressure fuel pump Terminal				
1	2	Temperature °C (°F)	20 – 30 (68 - 86)	9 - 11 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

2.CHECK HIGH PRESSURE FUEL PUMP-2

WITH CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check “FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
FUEL PRES SEN V	Engine speed: idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check FRP sensor signal voltage.

ECM			Condition	Value (Approx.)
Connector	+	–		
	Terminal			
F111	31	40	Engine speed: idle	0.82 – 1.22 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

P0101 MAF SENSOR

DTC Logic

INFOID:0000000009008912

DTC DETECTION LOGIC

NOTE:
If DTC P0101 is displayed with other DTC, perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0101	MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit range/performance)	• A high voltage from the sensor is sent to ECM under light load driving condition. • A low voltage from the sensor is sent to ECM under heavy load driving condition.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor • EVAP control system pressure sensor • Intake air leaks • Intake air temperature sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. 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.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-224, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008913

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 >> Reconnect or replace error-detected parts.

2. CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

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

+		–	Voltage
Mass air flow sensor			
Connector	Terminal		
F31	5	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair or replace error-detected parts.

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

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between mass air flow sensor harness connector and ECM harness connector.

Mass air flow sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	4	F111	25	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

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

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

Mass air flow sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	3	F111	22	Existed

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

Is the inspection result normal?

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

6. CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to EC-238, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to EM-28, "Removal and Installation".

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Removal and Installation"

8.CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor. Refer to EC-231, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace mass air flow sensor. Refer to EM-28, "Removal and Installation".

Component Inspection (MAF sensor)

INFOID:0000000009008914

1.CHECK MASS AIR FLOW SENSOR-I

WITH CONSULT

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

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 [MAF sensor signal]	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

Is the inspection result normal?

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

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Intake valve deposits

- Improper specification of intake air system parts

Is the inspection result normal?

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

3. CHECK MASS AIR FLOW SENSOR-II

WITH CONSULT

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

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

WITHOUT CONSULT

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 [MAF sensor signal]	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK MASS AIR FLOW SENSOR-III

WITH CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1”, and check the indication.

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 [MAF sensor signal]	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace malfunctioning mass air flow sensor. Refer to EM-28, "Removal and Installation".

P0102, P0103 MAF SENSOR

DTC Logic

INFOID:0000000009008915

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0102	MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The mass air flow sensor circuit is open or shorted.) • Intake air leakage • Mass air flow sensor
P0103	MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The mass air flow sensor circuit is open or shorted.) • Mass air flow sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

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

Is DTC detected?

YES >> Go to EC-229, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-I

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

Is DTC detected?

YES >> Go to EC-229, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-II

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

Is DTC detected?

YES >> Go to EC-229, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008916

1.INSPECTION START

Confirm the detected DTC.

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 MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

MAF sensor		Ground	Voltage
Connector	Terminal		
F31	5	Ground	Battery voltage

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R
- Loose or poor connection for each connector and harness

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

5. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F31	4	F111	25	Existed

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

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	3	F111	22	Existed

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Refer to EC-231, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace mass air flow sensor. Refer to EM-28, "Exploded View".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAF Sensor)

INFOID:0000000009008917

1. CHECK MASS AIR FLOW SENSOR-I

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

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 (MAF sensor signal)	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

Is the inspection result normal?

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

2. CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

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

Is the inspection result normal?

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

3.CHECK MASS AIR FLOW SENSOR-II

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

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

WITHOUT CONSULT
1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 (MAF sensor signal)	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4.CHECK MASS AIR FLOW SENSOR-III

WITH CONSULT
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1”, and check the indication.

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 (MAF sensor signal)	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace malfunctioning mass air flow sensor. Refer to EM-28, "Removal and Installation".

P010A MANIFOLD ABSOLUTE PRESSURE SENSOR

DTC Logic

INFOID:0000000009008918

DTC DETECTION LOGIC

NOTE:
If DTC P010A is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643.
Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P010A	ABSL PRES SEN/CIRC [Manifold absolute pressure (MAP) sensor circuit]	• An excessively low voltage from the sensor is sent to ECM. • An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (Manifold absolute pressure sensor circuit is shorted.) • Manifold absolute pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 10 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-234, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008919

1.CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR POWER SUPPLY CIRCUIT

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

Manifold absolute pressure (MAP) sensor		Ground	Voltage (V)
Connector	Terminal		
F65	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between manifold absolute pressure (MAP) sensor harness connector and ECM harness connector.

Manifold absolute pressure (MAP) sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F65	3	F110	70	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between manifold absolute pressure (MAP) sensor harness connector and ECM harness connector.

Manifold absolute pressure (MAP) sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F65	2	F110	67	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR

Refer to EC-235, "Component Inspection (MAP Sensor)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace manifold absolute pressure (MAP) sensor. Refer to EM-31, "Exploded View".

5. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAP Sensor)

INFOID:0000000009008920

1. CHECK MAP SENSOR-I

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

ECM			
+		–	
Connector	Terminal	Connector	Terminal
F110	67	F110	70

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

5. Measure the atmospheric pressure.

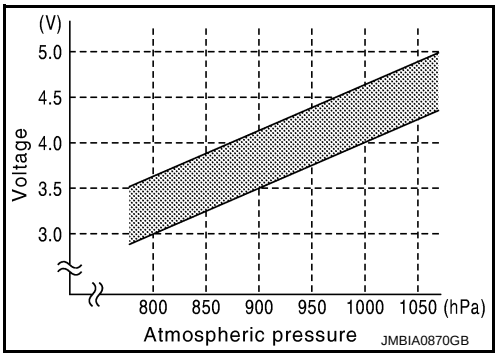
NOTE:
As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

Altitude (m)	Compensated pressure (hPa)
0	0
200	-24

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

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

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



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace MAP sensor.

2. CHECK MAP SENSOR-II

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

ECM			
+		–	
Connector	Terminal	Connector	Terminal
F110	67	F110	70

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

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAP sensor.

P0111 IAT SENSOR

DTC Logic

INFOID:0000000009008921

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0111	IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, 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.	• Harness or connectors (High or low resistance in the IAT sensor circuit) • IAT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-238, "Component Function Check".

NOTE:
Use the component function check to check the overall function of the IAT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-238, "Diagnosis Procedure".

3.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the food open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-238, "Diagnosis Procedure".
NO >> INSPECTION END

Component Function Check

INFOID:0000000009008922

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	25 (77)	1.94 – 2.06

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-238, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-238, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008923

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to EC-238, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to EM-28, "Removal and Installation".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000009008924

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as follows.

Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	25 (77)	1.94 – 2.06

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to EM-28, "Removal and Installation".

P0112, P0113 IAT SENSOR

DTC Logic

INFOID:0000000009008925

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0112	IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The intake air temperature sensor circuit is open or shorted.) • Intake air temperature sensor
P0113	IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-239, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008926

1.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor		Ground	Voltage (V)
Connector	Terminal		
F31	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F31	1	F111	25	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-240, "Component Inspection (Intake Air Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace mass air flow sensor (with intake air temperature sensor).

4.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Air Temperature Sensor)

INFOID:0000000009008927

1.CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as per the following.

Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	25 (77)	1.94 - 2.06

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to EM-28, "Removal and Installation".

P0116 ECT SENSOR

DTC Logic

INFOID:0000000009008928

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0116	ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/performance]	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 ECT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	• Harness or connectors (High or low resistance in the ECT sensor circuit) • ECT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-242, "Component Function Check".

NOTE:
Use the component function check to check the overall function of the ECT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-242, "Diagnosis Procedure".

3.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the food open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.

5. Check 1st trip DTC.

Is 1st trip DTC detected?

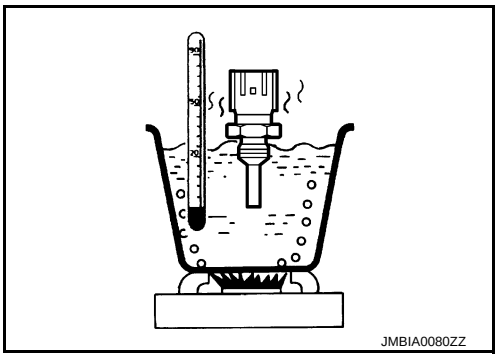
YES >> Proceed to EC-242, "Diagnosis Procedure".
NO >> INSPECTION END

Component Function Check

INFOID:0000000009008929

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to EC-23, "Component Parts Location".
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 – 2.73
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-242, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-242, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008930

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to EC-242, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace ECT sensor. Refer to EC-23, "Component Parts Location".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

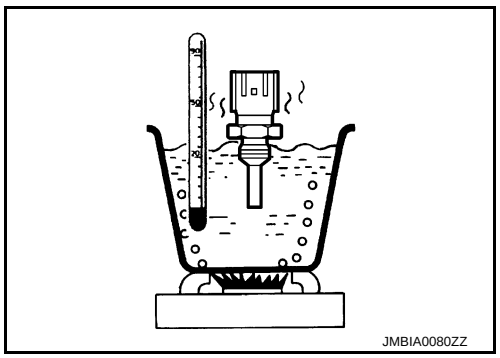
Component Inspection

INFOID:0000000009008931

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to EC-23, "Component Parts Location".

4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 – 2.73
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ECT sensor. Refer to EC-23, "Component Parts Location".

P0117, P0118 ECT SENSOR

DTC Logic

INFOID:0000000009008932

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0117	ECT SEN/CIRC (Engine coolant temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The engine coolant temperature sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118	ECT SEN/CIRC (Engine coolant temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to EC-244, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008933

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

ECT sensor		Ground	Voltage (V)
Connector	Terminal		
F21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

ECT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	2	F111	40	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-245, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace engine coolant temperature sensor.

4. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

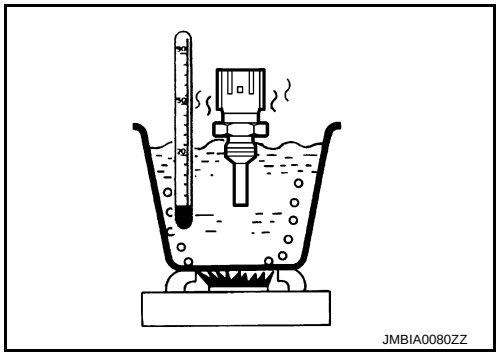
>> INSPECTION END

Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000009008934

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 - 2.73
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor. Refer to EM-92, "Exploded View".

P0122, P0123 TP SENSOR

DTC Logic

INFOID:0000000009008935

DTC DETECTION LOGIC

NOTE:
If DTC P0122 or P0123 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0122	TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit low input)	An excessively low voltage from the TP sensor 2 is sent to ECM.	• Harness or connectors (TP sensor 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 2)
P0123	TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit high input)	An excessively high voltage from the TP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-246, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008936

1.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

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

Electric throttle control actuator		Ground	Voltage
Connector	Terminal		
F66	2	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	4	F110	97	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	3	F110	79	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-247, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

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

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000009008937

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-162, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F110	91 (TP sensor 1 signal)	97 (Sensor ground)	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	79 (TP sensor 2 signal)			Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

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

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P0125 ECT SENSOR

DTC Logic

INFOID:0000000009008938

DTC DETECTION LOGIC

NOTE:
If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-244, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0125	ECT SENSOR (Insufficient engine coolant temperature for closed loop fuel control)	• Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. • Engine coolant temperature is insufficient for closed loop fuel control.	• Harness or connectors (High resistance in the circuit) • Engine coolant temperature sensor • Thermostat

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

WITH CONSULT
1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT.
3. Check that “COOLAN TEMP/S” is above 10°C (50°F).

WITH GST
Follow the procedure “With CONSULT” above.

Is the temperature above 10°C (50°F)?

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

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
   CAUTION:
   Never overheat engine.
2. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> EC-249, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008939

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-245, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace engine coolant temperature sensor.

2.CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm that the engine coolant does not flow.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace thermostat. Refer to CO-22, "Removal and Installation".

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

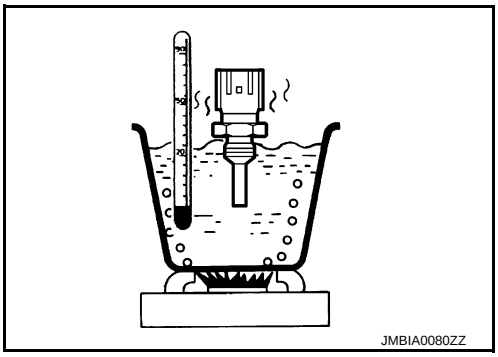
>> INSPECTION END

Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000009008940

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 - 2.73
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor. Refer to EM-92, "Exploded View".

P0127 IAT SENSOR

DTC Logic

INFOID:0000000009008941

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0127	IAT SENSOR-B1 (Intake air temperature too high)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	• Harness or connectors (The intake air temperature sensor circuit is open or shorted) • Intake air temperature sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Wait until engine coolant temperature is less than 90°C (194°F)
- Turn ignition switch ON.
- Select “DATA MONITOR” mode with CONSULT.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch OFF and cool down engine.

NOTE:
Perform the following steps before engine coolant temperature is above 90°C (194°F).

2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.

CAUTION:
Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-251, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008942

1.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-252, "Component Inspection (Intake Air Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace mass air flow sensor (with intake air temperature sensor).

2.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Air Temperature Sensor)

INFOID:0000000009008943

1. CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as per the following.

Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	25 (77)	1.94 - 2.06

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to EM-31, "Removal and Installation".

P0128 THERMOSTAT FUNCTION

DTC Logic

INFOID:0000000009008944

DTC DETECTION LOGIC

NOTE:
If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307 or P0308, first perform the trouble diagnosis for P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308. Refer to EC-323, "DTC Logic".
Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.
This is due to a leak in the seal or the thermostat being stuck open.

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0128	THERMSTAT FNCTN [Coolant thermostat (coolant temperature below thermostat regulating temperature)]	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	• Thermostat • Leakage from sealing portion of thermostat • Engine coolant temperature sensor

DTC CONFIRMATION PROCEDURE

NOTE:
Never refuel before and during the following procedure.

1.PRECONDITIONING-I

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PRECONDITIONING-II

With CONSULT-III
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-III.
4. Check the following conditions:

COOLAN TEMP/S	(–10) – (+48)°C (14 – 118°F)

Is the condition satisfied?

YES >> GO TO 3.
NO >> 1. Satisfy the condition.
2. GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III
1. Start engine.
2. 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 “COOLAN TEMP/S” and “FUEL T/TMP SE” becomes at least 24°C (43°F).

COOLAN TEMP/S	67°C (152°F) or less
FUEL T/TMP SE	Less than the value calculated by subtracting 24°C (43°F) from “COOLAN TEMP/S”.*

*: Example

COOLAN TEMP/S	FUEL T/TMP SE
70°C (158°F)	46°C (115°F) or less
65°C (149°F)	41°C (106°F) or less
60°C (140°F)	36°C (97°F) or less

- **STEP 2**

Drive the vehicle at 50 km/h (32 MPH) or more with the difference between “COOLAN TEMP/S” and “FUEL T/TMP SE” maintained at 24°C (43°F) or more.

NOTE:

Keep the accelerator pedal as steady as possible during cruising.

- **STEP 3**

Drive the vehicle at 50 km/h (32 MPH) or more until “COOLAN TEMP/S” increases by 6°C (11°F).

NOTE:

Keep the accelerator pedal as steady as possible during cruising.

Is the condition satisfied?

YES >> GO TO 4.
NO >> GO TO 1.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Drive the vehicle until the following condition is satisfied.

COOLAN TEMP/S	67°C (152°F) or less

CAUTION:
Always drive vehicle at safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-254, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008945

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-254, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace engine coolant temperature sensor.

2. CHECK THERMOSTAT

Remove and Check the thermostat. Refer toCO-22, "Removal and Installation" and CO-23, "Inspection".

Is the inspection result normal?

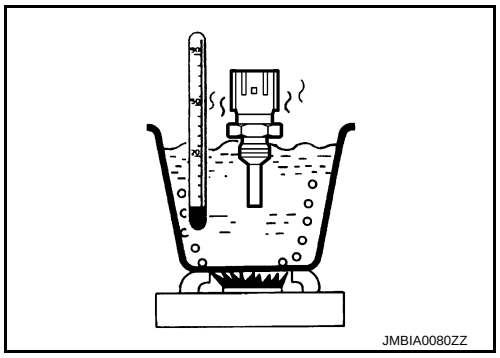
YES >> INSPECTION END
NO >> Replace thermostat.

Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000009008946

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 - 2.73
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

P0130, P0150 A/F SENSOR 1

DTC Logic

INFOID:0000000009008947

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible Cause
P0130	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit]	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 1.5 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V.	
P0150	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit]	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 1.5 V.	
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-258, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> With GST: GO TO 7.

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

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” or “A/F SEN1 (B2)” in “DATA MONITOR” mode with CONSULT.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.

Does the indication fluctuate around 1.5 V?

YES >> GO TO 4.
NO >> Go to EC-258, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

1. Select “A/F SEN1 (B1) P1276” (for DTC P0130) or “A/F SEN1 (B2) P1286” (for DTC P0150) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT.
2. Touch “START”.
3. When the following conditions are met, “TESTING” will be displayed on the CONSULT screen.

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

If "TESTING" is not displayed after 20 seconds, retry from step 2.
CAUTION:
Always drive vehicle at a safe speed.

Is "TESTING" displayed on CONSULT screen?

YES >> GO TO 5.
NO >> Check A/F sensor 1 function again. GO TO 3.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

Release accelerator pedal fully.
NOTE:
Never apply brake when releasing the accelerator pedal.

Which does "TESTING" change to?

COMPLETED>>GO TO 6.
OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III

Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT screen?

YES >> INSPECTION END
NO >> Go to EC-258, "Diagnosis Procedure".

7. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

WITH GST
Perform component function check. Refer to EC-257, "Component Function Check".
NOTE:
Use component function check to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-258, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009008948

1. PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever position to D, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   Never apply brake when releasing the accelerator pedal.
4. Repeat steps 2 and 3 for 5 times.
5. Stop the vehicle and turn ignition switch OFF.
6. Wait at least 10 seconds and turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for 5 times.
10. Stop the vehicle.
11. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-258, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008949

1. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Removal and Installation".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0131, P0151 A/F SENSOR 1

DTC Logic

INFOID:0000000009008950

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P0131	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage]	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0151	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

WITH CONSULT

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

WITH GST

Follow the procedure “With CONSULT” above.

Is the indication constantly approx. 0 V?

YES >> Go to EC-261, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:

- **Keep the accelerator pedal as steady as possible during cruising.**

- **If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.**

7. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-261, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008951

1.CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Removal and Installation".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0132, P0152 A/F SENSOR 1

DTC Logic

INFOID:0000000009008952

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P0132	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage]	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0152	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

WITH CONSULT

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

WITH GST

Follow the procedure “With CONSULT” above.

Is the indication constantly approx. 5 V?

YES >> Go to EC-264, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:

- **Keep the accelerator pedal as steady as possible during cruising.**

- **If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.**

7. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-264, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008953

1.CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Removal and Installation".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0133, P0153 A/F SENSOR 1

DTC Logic

INFOID:0000000009008954

DTC DETECTION LOGIC

To judge the malfunction of A/F sensor 1, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P0133	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response]	• The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks • PCV • Mass air flow sensor
P0153	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

Will CONSULT be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. 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 “A/F SEN1(B1) P1278/P1279” (for DTC P0133) or “A/F SEN1(B2) P1288/P1289” (for DTC P0153) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT.
8. Touch “START”.

Is “COMPLETED” displayed on CONSULT screen?

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

3.PERFORM DTC CONFIRMATION PROCEDURE-II

Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-267, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. After perform the following procedure, “TESTING” will be displayed on the CONSULT screen.
- Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
- Fully release accelerator pedal and then let engine idle for approximately 10 seconds.

If “TESTING” is not displayed after 10 seconds, refer to EC-183, "Component Function Check".

2. Wait for approximately 20 seconds at idle under the condition that “TESTING” is displayed on the CONSULT screen.
3. Check that “TESTING” changes to “COMPLETED”.

If “TESTING” changed to “OUT OF CONDITION”, refer to EC-183, "Component Function Check".

4. Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-267, "Diagnosis Procedure".

5.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Calculate the total value of “Short term fuel trim” and “Long term fuel trim” indications.

Is the total percentage within ±15%?

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

6.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.

7.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
5. Fully release accelerator pedal and then let engine idle for approximately 1 minute.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-267, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008955

1.RETIGHTEN AIR FUEL RATIO SENSOR 1

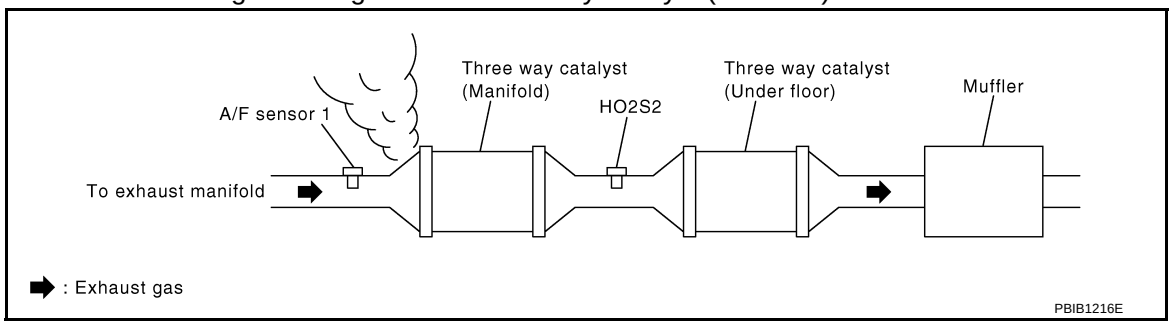
Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-41, "Exploded View".

>> GO TO 2.

2.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.

2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

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

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-291, "DTC Logic" or EC-295, "DTC Logic".
NO >> GO TO 5.

5. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0133	1	F67	4	Ground	3.0 V
P0153	2	F68	4		

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0133	1	F67	3	F110	88	Existed
P0153	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0133	1	F67	3	F110	88	Ground	Not existed
P0153	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0133	1	F67	6	F111	94	Existed
P0153	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK A/F SENSOR 1 HEATER

Refer to EC-204, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 12.

9. CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor.
Refer to EC-231, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace malfunctioning mass air flow sensor. Refer to EM-31, "Removal and Installation".

10. CHECK PCV VALVE

Refer to EC-581, "Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace PCV valve.

11. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace malfunctioning part.

12. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

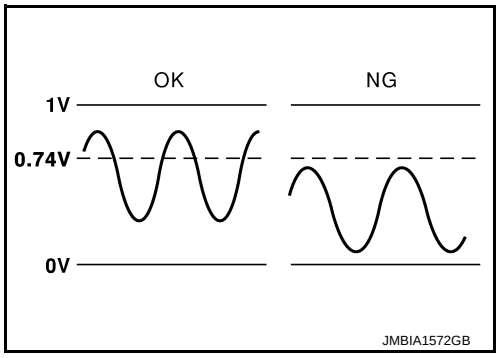
P0137, P0157 HO2S2

DTC Logic

INFOID:0000000009008956

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0137	HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit low voltage]	The maximum voltage from the sensor does not reach the specified voltage.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks
P0157	HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit low voltage]		

DTC CONFIRMATION PROCEDURE

1.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.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

TESTING CONDITION:

For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. 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 "DATA MONITOR" mode with CONSULT.
8. Check that "COOLAN TEMP/S" indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when "COOLAN TEMP/S" indication reaches 70°C (158°F).
9. Open engine hood.
10. Select "HO2S2 (B1) P1147" (for DTC P0137) or "HO2S2 (B2) P1167" (for DTC P0157) of "HO2S2" in "DTC WORK SUPPORT" mode with CONSULT.
11. Follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until "COMPLETED" is displayed.
12. Touch "SELF-DIAG RESULTS".

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-273, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 2.

4.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform component function check. Refer to EC-272, "Component Function Check".
NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-273, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009008957

1.PERFORM COMPONENT FUNCTION CHECK-I

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F110	96	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure.
P0157		87			

Is the inspection result normal?

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

2.PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F110	96	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure.
P0157		87			

Is the inspection result normal?

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

3. PERFORM COMPONENT FUNCTION CHECK-III

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F110	96	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure.
P0157		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-273, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008958

1. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to EC-291, "DTC Logic".
NO >> GO TO 2.

2. CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F87	1	F110	100	Existed
P0157	2	F88	1			

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F87	4	F110	96	Existed
P0157	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0137	1	F87	4	F110	96	Ground	Not existed
P0157	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-274, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

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

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000009008959

1. INSPECTION START

Will CONSULT be used?

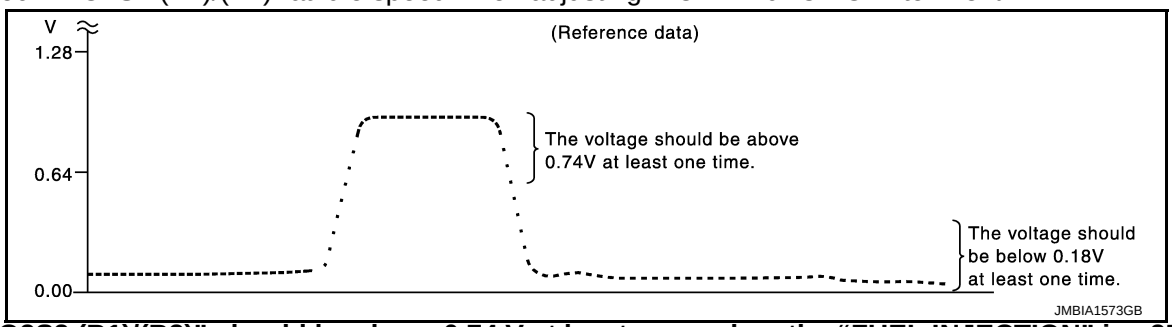
Will CONSULT be used?

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

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
5. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0138, P0158 HO2S2

DTC Logic

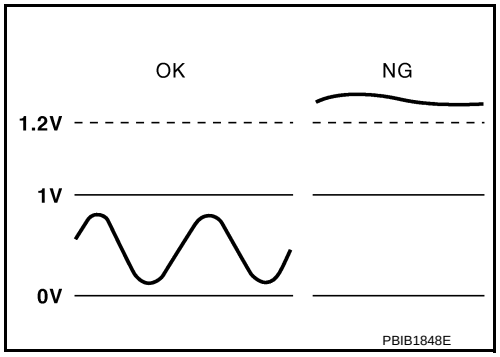
INFOID:0000000009008960

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

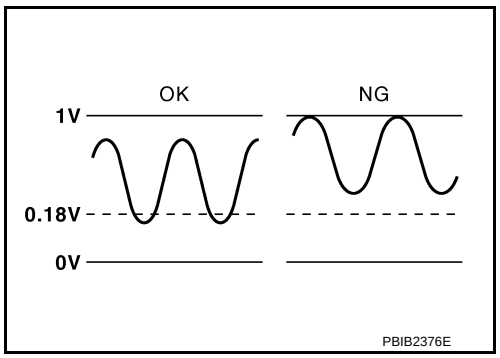
MALFUNCTION A

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0138	HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit high voltage]	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector
P0158	HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit high voltage]	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 2 minutes.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-279, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> With GST: GO TO 5.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

WITH CONSULT

NOTE:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1146” (for DTC P0138) or “HO2S2 (B2) P1166” (for DTC P0158) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
11. Follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-279, "Diagnosis Procedure".
CON NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

WITH GST

Perform component function check. Refer to EC-279, "Component Function Check".

NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-279, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009008961

1. PERFORM COMPONENT FUNCTION CHECK-I

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F110	96	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be below 0.18 V at least once during this procedure.
P0158		87			

Is the inspection result normal?

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

2. PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F110	96	100	Keeping engine at idle for 10 minutes	The voltage should be below 0.18 V at least once during this procedure.
P0158		87			

Is the inspection result normal?

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

3. PERFORM COMPONENT FUNCTION CHECK-III

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F110	96	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be below 0.18 V at least once during this procedure.
P0158		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-279, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008962

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-277, "DTC Logic".

Which malfunction is detected?

A >> GO TO 2
B >> GO TO 8.

2.CHECK HEATED OXYGEN SENSOR 2 CONNECTOR

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace harness or connectors.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	1	F110	100	Existed
P0158	2	F88	1			

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	4	F110	96	Existed
P0158	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0138	1	F87	4	F110	96	Ground	Not existed
P0158	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-282, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

8. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-295, "DTC Logic".
NO >> GO TO 9.

9. CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	1	F110	100	Existed
P0158	2	F88	1			

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

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	4	F110	96	Existed
P0158	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0138	1	F87	4	F110	96	Ground	Not existed
P0158	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-282, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000009008963

1. INSPECTION START

Will CONSULT be used?

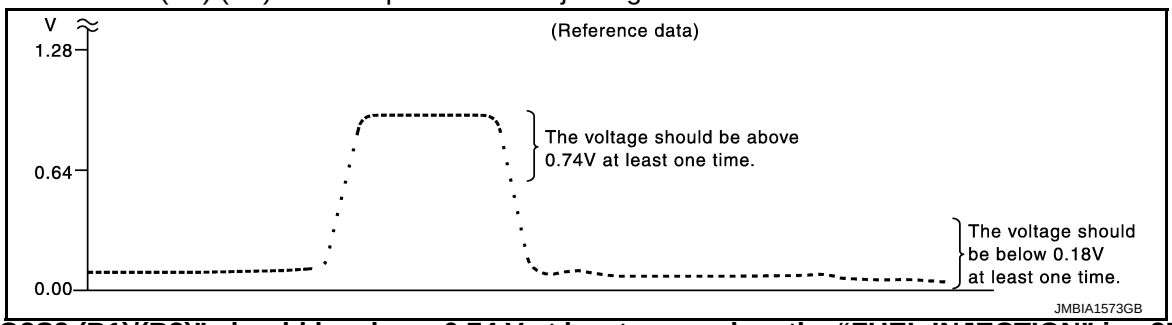
Will CONSULT be used?

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

2. CHECK HEATED OXYGEN SENSOR 2

WITH CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
5. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

WITHOUT CONSULT

1. Start engine and warm it up to the normal operating temperature.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

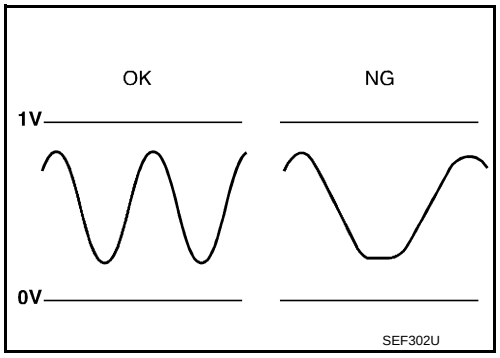
P0139, P0159 HO2S2

DTC Logic

INFOID:0000000009008964

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 (bank 1) circuit slow response	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel system • EVAP system • Intake air system
P0159	Heated oxygen sensor 2 (bank 2) circuit slow response		

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed.

CAUTION:
Always drive vehicle at a safe speed.

10. Release the accelerator pedal fully at least 5 seconds.
    CAUTION:
    - **Enable the engine brake.**
    - **Always drive carefully.**
    - **Never apply brake when releasing the accelerator pedal.**
11. Repeat step 9 and 10 at least 8 times.
12. Check the following item of “DATA MONITOR”.

DTC	Data monitor item	Status
P0139	HO2 S2 DIAG1 (B1)	CMPLT
	HO2 S2 DIAG2 (B1)	
P0159	HO2 S2 DIAG1 (B2)	
	HO2 S2 DIAG2 (B2)	

Is “CMPLT” displayed on CONSULT screen?

YES >> GO TO 6.
NO-1: “CMPLT” is not displayed on DIAG 1>>Perform DTC confirmation procedure again.
NO-2: “CMPLT” is not displayed on DIAG 2>>GO TO 4.

4. PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Select “HO2S2 (B1) P0139” or “HO2S2 (B2) P0159” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
3. Start engine and follow the instruction of CONSULT display.
   NOTE:
   It will take at most 10 minutes until “COMPLETED” is displayed.

Is “COMPLETED” displayed on CONSULT screen?

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

5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

6. PERFORM SELF-DIAGNOSIS

With CONSULT
Perform ECM self-diagnosis.

Is DTC “P0139” or “P0159” detected?

YES >> Proceed to EC-287, "Diagnosis Procedure".
NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-286, "Component Function Check".
NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-287, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009008965

1. PERFORM COMPONENT FUNCTION CHECK-I

WITH GST
1. Start engine and warm it up to the normal operating temperature.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F110	96	100	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		87			

Is the inspection result normal?

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

2.PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F110	96	100	Keeping engine at idle for 10 minutes	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		87			

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F110	96	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-287, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008966

1.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-291, "DTC Logic" or EC-295, "DTC Logic".
NO >> GO TO 2.

2.CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F87	1	F110	100	Existed
P0159	2	F88	1			

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F87	4	F110	96	Existed
P0159	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0139	1	F87	4	F110	96	Ground	Not existed
P0159	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-289, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

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

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000009008967

1.INSPECTION START

Will CONSULT be used?

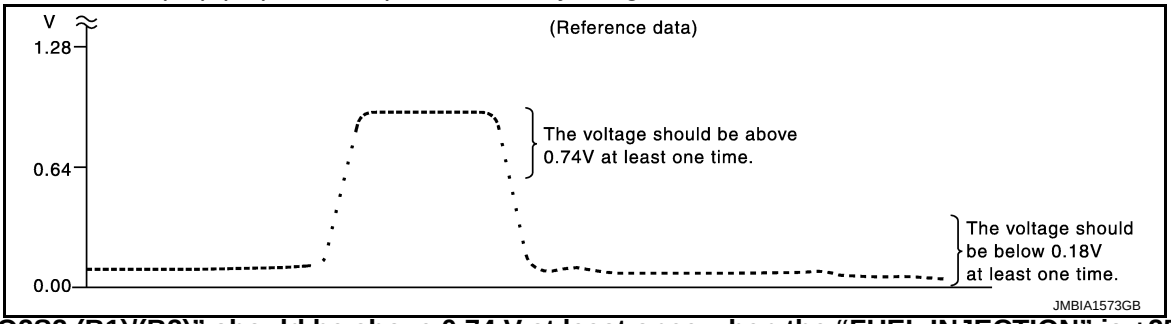
Will CONSULT be used?

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

2.CHECK HEATED OXYGEN SENSOR 2

WITH CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
5. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

3.CHECK HEATED OXYGEN SENSOR 2-I

WITHOUT CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000009008968

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0171	FUEL SYS-LEAN-B1 [Fuel injection system too lean (bank 1)]	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leakage • A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection
P0174	FUEL SYS-LEAN-B2 [Fuel injection system too lean (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Proceed to EC-292, "Diagnosis Procedure".
NO >> Check exhaust and intake air leakage visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-292, "Diagnosis Procedure".

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine.
5. Maintain the following conditions for at least 10 consecutive minutes.
   Hold the accelerator pedal as steady as possible.

Vehicle speed	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

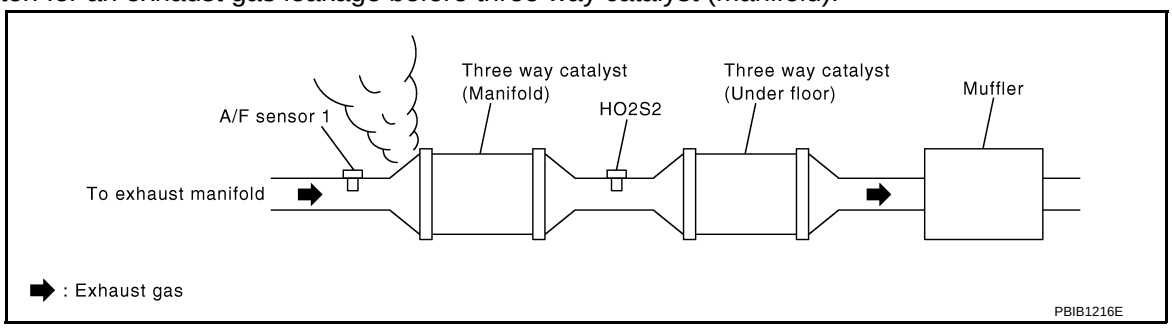
YES >> Proceed to EC-292, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008969

1. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAKAGE

1. Listen for an intake air leakage after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK A/F SENSOR 1 CIRCUIT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0171	1	F67	3	F110	88	Existed
			4		90	
			6		94	
P0174	2	F68	3		78	
			4		80	
			6		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Continuity	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0171	1	F67	3	F110	88	Existed	Not existed
			4		90		
			6		94		
P0174	2	F68	3		78		
			4		80		
			6		74		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-168, "Work Procedure".

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”. Refer to FL-5, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

WITH CONSULT
1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT.
   For specification, refer to EC-585, "Mass Air Flow Sensor".

WITH GST
1. Install all removed parts.
2. Check mass air flow sensor signal in Service $01 with GST.
   For specification, refer to EC-585, "Mass Air Flow Sensor".

Is the measurement value within the specification?

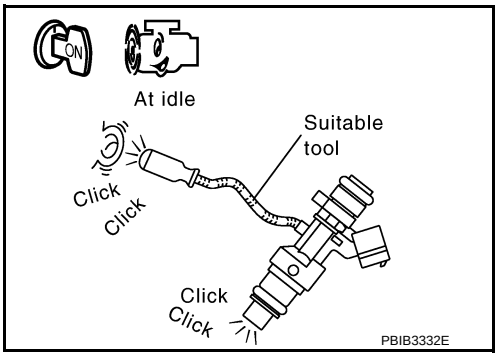
YES >> GO TO 7.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-229, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

WITH CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT
1. Start engine and let it idle.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for fuel injector, refer to EC-543, "Diagnosis Procedure".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace fuel injector. Refer to EM-49, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000009008970

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0172	FUEL SYS-RICH-B1 [Fuel injection system too rich (bank 1)]	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Mass air flow sensor
P0175	FUEL SYS-RICH-B2 [Fuel injection system too rich (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Proceed to EC-296, "Diagnosis Procedure".
NO >> Remove spark plugs and check for fouling, etc.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-296, "Diagnosis Procedure".
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine.
5. Maintain the following conditions for at least 10 consecutive minutes.
   Hold the accelerator pedal as steady as possible.

Vehicle speed	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

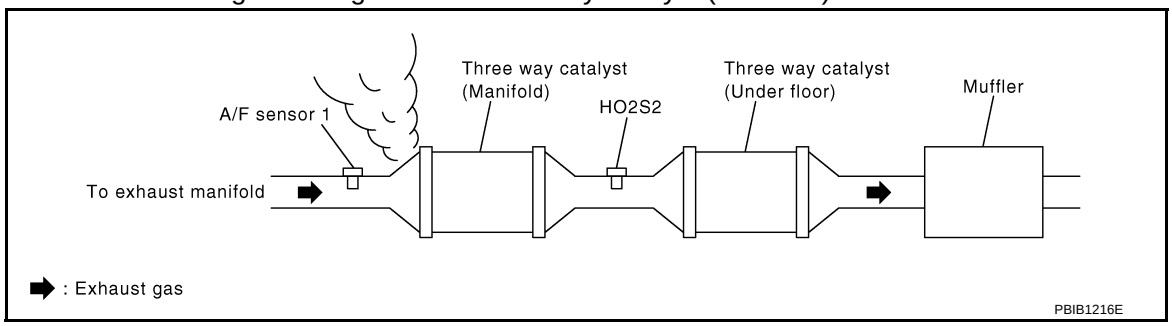
YES >> Proceed to EC-296, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008971

1.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3.CHECK A/F SENSOR 1 CIRCUIT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0171	1	F67	3	F110	88	Existed
			4		90	
			6		94	
P0174	2	F68	3		78	
			4		80	
			6		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Continuity	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0171	1	F67	3	F110	88	Existed	Not existed
			4		90		
			6		94		
P0174	2	F68	3		78		
			4		80		
			6		74		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-168, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filter and fuel pump assembly". Refer to FL-5, "Removal and Installation".

5. CHECK MASS AIR FLOW SENSOR

WITH CONSULT
1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
   For specification, refer to EC-585, "Mass Air Flow Sensor".

WITH GST
1. Install all removed parts.
2. Check mass air flow sensor signal in "Service $01" with GST.
   For specification, refer to EC-585, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 6.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-229, "Diagnosis Procedure".

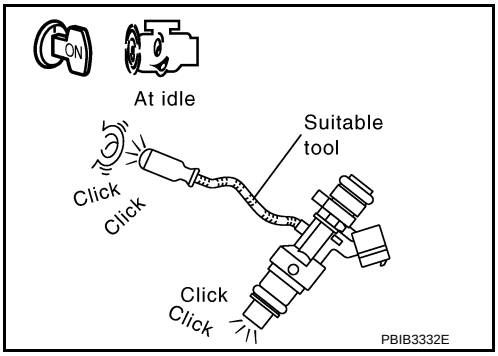
6. CHECK FUNCTION OF FUEL INJECTOR

WITH CONSULT
1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT
1. Start engine and let it idle.

2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> GO TO 7.
NO >> Perform trouble diagnosis for fuel injector, refer to EC-543, "Diagnosis Procedure".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace fuel injector. Refer to EM-49, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

P0181 FTT SENSOR

DTC Logic

INFOID:0000000009008972

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0181	FTT SENSOR [Fuel tank temperature (FTT) sensor circuit range/performance]	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor.	• Harness or connectors (The FTT sensor circuit is open or shorted) • FTT sensor • Combination meter
		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.	• Harness or connectors (High or low resistance in the FTT sensor circuit) • FTT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 7.
NO >> GO TO 2.

2.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-I

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-301, "Diagnosis Procedure".
NO >> GO TO 4.

4.CHECK ENGINE COOLANT TEMPERATURE

With CONSULT
1. Select “COOLAN TEMP/S” in “DATA MONITOR” with CONSULT.
2. Check “COOLAN TEMP/S” value.

With GST
Follow the procedure “With CONSULT” above.

“COOLAN TEMP/S” less than 60°C (140°F)?

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

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A-II

With CONSULT
1. Cool engine down until “COOLAN TEMP/S” is less than 60°C (140°F).

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-301, "Diagnosis Procedure".
NO >> GO TO 6.

6. PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to EC-300, "Component Function Check".
NOTE:
Use the component function check to check the overall function of the FTT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-301, "Diagnosis Procedure".

7. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 8.

8. PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the food open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-301, "Diagnosis Procedure".
NO >> INSPECTION END

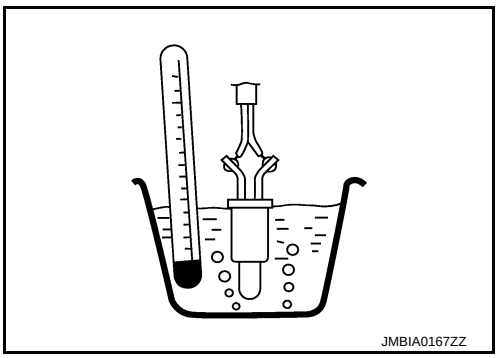
Component Function Check

INFOID:0000000009008973

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to FL-5, "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.



Terminals	Condition		Resistance (kΩ)
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 – 2.7
		50 (122)	0.79 – 0.90

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-301, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-301, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008974

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-299, "DTC Logic".

Which malfunction is detected?

A >> GO TO 2.
B >> GO TO 7.

2.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Proceed to MWI-71, "Component Function Check".

3.CHECK FUEL TANK TEMPERATURE (FTT) SENSOR POWER SUPPLY CIRCUIT

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.

Fuel level sensor unit and fuel pump		Ground	Voltage (V)
Connector	Terminal		
C5	4	Ground	Approx. 5

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and fuel level sensor unit and fuel pump
- Loose or poor connection for each connector and harness

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

5.CHECK FTT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect combination meter harness connector.
3. Check the continuity between fuel level sensor unit and fuel pump harness connector and combination meter harness connector.

Fuel level sensor unit and fuel pump		Combination meter		Continuity
Connector	Terminal	Connector	Terminal	
C5	5	M34	24	Existed

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between fuel level sensor unit and fuel pump and combination meter
- Loose or poor connection for each connector and harness

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

7. CHECK FTT SENSOR

Check FTT sensor. Refer to EC-302, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace fuel level sensor unit and fuel pump. Refer to FL-5, "Removal and Installation".

8. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

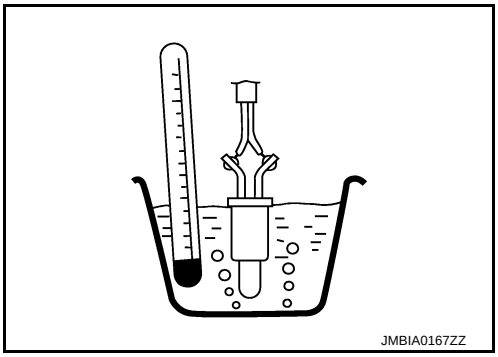
>> INSPECTION END

Component Inspection

INFOID:0000000009008975

1. CHECK FUEL TANK TEMPERATURE (FTT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump harness connector.
3. Remove fuel level sensor unit. Refer to FL-5, "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.


JMBIA0167ZZ

Terminals	Condition		Resistance (kΩ)
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 – 2.7
		50 (122)	0.79 – 0.90

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel level sensor unit and fuel pump. Refer to FL-5, "Removal and Installation".

P0182, P0183 FTT SENSOR

DTC Logic

INFOID:0000000009008976

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0182	FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The FTT sensor circuit is open or shorted.) • Fuel tank temperature sensor • Combination meter
P0183	FTT SEN/CIRCUIT (Fuel tank temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Proceed to EC-303, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008977

1.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to MWI-71, "Component Function Check".

2.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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.

Fuel level sensor unit and fuel pump		Ground	Voltage (V)
Connector	Terminal		
C5	4	Ground	Approx. 5

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
• Harness for open or short between ECM and “fuel level sensor unit and fuel pump”

• Loose or poor connection for each connector and harness

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

4. CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect combination meter harness connector.
3. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and “combination meter” harness connector.

Fuel level sensor unit and fuel pump		Combination meter		Continuity
Connector	Terminal	Connector	Terminal	
C5	5	M34	24	Existed

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

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
• Harness for open or short between “fuel level sensor unit and fuel pump” and “combination meter”
• Loose or poor connection for each connector and harness

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

6. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-304, "Component Inspection (Fuel Tank Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace “fuel level sensor unit and fuel pump”. Refer to FL-5, "Removal and Installation".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

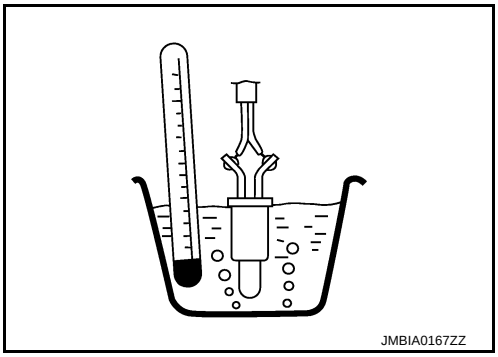
>> INSPECTION END

Component Inspection (Fuel Tank Temperature Sensor)

INFOID:0000000009008978

1. CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Remove fuel level sensor unit.
4. Check resistance between “fuel level sensor unit and fuel pump ” terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
		50 (122)	0.79 - 0.90

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace “fuel level sensor unit and fuel pump”.

P0190, P0192, P0193 FRP SENSOR

DTC Logic

INFOID:0000000009008979

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0190	Fuel rail pressure sensor circuit low input and high input	Signal voltage from the fuel rail pressure sensor remains at more than 4.84 V / less than 0.2 V for 5 seconds or more.	• Harness or connectors (Fuel rail pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) (The electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Low fuel pressure sensor • Electrically-controlled cooling fan coupling
P0192	Fuel rail pressure sensor circuit low input	Signal voltage from the fuel rail pressure sensor remains at less than 0.37 V for 5 seconds or more.	
P0193	Fuel rail pressure sensor circuit high input	Signal voltage from the fuel rail pressure sensor remains at more than 3.46 V for 5 seconds or more.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine ON and wait at least 60 seconds.
2. Check DTC or 1st trip DTC.

Is DTC or 1st trip DTC detected?

YES >> Proceed to EC-305, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008980

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 FRP SENSOR POWER SUPPLY-I

1. Turn ignition switch OFF.
2. Disconnect FRP sensor connector.
3. Turn ignition switch ON.
4. Check the voltage between FRP sensor harness connector terminals.

FRP sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F26	1	3	5 V

Inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK FRP SENSOR POWER SUPPLY-II

Check the voltage between FRP sensor harness connector and the ground.

+		–	Voltage (Approx.)
FRP sensor			
Connector	Terminal		
F26	1	Ground	5 V

Is inspection result normal?

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

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-190, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.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.

+		–		Continuity
FRP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F26	3	F111	40	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

ECM		Ground	Continuity
Connector	Terminal		
F111	5	Ground	Existed
E80	114		
	115		
	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

6.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.

+		–		Continuity
FRP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F26	2	F111	31	Existed

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

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK FRP SENSOR

Refer to EC-307, "Component Inspection (Fuel Rail Pressure Sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

Component Inspection (Fuel Rail Pressure Sensor)

INFOID:0000000009008981

1.CHECK FRP SENSOR

WITH CONSULT
1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Select “DATA MONITOR” mode with CONSULT.
5. Check that the “FUEL PRES SEN V” indication.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Engine speed: Idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Check FRP sensor signal voltage.

+		–		Condition	Value (Approx.)
ECM					
Connector	Terminal	Connector	Terminal		
F111	31	F111	40	[Engine is running] • Warm-up condition • Idle speed	0.82 – 1.22 V
				[Engine is running] • Warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END.

NO >> Replace FRP sensor. Refer to EM-49, "Exploded View".

P0191 FRP SENSOR

DTC Logic

INFOID:0000000009008982

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0191	Fuel rail pressure sensor	Fuel rail pressure remains at more than 14.5 MPa (147.9 kg/cm^2, 2102.5 psi) for 0.2 seconds or more during ignition ON.	• Harness or connectors (Fuel rail pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) (The electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Low fuel pressure sensor • Electrically-controlled cooling fan coupling

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and warm it up to the normal operating temperature.
   NOTE:
   Warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
2. Turn the ignition switch OFF and cool the engine until the engine coolant temperature reaches 35°C (95°F) or less.
   CAUTION:
   - **The difference between air temperature and engine coolant temperature must be 5°C (9°F) or less.**
   - **Do not turn ignition switch ON.**
3. Turn ignition switch ON and wait at least 60 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-309, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008983

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 FRP SENSOR POWER SUPPLY-I

1. Turn ignition switch OFF.
2. Disconnect FRP sensor connector.
3. Turn ignition switch ON.
4. Check the voltage between FRP sensor harness connector terminals.

FRP sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F26	1	3	5 V

Inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK FRP SENSOR POWER SUPPLY-II

Check the voltage between FRP sensor harness connector and the ground.

+		–	Voltage (Approx.)
FRP sensor			
Connector	Terminal		
F26	1	Ground	5 V

Is inspection result normal?

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

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-190, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.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.

+		–		Continuity
FRP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F26	3	F111	40	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

ECM		Ground	Continuity
Connector	Terminal		
F111	5	Ground	Existed
E80	114		
	115		
	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

6.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.

+		–		Continuity
FRP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F26	2	F111	31	Existed

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

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK FRP SENSOR

Refer to EC-307, "Component Inspection (Fuel Rail Pressure Sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

Component Inspection (Fuel Rail Pressure Sensor)

INFOID:0000000009008984

1.CHECK FRP SENSOR

WITH CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Select “DATA MONITOR” mode with CONSULT.
5. Check that the “FUEL PRES SEN V” indication.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Engine speed: Idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Check FRP sensor signal voltage.

+		–		Condition	Value (Approx.)
ECM					
Connector	Terminal	Connector	Terminal		
F111	31	F111	40	[Engine is running] • Warm-up condition • Idle speed	0.82 – 1.22 V
				[Engine is running] • Warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Replace FRP sensor. Refer to EM-49, "Exploded View".

P0196 EOT SENSOR

DTC Logic

INFOID:0000000009008985

DTC DETECTION LOGIC

NOTE:
If DTC P0196 is displayed with DTC P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198. Refer to EC-317, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0196	EOT SENSOR [Engine oil temperature (EOT) sensor circuit 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.	• Harness or connectors (The EOT sensor circuit is open or shorted) • EOT 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.	• Harness or connectors (High or low resistance in the EOT sensor circuit) • EOT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 6.
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 11 V or more at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MULFUNCTION A-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for 5 minutes and 10 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-315, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MULFUNCTION A-II

With CONSULT
1. Select “DATA MONITOR” mode with CONSULT.
2. Check that “COOLAN TEMP/S” indicates above 80°C (176°F).
   If it is above 80°C (176°F), go to the following steps.

If it is below 80°C (176°F), warm engine up until “COOLAN TEMP/S” indicates more than 80°C (176°F). Then perform the following steps.

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 with CONSULT.
6. Check the following.

COOLAN TEMP/S	Below 40°C (104°F)
INT/A TEMP SE	Below 40°C (104°F)
Difference between “COOLAN TEMP/S” and “INT/A TEMP SE”	Within 6°C (11°F)

If they are within the specified range, perform the following steps.
If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.
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-315, "Diagnosis Procedure".
NO >> GO TO 5.

5. PERFORM COMPONENT FUNCTION CHECK (FOR MULFUNCTION B)

Perform component function check. Refer to EC-315, "Component Function Check".
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.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-315, "Diagnosis Procedure".

6. PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 7.

7. PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the food open.

4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

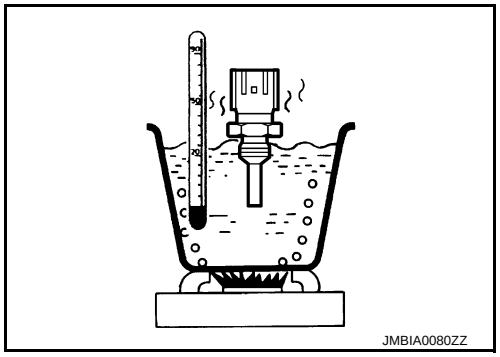
YES >> Proceed to EC-315, "Diagnosis Procedure".
NO >> INSPECTION END

Component Function Check

INFOID:0000000009008986

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-56, "Exploded View".
4. Check resistance between EOT sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 – 2.73
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-315, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident"

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-315, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009008987

1.CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

Check EOT sensor. Refer to EC-315, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace EOT sensor. Refer to EM-56, "Exploded View".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

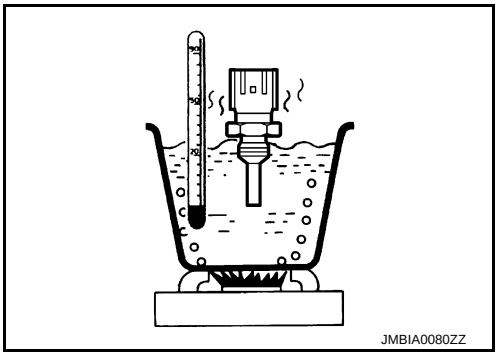
Component Inspection

INFOID:0000000009008988

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-56, "Exploded View".

4. Check resistance between EOT sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 – 2.73
		50 (122)	0.68 – 1.00
		90 (194)	0.236 – 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EOT sensor. Refer to EM-56, "Exploded View".

P0197, P0198 EOT SENSOR

DTC Logic

INFOID:0000000009008989

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC Detecting Condition	Possible Cause
P0197	EOT SEN/CIRC (Engine oil temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The engine oil temperature sensor circuit is open or shorted.) • Engine oil temperature sensor
P0198	EOT SEN/CIRC (Engine oil temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-317, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008990

1.CHECK ENGINE OIL TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine oil temperature (EOT) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between EOT sensor harness connector and ground.

EOT sensor		Ground	Voltage (V)
Connector	Terminal		
F38	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK EOT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F38	2	F111	40	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-318, "Component Inspection (Engine Oil Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace engine oil temperature sensor. Refer to EM-56, "Exploded View".

4.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

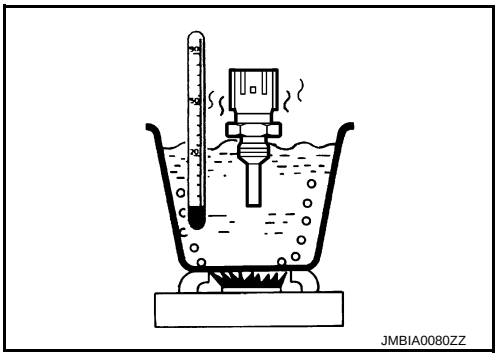
>> INSPECTION END

Component Inspection (Engine Oil Temperature Sensor)

INFOID:0000000009008991

1.CHECK ENGINE OIL TEMPERATURE SENSOR

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



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 - 2.73
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine oil temperature sensor. Refer to EM-56, "Exploded View".

P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208 INJECTOR

DTC Logic

INFOID:0000000009008992

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0201	No.1 fuel injector circuit	ECM detects No. 1 injector circuit is open or shorted.	• The fuel injector circuit is open or shorted • Fuel injector • ECM
P0202	No. 2 fuel injector circuit	ECM detects No. 2 injector circuit is open or shorted.	
P0203	No. 3 fuel injector circuit	ECM detects No. 3 injector circuit is open or shorted.	
P0204	No. 4 fuel injector circuit	ECM detects No. 4 injector circuit is open or shorted.	
P0205	No. 5 fuel injector circuit	ECM detects No. 5 injector circuit is open or shorted.	
P0206	No. 6 fuel injector circuit	ECM detects No. 6 injector circuit is open or shorted.	
P0207	No. 7 fuel injector circuit	ECM detects No. 7 injector circuit is open or shorted.	
P0208	No. 8 fuel injector circuit	ECM detects No. 8 injector circuit is open or shorted.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine and let it idle at least 30 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-319, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008993

1.PERFORM TROUBLE DIAGNOSIS FOR INJECTOR

Refer to EC-543, "Component Function Check".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

P0222, P0223 TP SENSOR

DTC Logic

INFOID:0000000009008994

DTC DETECTION LOGIC

NOTE:
If DTC P0222 or P0223 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0222	TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit low input)	An excessively low voltage from the TP sensor 1 is sent to ECM.	• Harness or connectors (TP sensor 1 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1)
P0223	TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit high input)	An excessively high voltage from the TP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-320, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008995

1.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

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

Electric throttle control actuator		Ground	Voltage (V)
Connector	Terminal		
F66	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	4	F110	97	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	1	F110	91	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR

Refer to EC-321, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

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

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000009008996

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-162, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F110	91 (TP sensor 1 signal)	97 (Sensor ground)	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	79 (TP sensor 2 signal)			Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

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

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

DTC Logic

INFOID:0000000009008997

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the 1st trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
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 signal every 1,000 engine revolutions.
   A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0300	MULTI CYL MISFIRE (Multiple cylinder misfires detected)	Multiple cylinders misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector circuit is open or shorted • Fuel injector • Intake air leakage • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • A/F sensor 1 • Incorrect PCV hose connection
P0301	CYL 1 MISFIRE (No.1 cylinder misfire detected)	No. 1 cylinder misfires.	
P0302	CYL 2 MISFIRE (No. 2 cylinder misfire detected)	No. 2 cylinder misfires.	
P0303	CYL 3 MISFIRE (No. 3 cylinder misfire detected)	No. 3 cylinder misfires.	
P0304	CYL 4 MISFIRE (No. 4 cylinder misfire detected)	No. 4 cylinder misfires.	
P0305	CYL 5 MISFIRE (No. 5 cylinder misfire detected)	No. 5 cylinder misfires.	
P0306	CYL 6 MISFIRE (No. 6 cylinder misfire detected)	No. 6 cylinder misfires.	
P0307	CYL 7 MISFIRE (No. 7 cylinder misfire detected)	No. 7 cylinder misfires.	
P0308	CYL 8 MISFIRE (No. 8 cylinder misfire detected)	No. 8 cylinder misfires.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and let it idle for about 15 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-324, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.
   Hold the accelerator pedal as steady as possible.
   Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.
   CAUTION:
   Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

Engine speed	Engine speed in the freeze frame data ± 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 × (1 ± 0.1)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

Driving time varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-324, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009008998

1.CHECK FOR INTAKE AIR LEAKAGE AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leakage.
3. Check PCV hose connection.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.
NO >> GO TO 2.

2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 3.
YES-2 >> Without CONSULT: GO TO 4.
NO >> Repair or replace malfunctioning part.

3. PERFORM POWER BALANCE TEST

WITH CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

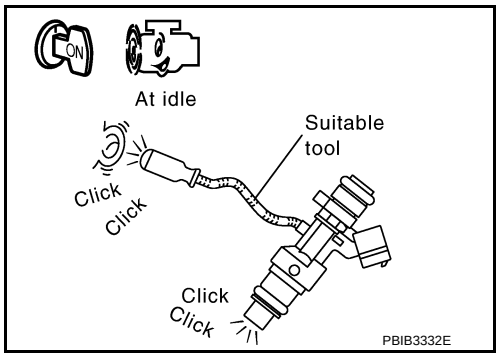
Is the inspection result normal?

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

4. CHECK FUNCTION OF FUEL INJECTOR-I

1. Start engine and let it idle.
2. Listen to each fuel injector operation.

Clicking sound should be heard.



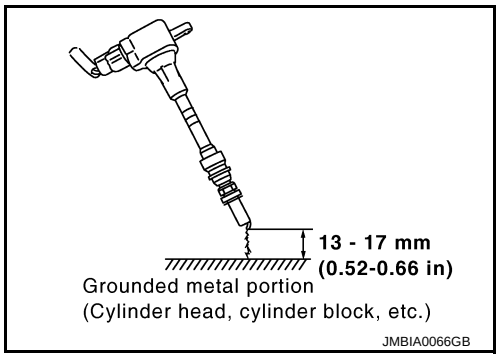
Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-543, "Diagnosis Procedure".

5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse No. in IPDM E/R to release fuel pressure.
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **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 9.
NO >> GO TO 6.

6. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

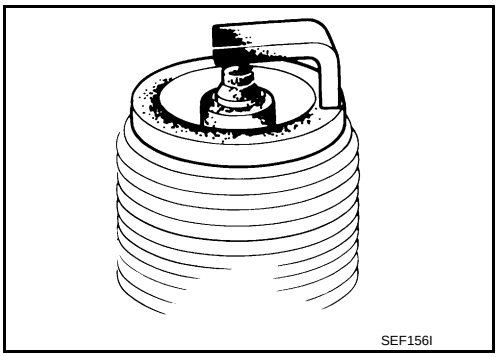
YES >> GO TO 7.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-551, "Diagnosis Procedure".

7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-140, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 8.



8. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-140, "Spark Plug".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-16, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Check fuel pressure. Refer to EC-168, "Work Procedure".

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”.
NO >> Repair or replace malfunctioning part.

12. CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.
For procedure, refer to EC-577, "Inspection" and EC-578, "Inspection".
For specification, refer to EC-585, "Idle Speed" and EC-585, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Follow the EC-153, "Work Procedure".

13. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

15. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 16.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

16. CHECK A/F SENSOR 1 HEATER

Refer to EC-204, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace malfunctioning A/F sensor 1. Refer to EX-5, "Exploded View".

17. CHECK MASS AIR FLOW SENSOR

WITH CONSULT
Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT.
For specification, refer to EC-585, "Mass Air Flow Sensor".

WITH GST
Check mass air flow sensor signal in Service $01 with GST.
For specification, refer to EC-585, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 18.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-229, "Diagnosis Procedure".

18. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-571, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 19.
NO >> Repair or replace malfunctioning part.

19. 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-71, "CONSULT Function" or EC-68, "On Board Diagnosis Function".

>> GO TO 20.

20. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0327, P0328, P0332, P0333 KS

DTC Logic

INFOID:0000000009008999

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detected condition	Possible cause
P0327	KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit low input]	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The knock sensor circuit is open or shorted.) • Knock sensor
P0328	KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit high input]	An excessively high voltage from the sensor is sent to ECM.	
P0332	KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit low input]	An excessively low voltage from the sensor is sent to ECM.	
P0333	KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit high input]	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-329, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009000

1.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector and ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

DTC	Knock sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0327, P0328	1	F203	2	F111	35	Existed
P0332, P0333	2	F204	2			

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

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between knock sensor and ECM
- Loose or poor connection for each connector and harness

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

3.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Knock sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0327, P0328	1	F203	1	F111	29	Existed
P0332, P0333	2	F204	1		33	

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

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and knock sensor
- Loose or poor connection for each connector and harness

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

5.CHECK KNOCK SENSOR

Refer to EC-330, "Component Inspection (Knock Sensor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning knock sensor. Refer to EM-115, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Knock Sensor)

INFOID:0000000009009001

1.CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as per the following.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Terminals	Resistance
1 and 2	Approx. 532 - 588 kΩ [at 20°C (68°F)]

CAUTION:
Never use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning knock sensor. Refer to EM-115, "Exploded View".

P0335 CKP SENSOR

DTC Logic

INFOID:0000000009009002

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0335	CKP SEN/CIRCUIT (Crankshaft position sensor circuit)	• The crankshaft position sensor signal is not detected by the ECM during the first few seconds of engine cranking. • The proper pulse signal from the crankshaft position sensor is not sent to ECM while the engine is running. • The crankshaft position sensor signal is not in the normal pattern during engine running.	• Harness or connectors (Crankshaft position sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Refrigerant pressure sensor circuit is open or shorted.) (EVAP control system pressure sensor circuit is open or shorted.) • Crankshaft position sensor • Accelerator pedal position sensor • Battery current sensor • Camshaft position sensor (bank 1) • Refrigerant pressure sensor • EVAP control system pressure sensor • Signal plate

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10.5 V or more with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-331, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009003

1.CHECK CRANKSHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect crankshaft position (CKP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CKP sensor harness connector and ground.

CKP sensor		Ground	Voltage (V)
Connector	Terminal		
F74	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK CKP SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch ON.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor harness connector and ECM harness connector.

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F74	1	F110	76	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	CKP sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (With ICC)	E67	9
	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.
- Battery current sensor (Refer to EC-448, "Component Inspection (Battery Current Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

7.CHECK CKP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F74	2	F110	98	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK CKP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F74	3	F110	86	Existed

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

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace crankshaft position sensor.

10.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace the signal plate.

11.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

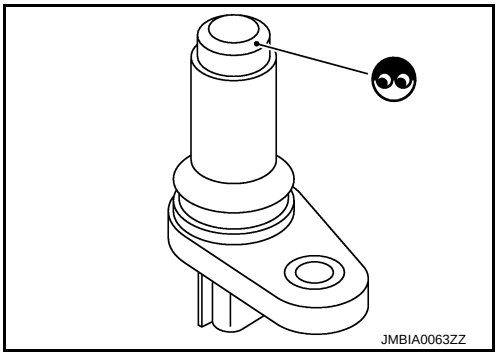
Component Inspection (Crankshaft Position Sensor)

INFOID:0000000009009004

1.CHECK CRANKSHAFT POSITION SENSOR-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect crankshaft position sensor harness connector.
4. Remove the sensor.

5. Visually check the sensor for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor. Refer to EM-59, "Exploded View".

2. CHECK CRANKSHAFT POSITION SENSOR-II

Check resistance between crankshaft position sensor terminals as per the following.

Terminals (Polarity)	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace crankshaft position sensor. Refer to EM-59, "Exploded View".

P0340, P0345 CMP SENSOR

DTC Logic

INFOID:0000000009009005

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0340	CMP SEN/CIRC-B1 [Camshaft position sensor (bank 1) circuit]	• The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. • The cylinder No. signal is not sent to ECM during engine running. • The cylinder No. signal is not in the normal pattern during engine running.	• Harness or connectors [Camshaft position sensor (bank 1) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) [Crankshaft position sensor circuit is shorted.] (Refrigerant pressure sensor circuit is open or shorted.) (EVAP control system pressure sensor circuit is open or shorted.) • Camshaft position sensor (bank 1) • Accelerator pedal position sensor • Battery current sensor • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery
P0345	CMP SEN/CIRC-B2 [Camshaft position sensor (bank 2) circuit]		• Harness or connectors [Camshaft position sensor (bank 2) circuit is open or shorted.] • Camshaft position sensor (bank 2) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10.5 V or more with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-336, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Maintain engine speed at more than 800 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-336, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009006

1.CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.
NO >> Check starting system. (Refer to STR-10, "Work Flow (With GR8-1200 NI)", or STR-13, "Work Flow (Without GR8-1200 NI)". For the details of the GR8-1200 NI, refer to STR-3, "Special Service Tools".)

2.CHECK CAMSHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect camshaft position (CMP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CMP sensor harness connector and ground.

DTC	CMP sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P0340	1	F84	1	Ground	Approx. 5
P0345	2	F83	1		

Is the inspection result normal?

YES >> GO TO 8.
NO-1 >> P0340: GO TO 3.
NO-2 >> P0345: Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK CMP SENSOR POWER SUPPLY CIRCUIT-II

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
Bank	Connector	Terminal	Connector	Terminal	
1	F84	1	F110	77	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	CKP sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (With ICC)	E67	9
	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Battery current sensor (Refer to EC-448, "Component Inspection (Battery Current Sensor)".)
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK CMP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	CMP sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F84	2	F110	68	Existed
P0345	2	F83	2		99	

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

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK CMP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	CMP sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F84	3	F110	95	Existed
P0345	2	F83	3		73	

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

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK CAMSHAFT POSITION SENSOR

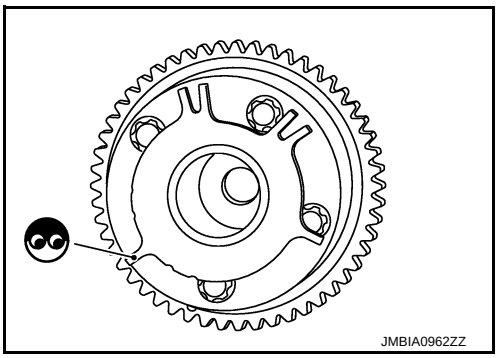
Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 11
NO >> Replace malfunctioning camshaft position sensor. Refer to EM-63, "Exploded View".

11. CHECK CAMSHAFT (INT)

Check the following.
- Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end



Is the inspection result normal?

YES >> GO TO 12.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

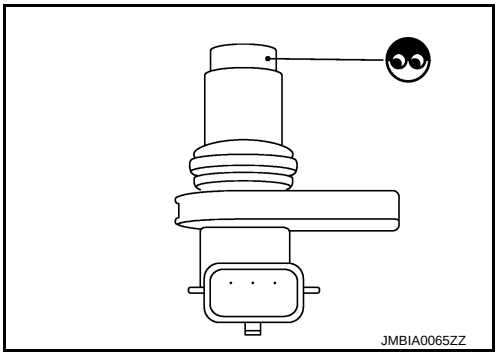
>> INSPECTION END

Component Inspection (Camshaft Position Sensor)

INFOID:0000000009009007

1. CHECK CAMSHAFT POSITION SENSOR-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position sensor harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning camshaft position sensor.

2. CHECK CAMSHAFT POSITION SENSOR-II

Check resistance camshaft position sensor terminals as per the following.

Terminals (Polarity)	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning camshaft position sensor. Refer to EM-63, "Exploded View".

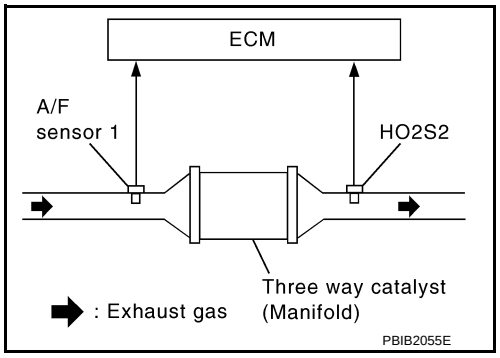
P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

INFOID:0000000009009008

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0420	TW CATALYST SYS-B1 [Catalyst system efficiency below threshold (bank 1)]	• Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity.	• Three way catalyst (manifold) • Exhaust tube • Intake air leakage • Fuel injector • Fuel injector leakage • Spark plug • Improper ignition timing
P0430	TW CATALYST SYS-B2 [Catalyst system efficiency below threshold (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

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.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT

TESTING CONDITION:

Do not maintain engine speed for more than the specified minutes below.

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT.
11. Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of “CATALYST”.

Which is displayed on CONSULT screen?

CMPLT >> GO TO 5.
INCMP >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Wait 5 seconds at idle.
2. Rev engine between 2,000 and 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).

Does the indication change to “CMPLT”?

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

4. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 2.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-341, "Diagnosis Procedure".
NO >> INSPECTION END

6. PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform component function check. Refer to EC-340, "Component Function Check".
NOTE:
Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-341, "Diagnosis Procedure"

Component Function Check

INFOID:0000000009009009

1. PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Open engine hood.
6. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0420	F110	96 [HO2S2 (bank 1)]	100	Keeping engine speed at 2,500 rpm constant under no load	The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0
P0430		87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-341, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009010

1. CHECK EXHAUST SYSTEM

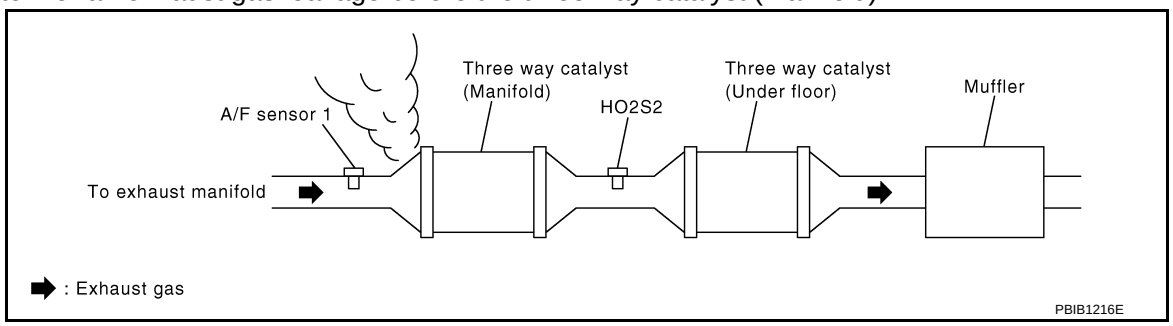
Visually check exhaust tubes and muffler for dents.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before the three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

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

4. CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.
For procedure, refer to EC-577, "Inspection" and EC-578, "Inspection".
For specification, refer to EC-585, "Idle Speed" and EC-585, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-153, "Work Procedure".

5. CHECK FUEL INJECTORS

Refer to EC-543, "Component Function Check".

Is the inspection result normal?

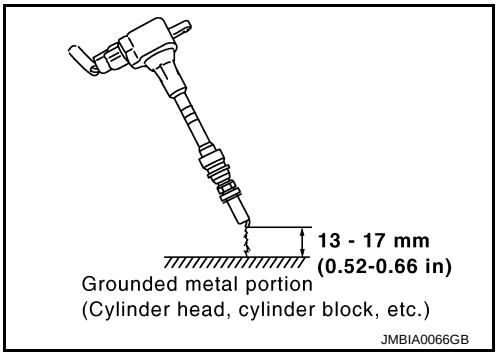
YES >> GO TO 6.
NO >> Perform EC-543, "Diagnosis Procedure".

6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
   NOTE:
   - For the fuse number, refer to EC-125, "Wiring Diagram".
   - For the fuse arrangement, refer to PG-96, "Fuse, Connector and Terminal Arrangement".
   - Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.

6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

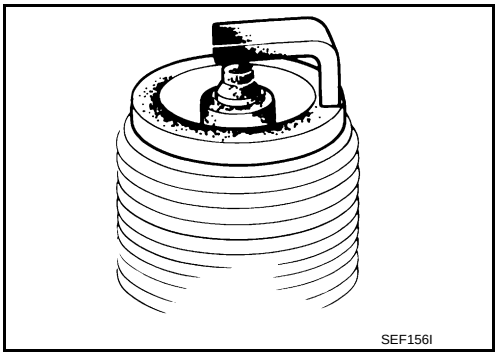
YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-551, "Diagnosis Procedure".

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-140, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-140, "Spark Plug".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to EM-49, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.
6. Check that fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping.
NO >> GO TO 11.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace three way catalyst assembly.
NO >> Repair or replace harness or connector.

P0441 EVAP CONTROL SYSTEM

DTC Logic

INFOID:0000000009009011

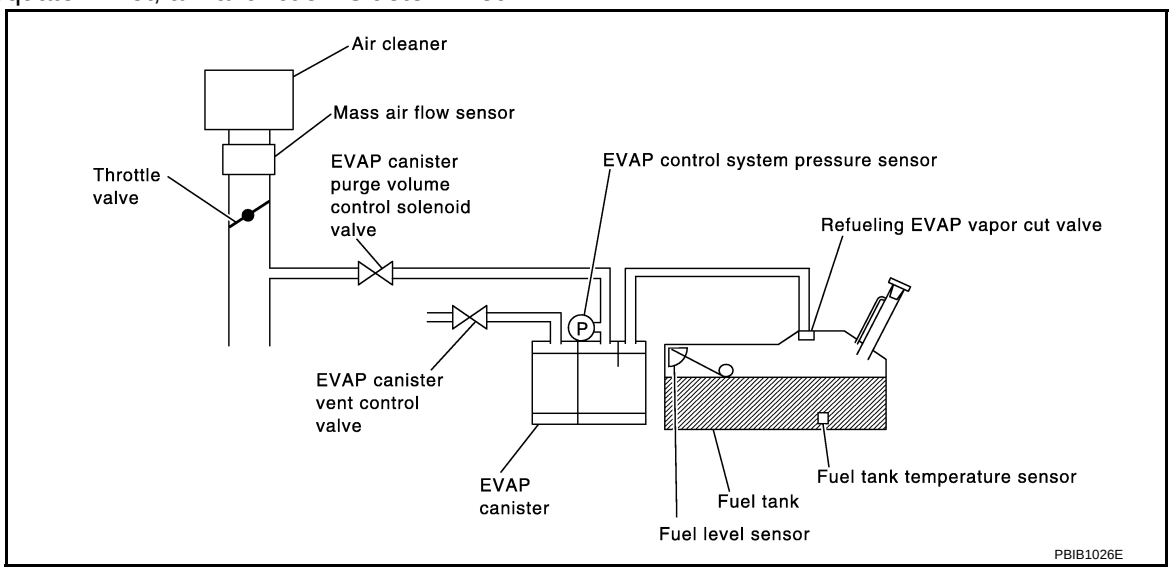
DTC DETECTION LOGIC

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0441	EVAP PURG FLOW/MON (EVAP control system incorrect purge flow)	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	• EVAP canister purge volume control solenoid valve stuck closed • EVAP control system pressure sensor and the circuit • Loose, disconnected or improper connection of rubber tube • Blocked rubber tube • Cracked EVAP canister • EVAP canister purge volume control solenoid valve circuit • Accelerator pedal position sensor • Blocked purge port • EVAP canister vent control valve

DTC CONFIRMATION PROCEDURE

1.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.

Will CONSULT be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT.
7. Touch “START”.

Is “COMPLETED” displayed on CONSULT screen?

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

3. PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, “TESTING” will be displayed on the CONSULT screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 MPH)
ENG SPEED	500 - 3,000 rpm
B/FUEL SCHDL	1.3 - 17.0 msec
COOLAN TEMP/S	More than 0°C (32°F)

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
If “TESTING” does not change for a long time, retry from step 2.

Is “COMPLETED” displayed on CONSULT screen?

YES >> GO TO 4.
NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 2.

4. PERFORM DTC CONFIRMATION PROCEDURE-III

Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Proceed to EC-346, "Diagnosis Procedure".

5. PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform component function check. Refer to EC-345, "Component Function Check".
NOTE:
Use component function check to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-346, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009012

1. PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Lift up drive wheels.
2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.

5. Set voltmeter probes to ECM harness connector terminals under the following conditions.

ECM		
Connector	+	–
	Terminal	Terminal
E80	143 (EVAP control system pressure sensor signal)	150

6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than P, N or R

8. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 6) for at least 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-346, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009013

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-12, "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.
2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.
4. 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. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to EC-52, "EVAPORATIVE EMISSION SYSTEM : System Description".

4. Start engine and let it idle.
   Never depress accelerator pedal even slightly.
5. Check vacuum gauge indication before 60 seconds pass after starting engine.

Vacuum should not exist.

6. Rev engine up to 2,000 rpm after 100 seconds pass after starting engine.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK EVAP PURGE LINE

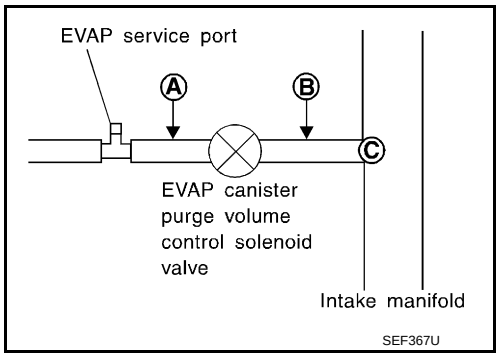
1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
   Refer to FL-11, "Hydraulic Layout".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair EVAP purge line.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

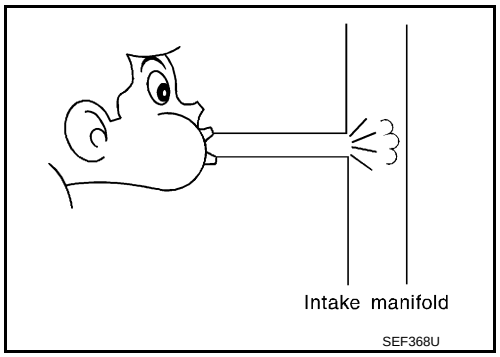
1. Disconnect purge hoses connected to EVAP service port (**A**) and EVAP canister purge volume control solenoid valve (**B**).
2. Blow air into each hose and EVAP purge port (**C**).



3. Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.
YES-2 >> Without CONSULT: GO TO 7.
NO >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

WITH CONSULT
1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-352, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-12, "Exploded View".

8. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-368, "DTC Logic" for DTC P0452, EC-373, "DTC Logic" for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP control system pressure sensor.

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-358, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace EVAP canister vent control valve.

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to FL-11, "Hydraulic Layout".

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.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000009009014

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0443	PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve)	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	• EVAP control system pressure sensor • EVAP canister purge volume control solenoid valve (The valve is stuck open.) • EVAP canister vent control valve • EVAP canister • Hoses (Hoses are connected incorrectly or clogged.)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

Do you have CONSULT

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

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT.
7. Touch “START”.
8. Start engine and let it idle until “TESTING” on CONSULT changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.
9. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Proceed to EC-350, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 20 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC displayed?

YES >> Proceed to EC-350, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009015

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge volume control solenoid valve		Ground	Voltage
Connector	Terminal		
F48	1	Ground	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM
- Loose or poor connection for each connector and harness

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

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
F48	2	F110	64	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace EVAP control system pressure sensor.

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

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.

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

WITH CONSULT
1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-352, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-12, "Exploded View".

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-358, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

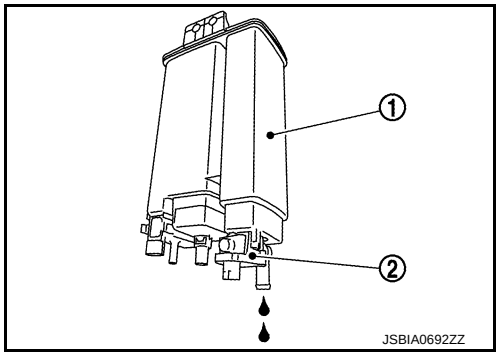
10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from EVAP canister (1).

- EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 11.
NO >> GO TO 13.



11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-11, "Hydraulic Layout".

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

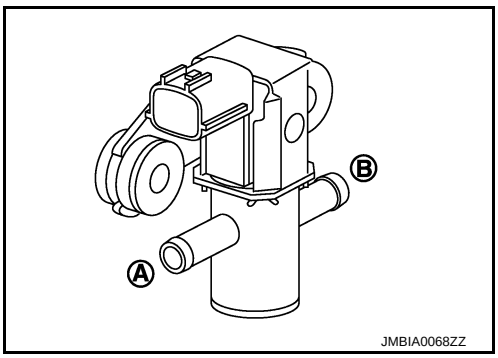
Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)

INFOID:0000000009009016

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

WITH CONSULT

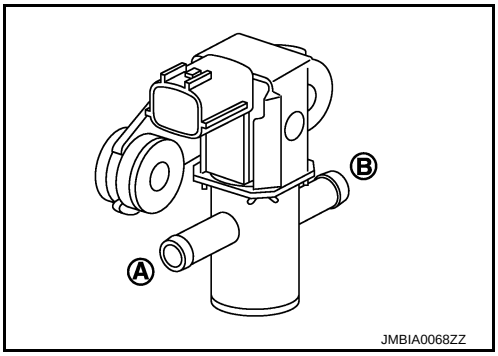
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Turn ignition switch ON.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.
6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-11, "Hydraulic Layout".

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000009009017

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0444	PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit open)	An excessively low voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is open or shorted.) • EVAP canister purge volume control solenoid valve
P0445	PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit shorted)	An excessively high voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is shorted.) • EVAP canister purge volume control solenoid valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-353, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009018

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge volume control solenoid valve		Ground	Voltage
Connector	Terminal		
F48	1	Ground	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R

• Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

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

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
F48	2	F110	64	Existed

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

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 4.
YES-2 >> Without CONSULT: GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

WITH CONSULT
1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-352, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace EVAP canister purge volume control solenoid valve.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)

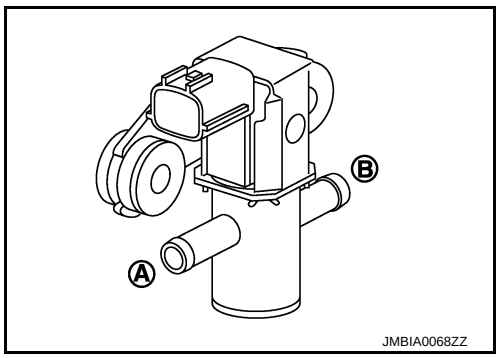
INFOID:0000000009009019

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. Turn ignition switch ON.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.

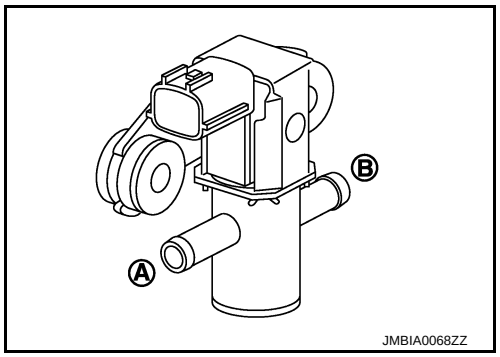
6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-11, "Hydraulic Layout".

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:0000000009009020

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0447	VENT CONTROL VALVE (EVAP canister vent control valve circuit open)	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	• Harness or connectors (The valve circuit is open or shorted.) • EVAP canister vent control valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-356, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009021

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

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

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

WITH CONSULT
1. Turn ignition switch OFF and then ON.
2. Select “VENT CONTROL/V” in “ACTIVE TEST” mode with CONSULT.
3. Touch “ON/OFF” on CONSULT screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

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.

EVAP canister vent control valve		Ground	Voltage
Connector	Terminal		
C18	1	Ground	Battery voltage

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP canister vent control valve and IPDM E/R
- Loose or poor connection for each connector and harness

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

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister vent control valve harness connector and ECM harness connector.

EVAP canister vent control valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
C18	2	E80	120	Existed

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between EVAP canister vent control valve and ECM

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

7. 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 8.
NO >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-358, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

9. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Canister Vent Control Valve)

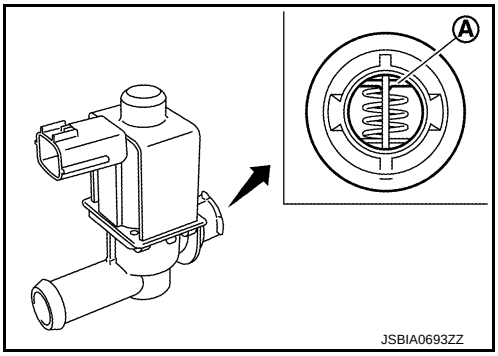
INFOID:0000000009009022

1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".
NO >> GO TO 2.



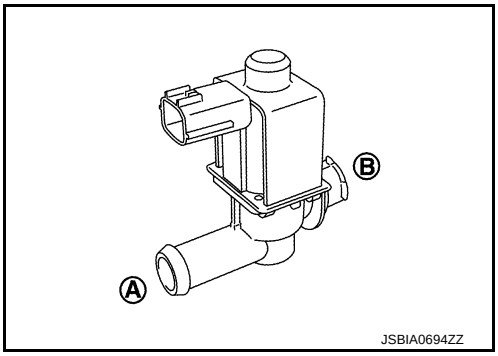
2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

WITH CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time.
   Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.



WITHOUT CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
   Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

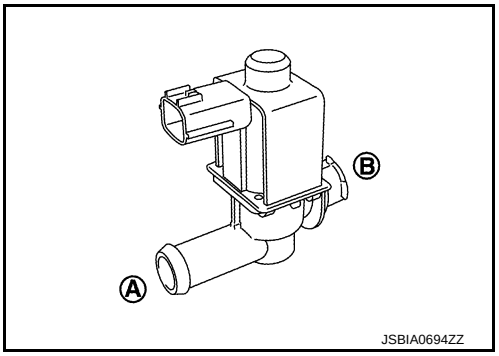
WITH CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

3. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.



WITHOUT CONSULT
1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

P0448 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:0000000009009023

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0448	VENT CONTROL VALVE (EVAP canister vent control valve close)	EVAP canister vent control valve remains closed under specified driving conditions.	• EVAP canister vent control valve • EVAP control system pressure sensor and the circuit • Blocked rubber tube to EVAP canister vent control valve • EVAP canister is saturated with water

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and let it idle for at least 1 minute.
4. Repeat next procedures 3 times.

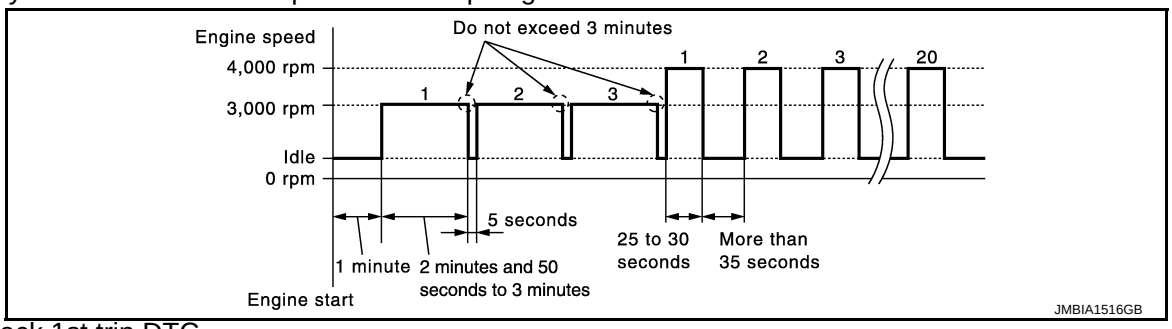
- Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes and 50 seconds to 3 minutes.

Do not exceed 3 minutes.

- Fully released accelerator pedal and keep engine idle for approximately 5 seconds.

5. Repeat next procedure 20 times.

- Quickly increase the engine speed up to between 4,000 and 4,500 rpm and maintain that speed for 25 to 30 seconds.
- Fully released accelerator pedal and keep engine idle for at least 35 seconds.



6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-360, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009024

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

Refer to EC-358, "Component Inspection (EVAP Canister Vent Control Valve)".

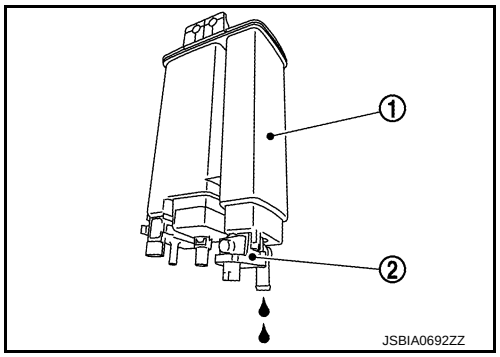
Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

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 (1).

2 : EVAP canister vent control valve



Does water drain from EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.

4.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-11, "Hydraulic Layout".

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

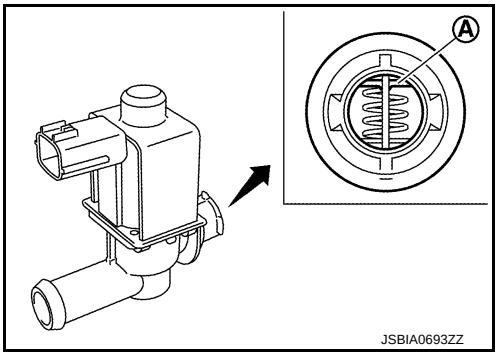
>> INSPECTION END

Component Inspection (EVAP Canister Vent Control Valve)

INFOID:0000000009009025

1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion (A) of EVAP canister vent control valve for rust.



Is it rusted?

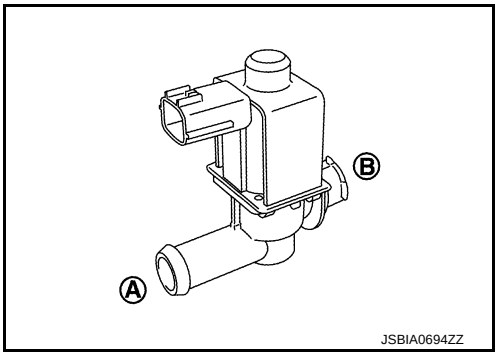
YES >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

NO >> GO TO 2.

2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

WITH CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time.
   Check that new O-ring is installed properly.



VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

WITHOUT CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
   Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

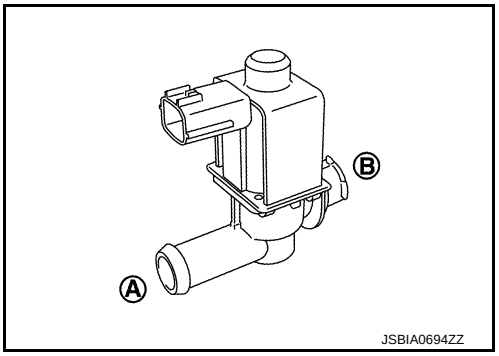
WITH CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

3. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.



WITHOUT CONSULT
1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:0000000009009026

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0451	EVAP SYS PRES SEN (EVAP control system pressure sensor performance)	ECM detects a sloshing signal from the EVAP control system pressure sensor	• (EVAP control system pressure sensor circuit is shorted.) Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

NOTE:
Never remove fuel filler cap during DTC confirmation procedure.

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

With CONSULT>>GO TO 2.
Without CONSULT>>GO TO 5.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Start engine and let it idle for least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-365, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Select “EVAP DIAG READY” in “DATA MONITOR” mode of “ENGINE”.
2. Let it idle until “OFF” of “EVAP DIAG READY” changes to “ON”.
   NOTE:
   It will take at most 2 hours until “OFF” of “EVAP DIAG READY” changes to “ON”.
3. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON.
5. Select “EVAP LEAK DIAG” in “DATA MONITOR” mode of “ENGINE”.
6. Check that “EVAP LEAK DIAG” indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 4.
YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.
2. GO TO 1.

4. PERFORM DTC CONFIRMATION PROCEDURE-3

With CONSULT
Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-365, "Diagnosis Procedure".
NO >> INSPECTION END

5. PERFORM DTC CONFIRMATION PROCEDURE-4

With GST
1. Start engine and let it idle for least 40 seconds.
NOTE:
Do not depress accelerator pedal even slightly.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-365, "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-365, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009027

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
C17	3	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-461, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer toEC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.
Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system)
Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP control system pressure sensor.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000009009028

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.

2. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	143	150	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Never apply below -93.3 kPa (-0.952 kg/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.

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:0000000009009029

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0452	EVAP SYS PRES SEN (EVAP control system pressure sensor low input)	An excessively low voltage from the sensor is sent to ECM.	• (EVAP control system pressure sensor circuit is shorted.) Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “DATA MONITOR” mode with CONSULT.
7. Check that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.

ECM		
Connector	+	–
	Terminal	Terminal
E80	134 (Fuel tank temperature sensor signal)	175

3. Check that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.

8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-369, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009030

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
C17	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
C17	3	E80	133	Existed

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between ECM and EVAP control system pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

5. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E80	133	EVAP control system pressure sensor	C17	3
		Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-448, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.
Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system)
Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
C17	1	E80	150	Existed

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP control system pressure sensor and ECM

• Loose or poor connection for each connector and harness

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

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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	
C17	2	E80	143	Existed

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

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
• Harness for open or short between EVAP control system pressure sensor and ECM
• Loose or poor connection for each connector and harness

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

13. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000009009031

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	143	150	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:
• **Always calibrate the vacuum pump gauge when using it.**

- **Never apply below -93.3 kPa (-0.952 kg/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.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:0000000009009032

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0453	EVAP SYS PRES SEN (EVAP control system pressure sensor high input)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (EVAP control system pressure sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • Crankshaft position sensor • Camshaft position sensor (bank 1) • Accelerator pedal position sensor 2 • Battery current sensor • Refrigerant pressure sensor • EVAP canister vent control valve • EVAP canister • Rubber hose from EVAP canister vent control valve to vehicle frame

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “DATA MONITOR” mode with CONSULT.
7. Check that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.

ECM		Ground
Connector	+	–
	Terminal	Terminal
E80	134 (Fuel tank temperature sensor signal)	175

3. Check that the voltage is less than 4.2 V.

4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-374, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009033

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
C17	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
C17	3	E80	133	Existed

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between ECM and EVAP control system pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

5. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-461, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.
Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system)
Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
C17	1	E80	150	Existed

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP control system pressure sensor and ECM
- Loose or poor connection for each connector and harness

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

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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	
C17	2	E80	143	Existed

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

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP control system pressure sensor and ECM
- Loose or poor connection for each connector and harness

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

13. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve. Refer to FL-11, "Hydraulic Layout".
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

14. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-358, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

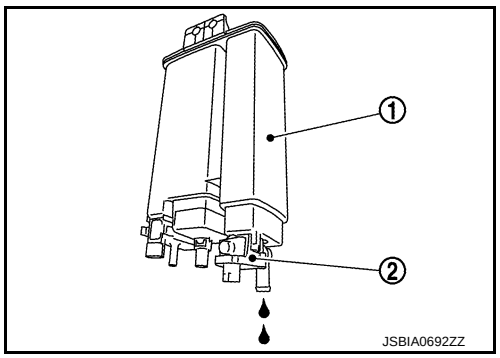
16. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Check if water will drain from the EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from EVAP canister?

YES >> GO TO 17.
NO >> GO TO 19.



17. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 18.

18. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-11, "Hydraulic Layout".

19. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000009009034

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	143	150	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:
- **Always calibrate the vacuum pump gauge when using it.**
- **Never apply below -93.3 kPa (-0.952 kg/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.

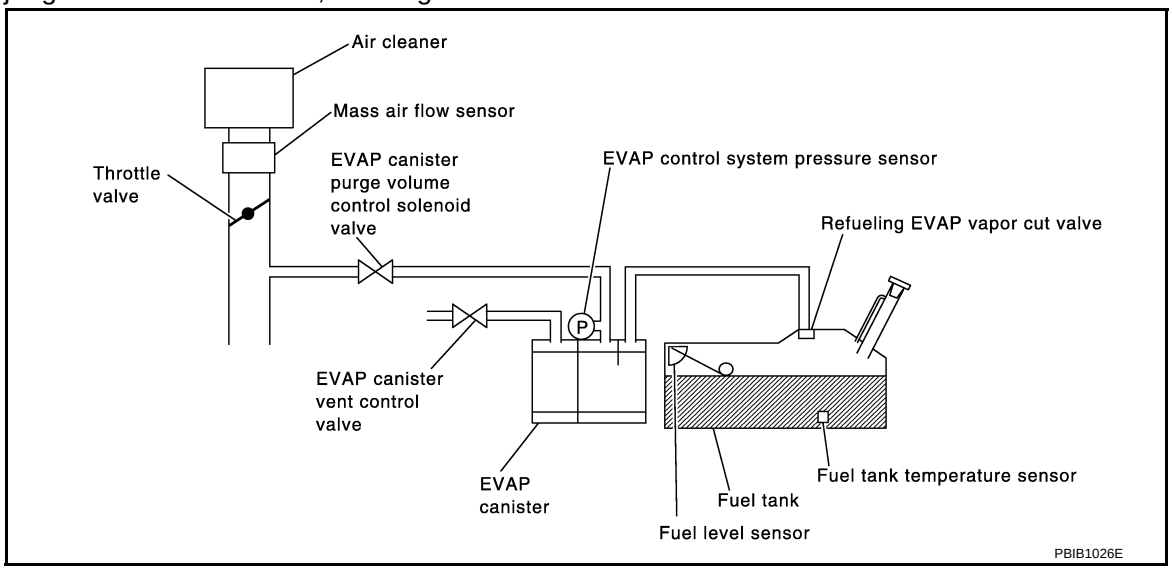
P0456 EVAP CONTROL SYSTEM

DTC Logic

INFOID:0000000009009035

DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.
If ECM judges there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0456	Evaporative emission control system leak	• EVAP system has a leak. • EVAP system does not operate properly.	• Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or does not close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks • Fuel level sensor and the circuit • Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.**
- **If the fuel filler cap is not tightened properly, the MIL may illuminate.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT

1. Turn ignition switch ON and select “EVAP DIAG READY” in “DATA MONITOR” mode with CONSULT.
2. Start engine and wait at idle until “OFF” of “EVAP DIAG READY” changes to “ON”.
   NOTE:
   It will take at most 2 hours until “OFF” of “EVAP DIAG READY” changes to “ON”.
3. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON and select “EVAP LEAK DIAG” in “DATA MONITOR” mode with CONSULT.
5. Check that “EVAP LEAK DIAG” indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 3.
YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed toEC-379, "Diagnosis Procedure".
NO >> INSPECTION END.

4.PERFORM DTC CONFIRMATION PROCEDURE

WITH GST

1. Start engine and wait engine idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-379, "Diagnosis Procedure".
NO >> INSPECTION END.

Diagnosis Procedure

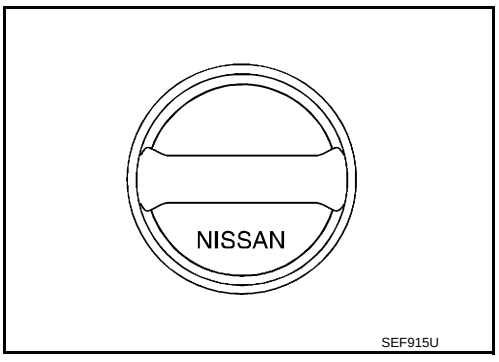
INFOID:0000000009009036

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-382, "Component Inspection (Fuel Filler Cap)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filler cap with a genuine one.

5.CHECK FOR EVAP LEAK

Refer to FL-13, "Inspection".

Is there any leak in EVAP line?

YES >> Repair or replace.
NO >> GO TO 6.

6.CHECK EVAP CANISTER VENT CONTROL VALVE

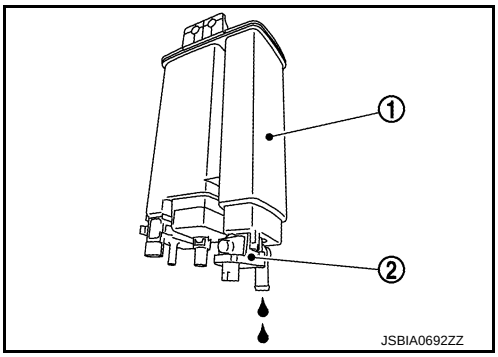
Check the following.
- EVAP canister vent control valve is installed properly.
  Refer to FL-12, "Exploded View".
- EVAP canister vent control valve.
  Refer to EC-358, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to FL-12, "Exploded View".

7.CHECK IF EVAP CANISTER SATURATED WITH WATER

1. Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister.



Does water drain from EVAP canister?

YES >> GO TO 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-12, "Exploded View".
The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 10.
YES-2 >> Without CONSULT: GO TO 11.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-11, "Hydraulic Layout".

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.
2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT screen to increase “PURG VOL CONT/V” opening to 100%.
5. Check vacuum hose for vacuum.

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.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to FL-11, "Hydraulic Layout".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or reconnect the hose.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-352, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-12, "Exploded View".

14. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-302, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel level sensor unit. Refer to FL-5, "Removal and Installation".

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 16.

NO >> Replace EVAP control system pressure sensor. Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".

16. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to FL-11, "Hydraulic Layout".

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 FL-11, "Hydraulic Layout".

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-9, "Exploded View".

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-563, "Component Inspection (EVAP Vapor Cut Valve)".

Is the inspection result normal?

YES >> GO TO 21.
NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-12, "Exploded View".

21. CHECK FUEL LEVEL SENSOR

Refer to MWI-72, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 22.
NO >> Replace fuel level sensor unit. Refer to FL-5, "Removal and Installation".

22. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

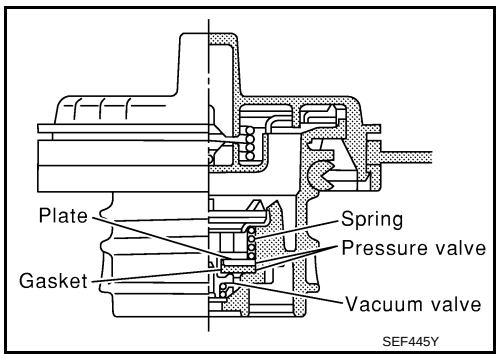
Component Inspection (Fuel Filler Cap)

INFOID:0000000009009037

1. CHECK FUEL FILLER CAP

1. Turn ignition switch OFF.
2. Remove fuel filler cap.

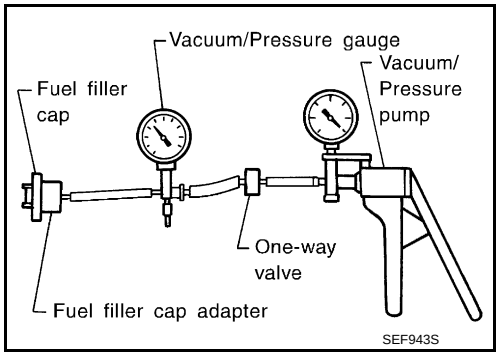
3. Wipe clean valve housing.



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 Logic

INFOID:0000000009009038

DTC DETECTION LOGIC

NOTE:

- **If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0460	FUEL LEV SEN SLOSH (Fuel level sensor circuit noise)	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Combination meter • Fuel level sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait maximum of 2 consecutive minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-384, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009039

1.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

Is any DTC detected?

YES >> Perform trouble diagnosis of detected DTC.
NO >> GO TO 2.

2.CHECK FUEL LEVEL SENSOR SIGNAL CIRCUIT

Check fuel level sensor signal circuit. Refer to MWI-71, "Component Function Check".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Perform trouble diagnosis of fuel level sensor signal circuit. Refer to MWI-71, "Diagnosis Procedure".

P0461 FUEL LEVEL SENSOR

DTC Logic

INFOID:0000000009009040

DTC DETECTION LOGIC

NOTE:

- **If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0461	FUEL LEVEL SENSOR (Fuel level sensor circuit range/performance)	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Combination meter • Fuel level sensor

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform Component Function Check. Refer to EC-385, "Component Function Check".
Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-386, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009041

1.PRECONDITIONING

WARNING:
When performing the following procedure, always observe the handling of the fuel. Refer to FL-2, "General Precautions".
TESTING CONDITION:
Before starting component function check, preparation of draining fuel and refilling fuel is required.

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

NOTE:
Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 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-168, "Work Procedure".
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-5, "Removal and Installation".
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-386, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009042

1.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

Is any DTC detected?

YES >> Perform trouble diagnosis of detected DTC.
NO >> GO TO 2.

2.CHECK FUEL LEVEL SENSOR SIGNAL CIRCUIT

Check fuel level sensor signal circuit. Refer to MWI-71, "Component Function Check".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Perform trouble diagnosis of fuel level sensor signal circuit. Refer to MWI-71, "Diagnosis Procedure".

P0462, P0463 FUEL LEVEL SENSOR

DTC Logic

INFOID:0000000009009043

DTC DETECTION LOGIC

NOTE:

- **If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.Refer to EC-410, "DTC Logic".**

This diagnosis indicates the former, to detect open or short circuit malfunction.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0462	FUEL LEVL SEN/CIRC (Fuel level sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Combination meter • Fuel level sensor
P0463	FUEL LEVL SEN/CIRC (Fuel level sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Proceed to EC-387, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009044

1.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

Is any DTC detected?

YES >> Perform trouble diagnosis of detected DTC.
NO >> GO TO 2.

2.CHECK FUEL LEVEL SENSOR SIGNAL CIRCUIT

Check fuel level sensor signal circuit. Refer to MWI-71, "Component Function Check".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Perform trouble diagnosis of fuel level sensor signal circuit. Refer to MWI-71, "Diagnosis Procedure".

P0500 VSS

Description

INFOID:0000000009009045

The vehicle speed signal is sent to the “combination meter” from the “ABS actuator and electric unit (control unit)” by CAN communication line. The “combination meter” then sends a signal to the ECM by CAN communication line.

DTC Logic

INFOID:0000000009009046

DTC DETECTION LOGIC

NOTE:

- **If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0500	VEH SPEED SEN/CIRC (Vehicle speed sensor)	The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The vehicle speed signal circuit is open or shorted) • Wheel sensor • Combination meter • ABS actuator and electric unit (control unit)

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

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.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.CHECK VEHICLE SPEED SIGNAL

NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT

1. Start engine (VDC switch OFF).
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT.
   The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to EC-389, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT.
2. Warm engine up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	More than 1,500 rpm
COOLAN TEMP/S	More than 70°C (158°F)

B/FUEL SCHDL	5.8 - 31.8 msec
Selector lever	Except P or N position
PW/ST SIGNAL	OFF

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-389, "Diagnosis Procedure".
NO >> INSPECTION END

4.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform Component Function Check. Refer to EC-389, "Component Function Check".
Use Component Function Check to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-389, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009047

1.PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in Service $01 with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-389, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009048

1.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-39, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

>> INSPECTION END

P0506 ISC SYSTEM

Description

INFOID:0000000009009049

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000009009050

DTC DETECTION LOGIC

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0506	ISC SYSTEM (Idle speed control system RPM lower than expected)	The idle speed is less than the target idle speed by 100 rpm or more.	• Electric throttle control actuator • Intake air leakage

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

If the target idle speed is out of the specified value, perform EC-163, "Work Procedure", before conducting DTC Confirmation Procedure.
TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Always perform the test at a temperature above –10°C (14°F).**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-390, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009051

1.CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.

NO >> GO TO 2.

2.REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform additional service when replacing ECM. Refer to EC-157, "Work Procedure".

>> INSPECTION END

P0507 ISC SYSTEM

Description

INFOID:0000000009009052

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000009009053

DTC DETECTION LOGIC

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0507	ISC SYSTEM (Idle speed control system RPM higher than expected)	The idle speed is more than the target idle speed by 200 rpm or more.	• Electric throttle control actuator • Intake air leakage • PCV system

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

If the target idle speed is out of the specified value, perform EC-163, "Work Procedure", before conducting DTC Confirmation Procedure.
TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-392, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009054

1.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.
NO >> GO TO 3.

3.REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform additional service when replacing ECM. Refer to EC-157, "Work Procedure".

>> INSPECTION END

P050A, P050B, P050E COLD START CONTROL

Description

INFOID:0000000009009055

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Logic

INFOID:0000000009009056

DTC DETECTION LOGIC

NOTE:
If DTC P050A, P050B or P050E is displayed with other DTC, first perform the trouble diagnosis for other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P050A	Cold start idle air control system performance	ECM does not control engine idle speed properly when engine is started with pre-warming up condition.	• Lack of intake air volume • Fuel injection system • ECM
P050B	Cold start ignition timing performance	ECM does not control ignition timing properly when engine is started with pre-warming up condition.	
P050E	Cold start engine exhaust temperature too low	The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT.
4. Check the indication of “COOLAN TEMP/S”.

With GST

Follow the procedure “With CONSULT” above.

Is the value of “COOLAN TEMP/S” between 4°C (39°F) and 36°C (97°F)?

YES >> GO TO 3.
NO-1 [If it is below 4°C (39°F)]>>Warm up the engine until the value of “COOLAN TEMP/S” reaches 15°C (59°F) or more. Retry from step 1.
NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Set the select lever in N range.
2. Start the engine and warm up in idle with the value of “COOLAN TEMP/S” between 4°C (39°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 >> Go to EC-395, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009057

1. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-163, "Work Procedure".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 2.
NO >> Follow the instruction of Idle Air Volume Learning.

2. CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part

3. CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-291, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-292, "Diagnosis Procedure" for DTC P0171, P0174.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-394, "DTC Logic".

Is the 1st trip DTC P050A, P050B or P050E displayed again?

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

5. REPLACE ECM

1. Replace ECM.
2. Go to EC-582, "Removal and Installation".

>> INSPECTION END

P0524 ENGINE OIL PRESSURE

DTC Logic

INFOID:0000000009009058

DTC DETECTION LOGIC

NOTE:
If DTC P0524 is displayed with DTC P0075 or P0081, perform trouble diagnosis for DTC P0075 or P0081 first. Refer to EC-209, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	Detecting condition	Possible cause
P0524	ENGINE OIL PRESSURE (Engine oil pressure too low)	Engine oil pressure is low because there is a gap between angle of target and phase-control angle.	• Engine oil pressure or level too low • Crankshaft position sensor • Camshaft position sensor • Intake valve timing control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-I

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-8, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Proceed to LU-8, "Inspection".

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

1. Select “DATA MONITOR” mode with CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	More than 1,700 rpm
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

WITH GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-397, "Diagnosis Procedure"

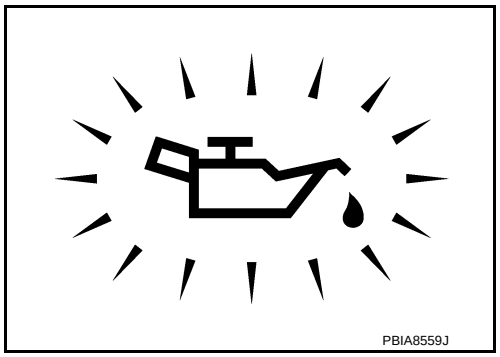
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009059

1. CHECK OIL PRESSURE WARNING LAMP

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



Is oil pressure warning lamp illuminated?

YES >> Proceed to LU-8, "Inspection".
NO >> GO TO 2.

2. 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 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve.

3. CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor.

4. CHECK CAMSHAFT POSITION SENSOR

Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".

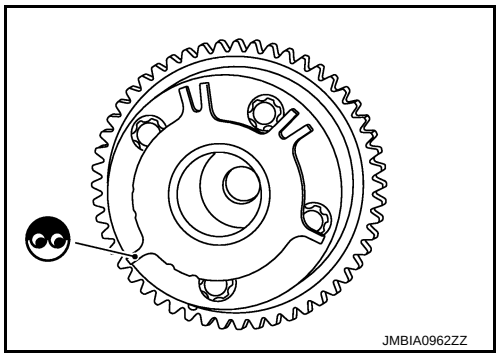
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor.

5. CHECK CAMSHAFT SPROCKET (SIGNAL PLATE)

Check the following.

- Accumulation of debris to the signal plate of camshaft sprocket (INT)
- Chipping signal plate of camshaft sprocket (INT)



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft sprocket (INT) or replace camshaft sprocket (INT). Refer to EM-63, "Exploded View".

6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-63, "Exploded View".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to LU-8, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0527 COOLING FAN SPEED SENSOR

DTC Logic

INFOID:0000000009009060

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0527	Cooling fan speed sensor circuit range/performance	The number of fan speed signals is 16 rpm or less during engine rev.	• Harness or connectors (The Fuel rail pressure sensor circuit is open or shorted.) (The Power steering pressure sensor circuit is open or shorted) (The Electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Cooling fan speed sensor • Electrically-controlled cooling fan coupling • Cooling fan • IPDM E/R

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Keep the engine speed approximately 1,000 rpm at no load.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-399, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009061

1.CHECK COOLING FAN SPEED SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect electrically-controlled cooling fan coupling harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electrically-controlled cooling fan coupling harness connector terminals.

Electrically-controlled cooling fan coupling			Voltage (Approx.)
Connector	+	–	
	terminal		
F39	2	4	5 V

Is inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK COOLING FAN SPEED SENSOR POWER SUPPLY CIRCUIT-II

1. Check the voltage between electrically-controlled cooling fan coupling harness connector and the ground.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	terminal		
F39	2	Ground	5 V

Is inspection result normal?

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

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-190, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.CHECK COOLING FAN SPEED SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electrically-controlled cooling fan coupling harness connector and ECM harness connector.

+		–		Continuity
Electrically-controlled cooling fan coupling		ECM		
Connector	Terminal	Connector	Terminal	
F39	4	F111	45	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and the ground.

+		–	Continuity
ECM			
Connector	Terminal		
F111	10	Ground	Existed
E80	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

6.CHECK COOLING FAN SPEED SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electrically-controlled cooling fan coupling harness connector and ECM harness connector.

+		–		Continuity
Electrically-controlled cooling fan coupling		ECM		
Connector	Terminal	Connector	Terminal	
F39	5	F111	37	Existed

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

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK COOLING FAN SPEED SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform cooling fan speed sensor component inspection. Refer to EC-401, "Component Inspection (Cooling Fan Speed Sensor)".

Is inspection result normal?

YES >> GO TO 8.
NO >> Replace electrically-controlled cooling fan coupling.

8.CHECK COOLING FAN ROTATIONAL CONDITION

Rotate the cooling fan by hand.

Dose the cooling fan rotates smoothly?

YES >> GO TO 9.
NO >> Check that the cooling fan is not interfered with other parts.

9.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING SYSTEM

Refer to EC-540, "Diagnosis Procedure".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

Component Inspection (Cooling Fan Speed Sensor)

INFOID:0000000009009062

1.CHECK COOLING FAN SPEED SENSOR

1. Turn ignition switch OFF.
2. Disconnect electrically-controlled cooling fan coupling harness connector.
3. Rotate the electrically-controlled cooling fan coupling slowly with hand and check the voltage between electrically-controlled cooling fan coupling connector terminals under the following conditions.

+	–	Condition	Voltage (V) (Approx.)
Electrically-controlled cooling fan coupling Terminal			
5	4	• 5V direct current supply to terminal 2 • Terminal 4 connect to ground	0 ⇔ 5 **NOTE:** The voltage is in waveform

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace Electrically-controlled cooling fan coupling.

P0550 PSP SENSOR

DTC Logic

INFOID:0000000009009063

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0550	PW ST P SEN/CIRC (Power steering pressure sensor circuit)	An excessively low or high voltage from the sensor is sent to ECM.	• Harness or connectors (The Fuel rail pressure sensor circuit is open or shorted.) (The Power steering pressure sensor circuit is open or shorted) (The Electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Electrically-controlled cooling fan coupling

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-403, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009064

1.CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect power steering pressure (PSP) sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between PSP sensor harness connector terminals.

PSP sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F35	1	3	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Check the voltage between PSP sensor harness connector and the ground.

+		–	Voltage (Approx.)
PSP sensor			
Connector	terminal		
F35	1	Ground	5 V

Is inspection result normal?

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

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-190, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.CHECK PSP SENSOR GROUND CIRCUIT

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

+		–		Continuity
PSP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F35	3	F111	45	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and the ground.

+		–	Continuity
ECM			
Connector	Terminal		
F111	10	Ground	Existed
E80	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

6. CHECK PSP SENSOR SIGNAL CIRCUIT

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

+		–		Continuity
PSP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F35	2	F111	39	Existed

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7. CHECK PSP SENSOR

Refer to EC-405, "Component Inspection (Power Steering Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace PSP sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Power Steering Pressure Sensor)

INFOID:0000000009009065

1. CHECK POWER STEERING PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and let it idle.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F111	39	45	Steering wheel	Being turned	0.5 - 4.5
				Not being turned	0.4 - 0.8

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace power steering pressure sensor.

P0603 ECM POWER SUPPLY

DTC Logic

INFOID:0000000009009066

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0603	ECM BACK UP/CIRCUIT (ECM power supply circuit)	ECM back up RAM system does not function properly.	• Harness or connectors [ECM power supply (back up) circuit is open or shorted.] • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON wait at least 10 seconds.
2. Turn ignition switch OFF and wait at least 5 minutes.
3. Turn ignition switch ON, wait at least 10 seconds.
4. Repeat step 2 and 3 for five times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-406, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009067

1.CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the voltage between ECM harness connector terminals.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
E80	156	E80	175	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- 20 A fuse (No. 43)
- Harness for open or short between ECM and battery
- Loose or poor connection for each connector and harness

>> Repair or replace harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-406, "DTC Logic".

Is the 1st trip DTC P0603 displayed again?

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

5. REPLACE ECM

Replace ECM.

>> INSPECTION END

P0605 ECM

DTC Logic

INFOID:0000000009009068

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605	Engine control module	A)	ECM calculation function is malfunctioning.	ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	
		D)	ECM temperature sensor is malfunctioning.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND D

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-408, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-408, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Repeat step 2 for 32 times.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-408, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009069

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-408, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

Replace ECM. Refer to EC-582, "Removal and Installation".

>> INSPECTION END

P0607 ECM

DTC Logic

INFOID:0000000009009070

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0607	ECM (CAN communication bus)	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-410, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009071

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-410, "DTC Logic".
4. Check DTC.

Is the DTC P0607 displayed again?

YES >> Replace ECM. Refer to EC-582, "Removal and Installation".
NO >> INSPECTION END

P0611 ECM PROTECTION

Description

INFOID:0000000009009072

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 Logic

INFOID:0000000009009073

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0611	ECM PROTECTION	ECM overheat protection control is activated.	ECM overheated

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-411, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009074

1.INSPECTION START

1. Perform DTC confirmation procedure. Refer to EC-411, "DTC Logic".
2. Check 1st trip DTC.

Is DTC P0605 detected?

YES >> Proceed to EC-408, "Diagnosis Procedure".
NO >> Explain the customer about the activation of the protection function.

P062B ECM

Description

INFOID:0000000009009075

This DTC is detected when the ECM-integrated injector driver unit has a malfunction. For injector driver unit, refer to EC-30, "ECM".

DTC Logic

INFOID:0000000009009076

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P062B	Internal control module fuel injector control performance	Injector driver unit is malfunctioning.	• Harness and connectors (Injector circuit is open or shorted) • Battery power supply • ECM (injector driver unit)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and keep the engine speed at idle for 30 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-412, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009077

1.CHECK FUEL INJECTOR

Perform fuel injector. Refer to EC-543, "Component Function Check".

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure again. Refer to EC-412, "DTC Logic".
4. Check 1st trip DTC.

Is the DTC P062B displayed again?

YES >> Replace ECM. Refer to EC-582, "Removal and Installation".
NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000009009078

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0643	SENSOR POWER/CIRC (Sensor power supply circuit short)	ECM detects that the voltage of power source for sensor is excessively low or high.	• Harness or connectors (Accelerator pedal position sensor 1 circuit is shorted.) [Camshaft position sensor (bank 2) circuit is shorted.] [Manifold absolute pressure (MAP) sensor circuit is shorted.] (Throttle position sensor circuit is shorted.) • Accelerator pedal position sensor 1 • Camshaft position sensor (bank 2) • Manifold absolute pressure (MAP) sensor • Throttle position sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-413, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009079

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	2	Ground	Approx. 5
E67 (With ICC)	12		

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	81	Electric throttle control actuator	F66	2
	83	Camshaft position sensor (bank 2)	F83	1
	85	Manifold absolute pressure (MAP) sensor	F65	1
E80	137	APP sensor 1 (Without ICC)	E110	2
	137	APP sensor 1 (With ICC)	E67	12

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair short to ground or short to power in harness or connectors.

3.CHECK COMPONENTS

Check the following.
- Camshaft position sensor (bank 2) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Manifold absolute pressure (MAP) sensor (Refer to EC-235, "Component Inspection (MAP Sensor)".)

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace malfunctioning component.

4.CHECK THROTTLE POSITION SENSOR

Refer to EC-247, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6.CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

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

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0850 PNP SWITCH

Description

INFOID:0000000009009080

When the selector lever position is P or N, park/neutral position (PNP) signal is sent to ECM from TCM.

DTC Logic

INFOID:0000000009009081

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0850	P-N POS SW/CIRCUIT (Park/neutral position switch)	The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started.	• Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] • TCM

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

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

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.

>> GO TO 3.

3.CHECK PNP SIGNAL

WITH CONSULT

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT. Then check the “P/N POSI SW” signal under the following conditions.

Position (Selector lever)	Known-good signal
N or P position	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-416, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	1,000 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.0 - 31.8 msec

VHCL SPEED SE	More than 64 km/h (40 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-416, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform Component Function Check. Refer to EC-416, "Component Function Check".
NOTE:
Use Component Function Check to check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-416, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009082

1.PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F111	11	175	Selector lever	P or N position	Battery voltage
				Except above position	Approx. 0

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-416, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009083

1.CHECK DTC WITH TCM

Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.
NO >> Check DTC with BCM. Refer to BCS-57, "DTC Index".

3.CHECK PNP SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/T assembly harness connector and ECM harness connector.

A/T assembly		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F301	9	F111	11	Existed

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between A/T assembly and ECM
- Loose or poor connection for each connector and harness

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

5. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P100A, P100B VVEL SYSTEM

DTC Logic

INFOID:0000000009009084

DTC DETECTION LOGIC

NOTE:

- If DTC P100A or P100B is displayed with DTC P1090 or P1093, first perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-426, "DTC Logic".
- If DTC P100A or P100B is displayed with DTC P0101, first perform the trouble diagnosis for DTC P0101. Refer to EC-224, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P100A	VVEL SYSTEM-B1 [VVEL response malfunction (bank 1)]	Actual event response to target is poor.	• Harness or connectors (VVEL actuator motor assembly circuit is open or shorted.) • VVEL actuator motor assembly • VVEL actuator housing assembly • VVEL ladder assembly • VVEL control module
P100B	VVEL SYSTEM-B2 [VVEL response malfunction (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.
3. Wait at idle for 5 seconds or more.
4. Repeat steps 2 to 3 for three times.
5. Check 1st trip DTC.

Is DTC detected?

YES >> Proceed to EC-418, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009085

1.VVEL ACTUATOR MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect VVEL control module harness connector.
2. Disconnect VVEL actuator motor harness connector.
3. Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

DTC No.	VVEL control module			VVEL actuator motor		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P100A	1	F56	12	F73	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P100B	2		2	F71	1	Existed
					2	Not existed
			15		1	Not existed
					2	Existed

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

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL actuator motor and VVEL control module
- Loose or poor connection for each connector and harness

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

3. CHECK VVEL ACTUATOR MOTOR

Refer to EC-420, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

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

4. REPLACE VVEL ACTUATOR MOTOR ASSEMBLY

Replace VVEL actuator motor assembly. Refer to EM-37, "Removal and Installation".

>> INSPECTION END

5. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6. REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-583, "Removal and Installation".

>> GO TO 7.

7. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase 1st trip DTC.
3. Perform DTC Confirmation Procedure.
   See EC-418, "DTC Logic".

Is the DTC P100A or P100B displayed again?

YES >> GO TO 8.
NO >> INSPECTION END

8. CHECK VVEL ACTUATOR HOUSING ASSEMBLY

Refer to EC-420, "Component Inspection (VVEL ACTUATOR HOUSING ASSEMBLY)".

Is the inspection result normal?

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

9. REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

10. CHECK VVEL LADDER ASSEMBLY

Refer to EM-83, "Inspection".

Is the inspection result normal?

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

11. REPLACE CYLINDER HEAD AND VVEL LADDER ASSEMBLY

Replace cylinder head and VVEL ladder assembly.
Refer to EM-93, "Removal and Installation" (Cylinder head).
Refer to EM-80, "Removal and Installation" (VVEL ladder assembly)

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000009009086

1. CHECK VVEL ACTUATOR MOTOR

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor harness connector.
3. Check resistance between VVEL actuator motor terminals as per the following.

VVEL actuator motor	Resistance
Terminal	
1 and 2	16 Ω or less

Is the inspection result normal?

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

2. REPLACE VVEL ACTUATOR MOTOR ASSEMBLY

Replace VVEL actuator motor assembly. Refer to EM-37, "Removal and Installation".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR HOUSING ASSEMBLY)

INFOID:0000000009009087

1. CHECK VVEL ACTUATOR HOUSING ASSEMBLY

1. Turn ignition switch OFF.
2. Remove VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".
3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

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

2. REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

P1087, P1088 VVEL SYSTEM

DTC Logic

INFOID:0000000009009088

DTC DETECTION LOGIC

NOTE:
If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.
Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-426, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1087	VVEL SYSTEM-B1 [VVEL small event angle malfunction (bank 1)]	The event angle of VVEL control shaft is always small.	• Harness or connectors (VVEL actuator motor assembly circuit is open or shorted.) • VVEL actuator motor assembly • VVEL actuator housing assembly • VVEL ladder assembly • VVEL control module
P1088	VVEL SYSTEM-B2 [VVEL small event angle malfunction (bank 2)]		

Diagnosis Procedure

INFOID:0000000009009089

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.
Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-426, "DTC Logic".

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

DTC Logic

INFOID:0000000009009090

DTC DETECTION LOGIC

NOTE:
If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608.
Refer to EC-489, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1089	VVEL POS SEN/CIRC-B1 [VVEL control shaft position sensor (bank 1) circuit]	• An excessively low voltage from the sensor is sent to VVEL control module. • An excessively high voltage from the sensor is sent to VVEL control module. • Rationally incorrect voltage is sent to VVEL control module compared with the signals from VVEL control shaft position sensor 1 and VVEL control shaft position sensor 2.	• Harness or connectors (VVEL control shaft position sensor circuit is open or shorted.) • VVEL control shaft position sensor • VVEL control module
P1092	VVEL POS SEN/CIRC-B2 [VVEL control shaft position sensor (bank 2) circuit]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-423, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009091

1.VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect VVEL control shaft position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

DTC No.	VVEL control shaft position sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P1089	1	F72	3	Ground	Approx. 5
			6		
P1092	2	F70	3		
			6		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

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

3. CHECK VVEL CONTROL SHAFT POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect VVEL control module harness connector.
3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1089	1	F72	2	F56	6	Existed
			5		19	
P1092	2	F70	2		4	
			5		17	

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

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

5. VVEL CONTROL SHAFT POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1089	1	F72	1	F56	3	Existed
			4		16	
P1092	2	F70	1		5	
			4		18	

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

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

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

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

8. REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-159, "Work Procedure".

>> GO TO 9.

9. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-423, "DTC Logic".

Is the DTC P1089 or P1092 displayed again?

YES >> GO TO 10.
NO >> INSPECTION END

10. REPLACE VVEL ACTUATOR LADDER ASSEMBLY

Replace VVEL actuator ladder assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

P1090, P1093 VVEL ACTUATOR MOTOR

DTC Logic

INFOID:0000000009009092

DTC DETECTION LOGIC

NOTE:
If DTC P1090 or P1093 is displayed with DTC P1091, first perform the trouble diagnosis for DTC P1091.
Refer to EC-429, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1090	VVEL ACTR MOT-B1 [VVEL system performance (bank 1)]	• Event angle difference between the actual and the target is detected. • Abnormal current is sent to VVEL actuator motor assembly.	• Harness or connectors (VVEL actuator motor assembly circuit is open or shorted.) • VVEL actuator motor assembly • VVEL actuator housing assembly • VVEL ladder assembly • VVEL control module
P1093	VVEL ACTR MOT-B2 [VVEL system performance (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 10 second.
2. Keep the engine speed at approximately 3,500 rpm for at least 10 seconds under no load.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-426, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009093

1.VVEL ACTUATOR MOTOR ASSEMBLY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect VVEL control module harness connector.
2. Disconnect VVEL actuator motor assembly harness connector.
3. Check the continuity between VVEL control module harness connector and VVEL actuator motor assembly harness connector.

DTC No.	VVEL control module			VVEL actuator motor assembly		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1090	1	F56	12	F73	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P1093	2		2	F71	1	Existed
					2	Not existed
			15		1	Not existed
					2	Existed

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

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL actuator motor assembly and VVEL control module
- Loose or poor connection for each connector and harness

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

3.CHECK VVEL ACTUATOR MOTOR ASSEMBLY

Refer to EC-428, "Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)".

Is the inspection result normal?

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

4.REPLACE VVEL ACTUATOR MOTOR ASSEMBLY

Replace VVEL actuator motor assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-159, "Work Procedure".

>> GO TO 7.

7.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-426, "DTC Logic".

Is the DTC P1090 or P1093 displayed again?

YES >> GO TO 8.
NO >> INSPECTION END

8.CHECK VVEL ACTUATOR HOUSING ASSEMBLY

Refer to EC-428, "Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)".

Is the inspection result normal?

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

9.REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

10.CHECK VVEL LADDER ASSEMBLY

Refer to EM-83, "Inspection".

Is the inspection result normal?

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

11. REPLACE VVEL LADDER ASSEMBLY

Replace VVEL ladder assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)

INFOID:0000000009009094

1. CHECK VVEL ACTUATOR MOTOR

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor harness connector.
3. Check resistance between VVEL actuator motor terminals as per the following.

VVEL actuator motor Terminal	Resistance
1 and 2	16Ω or less

Is the inspection result normal?

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

2. REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR HOUSING ASSEMBLY)

INFOID:0000000009009095

1. CHECK VVEL ACTUATOR HOUSING ASSEMBLY

1. Turn ignition switch OFF.
2. Remove VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".
3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

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

2. REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

P1091 VVEL ACTUATOR MOTOR RELAY

DTC Logic

INFOID:0000000009009096

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1091	VVEL ACTR MOT PWR [VVEL actuator motor relay circuit]	• VVEL control module detects the VVEL actuator motor relay is stuck OFF. • VVEL control module detects the VVEL actuator motor relay is stuck ON.	• Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.) • VVEL actuator motor relay • VVEL control module • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-429, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009097

1.VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor relay.
3. Check the voltage between VVEL actuator motor relay harness connector and ground.

VVEL actuator motor relay		Ground	Voltage
Connector	Terminal		
E62	1	Ground	Battery voltage
	3		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- 50A fusible link (letter O)
- Harness for open or short between VVEL actuator motor relay and battery

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

3. VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect VVEL control module harness connector.
2. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module		VVEL actuator motor relay		Continuity
Connector	Terminal	Connector	Terminal	
F56	23	E62	2	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

4. VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module			VVEL actuator motor relay		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F56	13	E62	5	Existed
2		1			

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK VVEL ACTUATOR MOTOR RELAY

Refer to EC-431, "Component Inspection (VVEL Actuator Motor Relay)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace VVEL actuator motor relay.

6. CHECK ABORT CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between VVEL control module harness connector and ECM harness connector.

VVEL control module		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F56	21	E80	122	Existed

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

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open and short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

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

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace.

9. REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-159, "Work Procedure".

>> GO TO 10.

10. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-429, "DTC Logic".

Is the DTC P1091 displayed again?

YES >> Replace ECM. Refer to EC-582, "Removal and Installation".
NO >> INSPECTION END

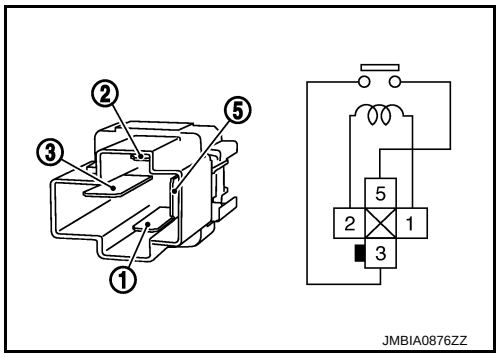
Component Inspection (VVEL Actuator Motor Relay)

INFOID:0000000009009098

1. CHECK VVEL ACTUATOR MOTOR RELAY

1. Turn ignition switch OFF.
2. Remove VVEL actuator motor relay.
3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.

Terminal	Condition	Continuity
3 and 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace VVEL actuator motor relay.

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

INFOID:0000000009009099

DTC DETECTION LOGIC

NOTE:

DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.
When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1148	CLOSED LOOP-B1 [Closed loop control function (bank 1)]	The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 • A/F sensor 1 heater
P1168	CLOSED LOOP-B2 [Closed loop control function (bank 2)]	The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition.	

Diagnosis Procedure

INFOID:0000000009009100

DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.
When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.Refer to EC-107, "DTC Index".

P1197 OUT OF GAS

Description

INFOID:0000000009009101

This diagnosis result is detected when the fuel level of the fuel tank is extremely low and the engine does not run normally.

DTC Logic

INFOID:0000000009009102

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1197	FUEL RUN OUT (Out of gas)	• Fuel rail pressure remains at 1.5 MPa (15 bar, 15.3 kg/cm^2, 217.5 psi) or less for 3 seconds or more with the fuel level too low. • Fuel rail pressure remains 2.7 MPa (27 bar, 27.5 kg/cm^2, 392 psi) lower than a target fuel pressure for 5 seconds or more with the fuel level too low. • Fuel rail pressure remains at 0.23 MPa (2.3 bar, 2.346 kg/cm^2, 33.35 psi) or less for 5 seconds or more with the fuel level too low. **NOTE:** Allow engine coolant temperature to reach 70°C (158°F) or more once.	• Out of gas • Harness or connectors (The low pressure fuel pump circuit is open or shorted.) • Low pressure fuel pump • Fuel pressure regulator • Low pressure fuel system • Low fuel pressure sensor • Harness or connectors (The high pressure fuel pump circuit is shorted.) • High pressure fuel pump • High pressure fuel system • Fuel rail pressure sensor • Disconnection of the fuel hose

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

Start the engine.

Does the engine start?

YES >> GO TO 3.
NO >> Proceed to EC-434, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Warm up the engine to the normal operating temperature.
   NOTE:
   For best results, warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
2. Keep the engine speed at 3,500 rpm for 5 seconds and let it idle at least 60 seconds.
3. Check the 1st trip DTC.
   NOTE:
   If the fuel tank has sufficient fuel, this diagnosis result may not be detected.

Is 1st trip DTC detected?

YES >> Proceed to EC-434, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009103

1.REFUEL THE VEHICLE

1. Refuel 10 liter (10 US qt, 8 imp qt).
   CAUTION:
   Never refuel more than 10 liter.
2. Start the engine and keep the engine speed at 3,000 rpm for 30 seconds.
   NOTE:
   For best results, warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Turn ignition switch ON.
7. Erase the DTC.
8. Start the engine and let it idle at least 60 seconds.
9. Perform the confirmation procedure again. Refer to EC-433, "DTC Logic".

Is 1st trip DTC detected?

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

2.CHECK LOW PRESSURE FUEL PUMP

Refer to EC-557, "Component Function Check".

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK HIGH PRESSURE FUEL PUMP

Refer to EC-546, "Component Function Check".

Is inspection result normal?

YES >> Check the fuel hose for disconnection and looseness.
NO >> Repair or replace error-detected parts.

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000009009104

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and “ABS actuator and electric unit (control unit)”.
Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000009009105

DTC DETECTION LOGIC

NOTE:
- **If DTC P1212 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1212 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607.**

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1212	TCS/CIRC (TCS communication line)	ECM cannot receive the information from “ABS actuator and electric unit (control unit)” continuously.	• Harness or connectors (The CAN communication line is open or shorted.) • ABS actuator and electric unit (control unit) • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-435, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009106

Perform the trouble diagnosis for TCS. Refer to BRC-58, "Work Flow".
NOTE:
If DTC P1212 is displayed with DTC UXXXX and/or P0607, perform the following trouble diagnosis.
- Trouble diagnosis for DTC UXXXX Refer to EC-107, "DTC Index".
- Trouble diagnosis for DTC P0607 Refer to EC-410, "DTC Logic".

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000009009107

DTC DETECTION LOGIC

NOTE:

- **If DTC P1217 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1217 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**
- **If DTC P1217 is displayed with DTC P0527, perform the trouble diagnosis for DTC P0527. Refer to EC-399, "DTC Logic".**

If the cooling fan or any of other components in the cooling system has a malfunction, engine coolant temperature increases.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over temperature (Overheat)	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant is not within the specified quantity.	• Harness or connectors (The cooling fan circuit is open or shorted.) • IPDM E/R • Electrically-controlled cooling fan coupling • Cooling fan speed sensor • Radiator hose • Radiator • Reservoir tank cap • Water pump • Thermostat

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to CO-8, "Draining" and CO-9, "Refilling". Also, replace the engine oil. Refer to LU-9, "Draining" and LU-9, "Refilling".

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to MA-16, "FOR NORTH AMERICA : Anti-Freeze Coolant Mixture Ratio".**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-436, "Component Function Check".

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-437, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009108

1.PERFORM COMPONENT FUNCTION CHECK-I

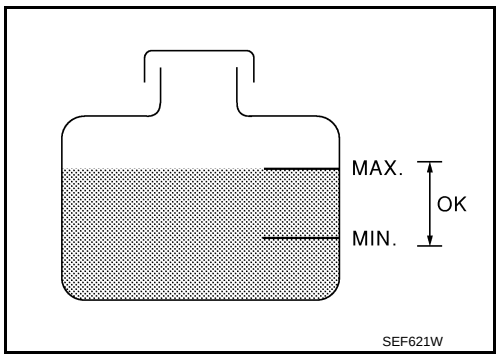
WARNING:

Never remove the reservoir tank 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.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Proceed to EC-437, "Diagnosis Procedure".
NO >> GO TO 2.



2. PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Proceed to EC-437, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

WITH CONSULT
1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Check that cooling fan speed varies according to the percentage.
   NOTE:
   Fan speed changes as the percentage changes.

WITHOUT CONSULT
1. Start the engine.
2. Perform IPDM E/R auto active test. Refer to PCS-10, "Diagnosis Description".
3. Check that cooling fan speed increase.
   NOTE:
   Speed changes gradually when performing the auto active test.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-437, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009109

1. CHECK COOLING FAN OPERATION

WITH CONSULT
1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Check that cooling fan speed varies according to the percentage.
   NOTE:
   Speed changes gradually as the percentage changes.

WITHOUT CONSULT
1. Start the engine.
2. Perform IPDM E/R auto active test and check cooling fan operation, refer to PCS-10, "Diagnosis Description".
3. Check that cooling fan speed increase.
   NOTE:
   Speed changes gradually when performing the auto active test.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-540, "Diagnosis Procedure".

2. CHECK ENGINE COOLANT LEAKAGE-I

Check cooling system for leakage. Refer to CO-8, "Inspection".

Is leakage detected?

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

3. CHECK ENGINE COOLANT LEAKAGE-II

Check the following for leakage.
- Hose
- Radiator
- Water pump

>> Repair or replace malfunctioning part.

4. CHECK RESERVOIR TANK CAP

Check reservoir tank cap. Refer to CO-12, "RESERVOIR TANK CAP : Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace reservoir tank cap.

5. CHECK THERMOSTAT

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

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat. Refer to CO-22, "Removal and Installation".

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-245, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor. Refer to EM-92, "Exploded View".

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the CO-6, "Troubleshooting Chart".

>> INSPECTION END

P1220 FUEL PUMP CONTROL MODULE (FPCM)

DTC Logic

INFOID:0000000009009110

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1220	FPCM (Fuel pump control module)	During engine cranking, the signal voltage of the FPCM to the ECM is too low.	• Harness or connectors (FPCM circuit is open or shorted) (Fuel pump circuit is open or shorted) • FPCM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is between 12 - 15 V at idle.**
- **Before performing the following procedure, check that the engine coolant temperature is –10°C (14°F) or more.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-439, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009111

1.CHECK FPCM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect FPCM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FPCM harness connector and ground.

FPCM		Ground	Voltage
Connector	Terminal		
B41	10	Ground	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- 15 A fuse (No.73)
- Harness for open or short between FPCM and IPDM E/R
- Loose or poor connection for each connector and harness

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

3. CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between FPCM harness connector and ground.

FPCM		Ground	Continuity
Connector	Terminal		
B41	5	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to power in harness or connectors.

4. CHECK FPCM INPUT AND OUTPUT CIRCUITS FOR OPEN AND SHORT

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

FPCM		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B41	8	E80	125	Existed
	9		142	

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

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between FPCM and ECM
- Loose or poor connection for each connector and harness

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

6. CHECK FUEL PUMP CONTROL CIRCUIT FOR OPEN AND SHORT

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump harness connector.

FPCM		Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
B41	6	C5	3	Existed
	7		1	

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK FPCM

Refer to EC-441, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace FPCM.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (FPCM)

INFOID:0000000009009112

1. CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Check the voltage between FPCM terminals under the following conditions.

FPCM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
B41	7	6	For 1 second after turning ignition switch ON	Approx. 8.5 V
			More than 1 second after turning ignition switch ON	Approx. 0 V
			Idle speed	Approx. 8.5 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace FPCM.

P1225 TP SENSOR

DTC Logic

INFOID:0000000009009113

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1225	CTP LEARNING-B1 (Closed throttle position learning performance)	Closed throttle position learning value is excessively low.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
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 >> Go to EC-442, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009114

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-162, "Work Procedure".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P1226 TP SENSOR

DTC Logic

INFOID:0000000009009115

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1226	CTP LEARNING-B1 (Closed throttle position learning performance)	Closed throttle position learning is not performed successfully, repeatedly.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
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 >> Go to EC-443, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009116

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-162, "Work Procedure".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P1423, P1424 COLD START CONTROL

Description

INFOID:0000000009009117

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 Logic

INFOID:0000000009009118

DTC DETECTION LOGIC

NOTE:

- **If DTC P1423 or P1424 is displayed with other DTC, first perform the trouble diagnosis for other DTC.**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1423	COLD START CONTROL (Cold start emission reduction strategy monitoring)	ECM does not control fuel injection timing properly when engine is started with the engine cold.	ECM
P1424	COLD START CONTROL (Cold start emission reduction strategy monitoring)	ECM does not control fuel injection quantity properly when engine is started with with the engine cold.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.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 with 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-444, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009119

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-444, "DTC Logic".
4. Check 1st trip DTC.

Is the 1st trip DTC P1423 or P1424 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

Replace ECM. Refer to EC-582, "Removal and Installation".

>> INSPECTION END

P1550 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009120

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1550	BAT CURRENT SENSOR (Battery current sensor circuit range/performance)	The output voltage of the battery current sensor remains within the specified range while engine is running.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-446, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009121

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-565, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

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

Is the inspection result normal?

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

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

10. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-448, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

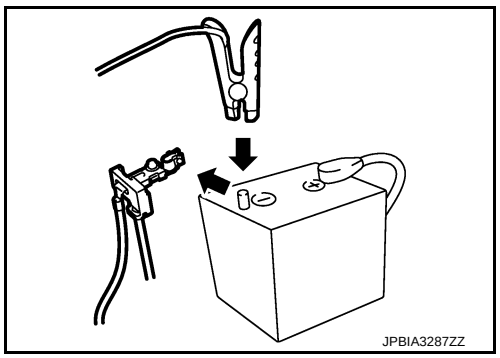
Component Inspection (Battery Current Sensor)

INFOID:0000000009009122

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.

3. Disconnect battery negative cable.



⬅: To body ground

4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1551, P1552 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009123

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1551	BAT CURRENT SENSOR (Battery current sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor
P1552	Battery current sensor circuit high input (BAT CURRENT SENSOR)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more with ignition switch ON

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-450, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009124

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-565, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

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

Is the inspection result normal?

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

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

10. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-461, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

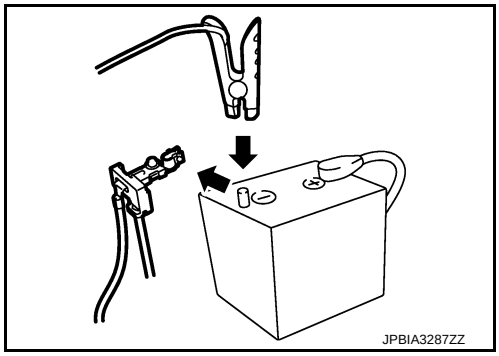
Component Inspection (Battery Current Sensor)

INFOID:0000000009009125

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.

⬅: To body ground



4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1553 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009126

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1553	BAT CURRENT SENSOR (Battery current sensor performance)	The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-454, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009127

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-565, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

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

Is the inspection result normal?

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

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

10. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-461, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Current Sensor)

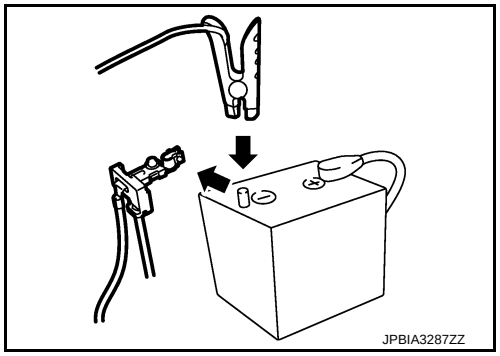
INFOID:0000000009009128

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.

: To body ground

4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1554 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009129

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1554	BAT CURRENT SENSOR (Battery current sensor performance)	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform Component Function Check. Refer to EC-458, "Component Function Check".

NOTE:

Use Component Function Check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-459, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009130

1.PRECONDITIONING

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 12.8 V or more at idle.**
- **Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.**

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

WITH CONSULT

1. Start engine and let it idle.
2. Select “BAT CUR SEN” in “DATA MONITOR” mode with CONSULT.
3. Check “BAT CUR SEN” indication for 10 seconds.
   “BAT CUR SEN” should be above 2,300 mV at least once.

WITHOUT CONSULT

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

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-459, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009131

1. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-565, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

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

Is the inspection result normal?

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

9.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

10.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

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

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-461, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

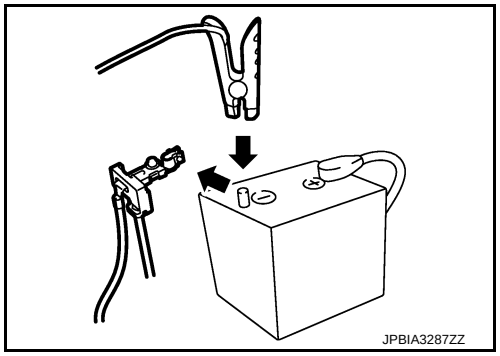
Component Inspection (Battery Current Sensor)

INFOID:0000000009009132

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.

⬅: To body ground



4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1556, P1557 BATTERY TEMPERATURE SENSOR

DTC Logic

INFOID:0000000009009133

DTC DETECTION LOGIC

NOTE:
If DTC P1556 or P1557 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1556	BAT TMP SEN/CIRC (Battery temperature sensor circuit low input)	Signal voltage from Battery temperature sensor remains 0.16V or less for 5 seconds or more.	• Harness or connectors [Battery current sensor (Battery temperature sensor) circuit is shorted.] (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor (Battery temperature sensor) • Crankshaft position sensor • Camshaft position sensor (bank 1) • Accelerator pedal position sensor 2 • Refrigerant pressure sensor • EVAP control system pressure sensor
P1557	BAT TMP SEN/CIRC (Battery temperature sensor circuit high input)	Signal voltage from Battery temperature sensor remains 4.84V or more for 5 seconds or more.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and let it idle at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-462, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009134

1.CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch ON.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	1	E80	139	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- CKP sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Battery current sensor (Refer to EC-457, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Diagnosis Procedure".)
- EVAP control system pressure sensor (Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

>> INSPECTION END

7.CHECK BATTERY TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY TEMPERATURE SENSOR

Refer to EC-464, "Component Inspection (Battery Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Temperature Sensor)

INFOID:0000000009009135

1.CHECK BATTERY TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect battery current sensor.
3. Check the resistance between battery current sensor connector terminals.

Battery current sensor		Resistance
+	–	
Terminal		
1	4	continuity with the resistance value 100 Ω or more

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1564 ASCD STEERING SWITCH

DTC Logic

INFOID:0000000009009136

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1564	ASCD SW (ASCD steering switch)	• An excessively high voltage signal from the ASCD steering switch is sent to ECM. • ECM detects that input signal from the ASCD steering switch is out of the specified range. • ECM detects that the ASCD steering switch is stuck ON.	• Harness or connectors (The switch circuit is open or shorted.) • ASCD steering switch • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Check DTC.

Is DTC detected?

YES >> Go to EC-465, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009137

1.CHECK ASCD STEERING SWITCH CIRCUIT

WITH CONSULT
1. Turn ignition switch ON.
2. Select “MAIN SW”, “CANCEL SW”, “RESUME/ACC SW” and “SET SW” in “DATA MONITOR” mode with CONSULT.
3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
		Released	OFF
RESUME/ACC SW	RESUME/ACCELERATE switch	Pressed	ON
		Released	OFF

Monitor item	Condition		Indication
SET SW	SET/COAST switch	Pressed	ON
		Released	OFF

⊗ WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	128 (ASCD steering switch signal)	130	MAIN switch: Pressed	Approx. 0
			CANCEL switch: Pressed	Approx. 1
			SET/COAST switch: Pressed	Approx. 2
			RESUME/ACCELERATE switch: Pressed	Approx. 3
			All ASCD steering switches: Released	Approx. 4

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector.
4. Check the continuity between combination switch and ECM harness connector.

Combination switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
—	32	E80	130	Existed

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

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

4. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

Combination switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
—	25	E80	128	Existed

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

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

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

6.CHECK ASCD STEERING SWITCH

Refer to EC-467, "Component Inspection (ASCD Steering Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace ASCD steering switch. Refer to ST-33, "Removal and Installation".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Steering Switch)

INFOID:0000000009009138

1.CHECK ASCD STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector M302.
3. Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance (Ω)
Connector	Terminals		
M302	13 and 16	MAIN switch: Pressed	Approx. 0
		CANCEL switch: Pressed	Approx. 250
		SET/COAST switch: Pressed	Approx. 660
		RESUME/ACCELERATE switch: Pressed	Approx. 1,480
		All ASCD steering switches: Released	Approx. 4,000

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD steering switch. Refer to ST-33, "Removal and Installation".

P1564 ICC STEERING SWITCH

DTC Logic

INFOID:0000000009009139

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1564	ASCD SW (ICC steering switch)	• An excessively high voltage signal from the ICC steering switch is sent to ECM. • ECM detects that input signal from the ICC steering switch is out of the specified range. • ECM detects that the ICC steering switch is stuck ON.	• Harness or connectors (The switch circuit is open or shorted.) • ICC steering switch • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press LDP switch for at least 10 seconds, then release it at wait at least 10 seconds.
8. Check DTC.

Is DTC detected?

YES >> Go to EC-468, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009140

1.CHECK ICC STEERING SWITCH CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	128 (ICC steering switch signal)	130	MAIN switch: Pressed	Approx. 0
			DYNAMIC DRIVER ASSISTANCE switch: Pressed	Approx. 1.0
			CANCEL switch: Pressed	Approx. 1.9
			DISTANCE switch: Pressed	Approx. 2.6
			SET/COAST switch: Pressed	Approx. 3.2
			RESUME/ACCELERATE switch: Pressed	Approx. 3.7
			All ICC steering switches: Released	Approx. 4.2

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2. CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector.
4. Check the continuity between combination switch and ECM harness connector.

Combination switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
—	32	E80	130	Existed

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

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

4. CHECK ICC STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

Combination switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
—	25	E80	130	Existed

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

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

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

6.CHECK ICC STEERING SWITCH

Refer to EC-470, "Component Inspection (ICC Steering Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace ICC steering switch. Refer to ST-33, "Removal and Installation".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Steering Switch)

INFOID:0000000009009141

1.CHECK ICC STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector M302.
3. Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance (Ω)
Connector	Terminals		
M302	13 and 16	MAIN switch: Pressed	Approx. 0
		DYNAMIC DRIVER ASSISTANCE switch: Pressed	Approx. 270
		CANCEL switch: Pressed	Approx. 620
		DISTANCE switch: Pressed	Approx. 1,100
		SET/COAST switch: Pressed	Approx. 1,810
		RESUME/ACCELERATE switch: Pressed	Approx. 3,000
		All ICC steering switches: Released	Approx. 5,420

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC steering switch. Refer to ST-33, "Removal and Installation".

P1568 ICC FUNCTION

DTC Logic

INFOID:0000000009009142

DTC DETECTION LOGIC

NOTE:

- **If DTC P1568 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1568 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".**
- **If DTC P1568 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC Detecting Condition	Possible Cause
P1568	ICC COMMAND VALUE (ICC function)	ECM detects a difference between signals from ADAS control unit is out of specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • ADAS control unit • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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:

Step 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Press MAIN switch on ICC steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH).

   CAUTION:

   Always drive vehicle at a safe speed.
4. Press SET/COAST switch.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-471, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009143

1.REPLACE ADAS CONTROL UNIT

1. Replace ADAS control unit. Refer to DAS-72, "Removal and Installation".
2. Check DTC of ADAS control unit. Refer to DAS-45, "DTC Index".

>> INSPECTION END

P1572 ASCD BRAKE SWITCH

DTC Logic

INFOID:0000000009009144

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P1572	ASCD BRAKE SW (ASCD brake switch)	A)	When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time.	• Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ASCD brake switch circuit is shorted.) • Stop lamp switch • ASCD brake switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • ECM
		B)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine (VDC switch OFF).
2. Press MAIN switch and check that CRUISE indicator is displayed in combination meter.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   CAUTION:

   Always drive vehicle at a safe speed.

   NOTE:

   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-473, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   CAUTION:

Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-473, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009145

1.CHECK OVERALL FUNCTION-I

WITH CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ASCD brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	147 (ASCD brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

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

2.CHECK OVERALL FUNCTION-II

WITH CONSULT
Select “BRAKE SW2” and check indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW2 (Stop lamp switch)	Brake pedal	Slightly depressed	ON
		Fully released	OFF

WITHOUT CONSULT
Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	158 (Stop lamp switch signal)	175	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 8.

3.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD brake switch		Ground	Voltage
Connector	Terminal		
E109	1	Ground	Battery voltage

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 3)
- Harness for open or short between ASCD brake switch and fuse
- Loose or poor connection for each connector and harness

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

5.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E109	2	E80	147	Existed

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and ASCD brake switch
- Loose or poor connection for each connector and harness

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

7.CHECK ASCD BRAKE SWITCH

Refer to EC-476, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace ASCD brake switch.

8. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E115	1	Ground	Battery voltage

Is the inspection result normal?

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

9. DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 7)
- Harness for open or short between stop lamp switch and battery
- Loose or poor connection for each connector and harness

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

10. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E115	2	E80	158	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and stop lamp switch
- Loose or poor connection for each connector and harness

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

12. CHECK STOP LAMP SWITCH

Refer to EC-476, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace stop lamp switch.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000009009146

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch. Refer to BR-20, "Removal and Installation".

Component Inspection (Stop Lamp Switch)

INFOID:0000000009009147

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 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-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Removal and Installation".

P1572 ICC BRAKE SWITCH

DTC Logic

INFOID:0000000009009148

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P1572	ASCD BRAKE SW (ICC brake switch)	A)	ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time.	• Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ICC brake switch circuit is shorted.) • Stop lamp switch • ICC brake switch • ICC brake hold relay • Incorrect stop lamp switch installation • Incorrect ICC brake switch installation • ECM
		B)	ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Press MAIN switch and check that CRUISE indicator is displayed in combination meter.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   CAUTION:

   Always drive vehicle at a safe speed.

   NOTE:

   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-478, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   CAUTION:

Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-478, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009149

1.CHECK OVERALL FUNCTION-I

With CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

Without CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	147 (ICC brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0
			Brake pedal	Fully released	Battery voltage

Is the inspection result normal?

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

2.CHECK OVERALL FUNCTION-II

With CONSULT
Select “BRAKE SW2” and check indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW2 (Stop lamp switch)	Brake pedal	Slightly depressed	ON
		Fully released	OFF

Without CONSULT
Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	158 (Stop lamp switch signal)	175	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

3.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E68	1	Ground	Battery voltage

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse

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

5.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E68	2	E80	147	Existed

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ICC brake switch and ECM

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

7.CHECK ICC BRAKE SWITCH

Refer to EC-481, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

8. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Disconnect ICC brake hold relay harness connector.
4. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E115	1	Ground	Battery voltage

5. Check the voltage between ICC brake hold relay harness connector and ground.

ICC brake hold relay		Ground	Voltage
Connector	Terminal		
E64	3	Ground	Battery voltage

Is the inspection result normal?

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

9. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between battery and stop lamp switch
- Harness for open or short between battery and ICC brake hold relay

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

10. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E115	2	E80	158	Existed

3. Check the continuity between ICC brake hold relay harness connector and ECM harness connector.

ICC brake hold relay		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E64	5	E80	158	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- Harness for open or short between ECM and stop lamp switch
- Harness for open or short between ECM and ICC brake hold relay

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

12. CHECK STOP LAMP SWITCH

Refer to EC-481, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

13. CHECK ICC BRAKE HOLD RELAY

Refer to EC-482, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace ICC brake hold relay.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000009009150

1. CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2. CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-7, "Inspection and Adjustment".
2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

Component Inspection (Stop Lamp Switch)

INFOID:0000000009009151

1. CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 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-II

1. Adjust stop lamp switch installation. Refer to BR-7, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

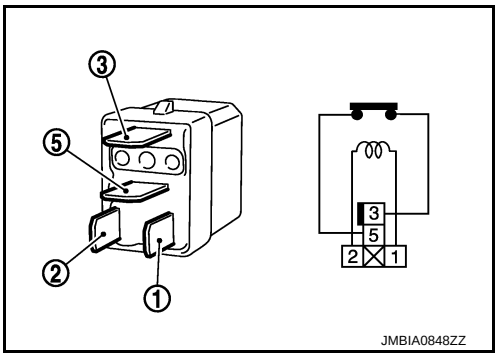
Component Inspection (ICC Brake Hold Relay)

INFOID:0000000009009152

1.CHECK ICC BRAKE HOLD RELAY

1. Turn ignition switch OFF.
2. Remove ICC brake hold relay.
3. Check the continuity between ICC brake hold relay terminals under the following conditions.

Terminals	Condition	Continuity
3 and 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



JMBIA0848ZZ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake hold relay

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000009009153

The ECM receives two vehicle speed signals by the CAN communication line. One is sent from “combination meter”, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to EC-56, "AUTOMATIC SPEED CONTROL DEVICE (ASCD) : System Description" for ASCD functions.

DTC Logic

INFOID:0000000009009154

DTC DETECTION LOGIC

NOTE:

- **If DTC P1574 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1574 is displayed with DTC P0500, perform the trouble diagnosis for DTC P0500. Refer to EC-388, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1574	ASCD VHL SPD SEN (ASCD vehicle speed sensor)	ECM detects a difference between two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-485, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009155

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-39, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

3.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

>> INSPECTION END

P1574 ICC VEHICLE SPEED SENSOR

Description

INFOID:0000000009009156

The ECM receives two vehicle speed signals by the CAN communication line. One is sent from “combination meter”, and the other is from TCM (Transmission control module). The ECM uses these signals for ICC control. Refer to CCS-12, "System Description" for ICC functions.

DTC Logic

INFOID:0000000009009157

DTC DETECTION LOGIC

NOTE:

- **If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-388, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1574	ASCD VHL SPD SEN (ICC vehicle speed sensor)	ECM detects a difference between two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-485, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009158

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-39, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform Diagnosis Procedure corresponding to the DTC indicated.

3.CHECK DTC WITH “COMBINATION METER”

Check combination meter function.
Refer to MWI-31, "CONSULT Function".

>> INSPECTION END

P1606 VVEL CONTROL MODULE

DTC Logic

INFOID:0000000009009159

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1606	VVEL CONTROL MODULE (VVEL control module)	• VVEL control module calculation function is malfunctioning. • VVEL EEP-ROM system is malfunctioning.	• VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-487, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009160

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-487, "DTC Logic".

Is the DTC P1606 displayed again?

YES >> Replace VVEL control module. Refer to EC-583, "Removal and Installation".
NO >> INSPECTION END

P1607 VVEL CONTROL MODULE

DTC Logic

INFOID:0000000009009161

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1607	VVEL CONTROL MODULE (VVEL control module circuit)	• The internal circuit of the VVEL control module is malfunctioning.	• VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-488, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009162

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-488, "DTC Logic".

Is the DTC P1607 displayed again?

YES >> Replace VVEL control module. Refer to EC-583, "Removal and Installation".
NO >> INSPECTION END

P1608 VVEL SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000009009163

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1608	VVEL SENSOR POWER/CIRC (VVEL sensor power supply circuit)	VVEL control module detects a voltage of power source for sensor is excessively low or high.	• Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) • VVEL control shaft position sensor • VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-489, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009164

1.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect VVEL control shaft position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

VVEL control shaft position sensor			Ground	Voltage
Bank	Connector	Terminal		
1	F72	3	Ground	Approx. 5V
		6		
2	F70	3		
		6		

Is the inspection result normal?

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

2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect VVEL control module harness connector.
3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

VVEL control shaft position sensor			VVEL control module		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F72	3	F56	7	Existed
		6		20	
2	F70	3		9	
		6		22	

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

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

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

4.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace VVEL control module. Refer to EC-583, "Removal and Installation".
NO >> Repair or replace.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6.REPLACE VVEL LADDER ASSEMBLY

Replace VVEL ladder assembly. Refer to EM-80, "Removal and Installation".

>> NSPECTION END

P1650 STARTER MOTOR RELAY 2

Description

INFOID:0000000009009165

ECM controls ON/OFF state of the starter relay, according to the engine and vehicle condition. Models with no Intelligent Key System transmit a control signal directly to IPDM E/R. On the other hand, models with the Intelligent Key System transmit a control signal to IPDM E/R by way of BCM via CAN communication.
Under normal conditions, ECM controls and maintains the starter relay in OFF state during engine running or “D” position.
When detecting a decrease in engine speed due to rapid deceleration or heavy load condition, ECM controls and reactivates the starter relay.
IPDM E/R detects a control state of starter relay and starter control relay and transmits a feedback signal to ECM via CAN communication.

DTC Logic

INFOID:0000000009009166

DTC DETECTION LOGIC

NOTE:

- If DTC P1650 is displayed with DTC U1001, perform the trouble diagnosis for DTC U1001. Refer to EC-194, "DTC Logic".
- If DTC P1650 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".
- If DTC P1650 is displayed with B209F or B20A0 of IPDM E/R, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-103, "DTC Logic" or SEC-105, "DTC Logic".
- If DTC P1650 is displayed with B26F9 or B26FA of BCM, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-95, "DTC Logic" or SEC-97, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P1650	STR MTR RELAY 2 (Starter relay circuit)	A	Starter relay is stuck ON.	• Harness and connectors (Between IPDM E/R harness connector and ECM harness connector is shorted to ground.) (Between IPDM E/R harness connector and BCM harness connector is shorted to ground.) • IPDM E/R
		B	Starter relay power supply circuit is excessively high voltage.	• Harness and connectors (Between IPDM E/R harness connector and ECM harness is open or shorted to power.) (Between IPDM E/R harness connector and BCM harness is open or shorted to power.) (Between IPDM E/R harness connector and battery is open.) • IPDM E/R
		C	Starter relay circuit is excessively low voltage	• Harness and connectors (Starter relay circuit is open or shorted.) • IPDM E/R

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND C

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. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-492, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT

CAUTION:

Always drive at a safe speed.

1. Start the engine.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Start the engine and warm it up to normal operating temperature.
5. Turn ignition switch OFF.
6. Lift up drive wheels.
7. Turn ignition switch ON.
8. Select “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
9. Restart the engine and let it idle at least 10 seconds.
10. Shift the selector lever to D position while depressing fully the brake pedal.
11. Select 1 - 4 cylinders in “POWER BALANCE” and cut the fuel of all cylinders.
12. Check 1st trip DTC.

Without CONSULT

CAUTION:

Always drive at a safe speed.

1. Start the engine.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Start the engine and warm it up to normal operating temperature.
5. Turn ignition switch OFF.
6. Lift up drive wheels.
7. Restart the engine and let it idle at least 10 seconds.
8. Shift the selector lever to D position while depressing fully the brake pedal.
9. Remove vacuum hoses from intake manifold.
10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-492, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009167

1. CHECK STARTER RELAY POWER SUPPLY CIRCUIT

Check the starter motor relay power supply circuit. Refer to PCS-33, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2. CHECK STARTER RELAY CONTROL SIGNAL CIRCUIT

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

+		–		Continuity
IPDM E/R		BCM		
Connector	Terminal	Connector	Terminal	
E13	30	M71	97	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace error-detected parts.

P1651 STARTER MOTOR RELAY

Description

INFOID:0000000009009168

ECM controls ON/OFF state of the starter relay, according to the engine and vehicle condition. Models with no Intelligent Key System transmit a control signal directly to IPDM E/R. On the other hand, models with the Intelligent Key System transmit a control signal to IPDM E/R by way of BCM via CAN communication.
Under normal conditions, ECM controls and maintains the starter relay in OFF state during engine running or “D” position.
When detecting a decrease in engine speed due to rapid deceleration or heavy load condition, ECM controls and reactivates the starter relay.
IPDM E/R detects a control state of starter relay and starter control relay and transmits a feedback signal to ECM via CAN communication.

DTC Logic

INFOID:0000000009009169

DTC DETECTION LOGIC

NOTE:
- If DTC P1651 is displayed with DTC U1001, perform the trouble diagnosis for DTC U1001. Refer to EC-194, "DTC Logic".
- If DTC P1651 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".
- If DTC P1651 is displayed with B209F or B20A0 of IPDM E/R, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-103, "DTC Logic" or SEC-105, "DTC Logic".
- If DTC P1651 is displayed with B26F9 or B26FA of BCM, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-95, "DTC Logic" or SEC-97, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	
P1651	STR MTR RELAY (Starter control relay circuit)	A correlated error is detected for 2 seconds or more between a control signal transmitted from ECM and a feedback signal transmitted from IPDM E/R via CAN communication line.	• Harness or connectors (Between ECM harness connector and IPDM E/R harness connector is shorted to power.) • IPDM E/R • BCM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine and let it idle at least 30 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-494, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009170

1.INSPECTION START

Check the starter motor operation.

Is the starter motor operated?

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

2. CHECK DTC WITH IPDM E/R

Check DTC with IPDM E/R. Refer to PCS-12, "CONSULT Function (IPDM E/R)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for DTC indicated.

3. CHECK DTC WITH BCM

Check DTC with BCM. Refer to BCS-30, "BCM : CONSULT Function (BCM - BCM)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform trouble diagnosis for DTC indicated.

4. CHECK CRANKING REQUEST SIGNAL CIRCUIT-

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

+		–		Continuity
ECM		IPDM E/R		
Connector	Terminal	Connector	Terminal	
E80	165	E13	23	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace error-detected parts.

P1652 STARTER MOTOR SYSTEM COMM

Description

INFOID:0000000009009171

ECM controls ON/OFF state of the starter relay, according to the engine and vehicle condition. Models with no Intelligent Key System transmit a control signal directly to IPDM E/R. On the other hand, models with the Intelligent Key System transmit a control signal to IPDM E/R by way of BCM via CAN communication.
Under normal conditions, ECM controls and maintains the starter relay in OFF state during engine running or “D” position.
When detecting a decrease in engine speed due to rapid deceleration or heavy load condition, ECM controls and reactivates the starter relay.
IPDM E/R detects a control state of starter relay and starter control relay and transmits a feedback signal to ECM via CAN communication.

DTC Logic

INFOID:0000000009009172

DTC DETECTION LOGIC

NOTE:
- If DTC P1652 is displayed with DTC U1001, perform the trouble diagnosis for DTC U1001. Refer to EC-194, "DTC Logic".
- If DTC P1652 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".
- If DTC P1652 is displayed with B209F or B20A0 of IPDM E/R, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-103, "DTC Logic" or SEC-105, "DTC Logic".
- If DTC P1652 is displayed with B26F9 or B26FA of BCM, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-95, "DTC Logic" or SEC-97, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	
P1652	STR MTR SYS COMM (Starter motor communication line)	ECM detects malfunction in starter motor drive circuit of the IPDM E/R.	IPDM E/R

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 5 minutes.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-496, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009173

1.INSPECTION START

1. Erase DTC.
2. Perform DTC confirmation procedure. Refer to EC-496, "DTC Logic".
3. Check DTC.

Is the P1652 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NG >> Repair or replace error-detected parts.

P1715 INPUT SPEED SENSOR

Description

INFOID:0000000009009174

ECM receives input speed sensor signal from TCM by the CAN communication line. ECM uses this signal for engine control.

DTC Logic

INFOID:0000000009009175

DTC DETECTION LOGIC

NOTE:

- **If DTC P1715 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1715 is displayed with DTC P0335, perform the trouble diagnosis for DTC P0335. Refer to EC-331, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0340, perform the trouble diagnosis for DTC P0340. Refer to EC-335, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-408, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-410, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1715	IN PULY SPEED [Input speed sensor (TCM output)]	Input speed sensor signal is different from the theoretical value calculated by ECM from output speed sensor signal and engine rpm signal.	• Harness or connectors (The CAN communication line is open or shorted) (Input speed sensor circuit is open or shorted) • TCM

Diagnosis Procedure

INFOID:0000000009009176

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform Diagnosis Procedure corresponding to DTC indicated.

2.REPLACE TCM

Replace TCM. Refer to TM-191, "Removal and Installation".

>> INSPECTION END

P1805 BRAKE SWITCH

DTC Logic

INFOID:0000000009009177

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1805	BRAKE SW/CIRCUIT (Brake switch)	A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	• Harness or connectors (Stop lamp switch circuit is open or shorted.) • Stop lamp switch

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-499, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009178

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check for stop lamp illumination under the following conditions.

Condition		Stop lamp
Brake pedal	Fully released	Not illuminated
	Slightly depressed	Illuminated

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.
2. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E115	1	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 7)
- Harness for open or short between stop lamp switch and battery
- Loose or poor connection for each connector and harness

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

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect stop lamp switch harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E115	2	E80	158	Existed

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

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and stop lamp switch
- Loose or poor connection for each connector and harness

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

6. CHECK STOP LAMP SWITCH

Refer to EC-500, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace stop lamp switch. Refer to BR-20, "Removal and Installation".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000009009179

1. CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 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-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Removal and Installation".

P2096, P2097, P2098, P2099 A/F SENSOR 1

DTC Logic

INFOID:0000000009009180

DTC DETECTION LOGIC

To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored so it will not shift to LEAN side or RICH side.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
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.	• A/F sensor 1 (bank 1) • A/F sensor 1 heater • Heated oxygen sensor 2 (bank 1) • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks
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.	
P2098	POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too lean bank 2)	The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period.	• A/F sensor 1 (bank 2) • A/F sensor 1 heater • Heated oxygen sensor 2 (bank 2) • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks
P2099	POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too rich bank 2)	The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
6. Let engine idle for 1 minute.
7. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-502, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009181

1.RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to EX-5, "Exploded View".

>> GO TO 2.

2.CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

3. CHECK A/F SENSOR 1 CONNECTOR

1. Disconnect A/F sensor 1 harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace harness connector.

4. CHECK FOR INTAKE AIR LEAKAGE

1. Reconnect A/F sensor 1 harness connector.
2. Start engine and run it at idle.
3. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 5.

5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-292, "Diagnosis Procedure" or EC-296, "Diagnosis Procedure".
NO >> GO TO 6.

6. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P2096 P2097	1	F67	4	Ground	3.0 V
P2098 P2099	2	F68	4		

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P2096 P2097	1	F67	3	F110	88	Existed
P2098 P2099	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P2096 P2097	1	F67	3	F110	88	Ground	Not existed
P2098 P2099	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P2096 P2097	1	F67	6	F110	94	Existed
P2098 P2099	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to EC-204, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

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

10. CHECK HEATED OXYGEN SENSOR 2

Check heated oxygen sensor 2. Refer to EC-289, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace malfunctioning part.

11. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace malfunctioning part.

12. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

Will CONSULT be used?

YES >> GO TO 13.
NO >> GO TO 14.

13. CONFIRM A/F ADJUSTMENT DATA

WITH CONSULT
1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT.
3. Check that “0.000” is displayed on CONSULT screen.

Is “0.000” displayed?

YES >> INSPECTION END
NO >> GO TO 14.

14. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-167, "Work Procedure".

Will CONSULT be used?

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

15. CONFIRM A/F ADJUSTMENT DATA

WITH CONSULT
1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT.
3. Check that “0.000” is displayed on CONSULT screen.

>> INSPECTION END

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

INFOID:0000000009009182

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2100	ETC MOT PWR-B1 [Throttle control motor relay circuit open (bank 1)]	ECM detects that the voltage of power source for throttle control motor is excessively low.	• Harness or connectors (Throttle control motor relay circuit is open) • Throttle control motor relay
P2103	ETC MOT PWR (Throttle control motor relay circuit short)	ECM detects that the throttle control motor relay is stuck ON.	• Harness or connectors (Throttle control motor relay circuit is shorted) • Throttle control motor relay

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

Which DTC is detected?

P2100 >> GO TO 2.
P2103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-506, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-506, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009183

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E15.
4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	60	E80	123	Existed

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

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

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

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

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

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	55	E80	173	Existed

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

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

5. CHECK FUSE

1. Disconnect 20 A fuse (No. 64) from IPDM E/R.
2. Check if 20 A fuse is blown.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 20 A fuse.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace harness or connectors.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000009009184

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM. ECM controls the throttle valve opening angle in response to driving condition via the throttle control motor.

DTC Logic

INFOID:0000000009009185

DTC DETECTION LOGIC

NOTE:

- **If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to EC-506, "DTC Logic".**
- **If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to EC-514, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101	Electric throttle control performance	Electric throttle control function does not operate properly.	• Harness or connectors (Throttle control motor circuit is open or shorted) • Electric throttle control actuator

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-508, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009186

1.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check the voltage between ECM harness connector and ground under the following conditions.

ECM		Ground	Condition	Voltage
Connector	Terminal			
E80	173	Ground	Ignition switch: OFF	Approx. 0 V
			Ignition switch: ON	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
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.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	60	E80	123	Existed

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

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

4. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

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

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	55	E80	173	Existed

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

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

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

6. CHECK FUSE

1. Disconnect 20 A fuse (No. 64) from IPDM E/R.
2. Check 20 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace 20 A fuse.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace harness or connectors.

8. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.

2. Disconnect electric throttle control actuator harness connector.
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	
F66	5	F110	57	Not existed
			63	Existed
	6		57	Existed
			63	Not existed

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

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace.

9. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-162, "Work Procedure".

10. CHECK THROTTLE CONTROL MOTOR

Refer to EC-510, "Component Inspection".

Is the inspection result normal?

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

11. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace harness or connectors.

12. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunction electric throttle control actuator. Refer to EM-31, "Removal and Installation".
2. Perform EC-511, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000009009187

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.

Terminals	Resistance
5 and 6	Approx. 1 - 15 Ω [at 25°C (77°F)]

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".
2. Perform EC-511, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000009009188

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-162, "Work Procedure".

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-163, "Work Procedure".

>> END

P2118 THROTTLE CONTROL MOTOR

DTC Logic

INFOID:0000000009009189

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2118	ETC MOT-B1 (Throttle control motor circuit short)	ECM detects short in both circuits between ECM and throttle control motor.	• Harness or connectors (Throttle control motor circuit is shorted.) • Electric throttle control actuator (Throttle control motor)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-512, "DTC Logic".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009190

1.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.
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	
F66	5	F110	57	Not existed
			63	Existed
	6		57	Existed
			63	Not existed

4. 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-513, "Component Inspection (Electric Throttle Control Motor)".

Is the inspection result normal?

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace harness or connectors.

4. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

Component Inspection (Electric Throttle Control Motor)

INFOID:0000000009009191

1. CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Check resistance between electric throttle control actuator terminals as per the following.

Terminals	Resistance
5 and 6	Approx. 1 - 15 Ω [at 25°C (77°F)]

Is the inspection result normal?

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

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic

INFOID:0000000009009192

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P2119	ETC ACTR-B1 (Electric throttle control actuator)	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	• Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detects that the throttle valve is stuck open.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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. Selector lever position is D and wait at least 3 seconds.
3. Selector lever position is P.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Selector lever position is D and wait at least 3 seconds.
7. Selector lever position is P.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to EC-514, "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. Selector lever position is D and wait at least 3 seconds.
3. Selector lever position is N or P.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-514, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009193

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-162, "Work Procedure".

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P2122, P2123 APP SENSOR

DTC Logic

INFOID:0000000009009194

DTC DETECTION LOGIC

NOTE:
If DTC P2122 or P2123 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2122	APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit low input)	An excessively low voltage from the APP sensor 1 is sent to ECM.	• Harness or connectors (APP sensor 1 circuit is open or shorted.) • Accelerator pedal position sensor (APP sensor 1)
P2123	APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit high input)	An excessively high voltage from the APP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-516, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009195

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	2	Ground	Approx. 5
E67 (With ICC)	12		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

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

3. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	4	E80	140	Existed
E67 (With ICC)	11			

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

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

5. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	3	E80	136	Existed
E67 (With ICC)	10			

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

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

7. CHECK APP SENSOR

Refer to EC-518, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000009009196

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	136 (APP sensor 1)	140	Accelerator pedal	Fully released	0.5 - 1.0
				Fully depressed	4.2 - 4.8
	126 (APP sensor 2)	129		Fully released	0.25 - 0.5
				Fully depressed	2.0 - 2.5

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

P2127, P2128 APP SENSOR

DTC Logic

INFOID:0000000009009197

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2127	APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit low input)	An excessively low voltage from the APP sensor 2 is sent to ECM.	• Harness or connectors (Accelerator pedal position sensor 2 circuit is open or shorted.) (Battery current sensor circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • Battery current sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor
P2128	APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit high input)	An excessively high voltage from the APP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-519, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009198

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	1	Ground	Approx. 5
E67 (With ICC)	9		

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	1	E80	131	Existed
E67 (With ICC)	9			

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3
	131	APP sensor (Without ICC)	E110	1
		APP sensor (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	5	E80	129	Existed
E67 (With ICC)	8			

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

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

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

8. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	6	E80	126	Existed
E67 (With ICC)	7			

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

Is the inspection result normal?

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

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

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

10. CHECK APP SENSOR

Refer to EC-522, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

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

11. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000009009199

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	136 (APP sensor 1)	140	Accelerator pedal	Fully released	0.5 - 1.0
				Fully depressed	4.2 - 4.8
	126 (APP sensor 2)	129		Fully released	0.25 - 0.5
				Fully depressed	2.0 - 2.5

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

P2135 TP SENSOR

DTC Logic

INFOID:0000000009009200

DTC DETECTION LOGIC

NOTE:
If DTC P2135 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2135	TP SENSOR-B1 (Throttle position sensor circuit range/performance)	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	• Harness or connector (TP sensor 1 or 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1 or 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-523, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009201

1.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

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

Electric throttle control actuator		Ground	Voltage (V)
Connector	Terminal		
F66	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	4	F110	97	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	1	F110	91	Existed
	3		79	

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR

Refer to EC-524, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

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

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000009009202

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-162, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F110	91 (TP sensor 1 signal)	97 (Sensor ground)	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	79 (TP sensor 2 signal)			Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P2138 APP SENSOR

DTC Logic

INFOID:0000000009009203

DTC DETECTION LOGIC

NOTE:
If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-413, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2138	APP SENSOR (Accelerator pedal position sensor circuit range/performance)	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	• Harness or connectors (APP sensor 1 or 2 circuit is open or shorted.) [CKP sensor circuit is shorted.] [CMP sensor (bank 1) circuit is shorted.] (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 or 2) • Crankshaft position sensor • Camshaft position sensor (bank 1) • Refrigerant pressure sensor • Battery current sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-526, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009204

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	2	Ground	Approx. 5
E67 (With ICC)	12		

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

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

3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	1	Ground	Approx. 5
E67 (With ICC)	9		

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 4.

4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	1	E80	131	Existed
E67 (With ICC)	9			

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

6. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E80	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3
	131	APP sensor (Without ICC)	E110	1
		APP sensor (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair short to ground or short to power in harness or connectors.

7.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-333, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-338, "Component Inspection (Camshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-565, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-366, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	4	E80	140	Existed
	5		129	
E67 (With ICC)	11	E80	140	Existed
	8		129	

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

Is the inspection result normal?

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

9.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

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

10.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	3	E80	136	Existed
	6		126	
E67 (With ICC)	10	E80	136	Existed
	7		126	

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

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

12. CHECK APP SENSOR

Refer to EC-529, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000009009205

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	136 (APP sensor 1)	140	Accelerator pedal	Fully released	0.5 - 1.0
				Fully depressed	4.2 - 4.8
	126 (APP sensor 2)	129		Fully released	0.25 - 0.5
				Fully depressed	2.0 - 2.5

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

P2539, P2541, P2542 LOW FUEL PRESSURE SENSOR

DTC Logic

INFOID:0000000009009206

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2539	LOW FUEL PRES SEN (Low fuel pressure sensor circuit low input and high input)	Signal voltage from the low fuel pressure sensor remains at more than 4.84 V / less than 0.3 V for 5 seconds or more.	• Harness or connectors (Low fuel pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Cooling fan speed sensor circuit is open or shorted.) (FRP sensor circuit is open or shorted.) • Low fuel pressure sensor • Power steering pressure sensor • Cooling fan speed sensor • FRP sensor
P2541	LOW FUEL PRES SEN (Low fuel pressure sensor circuit low input)	Signal voltage from the low fuel pressure sensor remains at less than 0.49 V for 5 seconds or more.	
P2542	LOW FUEL PRES SEN (Low fuel pressure sensor circuit high input)	Signal voltage from the low fuel pressure sensor remains at more than 4.1 V for 5 seconds or more.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-531, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009207

NOTE:
Turning the ignition switch ON with low fuel pressure sensor harness connector disconnected causes ECM to detect DTC P2539. Be sure to erase the DTC when the diagnosis procedure.

1.CHECK LOW FUEL PRESSURE SENSOR POWER SUPPLY-I

1. Turn ignition switch OFF.
2. Disconnect low fuel pressure sensor connector.
3. Turn ignition switch ON.
4. Check the voltage between low fuel pressure sensor harness connector terminals.

Low fuel pressure sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F25	3	1	5 V

Inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK LOW FUEL PRESSURE SENSOR POWER SUPPLY-II

Check the voltage between low fuel pressure sensor harness connector and the ground.

+		–	Voltage (Approx.)
Low fuel pressure sensor			
Connector	Terminal		
F25	3	Ground	5 V

Is inspection result normal?

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

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Power steering pressure sensor	F35	1
		Low fuel pressure sensor	F25	3
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-190, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.CHECK LOW FUEL PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between low fuel pressure sensor harness connector and ECM harness connector.

+		–		Continuity
Low fuel pressure sensor		ECM		
Connector	Terminal	Connector	Terminal	
F25	1	F111	45	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and the ground.

ECM		Ground	Continuity
Connector	Terminal		
F111	5	Ground	Existed
E80	114		
	115		
	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

6.CHECK LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between low fuel pressure sensor harness connector and ECM harness connector.

+		–		Continuity
Low fuel pressure sensor		ECM		
Connector	Terminal	Connector	Terminal	
F25	2	F111	23	Existed

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

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK LOW FUEL PRESSURE SENSOR

Refer to EC-533, "Component Inspection".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace low fuel pressure sensor.

Component Inspection

INFOID:0000000009009208

1.CHECK LOW FUEL PRESSURE SENSOR

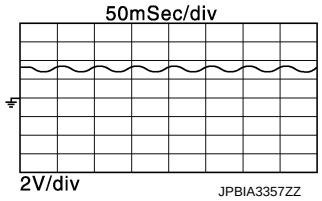
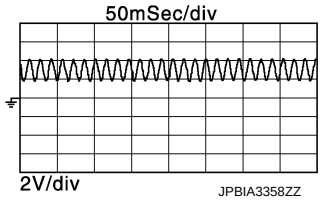
WITH CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Select “DATA MONITOR” mode with CONSULT.
5. Check that the “L/FUEL PRES SEN V” value.

Data monitor item	Condition	Value (Approx.)
L/FUEL PRES SEN V	Engine speed: idle	3,000 –3,300 mV
	Engine speed: 3,000 rpm (no load)	

WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Check low fuel pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Low fuel pressure sensor		Ground		
Connector	Terminal			
F25	2	Ground	[Engine is running] • Warm-up condition • Idle speed	
			[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Replace low fuel pressure sensor. Refer to EM-44, "Removal and Installation".

ASCD BRAKE SWITCH

Component Function Check

INFOID:0000000009009209

1.CHECK ASCD BRAKE SWITCH FUNCTION

WITH CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ASCD brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	147 (ASCD brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-535, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009210

1.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD brake switch		Ground	Voltage
Connector	Terminal		
E109	1	Ground	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 3)
- Harness for open or short between ASCD brake switch and fuse
- Loose or poor connection for each connector and harness

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

3.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E109	2	E80	147	Existed

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

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and ASCD brake switch
- Loose or poor connection for each connector and harness

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

5.CHECK ASCD BRAKE SWITCH

Refer to EC-536, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace ASCD brake switch. Refer to BR-20, "Removal and Installation".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000009009211

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch. Refer to BR-20, "Removal and Installation".

ASCD INDICATOR

Component Function Check

INFOID:0000000009009212

1.CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	• Ignition switch: ON	• MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-537, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009213

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-87, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000009009214

The electrical load signal (Rear window defogger switch signal, headlamp switch signal, heater fan switch signal, etc.) is transferred via the CAN communication line.

Component Function Check

INFOID:0000000009009215

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with 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 >> Go to EC-538, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check “LOAD SIGNAL” indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Lighting switch	ON at 2nd position	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to EC-538, "Diagnosis Procedure".

3.CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select “HEATER FAN SW” and check indication under the following conditions.

Monitor item	Condition		Indication
HEATER FAN SW	Heater fan control switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-538, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009216

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to EC-538, "Component Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2.
Headlamp>>GO TO 3.
Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-23, "Work Flow".

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Refer to EXL-60, "Work Flow".

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to HAC-64, "Work Flow".

>> INSPECTION END

ELECTRICALLY-CONTROLLED COOLING FAN COUPLING

Component Function Check

INFOID:0000000009009217

1.CHECK COOLING FAN FUNCTION

WITH CONSULT
1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Check that cooling fan speed varies according to the percentage.
   NOTE:
   Speed changes gradually as the percentage changes.

WITHOUT CONSULT
1. Start the engine and warm up the engine until engine coolant temperature reaches at least 98°C (209°F).
2. Check that cooling fan speed increase.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-540, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009218

1.CHECK DRIVE BELT

1. Turn ignition switch OFF.
2. Check that the drive belt is not broken.

Is inspection result normal?

YES >> GO TO 2.
NO >> Replace drive belt.

2.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING POWER SUPPLY

1. Disconnect electrically-controlled cooling fan coupling harness connector.
2. Turn ignition switch ON.
3. Check the voltage between electrically-controlled cooling fan coupling harness connector and ground.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	1	Ground	Battery voltage

Is inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for power supply circuit.

3.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between electrically-controlled cooling fan coupling harness connector and ground.

+		–	Continuity
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	6	Ground	Existed

Is inspection result normal?

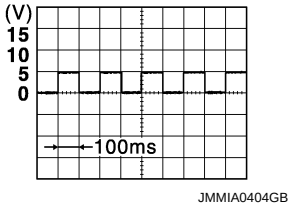
YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING CONTROL SIGNAL

WITH CONSULT

1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode of “ECM” with CONSULT.
3. Set the Duty value to 100%.
4. Check the voltage between electrically-controlled cooling fan coupling harness connector and ground.

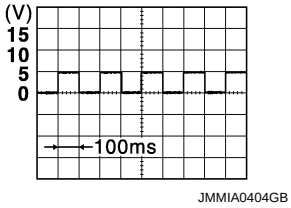
CAUTION:
Wait for 1 minute or more to measure.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	3	Ground	 JMMIA0404GB 2. 5 V

Ⓧ WITHOUT CONSULT

1. Start the engine and warm up the engine until engine coolant temperature reaches at least 98°C (209°F).
2. Check the voltage between electrically-controlled cooling fan coupling harness connector and ground.

CAUTION:
Wait for 1 minute or more to measure.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	3	Ground	 JMMIA0404GB 2. 5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 5.

5. CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING CONTROL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between electrically-controlled cooling fan coupling harness connector and IPDM E/R harness connector.

+		–		Continuity
Electrically-controlled cooling fan coupling		IPDM E/R		
Connector	Terminal	Connector	Terminal	
F39	3	E17	72	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 CAN COMMUNICATION

Refer to LAN-22, "Trouble Diagnosis Flow Chart".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or Replace error-detected parts.

7. CHECK COOLING FAN SPEED SENSOR

Refer to EC-399, "Diagnosis Procedure".

Is inspection result normal?

YES >> Replace electrically-controlled cooling fan coupling. Refer to CO-18, "Removal and Installation".
NO >> Repair or replace error-detected parts.

FUEL INJECTOR

Component Function Check

INFOID:0000000009009219

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

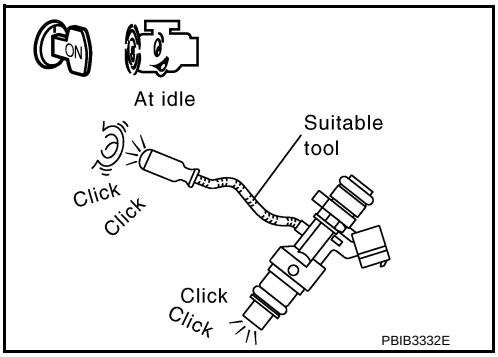
YES >> GO TO 2.
NO >> Proceed to EC-543, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

WITH CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT
1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-543, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009220

1.CHECK FUEL INJECTOR POWER SUPPLY

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

+		–	Voltage
ECM			
Connector	Terminal		
F111	46	Ground	Battery voltage
	51		
E80	111		
	112		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E46, E94, F22 or F103
- 15 A fuse (No. 87)
- 30 A fuse (No. 71)
- Harness for open or short between ECM and fuse
- Fuel injector relay. Refer to EC-545, "Component Inspection (Fuel Injector Relay)"

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

3.CHECK FUEL INJECTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector and ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

Cylinder	+		–		Continuity
	Fuel injector		ECM		
	Connector	Terminal	Connector	Terminal	
1	F123	1	F110	101	Existed
		2		108	
2	F124	1	F111	7	
		2		4	
3	F125	1	F111	6	
		2		3	
4	F126	1	F110	107	
		2		104	
5	F127	1	F111	2	
		2		9	
6	F128	1	F110	102	
		2		109	
7	F129	1	F110	106	
		2		103	
8	F130	1	F111	1	
		2		8	

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and ground.

+		–	Continuity
ECM			
Connector	Terminal		
F111	5	Ground	Existed
E80	114		
	115		

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK FUEL INJECTOR

Refer to EC-545, "Component Inspection (Fuel Injector)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace malfunctioning fuel injector. Refer to EM-49, "Removal and Installation".

Component Inspection (Fuel Injector)

INFOID:0000000009009221

1. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check the resistance between fuel injector terminals as per the following.

Injector		Condition		Resistance
+	–			
Terminal				
1	2	Temperature	10 - 60°C (50 - 140°F)	1.44 - 1.73 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector. Refer to EM-49, "Removal and Installation".

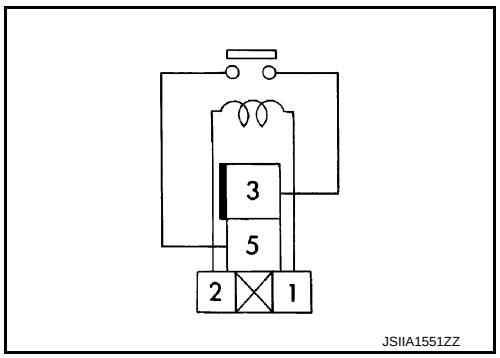
Component Inspection (Fuel Injector Relay)

INFOID:0000000009009222

1. CHECK FUEL INJECTOR RELAY

1. Turn ignition switch OFF.
2. Remove fuel injector relay.
3. Check the continuity between fuel injector relay terminals under the following conditions.

Fuel injector relay	Condition	Continuity
Terminal		
3 and 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel injector relay.

HIGH PRESSURE FUEL PUMP

Component Function Check

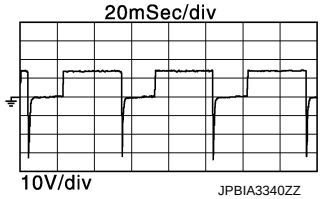
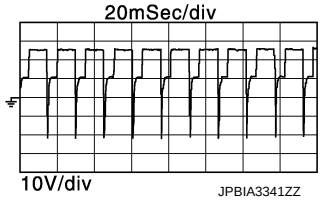
INFOID:0000000009009223

1.CHECK HIGH PRESSURE FUEL PUMP FUNCTION

WITH CONSULT
1. Start engine.
2. Check “FUEL PRES SEN V” in “DATA MONITOR” mode with CONSULT.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Engine speed: Idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT
1. Start engine.
2. Check the voltage between ECM harness connector and ground.

ECM				Condition	Voltage
+		–			
Connector	Terminal	Connector	Terminal		
F110	105	E80	175	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  JPBIA3340ZZ
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  JPBIA3341ZZ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-546, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009224

1.CHECK HIGH PRESSURE FUEL PUMP SOLENOID CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector and high pressure fuel pump harness connector.
3. Check the continuity between ECM harness connector and high pressure fuel pump harness connector.

+		–		Continuity
ECM		High pressure fuel pump		
Connector	Terminal	Connector	Terminal	
F110	105	F24	1	Existed
	110		2	

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

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2.CHECK HIGH PRESSURE FUEL PUMP SOLENOID

Refer to EC-547, "Component Inspection".

Is inspection result normal?

YES >> GO TO 3.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Removal and Installation".

3.CHECK HIGH PRESSURE FUEL PUMP INSTALLATION CONDITION

1. Turn ignition switch OFF.
2. Check that the high pressure fuel pump is installed with no backlash and looseness.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK CAMSHAFT

1. Remove camshaft. Refer to EM-80, "Removal and Installation".
2. Check camshaft. Refer to EM-83, "Inspection".

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace camshaft. Refer to EM-80, "Removal and Installation".

Component Inspection

INFOID:0000000009009225

1.CHECK HIGH PRESSURE FUEL PUMP SOLENOID

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump harness connector.
3. Check the resistance between high pressure fuel pump connector terminals as per the following.

+	–	Condition		Resistance
High pressure fuel pump Terminal				
1	2	Temperature	20 – 30°C (68 – 86°F)	9 – 11 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Removal and Installation".

ICC BRAKE SWITCH

Component Function Check

INFOID:0000000009009226

1.CHECK ICC BRAKE SWITCH FUNCTION

WITH CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage
Connector	+	–			
	Terminal	Terminal			
E80	147 (ICC brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0 V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-548, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009227

1.CHECK DTC WITH ADAS CONTROL UNIT

Refer to DAS-25, "CONSULT Function (ICC/ADAS)" and DAS-45, "DTC Index".

Are any DTCs detected?

YES >> Perform the Diagnosis Procedure corresponding to the detected DTC.
NO >> GO TO 2.

2.CHECK OVERALL FUNCTION

WITH CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	147 (ICC brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

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

3. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E68	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-II

Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E68	1	Ground	Battery voltage

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse

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

6. CHECK ICC BRAKE SWITCH

Refer to EC-550, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace ICC brake switch. Refer to BR-20, "Removal and Installation".

7. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E68	2	E80	147	Existed

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

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ICC brake switch and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000009009228

1. CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake switch. Refer to BR-20, "Removal and Installation".

IGNITION SIGNAL

Component Function Check

INFOID:0000000009009229

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT: GO TO 2.
YES-2 >> Without CONSULT: GO TO 3.
NO >> Go to EC-551, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

WITH CONSULT

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
2. Check that each circuit produces a momentary engine speed drop.

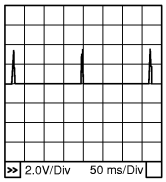
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-551, "Diagnosis Procedure".

3.CHECK IGNITION SIGNAL FUNCTION

WITHOUT CONSULT

1. Let engine idle.
2. Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

ECM					Voltage signal
Cylinder	+		–		
	Connector	Terminal	Connector	Terminal	
1	F111	12	E80	175	 PBIB0044E
2		13			
3		14			
4		15			
5		17			
6		18			
7		19			
8		20			

NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-551, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009230

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	171	175	Battery voltage
	172		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-190, "Diagnosis Procedure".

2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Turn ignition switch ON.
4. Check the voltage between condenser harness connector and ground.

Condenser		Ground	Voltage
Connector	Terminal		
F8	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 3.

3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E7.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
E15	61	F8	1	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Go to EC-190, "Diagnosis Procedure".
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between IPDM E/R and condenser
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between condenser harness connector and ground.

Condenser		Ground	Continuity
Connector	Terminal		
F8	2	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to power in harness or connectors.

6. CHECK CONDENSER

Refer to EC-555, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace condenser.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

1. Reconnect all harness connectors disconnected.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

Ignition coil			Ground	Voltage
Cylinder	Connector	Terminal		
1	F75	3	Ground	Battery voltage
2	F76	3		
3	F77	3		
4	F78	3		
5	F79	3		
6	F80	3		
7	F81	3		
8	F82	3		

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F22 and E46
- Harness for open or short between ignition coil and harness connector F22

>> Repair or replace harness or connectors.

9. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

Ignition coil			Ground	Continuity
Cylinder	Connector	Terminal		
1	F75	2	Ground	Existed
2	F76	2		
3	F77	2		
4	F78	2		
5	F79	2		
6	F80	2		
7	F81	2		
8	F82	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to power in harness or connectors.

10. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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	F75	1	F111	12	Existed
2	F76	1		13	
3	F77	1		14	
4	F78	1		15	
5	F79	1		17	
6	F80	1		18	
7	F81	1		19	
8	F82	1		20	

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-554, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace malfunctioning ignition coil with power transistor.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000009009231

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.

Terminals	Resistance [at 25°C (77°F)]
1 and 2	Except 0 or ∞ Ω
1 and 3	Except 0 Ω
2 and 3	

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor.

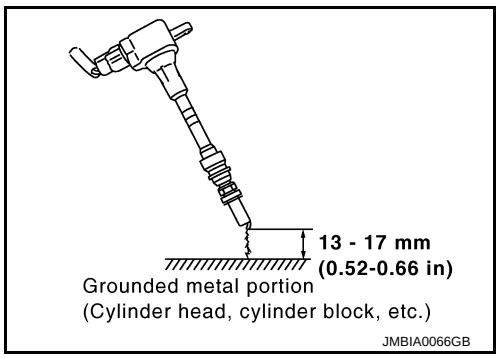
2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.

3. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
NOTE:
- For the fuse number, refer to EC-125, "Wiring Diagram".
- For the fuse arrangement, refer to PG-99, "Fuse, Connector and Terminal Arrangement".
- Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

4. Start engine.
5. After engine stalls, crank it 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.
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

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 >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor.

Component Inspection (Condenser)

INFOID:0000000009009232

1. CHECK CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as per the following.

Terminals	Resistance
1 and 2	Above 1 MΩ [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace condenser.

INFORMATION DISPLAY (ASCD)

Component Function Check

INFOID:0000000009009233

1.CHECK INFORMATION DISPLAY

1. Start engine.
2. Press MAIN switch on ASCD steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Press SET/COAST switch.
5. Check that the reading of the speedometer shows the same value as the set speed indicated in the information display while driving the vehicle on a flat road.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-556, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009234

1.CHECK DTC

Check that DTC UXXXX or P0500 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO-1 >> Perform trouble diagnosis for DTC UXXXX.
NO-2 >> Perform trouble diagnosis for DTC P0500. Refer to EC-388, "DTC Logic".

2.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for DTC indicated.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace.

LOW PRESSURE FUEL PUMP

Component Function Check

INFOID:0000000009009235

1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

NOTE:
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

YES >> INSPECTION END
NO >> EC-557, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009236

1.CHECK FPCM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect FPCM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FPCM harness connector and ground.

+		–	Voltage
FPCM			
Connector	Terminal		
B41	10	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform the trouble diagnosis for power supply circuit. Refer to EC-190, "Diagnosis Procedure".

2.CHECK FPCM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between FPCM harness connector and ground.

+		–	Continuity
FPCM			
Connector	Terminal		
B41	5	Ground	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to power in harness or connectors.

3.CHECK FPCM INPUT AND OUTPUT CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between FPCM harness connector and ECM harness connector.

+		–		Continuity
FPCM		ECM		
Connector	Terminal	Connector	Terminal	
B41	8	E80	125	Existed
	9		142	

3. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK FUEL PUMP CONTROL CIRCUIT

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump harness connector.

+		–		Continuity
FPCM		Fuel level sensor unit and fuel pump		
Connector	Terminal	Connector	Terminal	
B41	6	C5	3	Existed
	7		1	

3. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK LOW PRESSURE FUEL PUMP

Refer to EC-558, "Component Inspection (Low Pressure Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace fuel level sensor unit and fuel pump. Refer to FL-5, "Removal and Installation".

6.CHECK FPCM

Refer to EC-559, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace FPCM. Refer to EC-584, "Removal and Installation".

Component Inspection (Low Pressure Fuel Pump)

INFOID:0000000009009237

1.CHECK FUEL PRESSURE REGULATOR

1. Turn ignition switch OFF.
2. Check low fuel pressure. Refer to EC-168, "Work Procedure".

Is inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK LOW PRESSURE FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump.
3. Check resistance between fuel level sensor unit and fuel pump terminals as follows.

+	–	Condition	Resistance
Fuel level sensor unit and fuel pump			
Terminals			
1	3	Temperature: 25°C (77°F)	0.2 - 5.0 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel level sensor unit and fuel pump. Refer to FL-5, "Removal and Installation".

Component Inspection (FPCM)

INFOID:0000000009009238

1. CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Check the voltage between FPCM terminals under the following conditions.

FPCM		Condition	Voltage
+	–		
Terminal	Terminal		
7	6	For 1 second after turning ignition switch ON	Approx. 8.5 V
		More than 1 second after turning ignition switch ON	Approx. 0 V
		Idle speed	Approx. 8.5 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace FPCM. Refer to EC-584, "Removal and Installation".

MALFUNCTION INDICATOR LAMP

Component Function Check

INFOID:0000000009009239

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Check that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-560, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009240

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for DTC indicated.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace malfunctioning part.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:0000000009009241

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-561, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009242

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 2.5 kg (5.5 lb).

Is the inspection result normal?

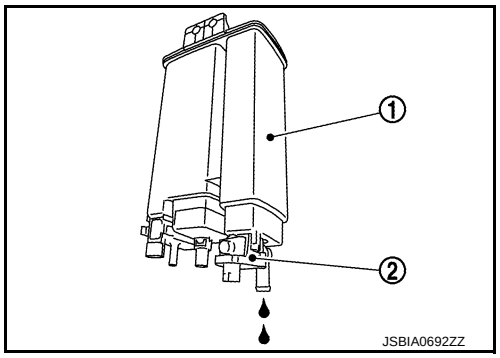
YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-563, "Component Inspection (EVAP Vapor Cut Valve)".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

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 2.5 kg (5.5 lb).

Is the inspection result normal?

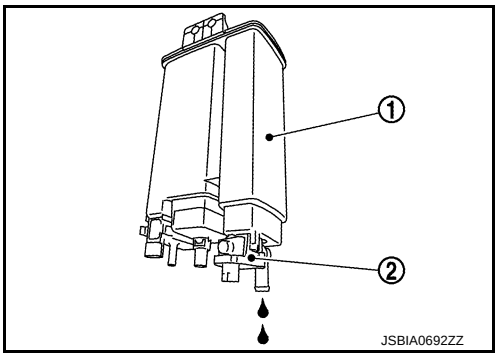
YES >> GO TO 8.
NO >> GO TO 9.

8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 9.
NO >> GO TO 11.



9. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

11. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace hoses and tubes.

12. CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace filler neck tube.

13. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-563, "Component Inspection (EVAP Vapor Cut Valve)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-I

Check one-way fuel valve for clogging.

Is the inspection result normal?

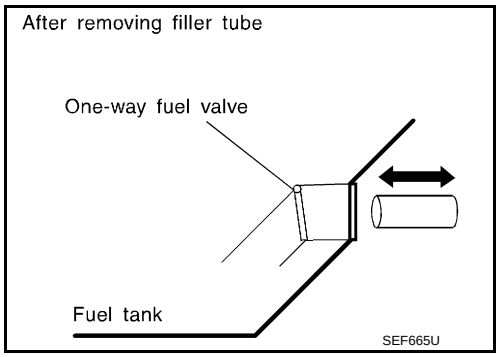
YES >> GO TO 16.
NO >> Repair or replace one-way fuel valve with fuel tank.

16. CHECK ONE-WAY FUEL VALVE-II

1. Check that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as per the following.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



Component Inspection (EVAP Vapor Cut Valve)

INFOID:0000000009009243

1. CHECK REFUELING EVAP VAPOR CUT VALVE

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-9, "Removal and Installation".
3. Drain fuel from the tank as per the following:

- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container.

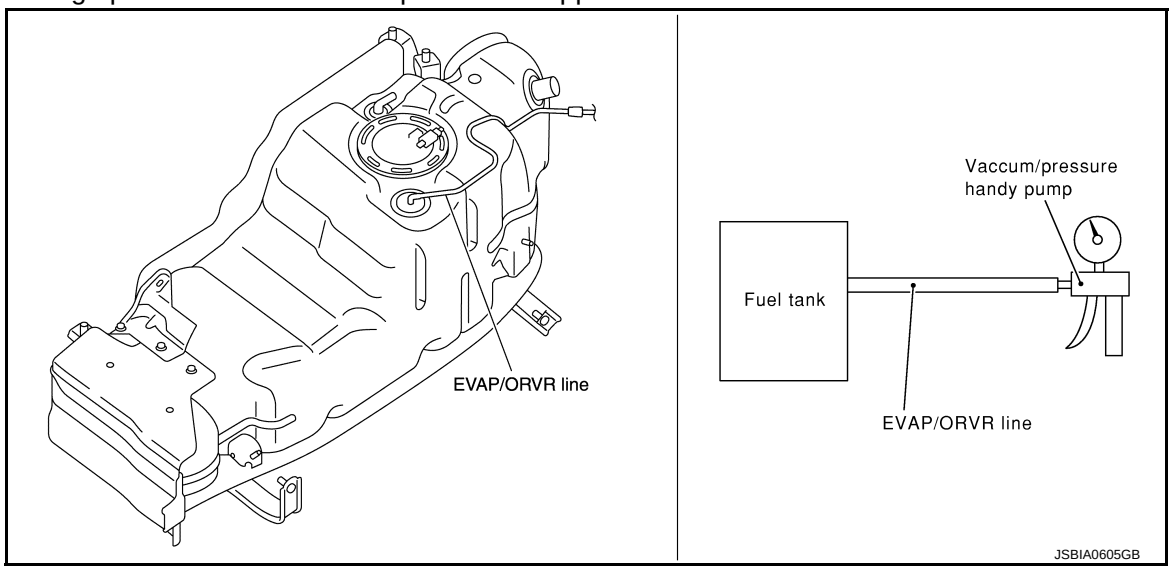
4. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as per the following.

- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.

- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^3, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:0000000009009244

1.CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	144 (Refrigerant pressure sensor signal)	150	1.0 - 4.0

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-565, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009245

1.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pressure sensor		Ground	Voltage (V)
Connector	Terminal		
E77	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
E77	3	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E77	2	E80	144	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to HA-40, "REFRIGERANT PRESSURE SENSOR : Removal and Installation".
NO >> Repair or replace malfunctioning part.

SNOW MODE SWITCH

2WD

2WD : Description

INFOID:0000000009009246

The snow mode switch signal is sent to the combination meter from the snow mode switch. The combination meter then sends the signal to the ECM via the CAN communication line.
The snow mode is used for driving or starting the vehicle on snowy roads or slippery areas. If the snow mode is activated, the vehicle speed will not accelerate as quickly as normal to avoid vehicle slip. In other words, ECM controls rapid engine torque change by controlling the electric throttle control actuator operating speed.

2WD : Component Function Check

INFOID:0000000009009247

1.CHECK SNOW MODE SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “SNOW MODE SW” in “DATA MONITOR” mode with CONSULT.
3. Check “SNOW MODE SW” indication under the following conditions.

Monitor item	Condition		Indication
SNOW MODE SW	Snow mode switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-567, "2WD : Diagnosis Procedure".

2WD : Diagnosis Procedure

INFOID:0000000009009248

1.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to MWI-59, "Work flow".

2.CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect snow mode/tow mode/VDC OFF switch assembly harness connector.
3. Turn ignition switch ON.
4. Check the voltage between snow mode/tow mode/VDC OFF switch assembly harness connector and ground.

Snow mode/tow mode/VDC OFF switch assembly		Ground	Voltage
Connector	Terminal		
M147	12	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block harness connector M3
- 10 A fuse (No. 13)
- Harness for open or short between Snow mode/tow mode/VDC OFF switch assembly and fuse.

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK SNOW MODE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect combination meter harness connector.
3. Check the continuity between snow mode/tow mode/VDC OFF switch assembly harness connector and combination meter harness connector.

Snow mode/tow mode/VDC OFF switch assembly		Combination meter		Continuity
Connector	Terminal	Connector	Terminal	
M147	22	M34	33	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connector.

5.CHECK SNOW MODE SWITCH

Refer to EC-568, "2WD : Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace snow mode/tow mode/VDC OFF switch assembly. Refer to IP-25, "Removal and Installation".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

2WD : Component Inspection

INFOID:0000000009009249

1.CHECK SNOW MODE SWITCH

1. Turn ignition switch OFF.
2. Disconnect snow mode/tow mode/VDC OFF switch assembly harness connector.
3. Check the continuity between snow mode/tow mode/VDC OFF switch assembly terminals under the following conditions.

Terminals	Condition		Continuity
12 and 22	Snow mode switch	ON	Existed
		OFF	Not Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace snow mode/tow mode/VDC OFF switch assembly. Refer to IP-25, "Removal and Installation".

4WD

4WD : Description

INFOID:0000000009009250

The snow mode switch signal is sent to the combination meter from the snow mode switch. The combination meter then sends the signal to the ECM via the CAN communication line.
The snow mode is used for driving or starting the vehicle on snowy roads or slippery areas. If the snow mode is activated, the vehicle speed will not accelerate as quickly as normal to avoid vehicle slip. In other words, ECM controls rapid engine torque change by controlling the electric throttle control actuator operating speed.

4WD : Component Function Check

INFOID:0000000009009251

1.CHECK SNOW MODE SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “SNOW MODE SW” in “DATA MONITOR” mode with CONSULT.
3. Check “SNOW MODE SW” indication under the following conditions.

Monitor item	Condition		Indication
SNOW MODE SW	Snow mode switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-569, "4WD : Diagnosis Procedure".

4WD : Diagnosis Procedure

INFOID:0000000009009252

1.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to MWI-59, "Work flow".

2.CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect 4WD switch assembly harness connector.
3. Turn ignition switch ON.
4. Check the voltage between 4WD switch assembly harness connector and ground.

4WD switch assembly		Ground	Voltage
Connector	Terminal		
M54	12	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block harness connector M3
- 10 A fuse (No. 13)
- Harness for open or short between 4WD switch assembly and fuse.

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK SNOW MODE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect combination meter harness connector.
3. Check the continuity between 4WD switch assembly harness connector and combination meter harness connector.

4WD switch assembly		Combination meter		Continuity
Connector	Terminal	Connector	Terminal	
M54	22	M34	33	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connector.

5.CHECK SNOW MODE SWITCH

Refer to EC-570, "4WD : Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 4WD switch assembly. Refer to IP-25, "Removal and Installation".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

4WD : Component Inspection

INFOID:0000000009009253

1.CHECK SNOW MODE SWITCH

1. Turn ignition switch OFF.
2. Disconnect 4WD switch assembly harness connector.
3. Check the continuity between 4WD switch assembly terminals under the following conditions.

Terminals	Condition		Continuity
12 and 22	Snow mode switch	ON	Existed
		OFF	Not Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace 4WD switch assembly. Refer to IP-25, "Removal and Installation".

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000009009254

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	Low pressure fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-557
	Low fuel pressure sensor circuit			4		4									EC-531
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-218
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-543
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-579
	FRP sensor circuit	1	1	2	2	2		2	2			2			EC-305 EC-309
	High pressure fuel pump circuit			4		3									EC-546
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-581
	Incorrect idle speed adjustment						1	1	1	1		1			EC-153
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-508 EC-514
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-153
	Ignition circuit	1	1	2	2	2		2	2			2			EC-551
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-190

	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	
Mass air flow sensor circuit	1			2										EC-229
Engine coolant temperature sensor circuit				3		3			3					EC-244
Air fuel ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-203 EC-256 EC-260 EC-263 EC-266
Throttle position sensor circuit						2			2					EC-246 EC-320 EC-442 EC-443 EC-523
Accelerator pedal position sensor circuit			3	2	1									EC-516 EC-519 EC-526
Knock sensor circuit			2								3			EC-329
Engine oil temperature sensor			4		2						3			EC-317
Crankshaft position sensor circuit	2	2												EC-331
Camshaft position sensor circuit	3	2												EC-335
Vehicle speed signal circuit		2	3		3						3			EC-388
Power steering pressure sensor circuit		2					3	3						EC-403
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-408 EC-410 EC-412
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-209
VVEL control module	3		4	4	3									EC-487 EC-488
VVEL actuator motor	3		4	4	3									EC-426
VVEL actuator motor relay	3		4	4	3									EC-429
VVEL control shaft position sensor	3		4	4	3									EC-423
PNP signal circuit			3		3		3	3			3			EC-415
Refrigerant pressure sensor circuit		2				3			3		4			EC-565
Electrical load signal circuit							3							EC-538
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-138
ABS actuator and electric unit (control unit)			4											BRC-58

	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	
Manifold absolute pressure sensor circuit											3			EC-234
Battery current sensor						4	5	5					3	EC-446 EC-454 EC-458
Heated oxygen sensor 2			6		6		6	6			5			EC-271 EC-277 EC-289

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

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	5												FL-4
	Fuel piping			5	5	5		5	5			5			FL-4
	Vapor lock														—
	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-28
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5			5		5			5					EM-29
	Electric throttle control actuator														EC-508
	Air leakage from intake manifold/ Collector/Gasket														EM-31
Cranking	Battery	1	1	1		1		1	1			1		1	PG-114
	Generator circuit														CHG-12 (With EXP-800 NI or GR8-1200 NI)*, CHG-16 (Without EXP-800 NI or GR8-1200 NI)*.
	Starter circuit	3													STR-10 (With GR8-1200 NI)*, STR-13 (Without GR8-1200 NI)*.
	Signal plate	6													EM-115
	PNP signal	4													EC-415
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-98
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-123
	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-77
	Camshaft														EM-83
	Intake valve timing control														EM-63
	Intake valve												3		EM-98
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-43 EX-6
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-58 EM-62 LU-11 LU-14 LU-16
	Oil level (Low)/Filthy oil														LU-8
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-12 CO-12
	Thermostat									5					CO-23
	Water pump														CO-21
	Water gallery														EM-123
	Cooling fan									5					CO-19
	Coolant level (Low)/Contaminated coolant														CO-8
IVIS (INFINITI Vehicle Immobilizer System — NATS)		1	1												SEC-46

1 - 6: The numbers refer to the order of inspection.

*: For the details of the EXP-800 NI or GR8-1200 NI, refer to CHG-4, "Special Service Tools".

NORMAL OPERATING CONDITION

Description

INFOID:0000000009009255

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 1,800 rpm under no load (for example, the selector lever position is neutral and engine speed is over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under direct injection gasoline System, EC-43, "DIRECT INJECTION GASOLINE SYSTEM : System Description".

PERIODIC MAINTENANCE

IDLE SPEED

Inspection

INFOID:0000000009009256

1.CHECK IDLE SPEED

WITH CONSULT
Check idle speed in “DATA MONITOR” mode with CONSULT.
WITH GST
Check idle speed with Service $01 of GST.

>> INSPECTION END

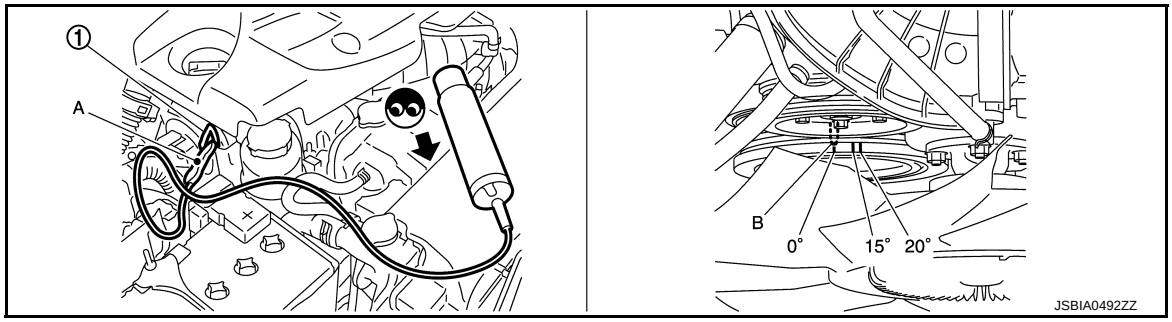
IGNITION TIMING

Inspection

INFOID:0000000009009257

1.CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



1. Loop wire
A. Timing light
B. Timing indicator

2. Check ignition timing.

>> INSPECTION END

EVAP LEAK CHECK

Inspection

INFOID:0000000009009258

CAUTION:

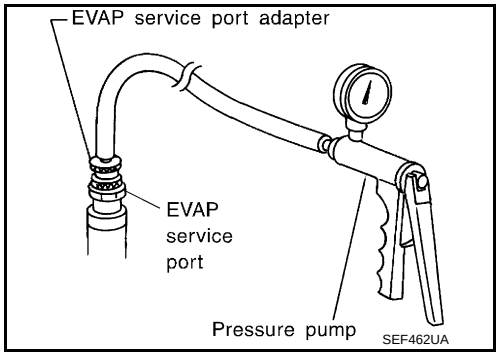
- **Do not use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

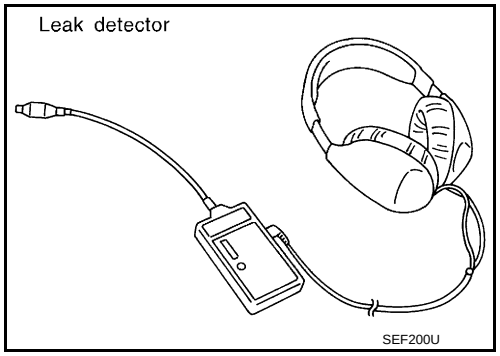
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leak.

WITH CONSULT

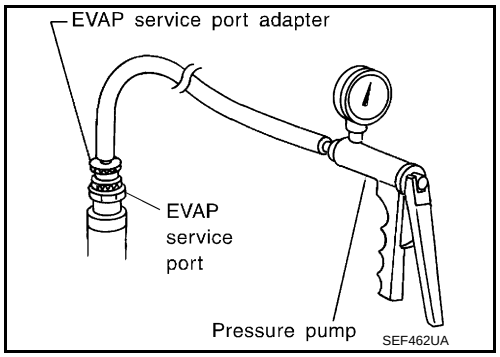
1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Turn ignition switch ON.
3. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT.
4. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump.
7. Locate the leak using a leak detector (commercial service tool). Refer to EC-52, "EVAPORATIVE EMISSION SYSTEM : System Diagram".



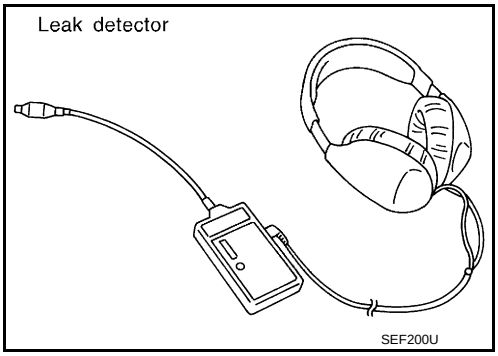


WITHOUT CONSULT

1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
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) and hose with pressure pump.



5. Locate the leak using a leak detector (commercial service tool). Refer to EC-52, "EVAPORATIVE EMISSION SYSTEM : System Diagram".



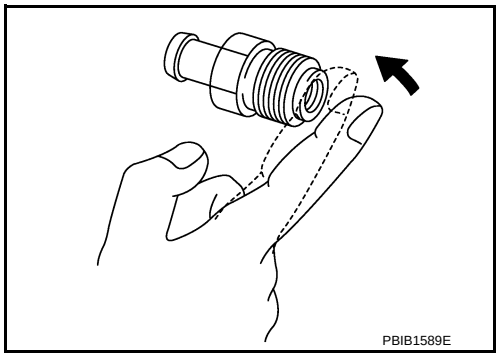
POSITIVE CRANKCASE VENTILATION

Inspection

INFOID:0000000009009259

1.CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace PCV valve. Refer to EM-34, "Exploded View".

REMOVAL AND INSTALLATION

ECM

Removal and Installation

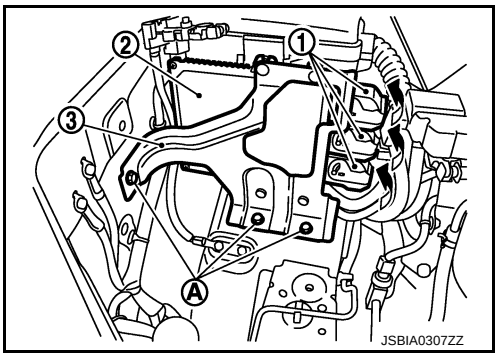
INFOID:0000000009009260

REMOVAL

CAUTION:

Perform ADDITIONAL SERVICE WHEN REPLACING ECM. Refer to EC-157, "Work Procedure".

1. Remove the battery and battery tray. Refer to PG-122, "Removal and Installation".
2. Disconnect ECM harness connectors (1) as shown in the figure.
3. Remove ECM bracket bolts (A).
4. Separate ECM (2) and ECM bracket (3).



INSTALLATION

Install in the reverse order of removal.

VVEL CONTROL MODULE

Removal and Installation

INFOID:0000000009009261

REMOVAL

1. Disconnect VVEL control module harness connector.
2. Remove the fix bolts. And then remove VVEL control module.

INSTALLATION

Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing VVEL control module. Refer to EC-159, "Work Procedure".

FUEL PUMP CONTROL MODULE (FPCM)

Removal and Installation

INFOID:0000000009009262

REMOVAL

1. Remove the luggage side finisher lower (LH). Refer to INT-36, "LUGGAGE SIDE LOWER FINISHER : Removal and Installation".
2. Disconnect fuel pump control module (FPCM) connector.
3. Remove mounting bolts and then remove fuel pump control module (FPCM).

INSTALLATION

Install in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000009009263

Condition	Specification
No load* (in P or N position)	600 ± 50 rpm

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:0000000009009264

Condition	Specification
No load* (in P or N position)	12 ± 2°BTDC

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000009009265

Condition	Specification (Using CONSULT or GST)
At idle	5 – 35%
At 2,500 rpm	5 – 35%

Mass Air Flow Sensor

INFOID:0000000009009266

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.7 – 1.2 V*
Mass air flow (Using CONSULT or GST)	1.0 – 5.0 g/s at idle* 7.0 – 20.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:0000000009009267

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted. Information necessary to service the system safely is included in the “SRS AIR BAG” and “SEAT BELT” of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see “SRS AIR BAG”.**
- **Never 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:

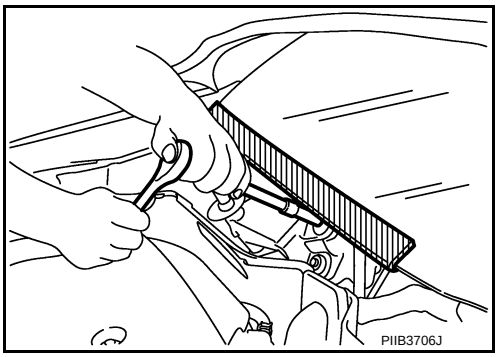
Always observe the following items for preventing accidental activation.

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Procedure without Cowl Top Cover

INFOID:0000000009009268

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 Xenon Headlamp Service

INFOID:0000000009009269

WARNING:

Comply with the following warnings to prevent any serious accident.

- **Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.**
- **Never work with wet hands.**
- **Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector.**

(Turning it ON outside the lamp case may cause fire or visual impairments.)
- **Never touch the bulb glass immediately after turning it OFF. It is extremely hot.**

CAUTION:

Comply with the following cautions to prevent any error and malfunction.
- **Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)**
- **Never perform HID circuit inspection with a tester.**
- **Never touch the xenon bulb glass with hands. Never put oil and grease on it.**
- **Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.**
- **Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).**

On Board Diagnostic (OBD) System of Engine and A/T

INFOID:0000000009009270

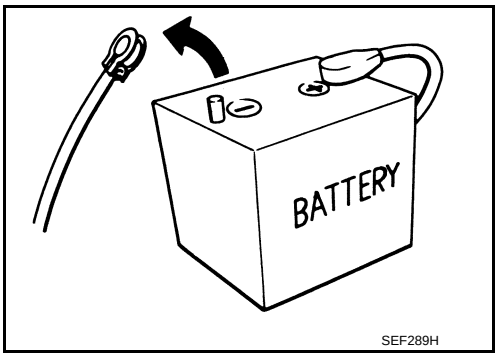
The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:
- **Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.**
- **Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to EC-626, "Diagnosis Description".**
- **Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.**
- **Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

General Precautions

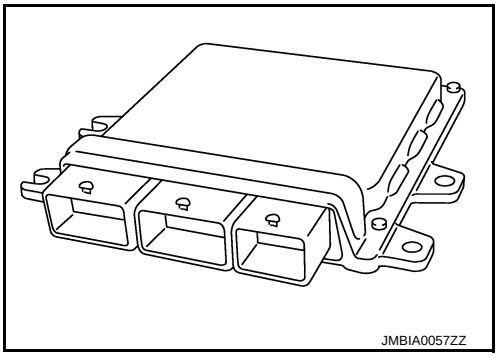
INFOID:0000000009009271

- **Always use a 12 volt battery as power source.**
- **Never attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.**
- **Before removing parts, turn ignition switch OFF and then disconnect battery ground cable.**

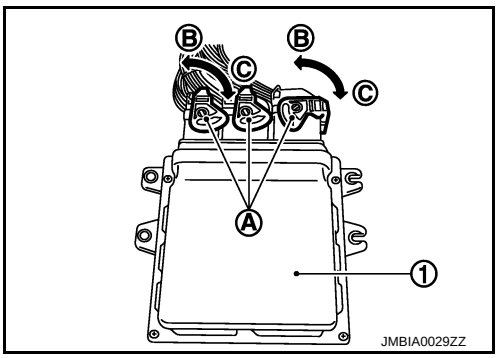


SEF289H

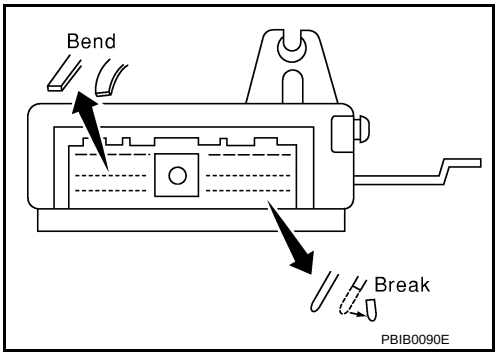
- **Never disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- **If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.**
  - **Diagnostic trouble codes**
  - **1st trip diagnostic trouble codes**
  - **Freeze frame data**
  - **1st trip freeze frame data**
  - **System readiness test (SRT) codes**
  - **Test values**

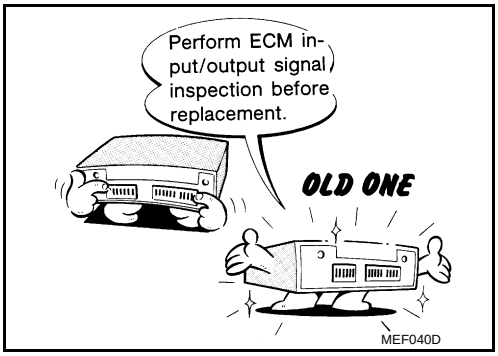

JMBIA0057ZZ

- **When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.**
- ECM (1)
- Loosen (C)

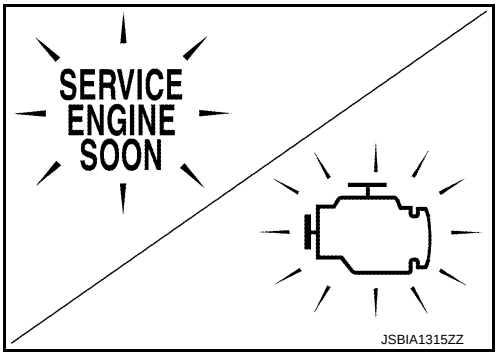


- **When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break). Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.**
- **Securely connect ECM harness connectors. A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.**
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and check that ECM functions properly. Refer to EC-647, "Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Never clean mass air flow sensor with any type of detergent.**
- **Never disassemble electric throttle control actuator.**
- **Even a slight leakage in the air intake system can cause serious incidents.**
- **Never shock or jar the camshaft position sensor, crankshaft position sensor.**

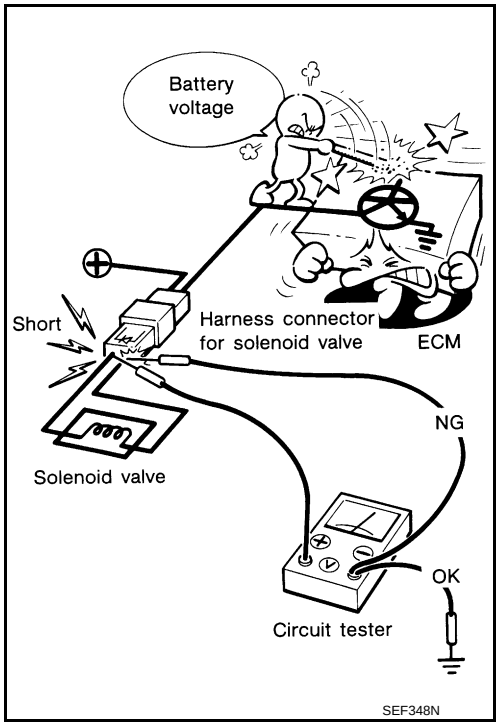




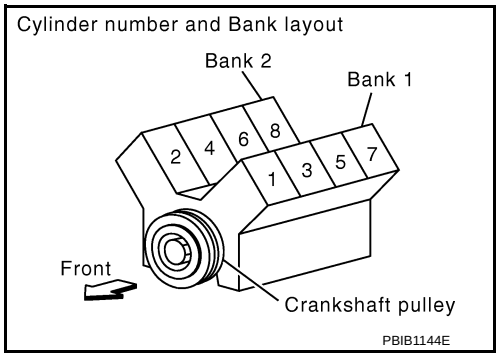
- **After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.**



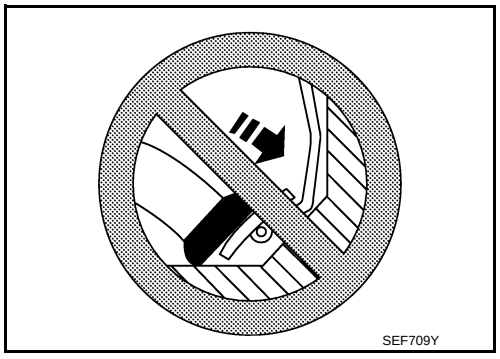
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



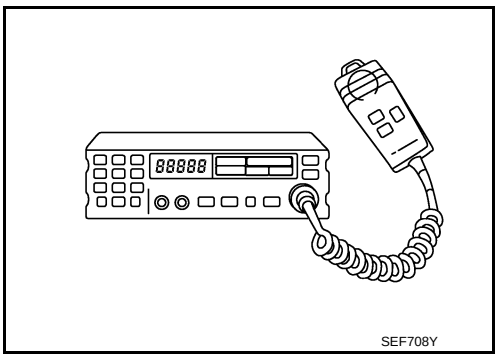
- **B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.**
- **Never operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Never depress accelerator pedal when starting.**
- **Immediately after starting, never rev up engine unnecessarily.**
- **Never rev up engine just prior to shutdown.**



- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
- **Keep the antenna as far as possible from the electronic control units.**
- **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
  Never let them run parallel for a long distance.
- **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**
- **Be sure to ground the radio to vehicle body.**

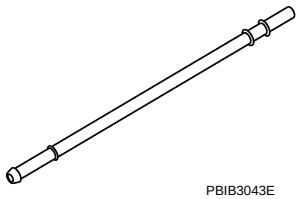


PREPARATION

PREPARATION

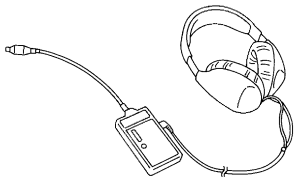
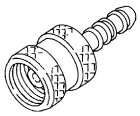
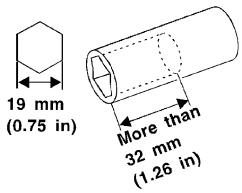
Special Service Tools

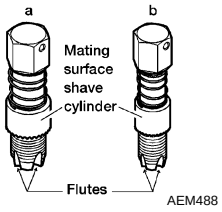
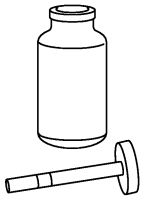
INFOID:0000000009009272

Tool number (Kent-Moore No.) Tool name	Description
KV10118400 (—) Fuel tube adapter  PBIB3043E	Measures fuel pressure

Commercial Service Tools

INFOID:0000000009009273

Tool name (Kent-Moore No.)	Description
Leak detector i.e.: (J-41416)  S-NT703	Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBD)  S-NT704	Applies positive pressure through EVAP service port
Fuel filler cap adapter i.e.: (MLR-8382)  S-NT815	Checks fuel tank vacuum relief valve opening pressure
Socket wrench  S-NT705	Removes and installs engine coolant temperature sensor

Tool name (Kent-Moore No.)		Description
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 AEM488	Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

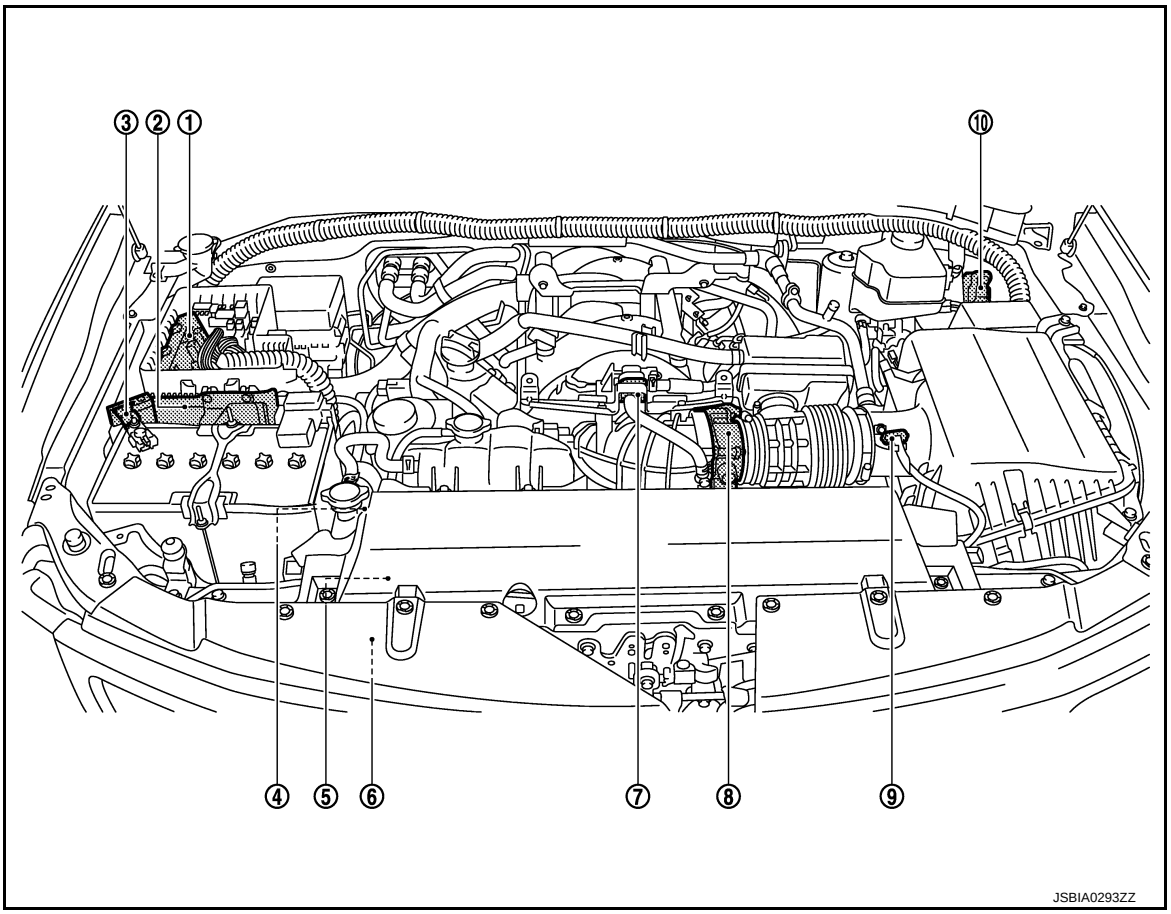
SYSTEM DESCRIPTION

COMPONENT PARTS

Component Parts Location

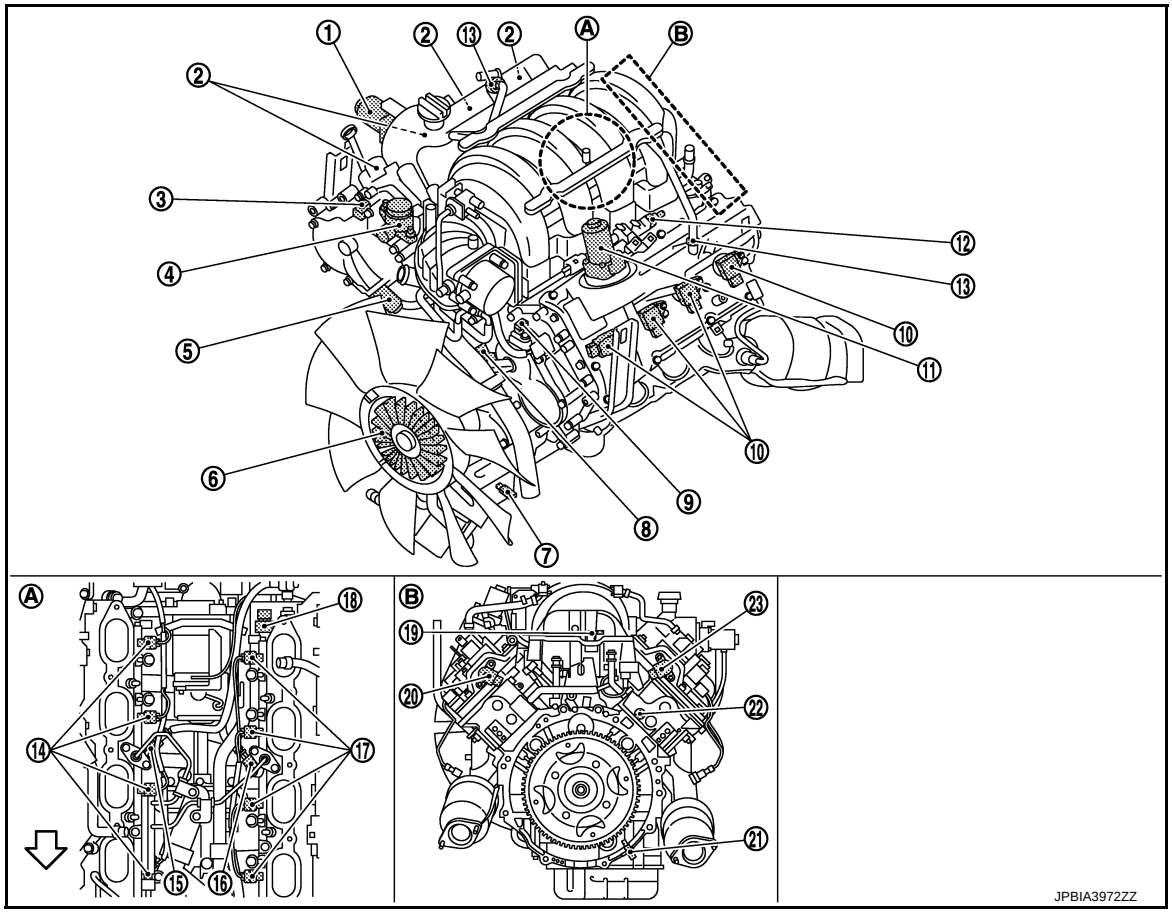
INFOID:0000000009009274

ENGINE ROOM COMPARTMENT



1. IPDM E/R
2. ECM
3. Battery current sensor (with battery temperature sensor)
4. Power steering pressure sensor
5. Alternator
6. Refrigerant pressure sensor
7. EVAP canister purge volume control solenoid valve
8. Electric throttle control actuator
9. Mass air flow sensor (with intake air temperature sensor)
10. VVEL control module

ENGINE COMPARTMENT

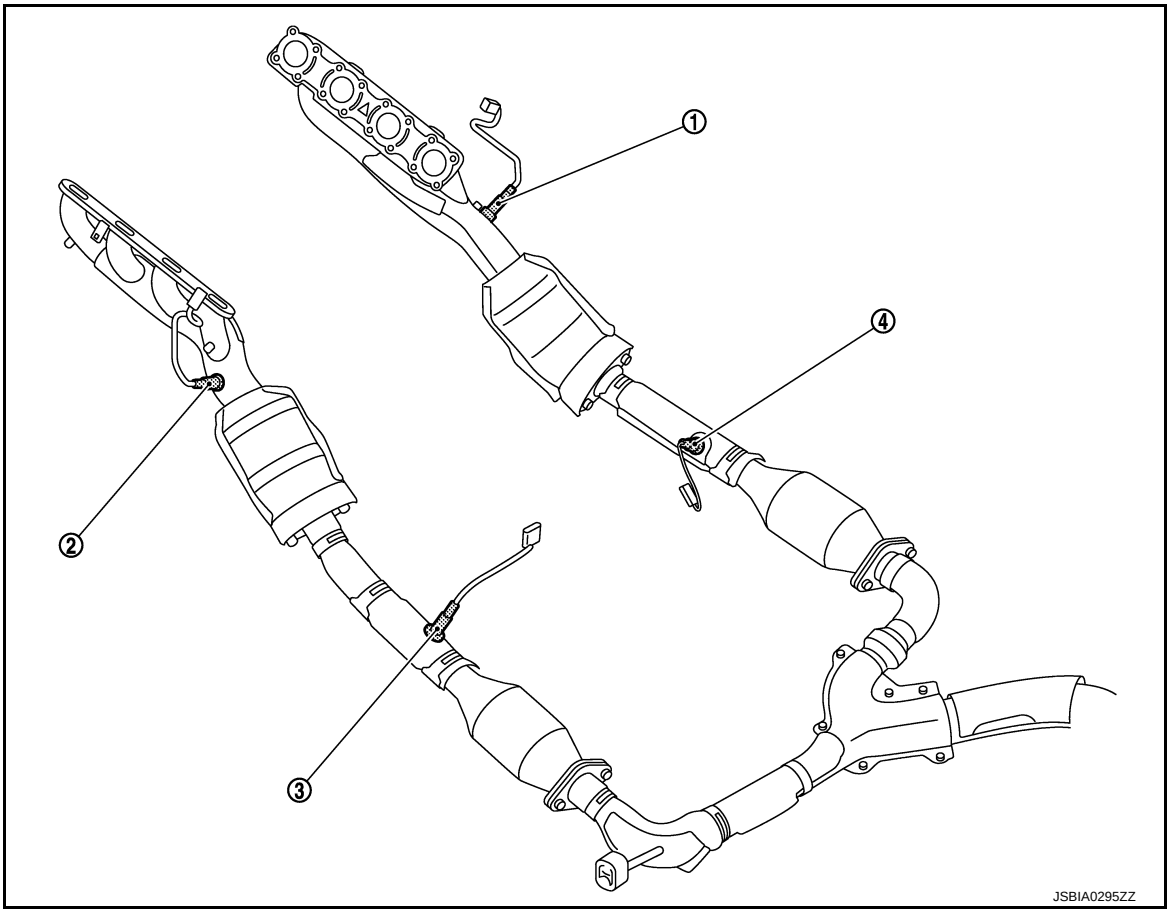


1. VVEL actuator motor (bank 2)
2. Ignition coil (with power transistor) and spark plug (bank 2)
3. Camshaft position sensor (bank 2)
4. High pressure fuel pump
5. Intake valve timing control solenoid valve (bank 2)
6. Electric-viscous fan assembly
7. Engine oil temperature sensor
8. Intake valve timing control solenoid valve (bank 1)
9. Camshaft position sensor (bank 1)
10. Ignition coil (with power transistor) and spark plug (bank 1)
11. VVEL actuator motor (bank 1)
12. Low fuel pressure sensor
13. Positive crankcase ventilation (PCV) valve
14. Fuel injector (bank 2)
15. Knock sensor (bank 2)
16. Knock sensor (bank 1)
17. Fuel injector (bank 1)
18. Fuel rail pressure sensor
19. Manifold absolute pressure sensor
20. VVEL control shaft position sensor (bank 1)
21. Crankshaft position sensor
22. Engine coolant temperature sensor
23. VVEL control shaft position sensor (bank 2)

A. Top view of the engine (View with intake manifold is removed)
B. Rear view of the engine

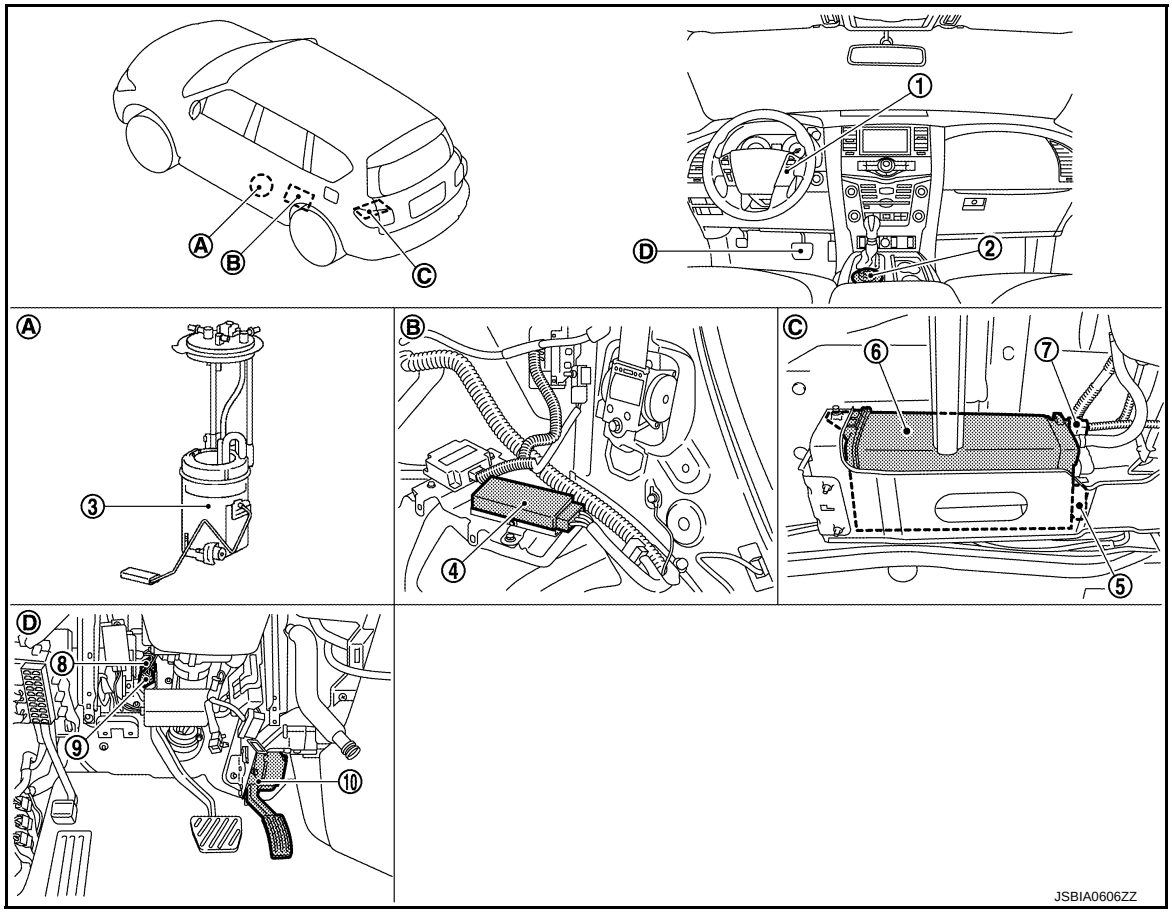
⇦ : Engine front

EXHAUST COMPARTMENT



1. A/F sensor 1 (bank 2)
2. A/F sensor 1 (bank 1)
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 2)

BODY COMPARTMENT



1. ICC steering switch
2. Snow mode switch
3. Fuel level sensor unit and fuel pump assembly (with fuel tank temperature sensor)
4. Fuel pump control module (FPCM)
5. EVAP canister vent control valve
6. EVAP canister
7. EVAP control system pressure sensor
8. Stop lamp switch
9. ICC brake switch
10. Accelerator pedal position sensor

Component Description

INFOID:0000000009009275

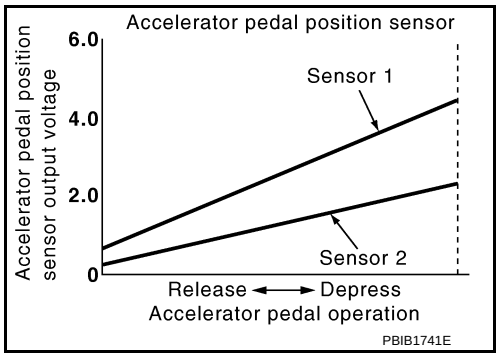
Component	Reference
ECM	EC-600, "ECM"
Malfunction indicator lamp (MIL)	EC-607, "Malfunction Indicator Lamp (MIL)"
Ignition coil with power transistor	EC-606, "Ignition Coil With Power Transistor"
Accelerator pedal position sensor	EC-597, "Accelerator Pedal Position Sensor"
Mass air flow sensor	EC-607, "Mass Air Flow Sensor (With Intake Air Temperature Sensor)"
Intake air temperature sensor	
Electric throttle control actuator	EC-600, "Electric Throttle Control Actuator"
Throttle control motor relay	
Throttle control motor	
Throttle position sensor	
Crankshaft position sensor	EC-599, "Crankshaft Position Sensor"
Camshaft position sensor	EC-599, "Camshaft Position Sensor"
Engine coolant temperature sensor	EC-601, "Engine Coolant Temperature Sensor"

Component	Reference
High pressure fuel pump	EC-605, "High Pressure Fuel Pump"
Low pressure fuel pump	EC-607, "Low Pressure Fuel Pump"
Fuel pump control module (FPCM)	EC-604, "Fuel Pump Control Module"
Fuel rail pressure sensor	EC-604, "Fuel Rail Pressure Sensor"
Low fuel pressure sensor	EC-607, "Low Fuel Pressure Sensor"
Fuel injector	EC-603, "Fuel Injector"
Fuel level sensor	EC-603, "Fuel Level Sensor"
Fuel tank temperature sensor	EC-604, "Fuel Tank Temperature Sensor"
A/F sensor 1	EC-597, "Air Fuel Ratio (A/F) Sensor 1"
A/F sensor 1 heater	
Heated oxygen sensor 2	EC-604, "Heated Oxygen Sensor 2"
Heated oxygen sensor 2 heater	
Manifold absolute pressure sensor	EC-607, "Manifold Absolute Pressure Sensor"
Knock sensor	EC-606, "Knock Sensor"
Engine oil temperature sensor	EC-602, "Engine Oil Temperature Sensor"
Power steering pressure sensor	EC-608, "Power Steering Pressure (PSP) Sensor"
Electrically-controlled cooling fan coupling	EC-601, "Electrically-controlled cooling fan coupling"
Intake valve timing control solenoid valve	EC-606, "Intake Valve Timing Control Solenoid Valve"
VVEL control module	EC-609, "VVEL Control Module"
VVEL actuator motor relay	EC-609, "VVEL Actuator Motor Relay"
VVEL actuator motor	EC-608, "VVEL Actuator Motor"
VVEL control shaft position sensor	EC-609, "VVEL Control Shaft Position Sensor"
EVAP control system pressure sensor	EC-602, "EVAP Control System Pressure Sensor"
EVAP canister vent control valve	EC-603, "EVAP Canister Vent Control Valve"
EVAP canister purge volume control solenoid valve	EC-603, "EVAP Canister Purge Volume Control Solenoid Valve"
Battery current sensor (with battery temperature sensor)	EC-598, "Battery Current Sensor (With Battery Temperature Sensor)"
Refrigerant pressure sensor	EC-608, "Refrigerant Pressure Sensor"
Stop lamp switch	EC-605, "ICC Brake Switch & Stop Lamp Switch"
ICC brake switch	
ICC steering switch	EC-606, "ICC Steering Switch"

Accelerator Pedal Position Sensor

INFOID:0000000009009276

The accelerator pedal position (APP) sensor is installed on the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



Air Fuel Ratio (A/F) Sensor 1

INFOID:0000000009009277

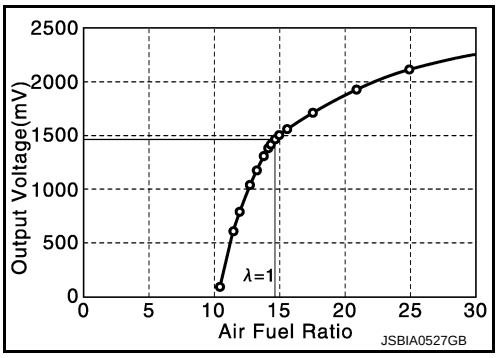
DESCRIPTION

The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement λ = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.

Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of approximately 760°C (1,400°F).



A/F SENSOR 1 HEATER

A/F sensor 1 heater is integrated in the sensor.

The ECM performs ON/OFF duty control of the A/F sensor 1 heater corresponding to the engine operating condition to keep the temperature of A/F sensor 1 element within the specified range.

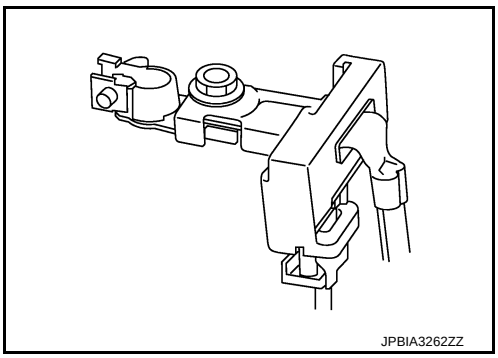
Battery Current Sensor (With Battery Temperature Sensor)

INFOID:0000000009009278

OUTLINE

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator.

Based on sensor signals, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-6, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description".



CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

BATTERY CURRENT SENSOR

The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery.

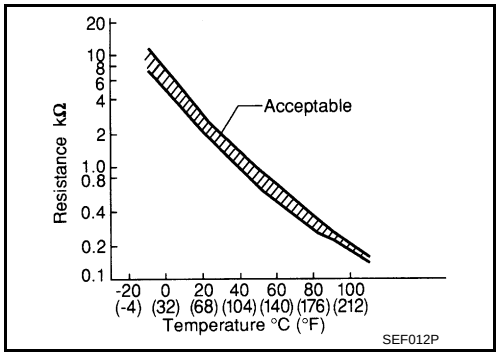
BATTERY TEMPERATURE SENSOR

Battery temperature sensor is integrated in battery current sensor.
The sensor measures ambient temperature around the battery.
The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

Temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.333	1.9 - 2.1
90 (194)	0.969	0.222 - 0.258

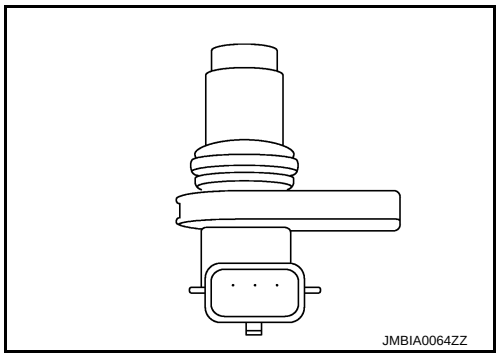
*: These data are reference values and are measured between ECM terminals.

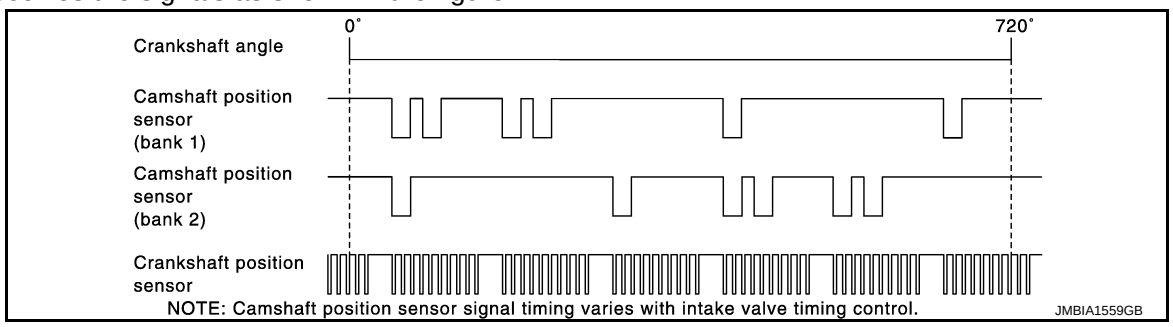


Camshaft Position Sensor

INFOID:0000000009009279

The camshaft position (CMP) sensor senses the protrusion of the signal plate installed to the camshaft (INT) front end to identify a particular cylinder. The camshaft position sensor senses the piston position.
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.
When the crankshaft position sensor system becomes inoperative, the camshaft position sensor provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
ECM receives the signals as shown in the figure.

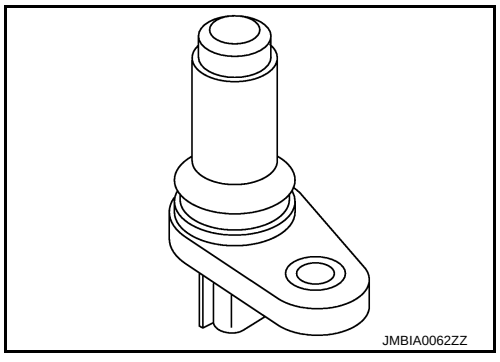




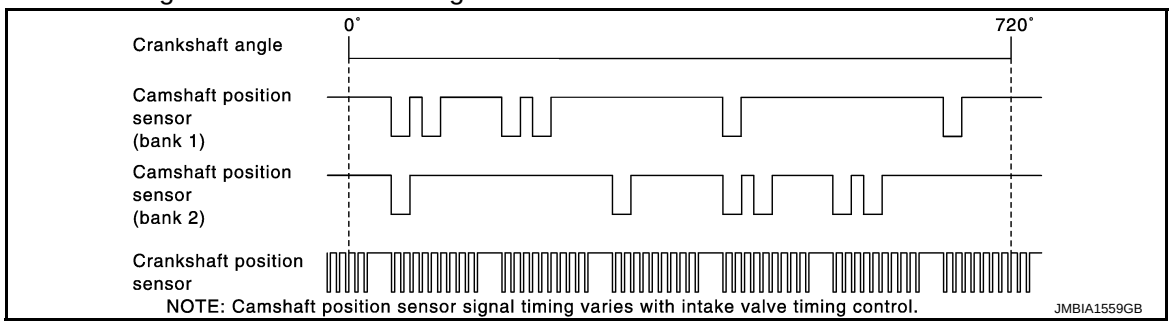
Crankshaft Position Sensor

INFOID:0000000009009280

The crankshaft position (CKP) sensor senses the protrusion of the signal plate installed to the drive plate to identify fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.



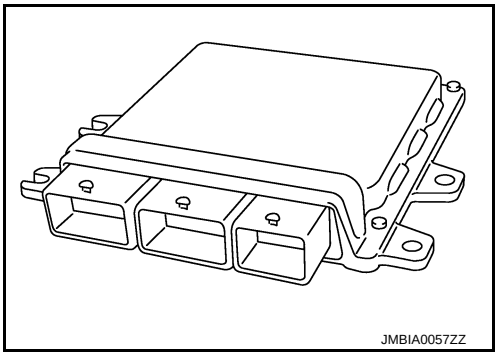
ECM receives the signals as shown in the figure.



ECM

INFOID:0000000009009281

- ECM (Engine Control Module) controls the engine.
- The ECM consists of a microcomputer and connectors for transmitting/receiving signals and for supplying power. Furthermore, the ECM is equipped with an injector driver unit and actuates the fuel injector at a high voltage (approximately 70 V at the maximum).
- ECM is equipped with ECM temperature sensors. If ECM is overheated, ECM controls output torque to prevent damage to itself.
- Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.

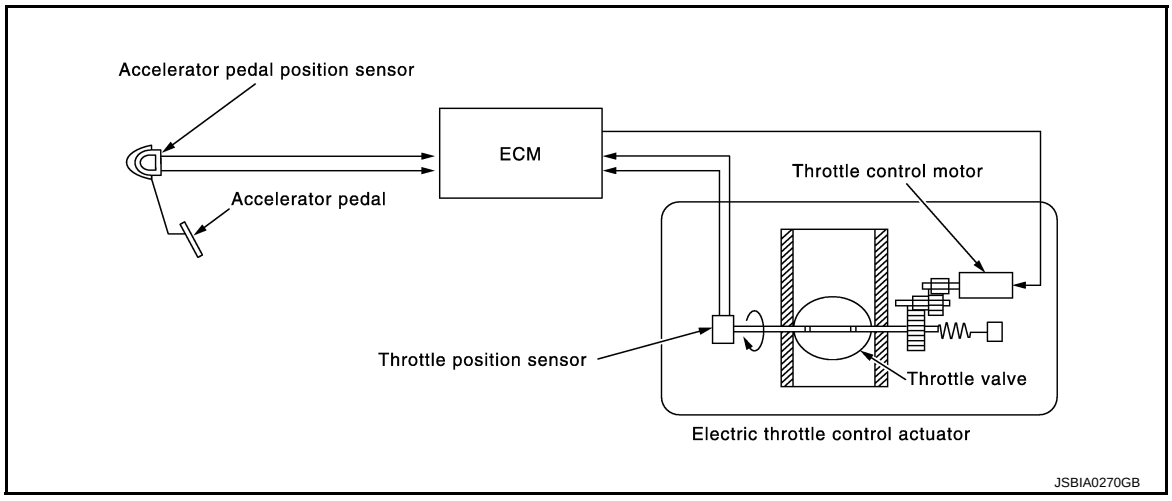


Electric Throttle Control Actuator

INFOID:0000000009009282

OUTLINE

Electric throttle control actuator consists of throttle body, throttle valve, throttle control motor and throttle position sensor.

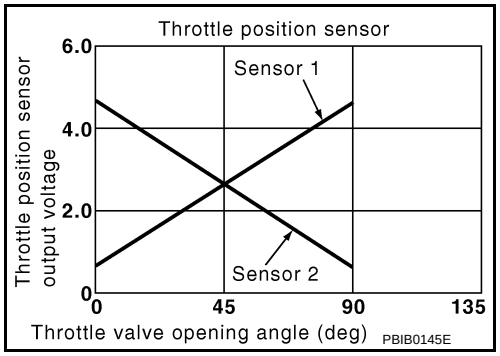


THROTTLE CONTROL MOTOR

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

THROTTLE POSITION SENSOR

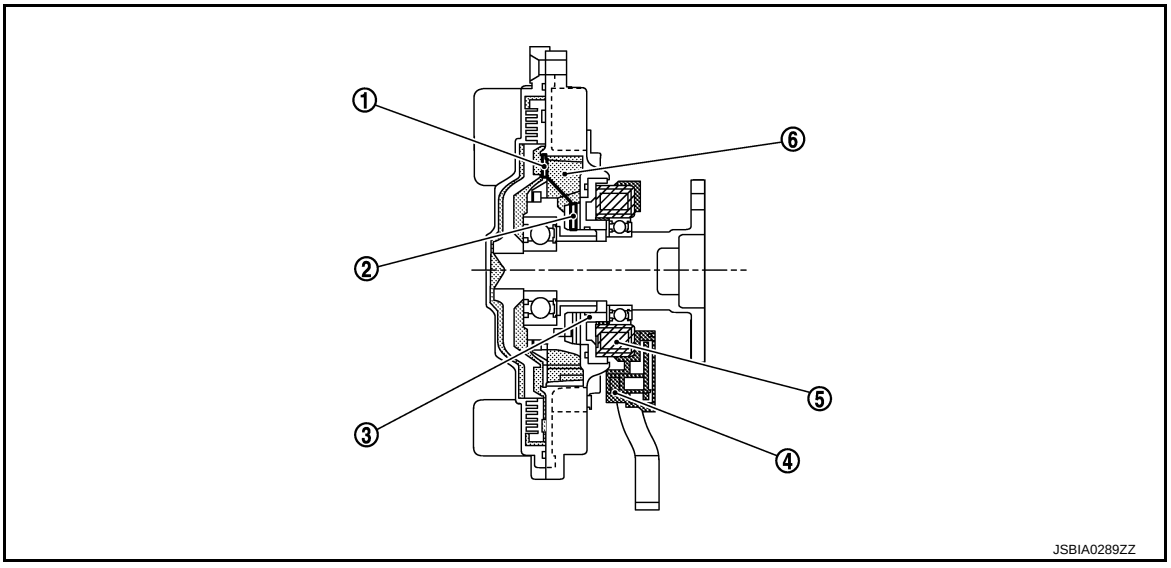
The throttle position (TP) sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle in response to driving conditions via the throttle control motor.



Electrically-controlled cooling fan coupling

INFOID:0000000009009283

Electrically-controlled cooling fan coupling is integrated with a fan coupling, fan coupling driver, and fan speed sensor, mounted to the fan pulley, and actuated by the drive belt to rotate the cooling fan at a speed suitable for a driving condition.

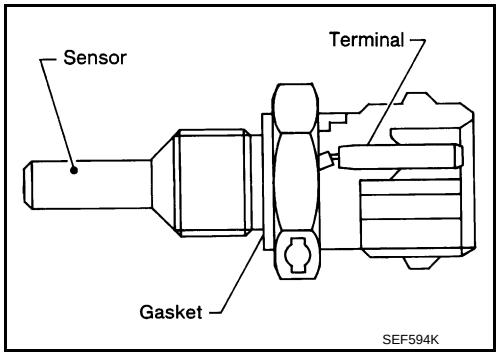


1. Valve
2. Armature
3. Magnet Loop Element
4. Fan speed sensor
5. Coil
6. Silicon oil

Engine Coolant Temperature Sensor

INFOID:0000000009009284

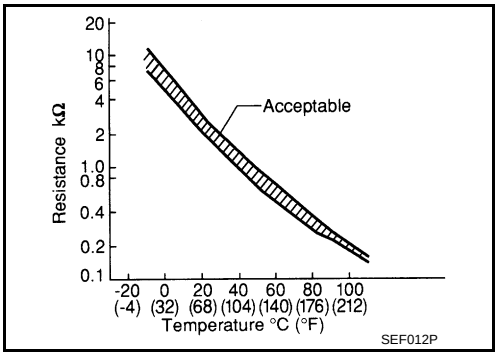
The engine coolant temperature (ECT) sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.35 - 2.73
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

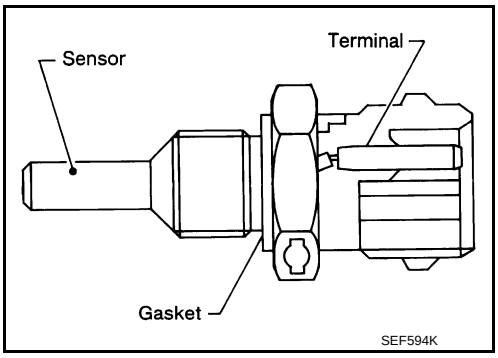
*: These data are reference values and are measured between ECM terminals.



Engine Oil Temperature Sensor

INFOID:0000000009009285

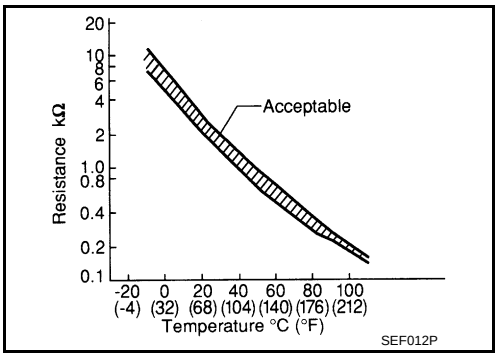
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance 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	2.35 - 2.73
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153

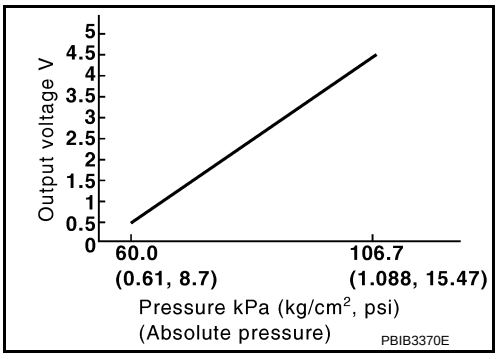
*: These data are reference values and are measured between ECM terminals.



EVAP Control System Pressure Sensor

INFOID:0000000009009286

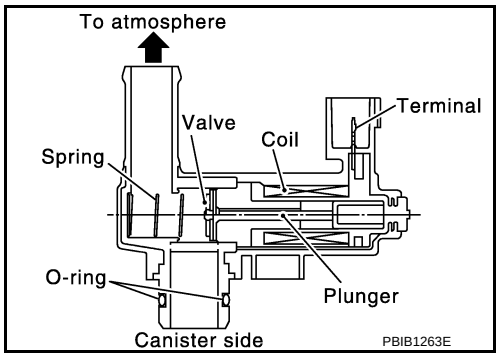
The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



EVAP Canister Vent Control Valve

INFOID:0000000009009287

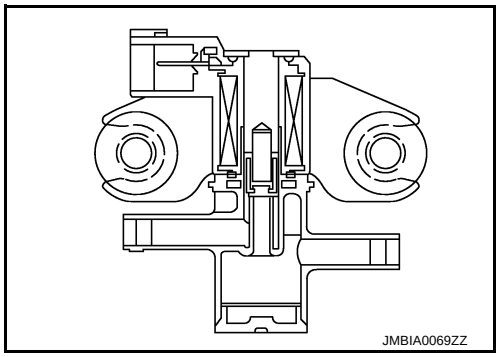
The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability 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 Canister Purge Volume Control Solenoid Valve

INFOID:0000000009009288

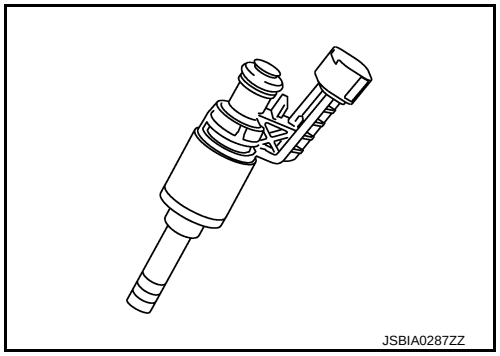
The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



Fuel Injector

INFOID:0000000009009289

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 Level Sensor

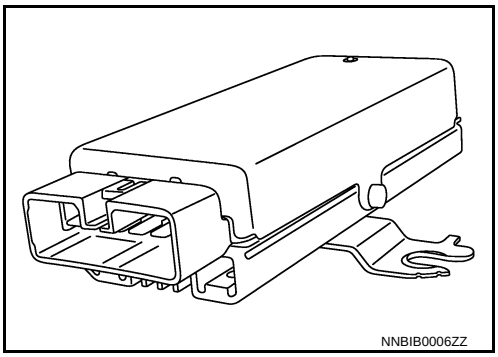
INFOID:0000000009009290

The fuel level sensor is mounted in the fuel level sensor unit.
The sensor detects a fuel level in the fuel tank and transmits a signal to the combination meter. The combination meter sends the fuel level sensor signal to the ECM via the CAN communication line.
It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

Fuel Pump Control Module

INFOID:0000000009009291

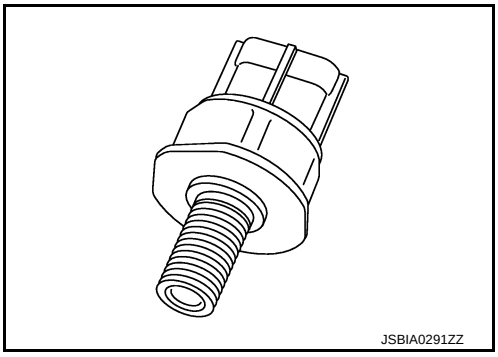
The fuel pump control module (FPCM) controls the discharging volume of the fuel pump by transmitting the FPCM control signals (Low/Mid/High) depending on driving conditions.



Fuel Rail Pressure Sensor

INFOID:0000000009009292

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 Tank Temperature Sensor

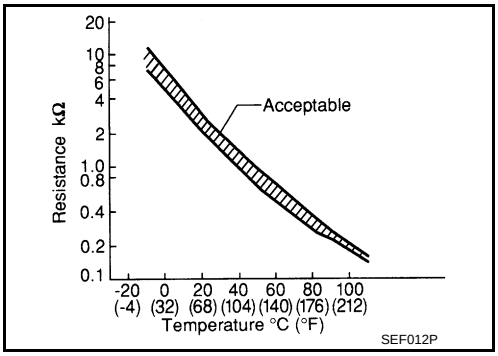
INFOID:0000000009009293

The fuel tank temperature sensor is used to detect the fuel temperature inside the fuel tank. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the fuel temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.

<Reference data>

Fuel temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: These data are reference values and are measured between ECM terminals.



Heated Oxygen Sensor 2

INFOID:0000000009009294

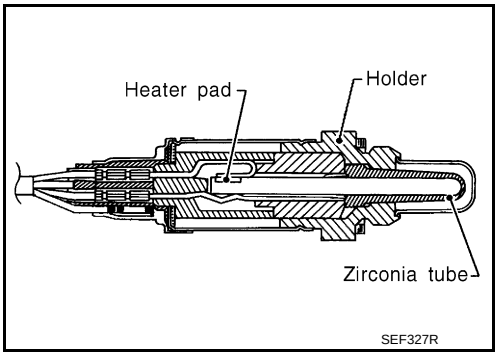
DESCRIPTION

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



HEATED OXYGEN SENSOR 2 HEATER

Heated oxygen sensor 2 heater is integrated in the sensor.
The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

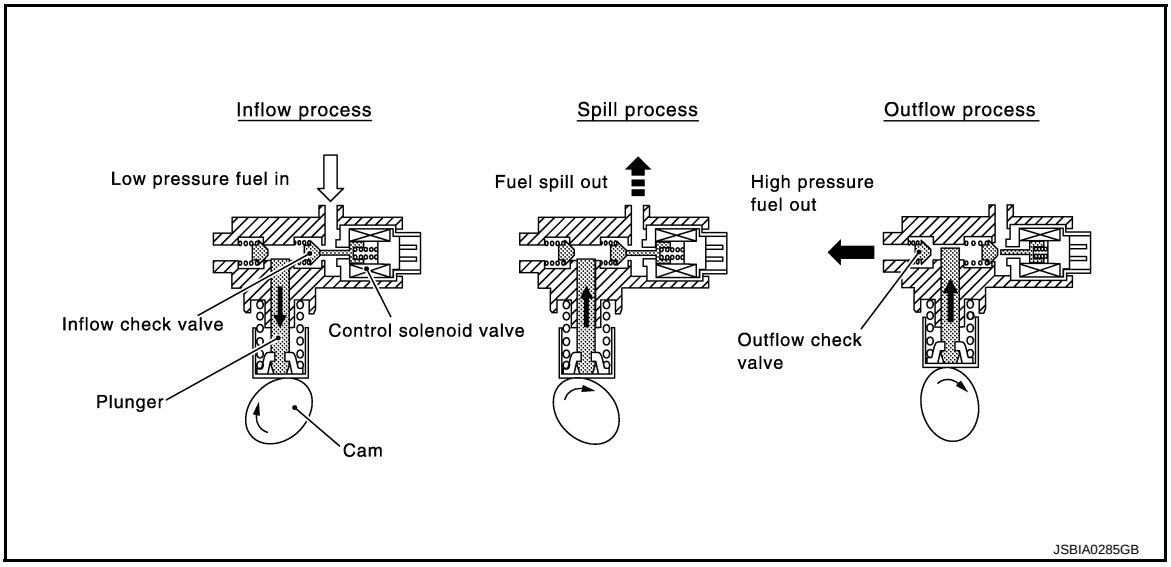
Engine speed	Heated oxygen sensor 2 heater
Above 3,600 rpm	OFF
Below 3,600 rpm after the following conditions are met. • Engine: After warming up • Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	ON

High Pressure Fuel Pump

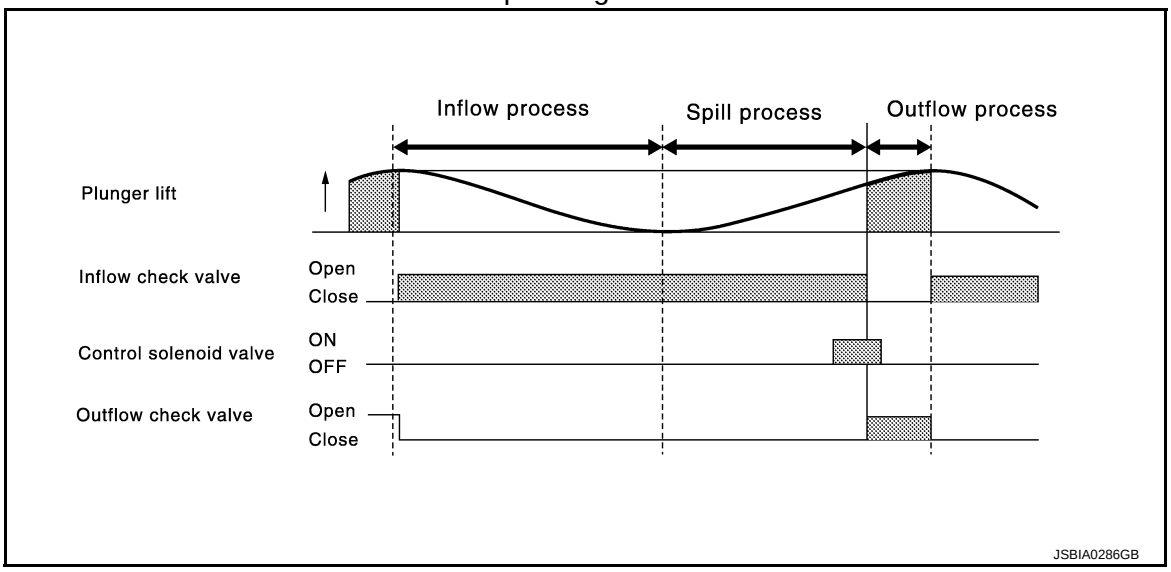
INFOID:0000000009009295

The high pressure fuel pump is installed at the front of the engine bank 2 side and activated by the camshaft.
ECM controls the high pressure fuel pump control solenoid valve built into the high pressure fuel pump and adjusts the amount of discharge by changing the suction timing of the low pressure fuel.

Operating Description



Operating Chart



ICC Brake Switch & Stop Lamp Switch

INFOID:0000000009009296

Stop lamp switch and ICC brake switch are installed to brake pedal bracket.
When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON.

ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).
ECM transmits ICC brake switch signal to ADAS control unit via CAN communication line.

ICC Steering Switch

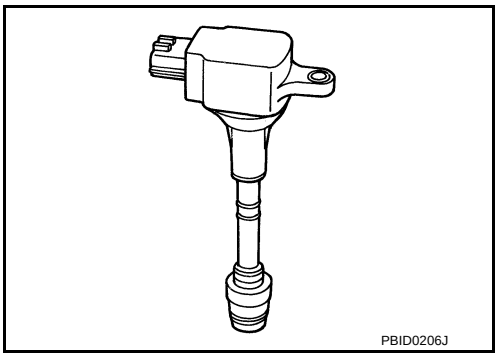
INFOID:0000000009009297

ICC steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
ECM transmits ICC steering switch signal to ADAS control unit via CAN communication line.

Ignition Coil With Power Transistor

INFOID:0000000009009298

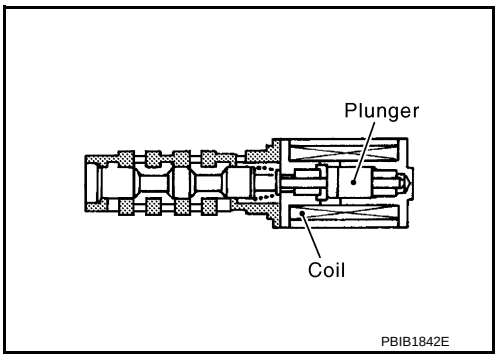
The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.



Intake Valve Timing Control Solenoid Valve

INFOID:0000000009009299

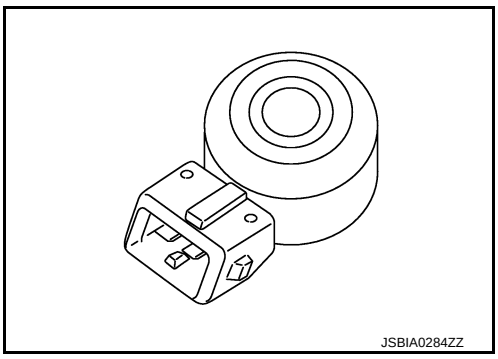
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
The shorter pulse width retards valve angle.
When ON and OFF pulse widths become equal, the solenoid valve stops oil pressure flow to fix the intake valve angle at the control position.



Knock Sensor

INFOID:0000000009009300

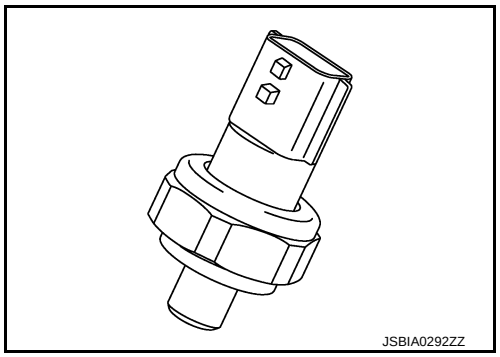
The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



Low Fuel Pressure Sensor

INFOID:0000000009009301

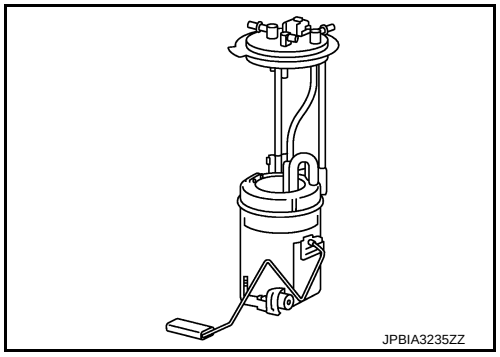
The low fuel pressure sensor is installed to low fuel pressure piping and measures the low fuel pressure. The sensor transmits voltage signal to the ECM. As the pressure increases, the voltage rises.



Low Pressure Fuel Pump

INFOID:0000000009009302

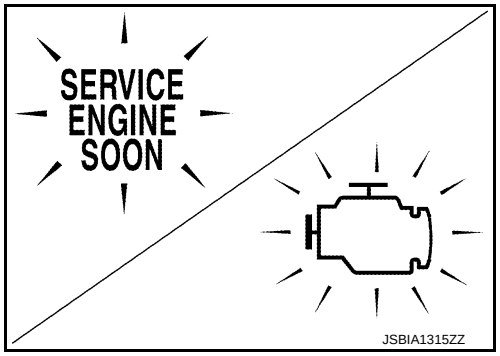
The low pressure fuel pump is integrated with a fuel pressure regulator and a fuel filter. This pump is build into the fuel tank.
ECM controls the low pressure fuel pump via FPCM.



Malfunction Indicator Lamp (MIL)

INFOID:0000000009009303

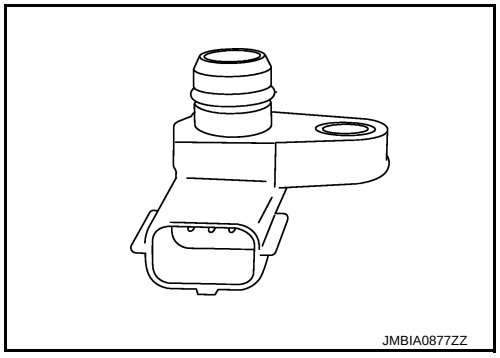
The Malfunction Indicator Lamp (MIL) is located on the combination meter.
The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MIL should turn off. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.
For details, refer to EC-626, "Diagnosis Description".



Manifold Absolute Pressure Sensor

INFOID:0000000009009304

The manifold absolute pressure (MAP) sensor is installed on the intake manifold collector. Detects intake manifold pressure, and transmits a voltage signal to the ECM.
The sensor uses a silicon diaphragm which is sensitive to the change in pressure. As the pressure increases, the voltage rises.

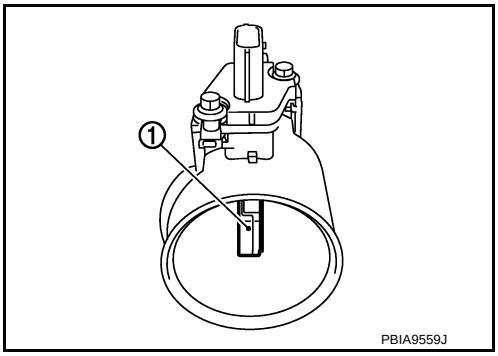


Mass Air Flow Sensor (With Intake Air Temperature Sensor)

INFOID:0000000009009305

MASS AIR FLOW SENSOR

The mass air flow (MAF) sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows around it. The greater air flow, the greater the heat loss.
Therefore, the electric current supplied to hot wire is changed to maintain the temperature of the hot wire as air flow increases. The ECM detects the air flow by means of this current change.



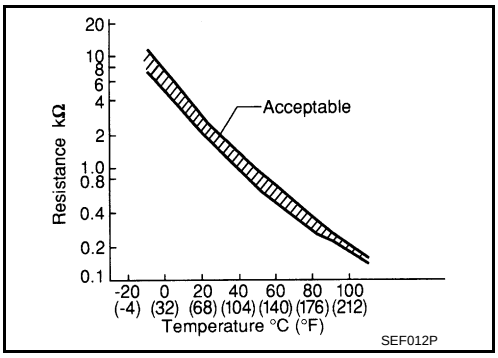
INTAKE AIR TEMPERATURE SENSOR

The intake air temperature (IAT) sensor is built-into the mass air flow sensor. The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.

<Reference data>

Intake air temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
25 (77)	3.3	1.94 - 2.06
80 (176)	1.2	0.293 - 0.349

*: These data are reference values and are measured between ECM terminals.



Power Steering Pressure (PSP) Sensor

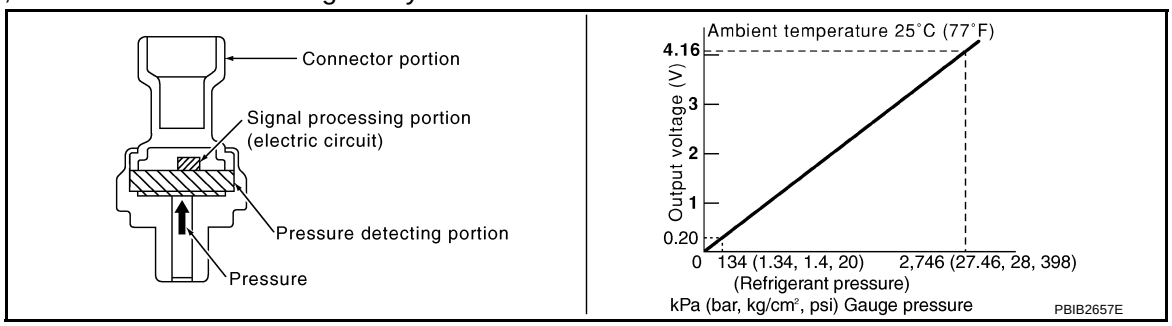
INFOID:0000000009009306

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load.
This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

Refrigerant Pressure Sensor

INFOID:0000000009009307

The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



VVEL Actuator Motor

INFOID:0000000009009308

The VVEL actuator motor rotates the control shaft according to the control signal from the VVEL control module. The VVEL control module judges whether the VVEL actuator motor controls the angle properly by the VVEL control shaft position sensor signal.

VVEL Actuator Motor Relay

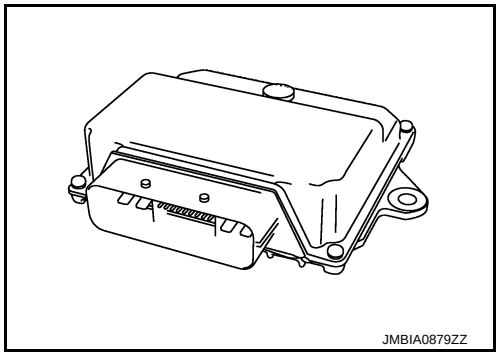
INFOID:0000000009009309

Power supply for the VVEL actuator motor is provided to the VVEL control module via VVEL actuator motor relay. VVEL actuator motor relay is ON/OFF controlled by the VVEL control module. In addition, when the VVEL actuator motor relay cannot be controlled by the VVEL control module for some reason, it ON/OFF controlled by ECM.

VVEL Control Module

INFOID:0000000009009310

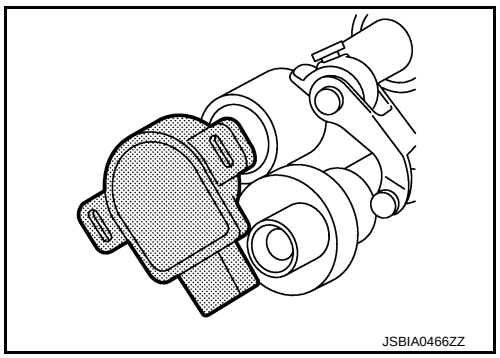
The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.



VVEL Control Shaft Position Sensor

INFOID:0000000009009311

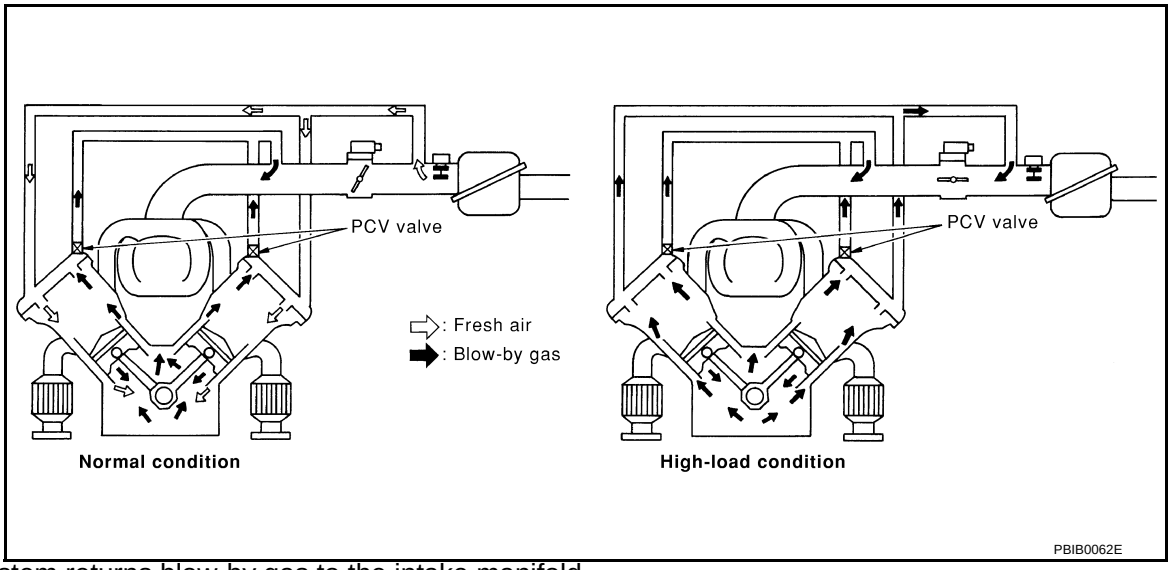
VVEL control shaft position sensor detects the control shaft position angle.
A magnet is installed to the tip of the control shaft.
The magnetic field changes as the control shaft rotates. This changes output voltage of the VVEL control shaft position sensor.
VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.



STRUCTURE AND OPERATION

Positive Crankcase Ventilation

INFOID:0000000009009312



This system returns blow-by gas to the intake manifold.

The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.

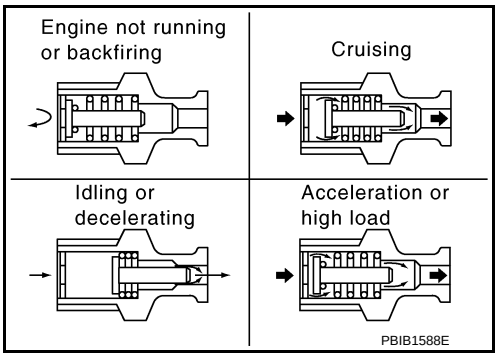
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.

The ventilating air is drawn from the air inlet tubes into the crankcase. In this process the air passes through the hose connecting air inlet tubes to rocker cover.

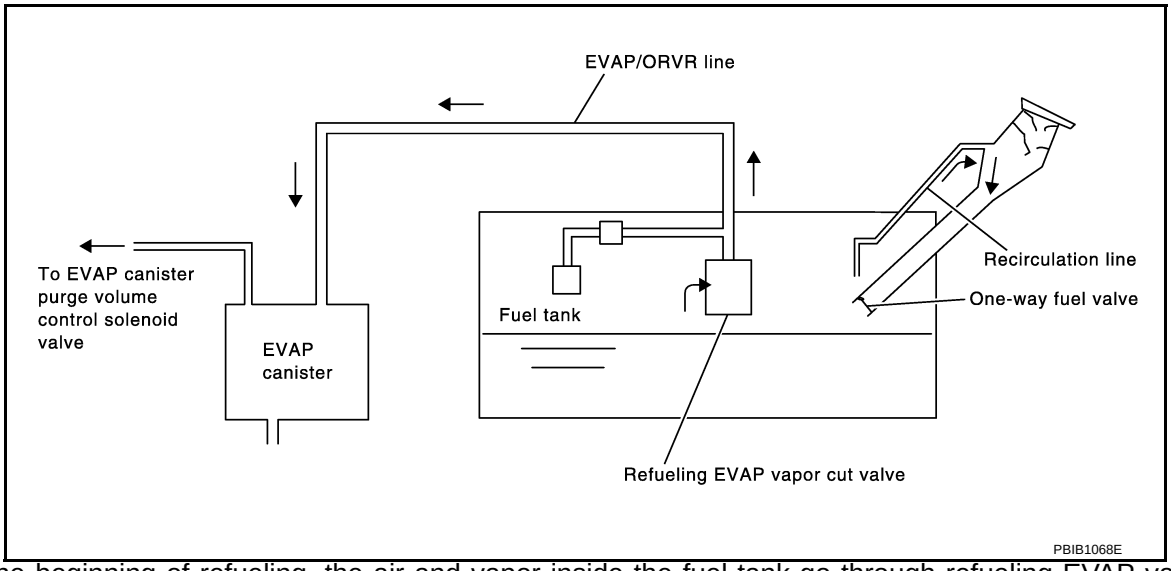
Under full-throttle condition, the manifold vacuum is insufficient to draw the blow-by flow through the valve. The flow goes through the hose connection in the reverse direction.

On vehicles with an excessively high blow-by, the valve does not meet the requirement. This is because some of the flow will go through the hose connection to the air inlet tubes under all conditions.



On Board Refueling Vapor Recovery (ORVR)

INFOID:0000000009009313



From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

WARNING:

When conducting inspections below, be sure to observe the following:

- **Put a “CAUTION: FLAMMABLE” sign in workshop.**
- **Never smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Always furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

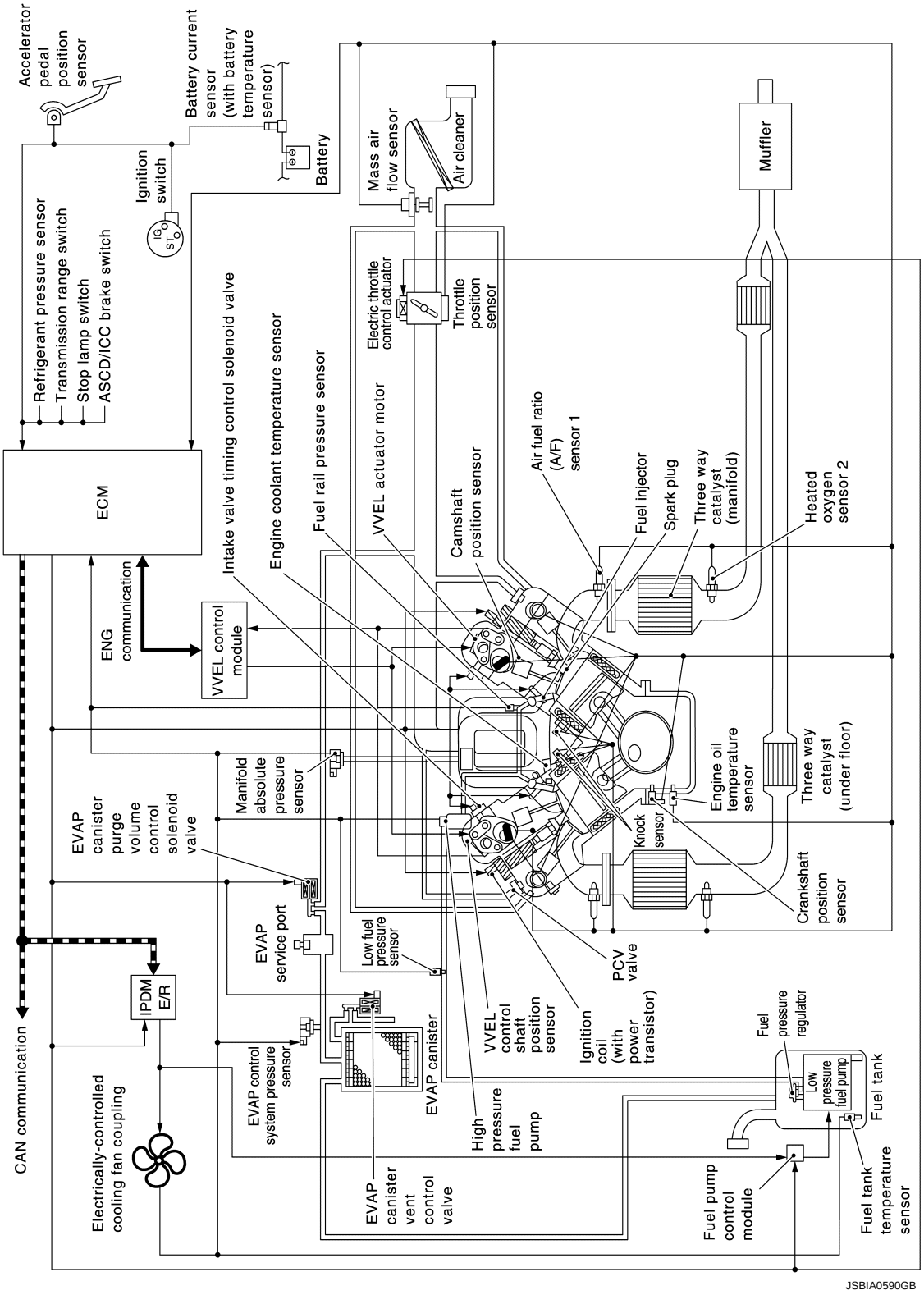
- **Before removing fuel line parts, carry out the following procedures:**
  - **Put drained fuel in an explosion-proof container and put lid on securely.**
  - **Release fuel pressure from fuel line. Refer to EC-731, "Work Procedure".**
  - **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Never kink or twist hose and tube when they are installed.**
- **Never tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connections.**
- **Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

SYSTEM

ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : System Diagram

INFOID:0000000009009314



ENGINE CONTROL SYSTEM : System Description

INFOID:0000000009009315

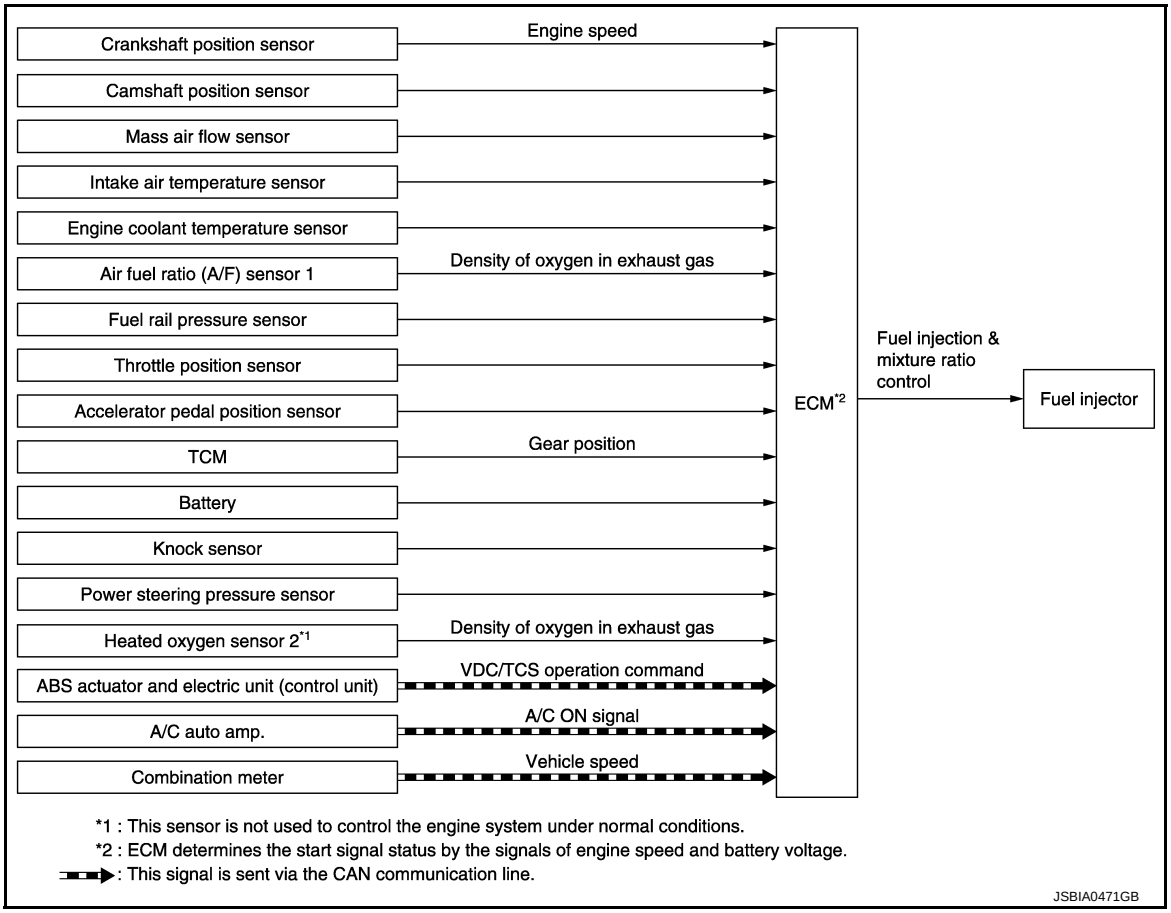
ECM controls the engine by various functions.

Function	Reference
Fuel injection control	EC-613, "DIRECT INJECTION GASOLINE SYSTEM : System Description"
Fuel pressure control	EC-616, "FUEL PRESSURE CONTROL : System Description"
Cooling fan control	EC-618, "COOLING FAN CONTROL : System Description"
Electric ignition control	EC-619, "ELECTRIC IGNITION SYSTEM : System Description"
Intake valve timing control	EC-620, "INTAKE VALVE TIMING CONTROL : System Description"
VVEL (Variable Valve Event & Lift)	EC-621, "VVEL SYSTEM : System Description"
Evaporative emission	EC-622, "EVAPORATIVE EMISSION SYSTEM : System Description"
Air conditioning cut control	EC-624, "AIR CONDITIONING CUT CONTROL : System Description"
Power generation voltage variable control	CHG-6, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Description"

DIRECT INJECTION GASOLINE SYSTEM

DIRECT INJECTION GASOLINE SYSTEM : System Diagram

INFOID:0000000009009316



DIRECT INJECTION GASOLINE SYSTEM : System Description

INFOID:0000000009009317

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*2	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor	Camshaft position		
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Fuel rail pressure sensor	Fuel rail pressure		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
TCM	Gear position		
Battery	Battery voltage*2		
Knock sensor	Engine knocking condition		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
ABS actuator and electric unit (control unit)	VDC/TCS operation command		
A/C auto amp.	A/C ON signal		
Combination meter	Vehicle speed		

*1: This sensor is not used to control the engine system under normal conditions.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

The adoption of the direct fuel injection method enables more accurate adjustment of fuel injection quantity by injecting atomized high-pressure fuel directly into the cylinder. This method allows high-powered engine, low fuel consumption, and emissions-reduction.

The amount of fuel injected from the fuel injector is determined by the ECM. The ECM controls the length of time the valve remains open (injection pulse duration). The amount of fuel injected is a program value in the ECM memory. The program value is preset by engine operating conditions. These conditions are determined by input signals (for engine speed and intake air and fuel rail pressure) from the crankshaft position sensor, camshaft position sensor, mass air flow sensor and the fuel rail pressure sensor.

VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

In addition, the amount of fuel injected is compensated to improve engine performance under various operating conditions as listed below.

<Fuel increase>
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever position is changed from N to D
- High-load, high-speed operation

<Fuel decrease>
- During deceleration
- During high engine speed operation

FUEL INJECTION CONTROL

Stratified-charge Combustion

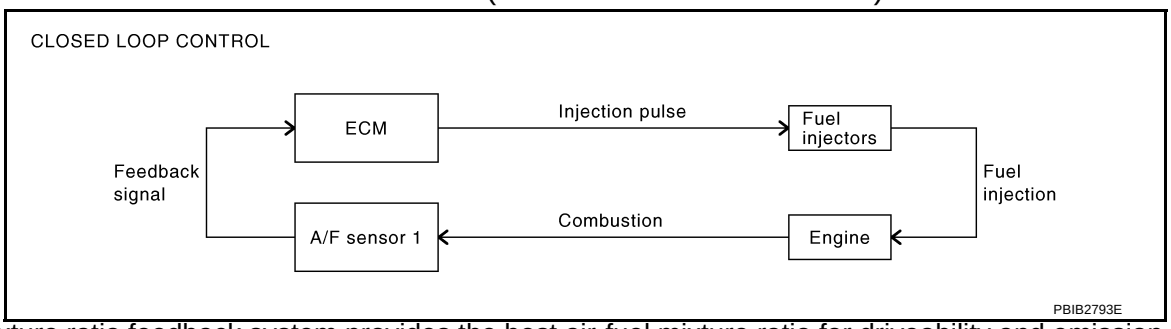
Stratified-charge combustion is a combustion method which enables extremely lean combustion by injecting fuel in the latter half of a compression process, collecting combustible air-fuel around the spark plug, and forming fuel-free airspace around the mixture.

Right after a start with the engine cold, the catalyst warm-up is accelerated by stratified-charge combustion.

Homogeneous Combustion

Homogeneous combustion is a combustion method that fuel is injected during intake process so that combustion occurs in the entire combustion chamber, as is common with conventional methods.
As for a start except for starts with the engine cold, homogeneous combustion occurs.

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to EC-597, "Air Fuel Ratio (A/F) Sensor 1". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (manifold). Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

- Open Loop Control
  The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of A/F sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D
- When starting the engine

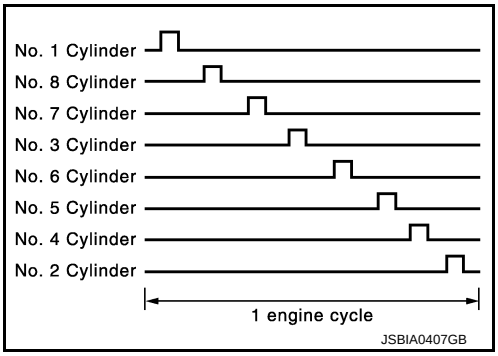
MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.
“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes “short-term fuel trim” and “long-term fuel trim”.
“Short term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
“Long-term fuel trim” is overall fuel compensation carried out over time to compensate for continual deviation of the “short-term fuel trim” from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING

Sequential Direct Injection Gasoline System

Fuel is injected into each cylinder during each engine cycle according to the ignition order.



STRATIFIED-CHARGE START CONTROL

The use of the stratified-charge combustion method enables emissions-reduction when starting the engine with engine coolant temperature between 5°C (41°F) and 40°C (104°F).

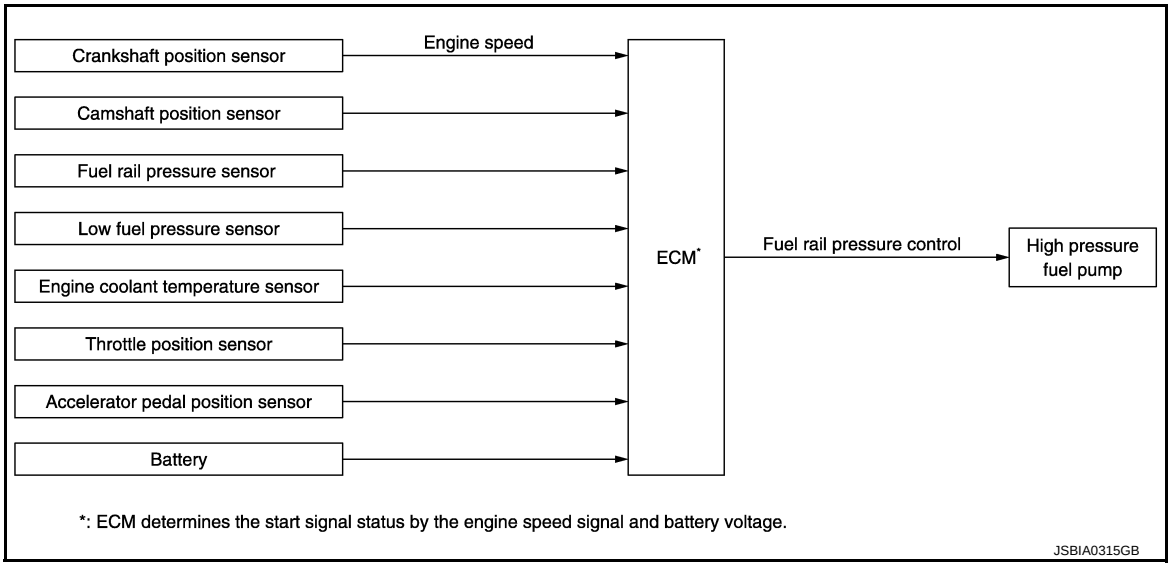
FUEL SHUT-OFF

Fuel to each cylinder is shut-off during deceleration, operation of the engine at excessively high speed or operation of the vehicle at excessively high speed.

FUEL PRESSURE CONTROL

FUEL PRESSURE CONTROL : System Diagram

INFOID:0000000009009318



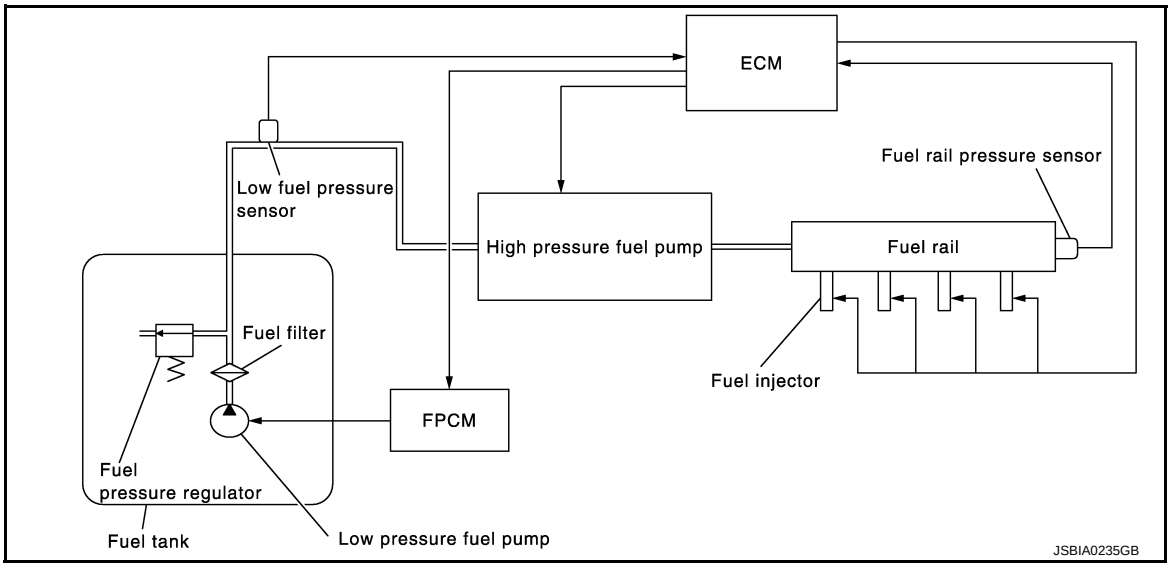
FUEL PRESSURE CONTROL : System Description

INFOID:0000000009009319

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed	Fuel injection & mixture ratio control	High pressure fuel pump
Camshaft position sensor	Camshaft position		
Fuel rail pressure sensor	Fuel rail pressure		
Low fuel pressure sensor	Low fuel pressure		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage		

SYSTEM DESCRIPTION



Low fuel pressure control

- The low fuel pressure pump is controlled by the fuel pump control module (FPCM) and pumps fuel according to a driving condition. The pumped fuel passes through the fuel filter and is sent to the high pressure fuel pump. FPCM controls the low pressure fuel pump, according to a signal from ECM as shown in the table below.

Conditions	Amount of fuel flow	Supplied voltage
After a laps of 1 second after ignition ON	OFF	0 V
• For 1 second after turning ignition switch ON • Engine is running under low load and low speed conditions	Low	Approximately 8.5 V
• Engine cranking • Engine coolant temperature is below 10°C (50°F) • Engine is running under high load and high speed conditions	High	Battery voltage (11 – 14 V)
Except the above	Mid	Approximately 10 V

- Low fuel pressure is adjusted by the fuel pressure regulator.

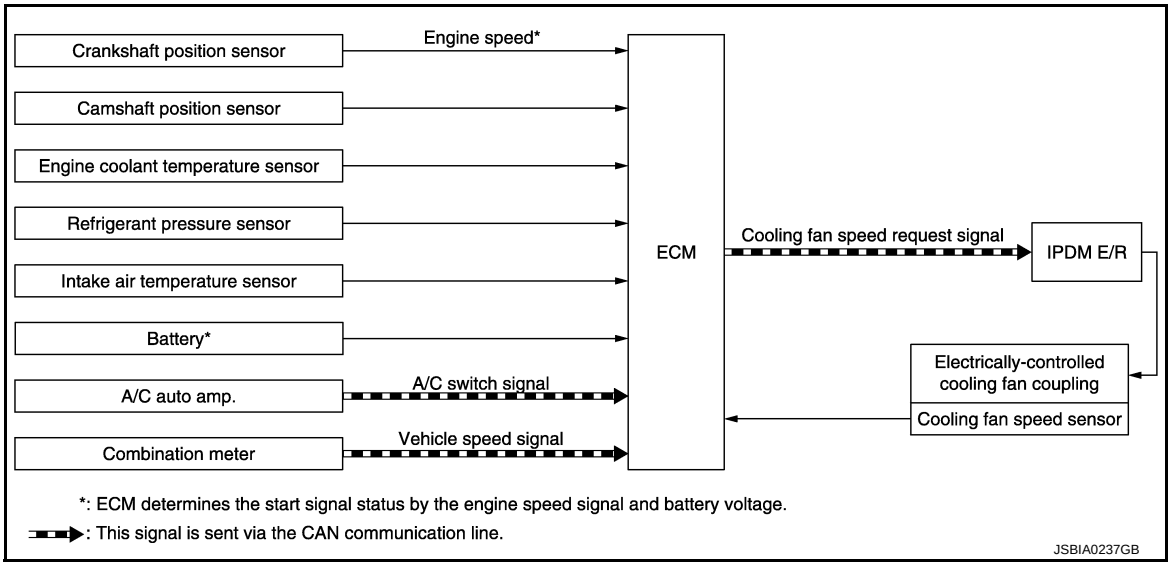
High fuel pressure control

- The high pressure fuel pump raises the pressure of the fuel sent from the low pressure fuel pump. Actuated by the camshaft, the high pressure fuel pump activates the high pressure fuel pump solenoid based on a signal received from ECM, and adjusts the amount of discharge by changing the timing of closing the inlet check valve to control fuel rail pressure.

COOLING FAN CONTROL

COOLING FAN CONTROL : System Diagram

INFOID:0000000009009320



COOLING FAN CONTROL : System Description

INFOID:0000000009009321

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*1	Cooling fan speed request signal*2	IPDM E/R ↓ Electrically-controlled cooling fan coupling
Camshaft position sensor	Camshaft position		
Engine coolant temperature sensor	Engine coolant temperature		
Refrigerant pressure sensor	Refrigerant pressure		
Intake air temperature sensor	Intake air temperature		
Battery	Battery voltage		
Combination meter	Vehicle speed signal*2		
BCM	A/C switch signal*2		
Cooling fan speed sensor	Cooling fan speed		

*1: The ECM determines the engine speed by the signals of crankshaft position and camshaft position.

*2: This signal is sent to ECM via the CAN communication line.

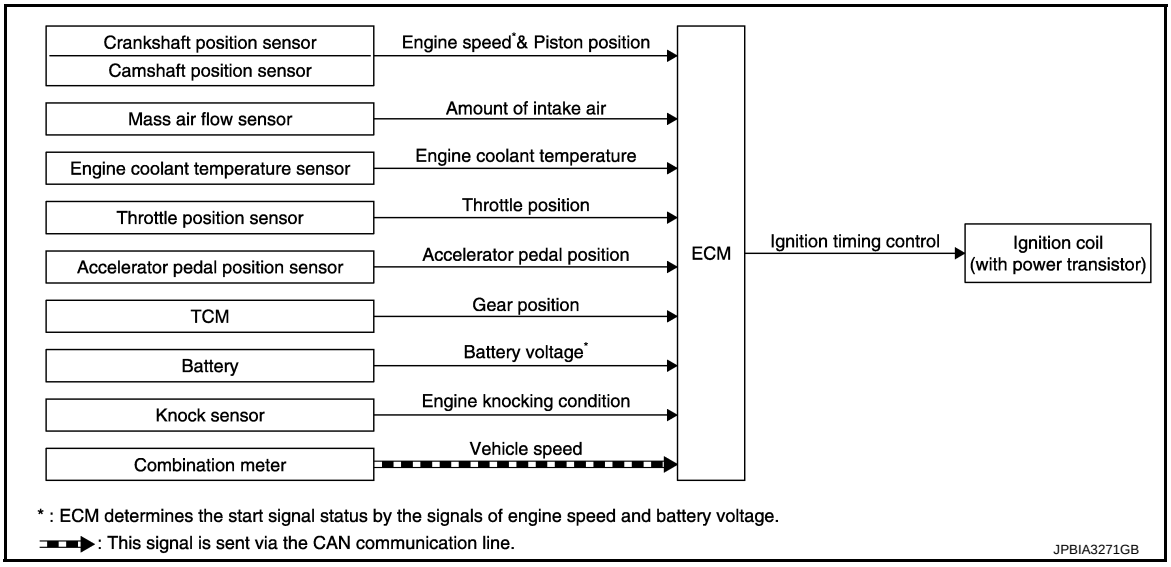
SYSTEM DESCRIPTION

- Based on a signal transmitted from each sensor, ECM calculates a target fan speed responsive to a driving condition. In addition, ECM calculates a fan pulley speed according to an engine speed and transmits a cooling fan request signal to IPDM E/R via the CAN communication line to satisfy the target fan speed. Then, IPDM E/R transmits ON/OFF pulse duty signal to electrically-controlled cooling fan coupling.
  The cooling fan speed sensor detects a cooling fan speed and transmits the detection result to ECM.
- ECM judges the start signal state from the engine speed signal and battery voltage.

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM : System Diagram

INFOID:0000000009009322



ELECTRIC IGNITION SYSTEM : System Description

INFOID:0000000009009323

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*1 Piston position	Ignition timing control	Ignition coil (with power transistor)
Camshaft position sensor			
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
TCM	Gear position		
Battery	Battery voltage*1		
Knock sensor	Engine knocking condition		
Combination meter	Vehicle speed*2		

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION

Ignition order: 1 - 8 - 7 - 3 - 6 - 5 - 4 - 2

The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.

The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.

During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

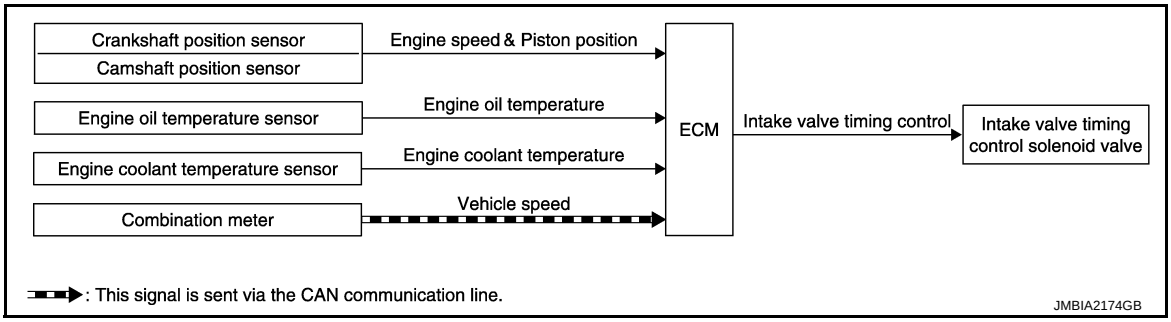
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

INTAKE VALVE TIMING CONTROL

INTAKE VALVE TIMING CONTROL : System Diagram

INFOID:0000000009009324



INTAKE VALVE TIMING CONTROL : System Description

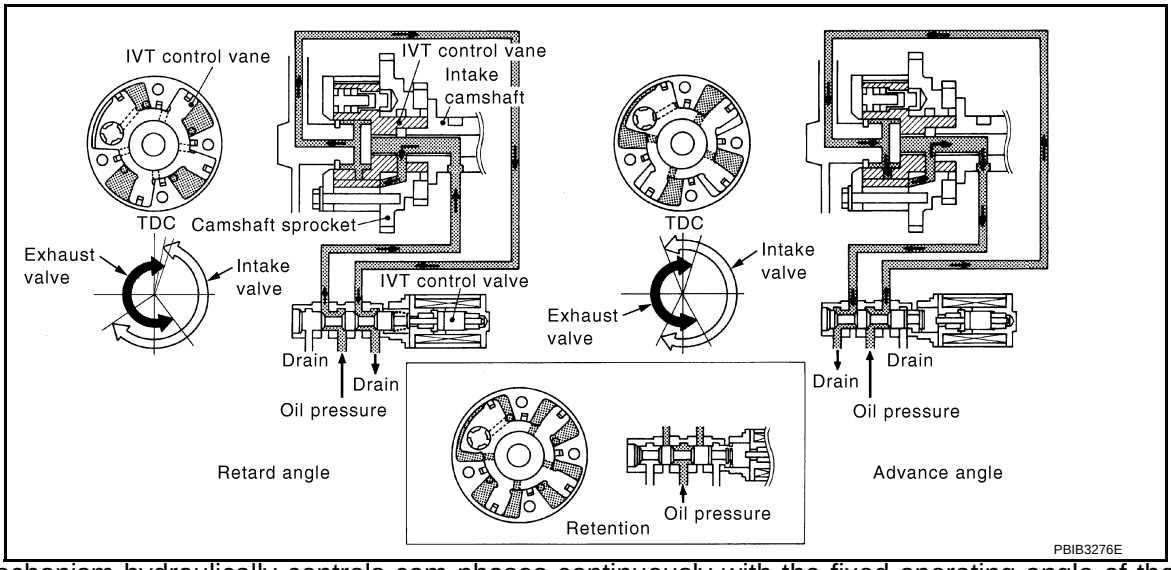
INFOID:0000000009009325

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed and piston position	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor			
Engine oil temperature sensor	Engine oil temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Combination meter	Vehicle speed*		

*: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION



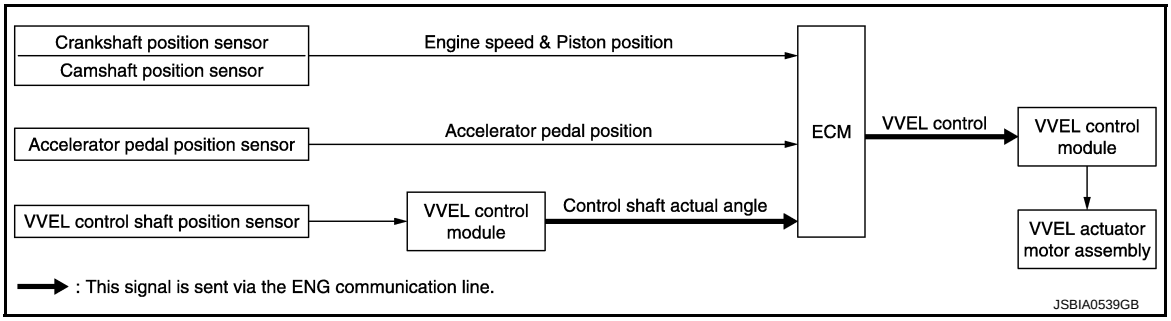
This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

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 control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the intake valve to increase engine torque in low/mid speed range and output in high speed range.

VVEL SYSTEM

VVEL SYSTEM : System Diagram

INFOID:0000000009009326



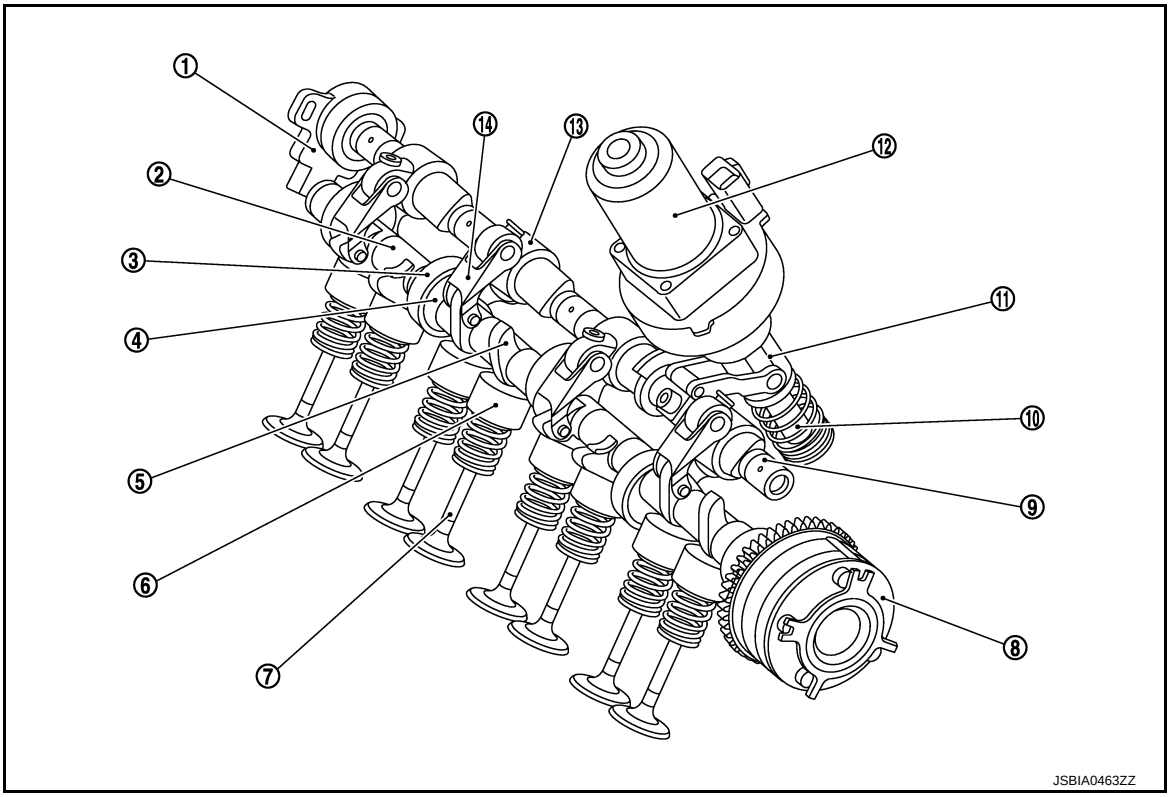
VVEL SYSTEM : System Description

INFOID:0000000009009327

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Camshaft position sensor Crankshaft position sensor	Engine speed and piston position	VVEL control	VVEL control module ↓ VVEL actuator motor assembly
Accelerator pedal position sensor	Accelerator pedal position		
VVEL control shaft position sensor ↓ VVEL control module	Control shaft actual angle		

SYSTEM DESCRIPTION

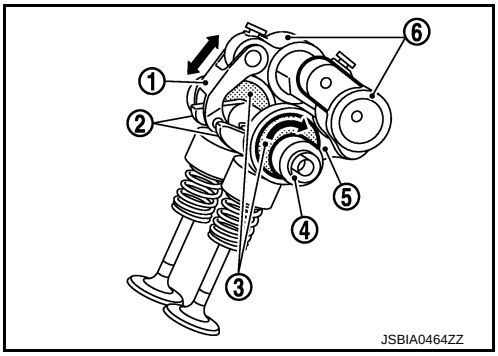


1. VVEL control shaft position sensor
2. Drive shaft
3. Link A
4. Eccentric cam
5. Output cam
6. Valve lifter
7. Intake valve
8. Intake camshaft sprocket
9. Control shaft
10. Ball screw shaft
11. Ball screw nut
12. VVEL actuator motor assembly
13. Rocker arm
14. Link B

VVEL (Variable Valve Event & Lift) is a system that controls valve event and valve lift continuously.
ECM decides the target valve lift according to the driving condition and sends the command signal to the VVEL control module via ENG communication line.

VALVE LIFT OPERATION

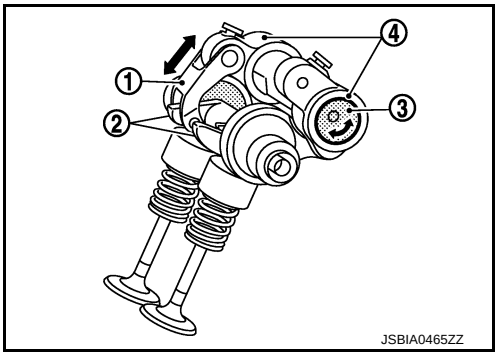
Rotational movement of the drive shaft equipped with eccentric cam is transmitted to output cam via the rocker arm and two kinds of links to depress the intake valve.



1. Link B
2. Output cam
3. Eccentric cam
4. Drive shaft
5. Link A
6. Rocker arm

VARIABLE OPERATION

VVEL control module controls the rotation of the control shaft using the VVEL actuator motor assembly and changes the movement of the output cam by shifting the link supporting point. As a result, valve lift changes continuously to improve engine output and response.

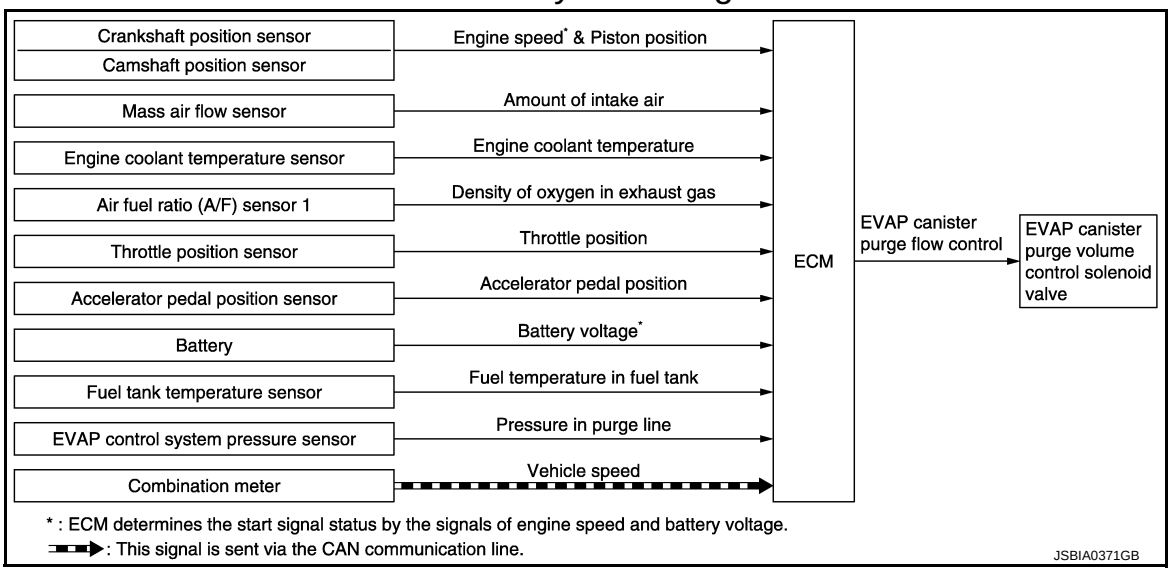


1. Link B
2. Output cam
3. Control shaft
4. Rocker arm

EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM : System Diagram

INFOID:0000000009009328



EVAPORATIVE EMISSION SYSTEM : System Description

INFOID:0000000009009329

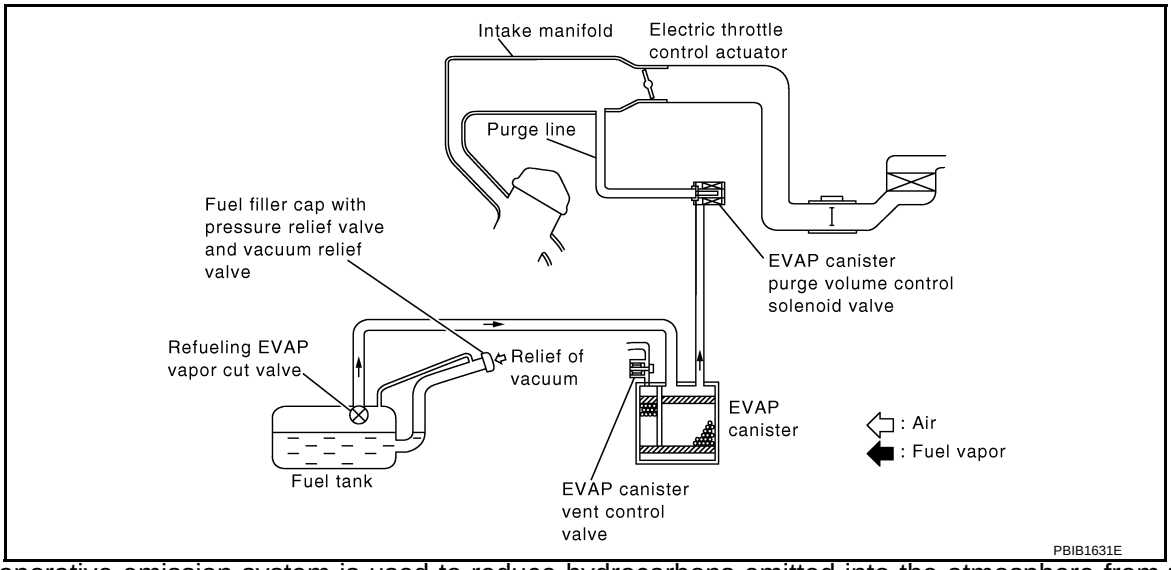
INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor Camshaft position sensor	• Engine speed*1 • Piston position	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Fuel tank temperature sensor	Fuel temperature in fuel tank		
EVAP control system pressure sensor	Pressure in purge line		
Combination meter	Vehicle speed*2		

*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.

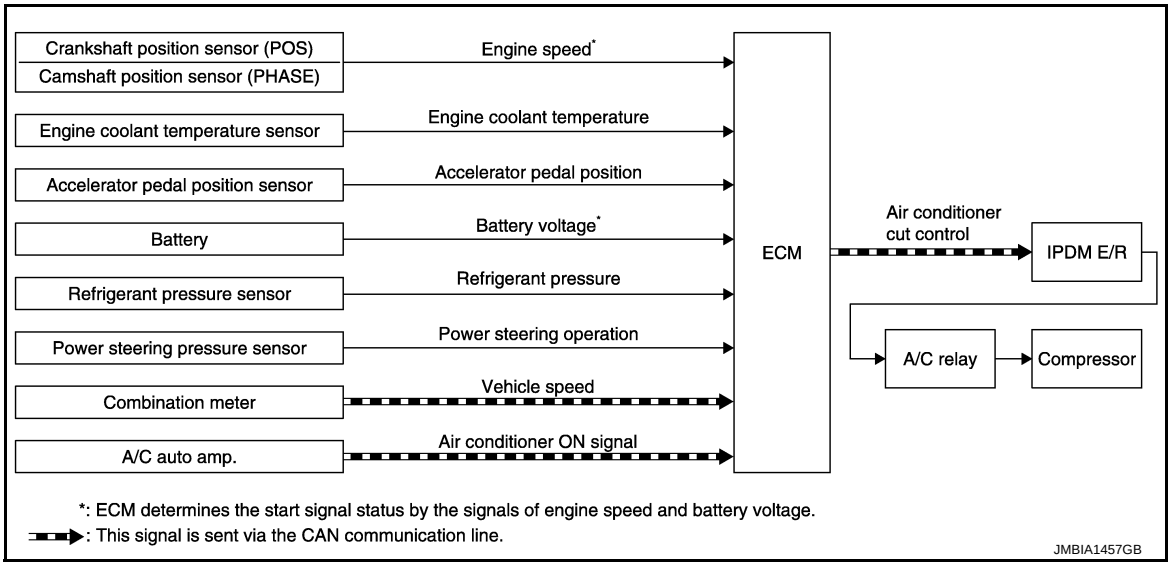
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.

EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

AIR CONDITIONING CUT CONTROL

AIR CONDITIONING CUT CONTROL : System Diagram

INFOID:0000000009009330



AIR CONDITIONING CUT CONTROL : System Description

INFOID:0000000009009331

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor Camshaft position sensor	Engine speed*2	Air conditioner cut control	IPDM E/R ↓ A/C relay ↓ Compressor
Engine coolant temperature sensor	Engine coolant temperature		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
A/C auto amp.	A/C ON signal*1		
	A/C evaporator temperature*1		
	Target A/C evaporator temperature*1		
	Blower fan ON signal		
Combination meter	Vehicle speed*1		

*1: This signal is sent to the ECM via the CAN communication line.

*2: ECM determines the start signal status by the signals of engine speed and battery voltage.

SYSTEM DESCRIPTION

This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned OFF.

- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant pressure is excessively low or high.

ALTERNATOR POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM

ALTERNATOR POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM :

System Description

INFOID:0000000009009332

The alternator power generation voltage variable control system controls the amount of power generation, according to a battery loaded condition. ECM judges a battery condition, according to a signal received from the battery current sensor which detects a charge/discharge current. ECM then transmits a signal to IPDM E/R to command power generation via CAN communication. IPDM E/R transmits a power generation control signal to the alternator so that the system can control the amount of power generation. The voltage of power generation is lowered during battery low-load conditions and boosted under heavy load conditions. In this way, the system reduces the engine load through the adequate power generation control.
For details, refer to CHG-6, "POWER GENERATION VOLTAGE VARIABLE CONTROL SYSTEM : System Diagram".

CAN COMMUNICATION

CAN COMMUNICATION : System Description

INFOID:0000000009009333

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-32, "CAN COMMUNICATION SYSTEM : CAN Communication Signal Chart", about CAN communication for detail.

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000009009334

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:0000000009009335

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to GI-51, "Description".

NOTE:
Service $0A is not applied for regions where it is not mandated.

DIAGNOSIS SYSTEM (ECM)
DIAGNOSIS DESCRIPTION

DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:0000000009009336

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>
If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminate	Blinking	Illuminate				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0308 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-672, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:0000000009009337

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-672, "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-712, "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 - P0308 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was saved in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

DIAGNOSIS DESCRIPTION : Counter System

INFOID:0000000009009338

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.

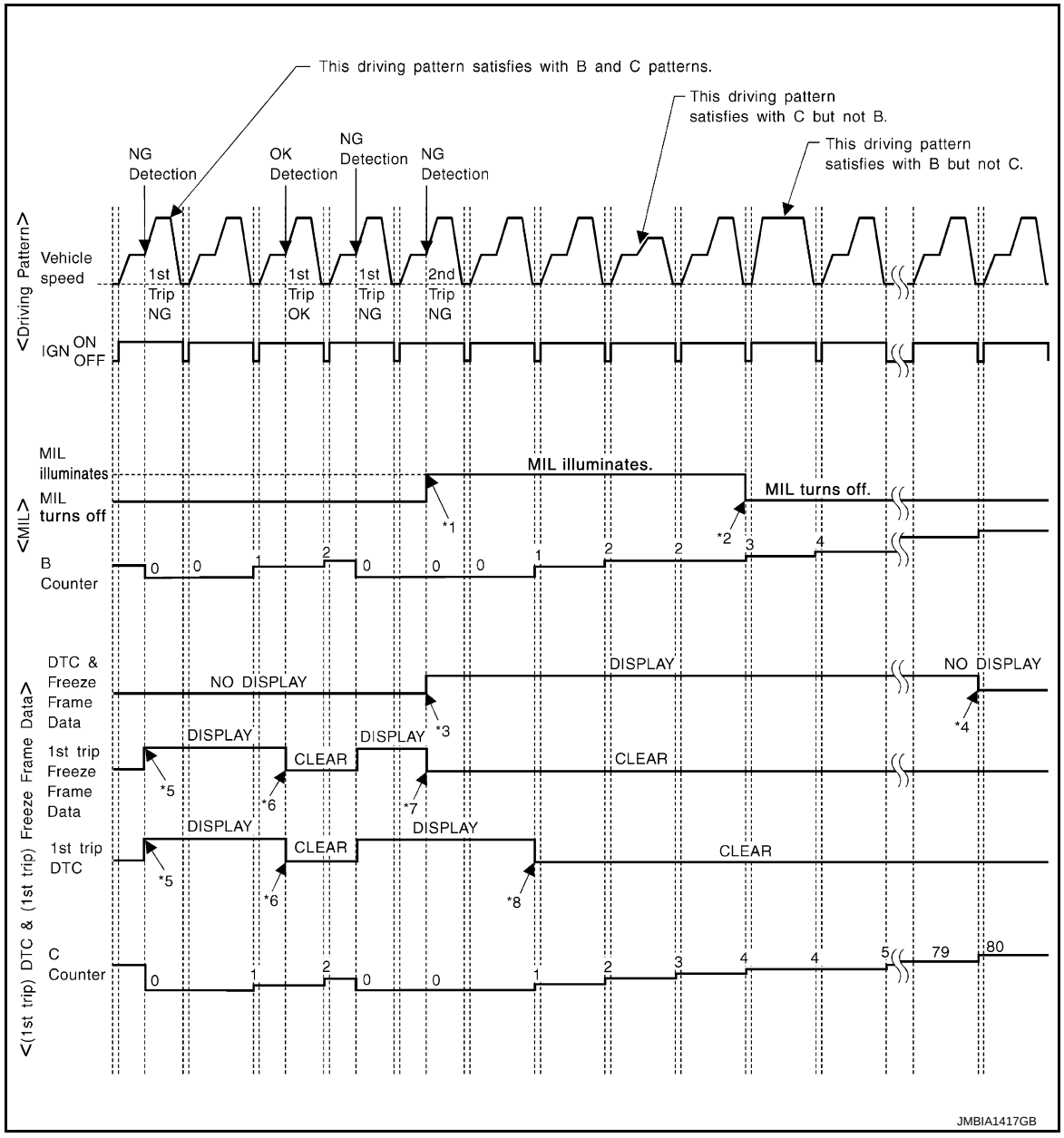
COUNTER SYSTEM CHART

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>

Driving pattern B means the vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will turn OFF when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

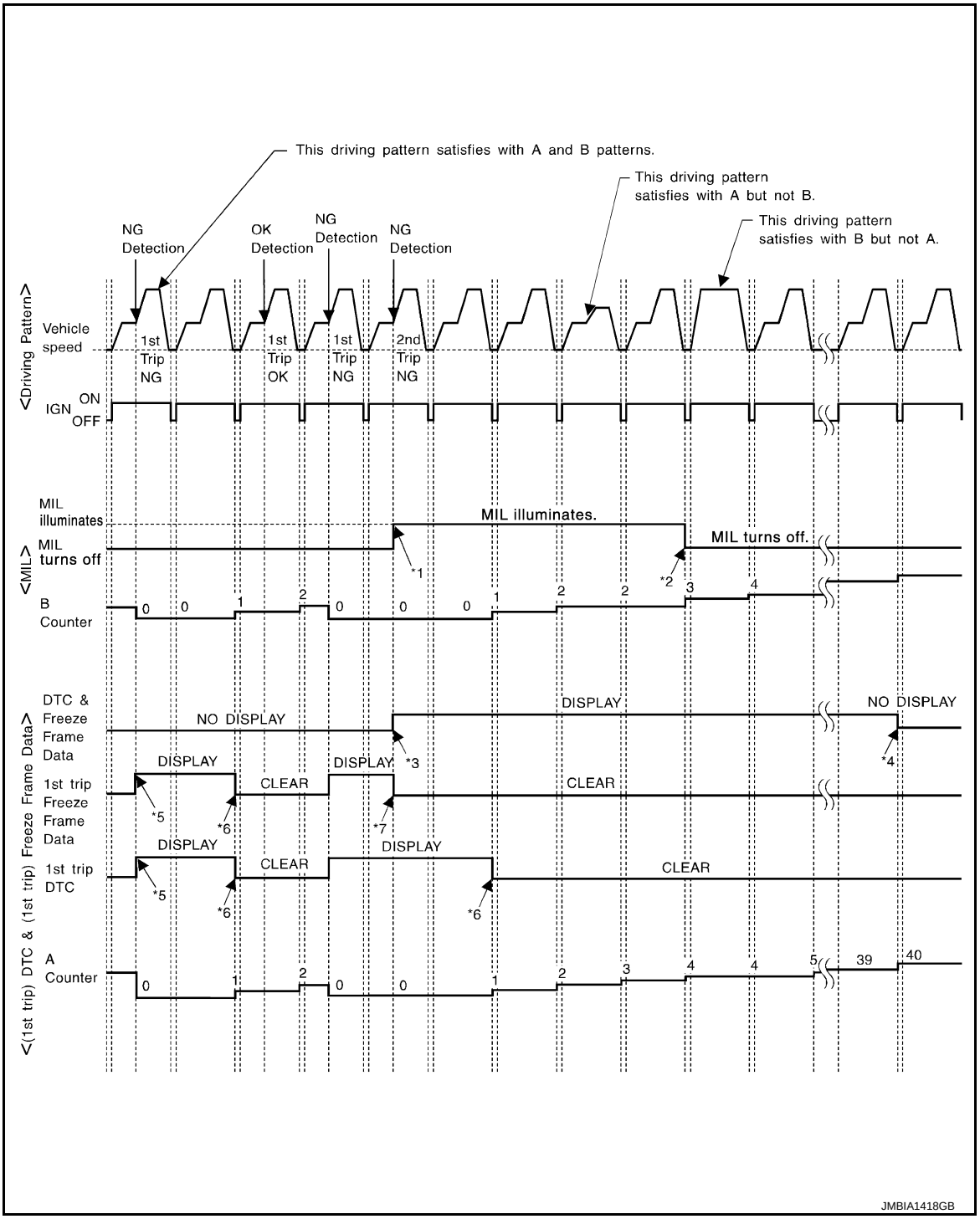
<Driving Pattern C>
Driving pattern C means operating vehicle as per the following:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as per the following:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above are satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

Relationship Between MIL, DTC, 1st Trip DTC and Driving Patterns Except For “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”



*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.)

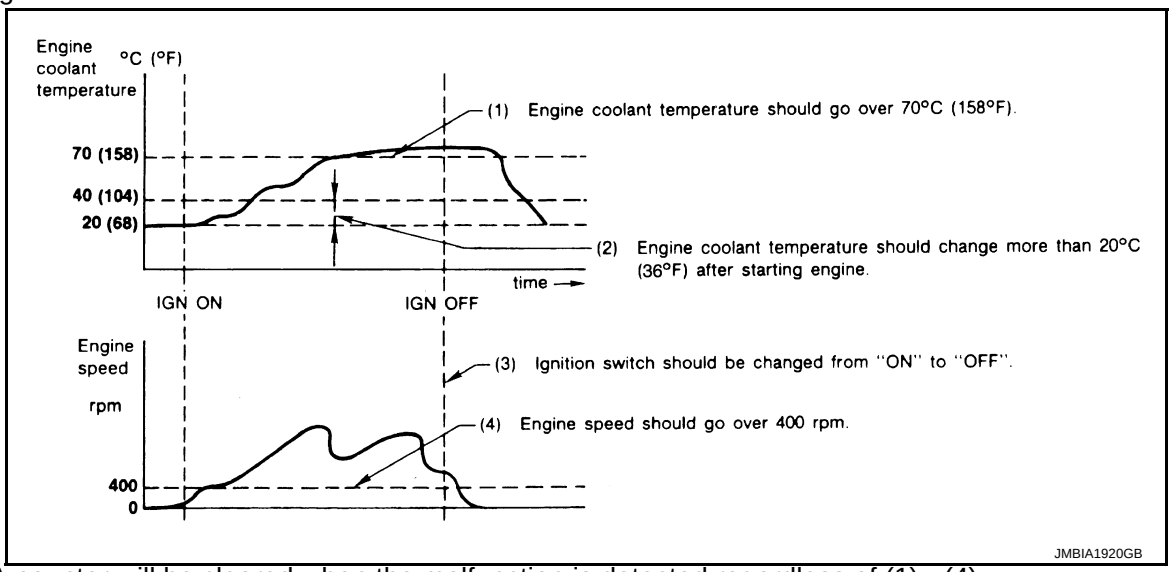
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*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>



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

<Driving Pattern B>

Driving pattern B means operating vehicle operation as per the following:

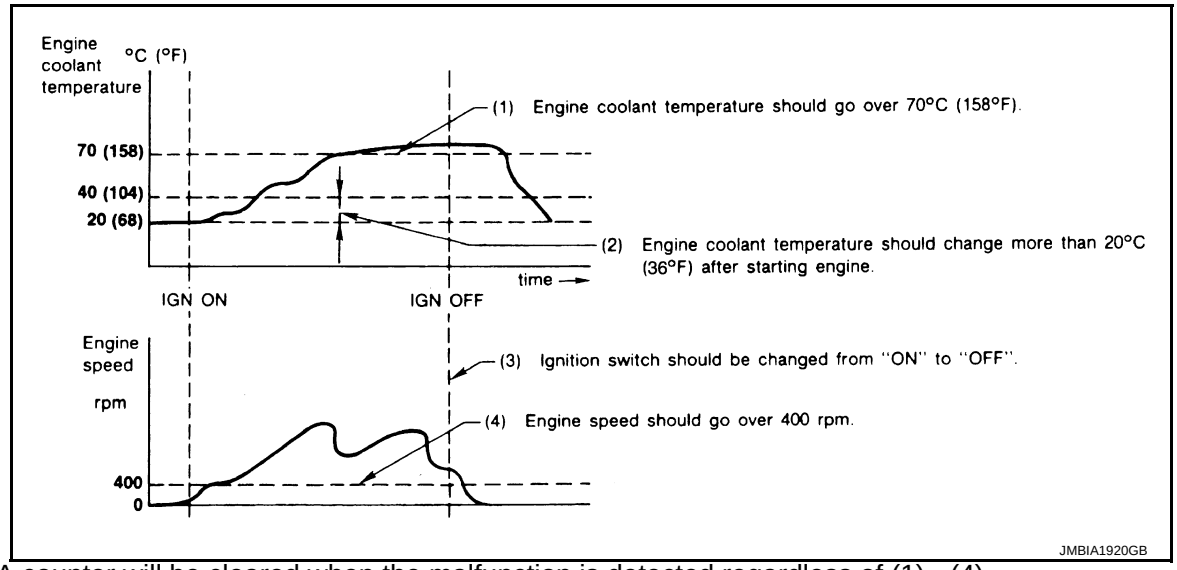
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will turn OFF when the B counter reaches 3 (*2 in OBD SYSTEM OPERATION CHART).

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:0000000009009339

DRIVING PATTERN A



- The A counter will be cleared when the malfunction is detected regardless of (1) - (4).
- The A counter will be counted up when (1) - (4) are satisfied without the same malfunction.
- The DTC will not be displayed after the A counter reaches 40.

DRIVING PATTERN B

Driving pattern B means operating vehicle operation as per the following:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunctions.
- The MIL will turn OFF when the B counter reaches 3.

DRIVING PATTERN C

Driving pattern C means operating vehicle as per the following:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:

- When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).
- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above are satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:0000000009009340

System Readiness Test (SRT) code is specified in Service $01 of SAE J1979/ISO 15031-5.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.
If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.
Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.
NOTE:

The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.
If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:
If MIL is ON during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”) and DTC (No DTCs) before the inspection.

SRT SET TIMING

SRT is set as “CMPLT” after self-diagnosis has been performed one or more times. Completion of SRT is done regardless of whether the result is OK or NG. The set timing is different between OK and NG results and is shown in the table below.

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”.

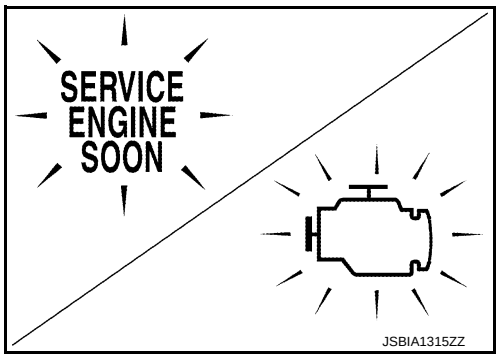
DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:0000000009009341

DESCRIPTION

The MIL is located on the instrument panel.

1. The MIL will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not light up, refer to EC-1028, "Component Function Check".
2. When the engine is started, the MIL should go off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



On Board Diagnosis Function

INFOID:0000000009009342

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Self-diagnostic results	DTCs or 1st trip DTCs stored in ECM can be read.
Accelerator pedal released position learning	ECM can learn the accelerator pedal released position. Refer to EC-724, "Description".
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-725, "Description".
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-726, "Description".
VVEL control shaft position sensor adjustment	The initial position of the VVEL control shaft position sensor can be adjusted. Refer to EC-728, "Description".

BLUB CHECK MODE

Description

This function allows damage inspection in the MIL bulb (blown, open circuit, etc.).

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
   If it remains OFF, check MIL circuit. Refer to EC-1028, "Diagnosis Procedure".

SRT STATUS MODE

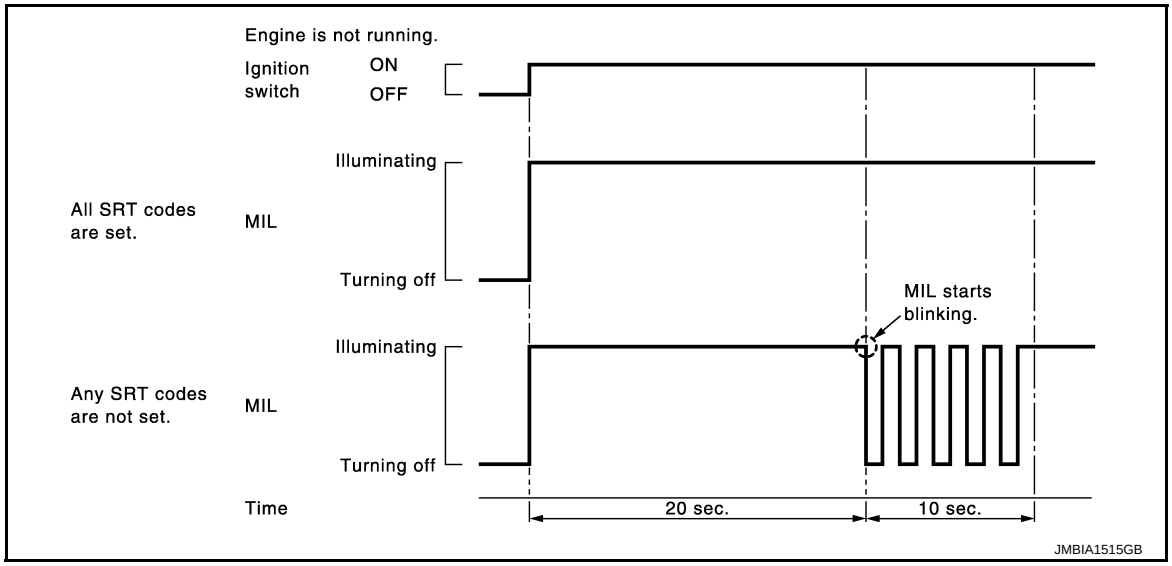
Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to EC-633, "DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code".

Operation Procedure

1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown blow.
   - ECM continues to illuminate MIL if all SRT codes are set.

- ECM blinks MIL for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

In this function ECM turns on or blinks MIL when it detects a malfunction in the emission control system components and/or the powertrain control components (which affect vehicle emissions) to inform the driver that a malfunction has been detected.

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
   If it remains OFF, check MIL circuit. Refer to EC-1028, "Diagnosis Procedure".
3. Start engine and let it idle.
   - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
   - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
   - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MIL is blinking.

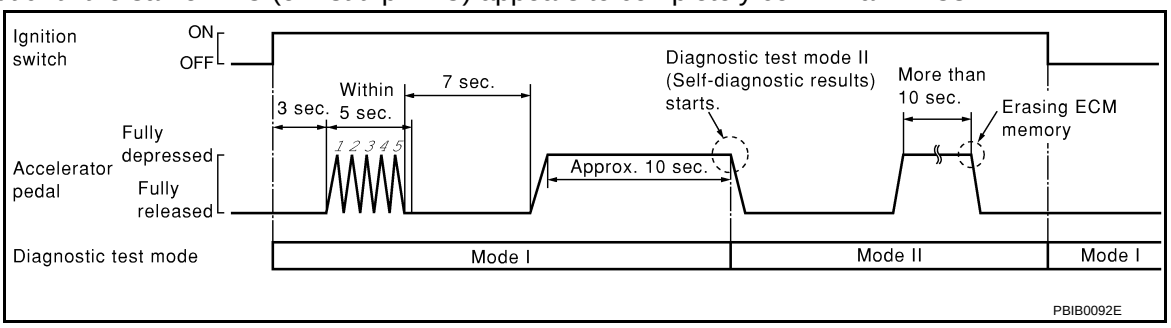
How to Set Self-diagnostic Results Mode

NOTE:

- It is better to count the time accurately with a clock.
- It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.
- After ignition switch is turned off, ECM is always released from the “Self-diagnostic results” mode.

1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.
   - Fully depress the accelerator pedal.
   - Fully release the accelerator pedal.
3. Wait 7 seconds, fully depress the accelerator pedal and keep it depressed for approx. 10 seconds until the MIL starts blinking.
   NOTE:
   Do not release the accelerator pedal for 10 seconds if MIL starts blinking during this period. This blinking is displaying SRT status and is continued for another 10 seconds.
4. Fully release the accelerator pedal.
   ECM has entered to Self-diagnostic results mode.

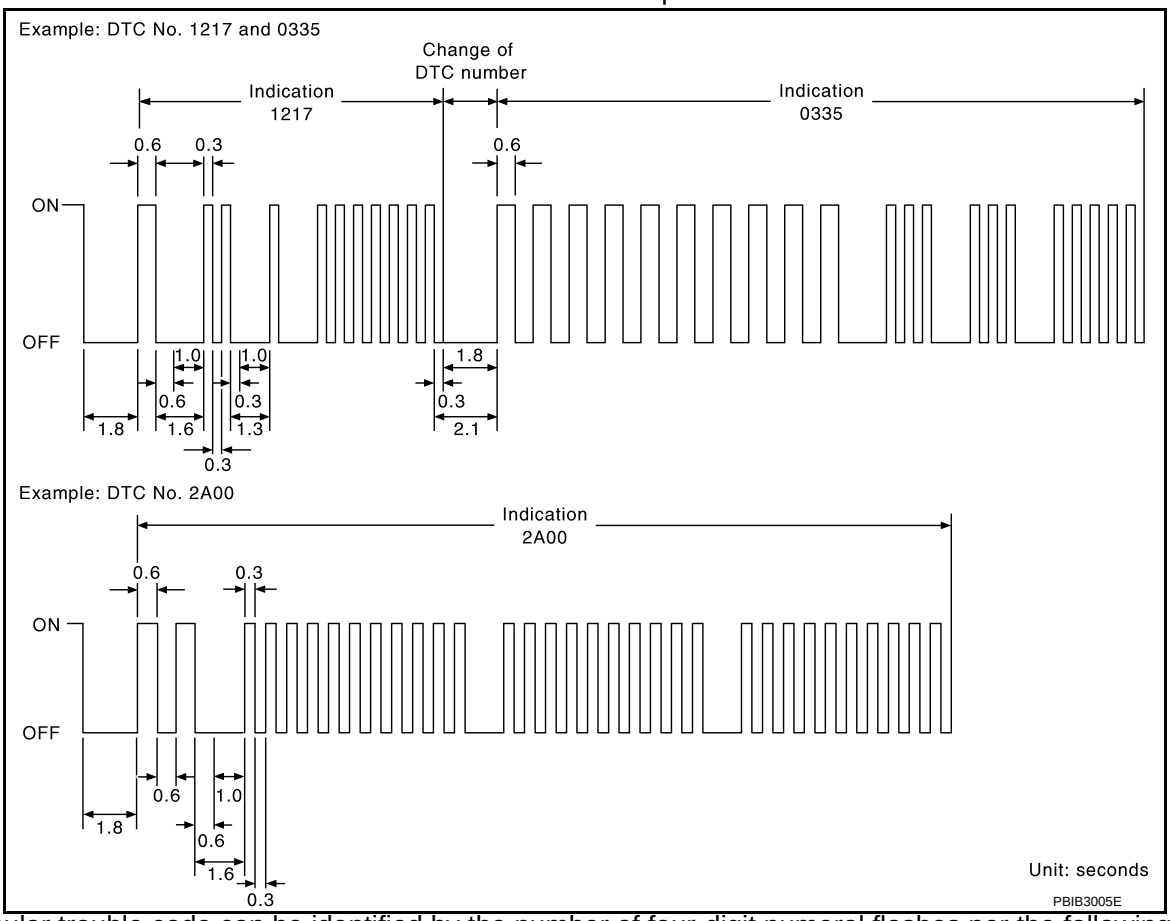
NOTE:
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

The DTC and 1st trip DTC are indicated by the number of blinks of the MIL as shown below.

The DTC and 1st trip DTC are displayed at the same time. If the MIL does not illuminate in diagnostic test mode I (Malfunction warning), all displayed items are 1st trip DTCs. If only one code is displayed when the MIL illuminates in “malfunction warning” mode, it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral flashes per the following.

Number	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Flashes	10	1	2	3	4	5	6	7	8	9	11	12	13	14	15	16

The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-seconds) - OFF (0.6-seconds) cycle.

The 100th-digit numeral and lower digit numerals consist of a 0.3-seconds ON and 0.3-seconds OFF cycle.

A change from one digit numeral to another occurs at an interval of 1.0-second OFF. In other words, the later numeral appears on the display 1.3 seconds after the former numeral has disappeared.

A change from one trouble code to another occurs at an interval of 1.8-seconds OFF.

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to EC-672, "DTC Index".

How to Erase Self-diagnostic Results

By performing this procedure, ECM memory is erased and the following diagnostic information is erased as well.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

NOTE:

Also, if a battery terminal is disconnected, ECM memory is erased and the diagnostic information as listed above is erased. (The amount of time required for erasing may vary from a few seconds to several hours.)

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Set ECM in Self-diagnostic results.
6. The diagnostic information has been erased from the backup memory in the ECM.
   Fully depress the accelerator pedal and keep it depressed for more than 10 seconds.
7. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

CONSULT Function

INFOID:0000000009009343

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	The status of system monitoring tests and the self-diagnosis status/results can be confirmed.

*: The following emission-related diagnostic information is cleared when the ECM memory is erased.

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data
- System readiness test (SRT) codes
- Test values

SELFDIAGNOSTIC RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-672, "DTC Index".

How to Read DTC and 1st Trip DTC

DTCs and 1st trip DTCs related to the malfunction are displayed in “Self-diag results”.

- When ECM detects a 1st trip DTC, “1t” is displayed for “TIME”.
- When ECM has detected a current DTC, “0” is displayed for “TIME”.
- If “TIME” is neither “0” nor “1t”, the DTC occurred in the past and ECM shows the number of times the vehicle has been driven since the last detection of the DTC.

How to Erase DTC and 1st Trip DTC

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see EC-672, "DTC Index"), skip step 1.

1. Erase DTC in TCM. Refer to TM-63, "Diagnosis Description".
2. Select “ENGINE” with CONSULT.
3. Select “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	• The engine control component part/control system has a trouble code the is displayed as PXXXX. (Refer to EC-672, "DTC Index".)
CAL/LD VALUE [%]	• The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	• The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRM-B1 [%]	• “Long-term fuel trim” at the moment a malfunction is detected is displayed. • 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 [%]	
ENGINE SPEED [rpm]	• The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	• The vehicle speed at the moment a malfunction is detected is displayed.
INT MANI PRES [kPa]	• These items are displayed but are not applicable to this model.
ABSOL TH·P/S [%]	• The throttle valve opening angle at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	• The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	• The intake air temperature at the moment a malfunction is detected is displayed.
FUEL SYS-B1	• “Fuel injection system status” at the moment a malfunction is detected is displayed. • One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop
FUEL SYS-B2	
COMBUST CONDITION	• These items are displayed but are not applicable to this model.
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.

*: The items are the same as those of 1st trip freeze frame data.

DATA MONITOR MODE

NOTE:

The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.

Monitored Item

For reference values of the following items, refer to EC-647, "Reference Value".

×: Applicable

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor and camshaft position sensor.	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated. • When engine is running, specification range is indicated in “SPEC”.
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, specification range is indicated in “SPEC”.
A/F ALPHA-B1 A/F ALPHA-B2	%	• 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, specification range is indicated in “SPEC”.
COOLAN TEMP/S	°C or °F	• The engine coolant temperature (determined by the signal voltage of the engine 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.
A/F SEN1 (B1) A/F SEN1 (B2)	V	• The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed.	
HO2S2 (B1) HO2S2 (B2)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR (B1) HO2S2 MNTR (B2)	RICH/LEAN	• Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
BATTERY VOLT	V	• The power supply voltage of ECM is displayed.	
ACCEL SEN 1 ACCEL SEN 2	V	• The accelerator pedal position sensor signal voltage is displayed.	• ACCEL SEN 2 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal.
TP SEN 1-B1 TP SEN 2-B1	V	• The throttle position sensor signal voltage is displayed.	• TP SEN 2-B1 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal.
FUEL T/TMP SE	°C or °F	• The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
EVAP SYS PRES	V	• The signal voltage of EVAP control system pressure sensor is displayed.	

Monitored item	Unit	Description	Remarks
FUEL LEVEL SE	V	• The signal voltage of the fuel level sensor is displayed.	
START SIGNAL	ON/OFF	• Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS	ON/OFF	• Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
PW/ST SIGNAL	ON/OFF	• [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated.	
LOAD SIGNAL	ON/OFF	• Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	• Indicates [ON/OFF] condition from the blower fan ON signal.	
BRAKE SW	ON/OFF	• Indicates [ON/OFF] condition from the stop lamp switch signal.	
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.
COMBUSTION	—	• These items are displayed but are not applicable to this model.	
CAL/LD VALUE	%	• “Calculated load value” indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g/s	• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
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.	
INT/V SOL (B2)			
AIR COND RLY	ON/OFF	• The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
VENT CONT/V	ON/OFF	• The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open	
THRTL RELAY	ON/OFF	• Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	

Monitored item	Unit	Description	Remarks
A/F S1 HTR (B1)	%	• Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. • The current flow to the heater becomes larger as the value increases.	
A/F S1 HTR (B2)			
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
HO2S2 HTR (B2)			
ALT DUTY SIG	ON/OFF	• The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive.	
I/P PULLY SPD	rpm	• Indicates the engine speed computed from the input speed sensor signal.	
VEHICLE SPEED	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN	YET/CMPLT	• Displays the condition of Idle Air Volume Learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL	km or mile	• Distance traveled while MIL is activated.	
SNOW MODE SW	ON/OFF	• Indicates [ON/OFF] condition from the snow mode switch signal.	
ENG OIL TEMP	°C or °F	• The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	• Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW	ON/OFF	• Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	• Indicates [ON/OFF] condition from ICC brake switch signal.	
BRAKE SW2	ON/OFF	• Indicates [ON/OFF] condition of stop lamp switch signal.	
DIST SW	ON/OFF	• Indicates [ON/OFF] condition from DISTANCE switch signal.	
CRUISE LAMP*	ON/OFF	• Indicates [ON/OFF] condition of CRUISE indicator determined by the ECM according to the input signals.	
AC EVA TEMP	°C or °F	• Indicates A/C evaporator temperature sent from A/C auto amp.	
AC EVA TARGET	°C or °F	• Indicates target A/C evaporator temperature sent from A/C auto amp.	
FAN DUTY	%	• Indicates a command value for cooling fan. The value is calculated by ECM based on input signals.	
ALT DUTY	%	• Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	

Monitored item	Unit	Description	Remarks
BAT CUR SEN	mV	• The signal voltage of battery current sensor is displayed.	
A/F ADJ-B1	—	• Indicates the correction of a factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal.	
A/F ADJ-B2			
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
FUEL PRES SEN	MPa	• Indicates the fuel rail pressure computed by ECM according to the input signals	
FUEL INJ B1	msec	• ECM-calculated injection pulse width of the fuel injector on the Bank 1 side.	
FUEL INJ B2	msec	• ECM-calculated injection pulse width of the fuel injector on the Bank 2 side.	
INT/V TIM (B1)	°CA	• Indicates [°CA] of intake camshaft advance angle.	
INT/V TIM (B2)			
MAP SENSOR	V	• The signal voltage from the manifold absolute pressure (MAP) sensor is displayed.	
VVEL LEARN	YET/DONE	• Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been performed successfully.	
VVEL SEN LEARN-B1	V	• Indicates the VVEL learning value.	
VVEL SEN LEARN-B2			
VVEL POSITION SEN-B1	V	• The VVEL control shaft position sensor signal voltage is displayed.	
VVEL POSITION SEN-B2			
VVEL TIM-B1	deg	• Indicates [deg] of VVEL control shaft angle.	
VVEL TIM-B2			
FPCM	HI/MID/LOW/OFF	• The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signals) is indicated.	
BAT TEMP SEN	V	• The signal voltage from the battery temperature sensor is displayed.	
COOLING FAN SPD	rpm	• Displays a cooling fan speed from a signal of electrically-controlled cooling fan coupling.	
THRTL STK CNT B1*	—	—	
HO2 S2 DIAG2(B1)*	INCMP/CMPLT	• Indicates DTC P0139 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG2(B2)*	INCMP/CMPLT	• Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
FUEL INJ TIMG	deg	• Indicates the fuel injection timing computed by ECM according to the input signals.	

Monitored item	Unit	Description	Remarks
H/P FUEL PUMP DEG	deg	• Displays ECM-calculated fuel discharge position of the high pressure fuel pump.	
FUEL PRES SEN V	mV	• The signal voltage of FRP sensor is displayed.	
L/FUEL PRES SEN	MPa	• Displays a pressure value calculated from a low fuel pressure sensor voltage.	
L/FUEL PRES SEN V	mV	• The signal voltage of low fuel pressure sensor is displayed.	
ECM TEMP 1	°C or °F	• Displays a temperature calculated from a signal of ECM temperature sensor 1.	
ECM TEMP 2	°C or °F	• Displays a temperature calculated from a signal of ECM temperature sensor 2.	
FUEL PUMP DUTY	%	• The control condition of the fuel pump control module (FPCM) (determined by ECM according to the input signals) is indicated.	

*: The item is indicated, but not used.

NOTE:

Any monitored item that does not match the vehicle being diagnosed is deleted from the display automatically.

WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
IDLE AIR VOL LEARN	• THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
EVAP SYSTEM CLOSE	CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. • IGN SW ON • ENGINE NOT RUNNING • AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). • NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM • FUEL TANK TEMP. IS MORE THAN 0°C (32°F). • WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” • WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER THE CONDITION EXCEPT ABOVE, CONSULT 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
FUEL PRESSURE RELEASE	• FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
SELF-LEARNING CONT	• THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing mixture ratio self-learning value
TARGET IDLE RPM ADJ*	• IDLE CONDITION	When setting target idle speed
VIN REGISTRATION	• IN THIS MODE, VIN IS REGISTERED IN ECM.	When registering VIN in ECM
TARGET IGN TIM ADJ*	• IDLE CONDITION	When adjusting target ignition timing
CLSD THL POS LEARN	• IGNITION ON AND ENGINE STOPPED.	When learning the throttle valve closed position

WORK ITEM	CONDITION	USAGE
VVEL POS SEN ADJ PREP	• USE THIS ITEM ONLY WHEN REPLACING VVEL ACTUATOR SUB ASSEMBLY. • IGNITION ON AND ENGINE STOPPED.	When adjusting VVEL control shaft position sensor
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)
VENT CONTROL/V	• Ignition switch: ON (Engine stopped) • Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connectors • Solenoid valve
ENG COOLANT TEMP	• Engine: Return to the original non-standard condition • 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	• Engine: Return to the original non-standard condition • 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
FUEL/T TEMP SEN	• Change the fuel tank temperature using CONSULT.		
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 • Solenoid valve
FAN DUTY CONTROL*	• Ignition switch: ON • Change duty ratio using CONSULT.	Cooling fan speed changes.	• Harness and connectors • Cooling fan motor • Cooling fan relay • Cooling fan control module • IPDM E/R
ALTERNATOR DUTY	• Engine: Idle • Change duty ratio using CONSULT.	Battery voltage changes.	• Harness and connectors • IPDM E/R • Alternator
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch OFF • Selector lever: P or N • Cut off each injector signal one at a time using CONSULT.	Engine runs rough or stops.	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil
IGNITION TIMING	• Engine: Return to the original non-standard condition • Timing light: Set • Retard the ignition timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
V/T ASSIGN ANGLE	• Engine: Return to the original non-standard condition • Change intake valve timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve
FPCM	• Engine: Return to the original trouble condition • Select “LOW”, “MID” and “HI” with CONSULT.	Fuel pump speed changes or stops.	• Harness and connectors • Fuel pump control module (FPCM)

*: Leaving cooling fan OFF with CONSULT while engine is running may cause the engine to overheat.

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For items whose SRT codes are set, “CMPLT” is displayed on the CONSULT screen; for items whose SRT codes are not set, “INCMP” is displayed.

SRT WORK SUPPORT Mode

This mode enables a technician to drive a vehicle to set the SRT while monitoring the SRT status.

DTC WORK SUPPORT Mode

Test mode	Test item	Corresponding DTC No.	Reference page
HO2S2	HO2S2 (B1) P1146	P0138	EC-812
	HO2S2 (B1) P1147	P0137	EC-806
	HO2S2 (B1) P0139	P0139	EC-820
	HO2S2 (B2) P1166	P0158	EC-812
	HO2S2 (B2) P1167	P0157	EC-806
	HO2S2 (B2) P0159	P0159	EC-820
A/F SEN1	A/F SEN1 (B1) P1278/P1279	P0133	EC-801
	A/F SEN1 (B1) P1276	P0130	EC-791
	A/F SEN1 (B2) P1288/P1289	P0153	EC-801
	A/F SEN1 (B2) P1286	P0150	EC-791

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

INFOID:0000000009009344

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- Numerical values in the following table are reference values.
- These values are input/output values that ECM receives/transmits and may differ from actual operations.
  Example:
  The ignition timing shown by the timing light may differ from the ignition timing displayed on the data monitor. This occurs because the timing light shows a value calculated by ECM according to signals received from the cam shaft position sensor and other sensors related to ignition timing.

For outlines of following items, refer to EC-638, "CONSULT Function".

CONSULT MONITOR ITEM

Monitor Item	Condition		Values/Status
ENG SPEED	• Run engine and compare CONSULT value with the tachometer indication.		Almost the same speed as the tachometer indication
MAS A/F SE-B1	See EC-739, "Description".		
B/FUEL SCHDL	See EC-739, "Description".		
A/F ALPHA-B1	See EC-739, "Description".		
A/F ALPHA-B2	See EC-739, "Description".		
COOLANT TEMP/S	• Ignition switch: ON		Indicates engine coolant temperature
A/F SEN1 (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V
A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V
HO2S2 (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		0 - 0.3 V ⇔ Approx. 0.6 - 1.0 V
HO2S2 (B2)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		0 - 0.3 V ⇔ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ⇔ RICH
HO2S2 MNTR (B2)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ⇔ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.2 - 4.8 V

Monitor Item	Condition		Values/Status
ACCEL SEN 2*1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.5 - 1.0 V
		Accelerator pedal: Fully depressed	4.2 - 4.8 V
TP SEN 1-B1	• 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 T/TMP SE	• Ignition switch: ON		Indicates fuel tank temperature
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 - 4.8 V
FUEL LEVEL SE	• Ignition switch: ON		Depending on fuel level of fuel tank
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
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
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
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	• Engine: After warming up, idle the engine	Heater fan switch: ON	ON
		Heater fan switch: OFF	OFF
BRAKE SW	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
IGN TIMING	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	1 - 4°BTDC
		2,000 rpm	25 - 45°BTDC
COMBUSTION	—		These items are displayed but are not applicable to this model.
CAL/LD VALUE	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	5 - 35%
		2,500 rpm	5 - 35%
MASS AIRFLOW	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	2.0 - 6.0 g/s
		2,500 rpm	7.0 - 20.0 g/s
PURG VOL C/V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
		2,000 rpm	5%

Monitor Item	Condition		Values/Status
INT/V SOL (B1)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 0 - 50%
INT/V SOL (B2)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 0 - 50%
AIR COND RLY	• Engine: After warming up, idle the engine	A/C switch: OFF	OFF
		A/C switch: ON (Compressor operates)	ON
VENT CONT/V	• Ignition switch: ON		OFF
THRTL RELAY	• Ignition switch: ON		ON
A/F S1 HTR (B1)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
A/F S1 HTR (B2)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
HO2S2 HTR (B1)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B2)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
ALT DUTY SIG	• Power generation voltage variable control: Operating		ON
	• Power generation voltage variable control: Not operating		OFF
I/P PULLY SPD	• Vehicle speed: More than 20 km/h (12 MPH)		Almost the same speed as the tachometer indication
VEHICLE SPEED	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as the speedometer indication
IDL A/V LEARN	• Engine: Running	Idle air volume learning has not been performed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	• Ignition switch: ON	Vehicle has traveled after MIL has illuminated.	0 - 65,535 km (0 - 40,723 miles)
SNOW MODE SW	• Ignition switch: ON	Snow mode switch: ON	ON
		Snow mode switch: OFF	OFF
ENG OIL TEMP	• Engine: After warming up		More than 70°C (158°F)
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	• Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	• Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF

Monitor Item	Condition		Values/Status
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1 (ICC brake switch)	• Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
DIST SW	• Ignition switch: ON	DISTANCE switch: Pressed	ON
		DISTANCE switch: Released	OFF
CRUISE LAMP*3	• Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
AC EVA TEMP	• Engine: Running		Indicates A/C evaporator temperature sent from“unified meter and A/C amp.”.
AC EVA TARGET	• Engine: Running		Indicates target A/C evaporator temperature sent from “unified meter and A/C amp.”.
FAN DUTY	• Engine: Running		0 - 100%
ALT DUTY	• Engine: Idle		0 - 80%
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged*2 • Selector lever: P or N position • A/C switch: OFF • No load		Approx. 2,600 - 3,500 mV
A/F ADJ-B1	• Engine: Running		–0.330 - 0.330
A/F ADJ-B2	• Engine: Running		–0.330 - 0.330
P/N POSI SW	• Ignition switch: ON	Selector lever: P or N position	ON
		Selector lever: Except above position	OFF
INT/A TEMP SE	• Ignition switch: ON		Indicates intake air temperature
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0 V
FUEL PRES SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 2.74 Mpa
		2,000 rpm	Approx. 3.0 Mpa
FUEL INJ B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.4 msec
		2,000 rpm	Approx. 1.0 msec
FUEL INJ B2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.4 msec
		2,000 rpm	Approx. 1.0 msec
INT/V TIM (B1)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 30°CA
INT/V TIM (B2)	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 30°CA

Monitor Item	Condition		Values/Status
MAP SENSOR	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.0 V
		2,000 rpm	Approx. 1.35 V
VVEL LEARN	• Ignition switch: OFF → ON (After warming up)	VVEL learning has not been performed yet.	YET
		VVEL learning has already been performed successfully.	DONE
VVEL SEN LEARN-B1	• VVEL learning has already been performed successfully		Approx. 0.30 - 0.80 V
VVEL SEN LEARN-B2	• VVEL learning has already been performed successfully		Approx. 0.30 - 0.80 V
VVEL POSITION SEN-B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0.25 - 1.50 V
		When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V
VVEL POSITION SEN-B2	• Engine: After warming up • Selector lever: P or N position • Air conditioner switch: OFF • No load	Idle	Approx. 0.25 - 1.50 V
		When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V
VVEL TIM-B1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0 - 23 deg
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg
VVEL TIM-B2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0 - 23 deg
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg
FPCM	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	• Engine: Cranking	HI
		• Revving engine from idle to 4,000 rpm quickly	MID
		• Engine: Idle • Engine coolant temperature: More than 10°C (50°F)	LOW
BAT TEMP SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Indicates the temperature around the battery.
COOLING FAN SPD	• Engine speed: Idle • Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Water temp: Less than 98°C	Approx. 100 – 200 rpm
		Water temp: More than 98°C	Approx. 600 – 700 rpm
THRTL STK CNT B1	**NOTE:** The item is indicated, but not used.		—
HO2 S2 DIAG2(B1)	**NOTE:** The item is indicated, but not used.		—
HO2 S2 DIAG2(B2)	**NOTE:** The item is indicated, but not used.		—
FUEL INJ TIMG	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 16 deg
		2,000 rpm	Approx. –170 deg
H/P FUEL PUMP DEG	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 211.0 deg
		2,000 rpm	Approx. 206.0 deg

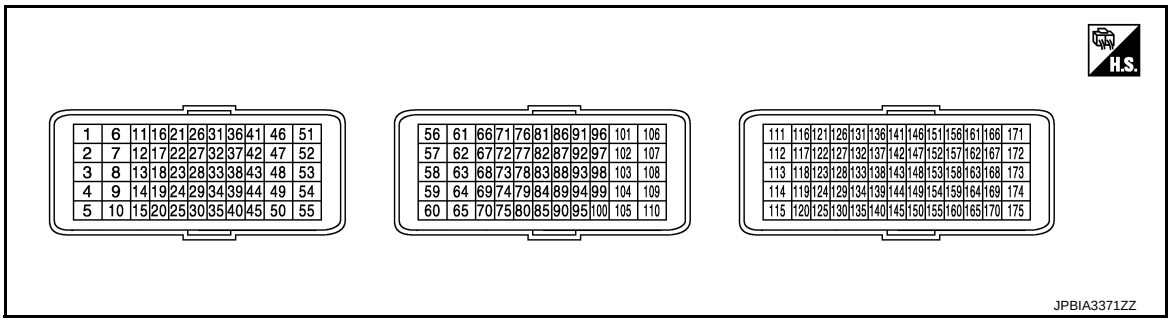
Monitor Item	Condition		Values/Status
FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 820 - 1.220 mV
		Revving engine from idle to 4,000 rpm quickly	Approx. 820 - 3.060 mV
L/FUEL PRES SEN	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 0.45 MPa
		2,000 rpm	Approx. 0.45 MPa
L/FUEL PRES SEN V	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 3250 mV
		3,000 rpm	Approx. 3100 mV
ECM TEMP 1	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Indicates the temperature of ECM internal circuit 1.
ECM TEMP 2	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Indicates the temperature of ECM internal circuit 2.
FUEL PUMP DUTY	• Engine: After warming up • Shift lever: P or N • Air conditioner switch: OFF • No load	Engine speed: Idle	30 - 40%

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

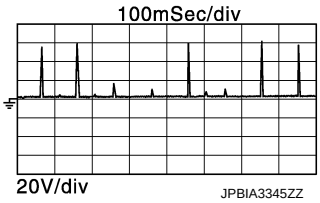
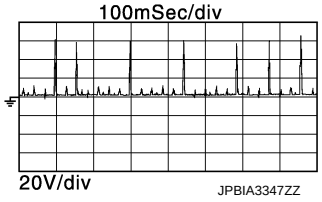
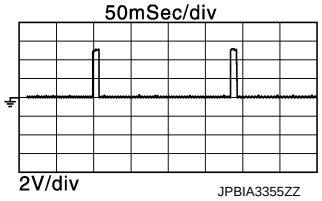
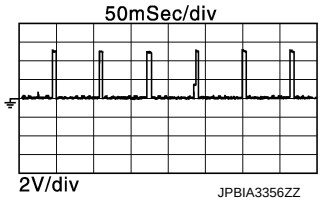
*3: The item is indicated, but not used.

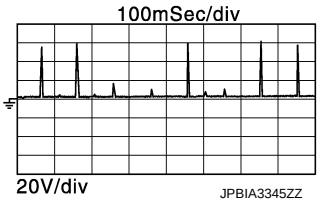
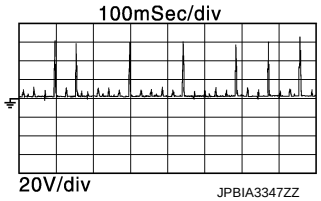
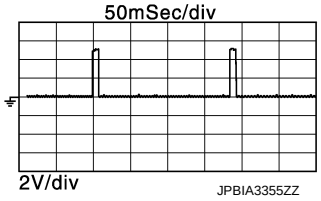
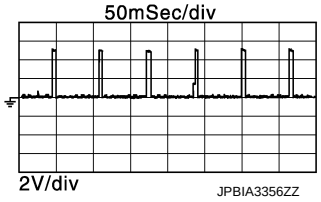
TERMINAL LAYOUT

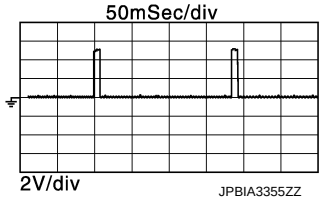
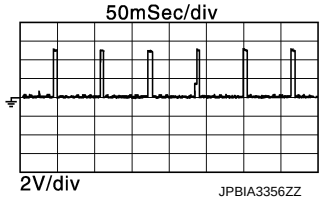
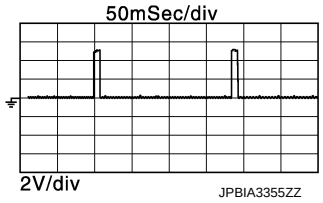
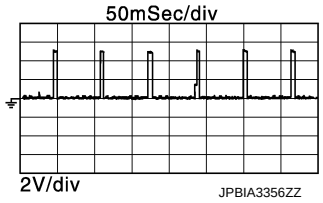


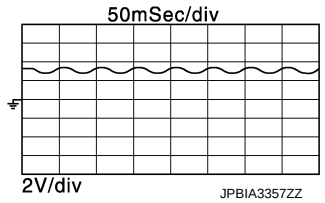
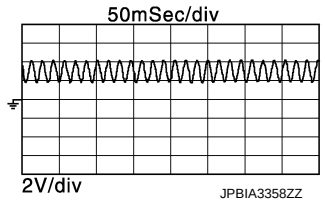
PHYSICAL VALUES

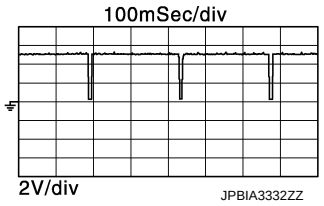
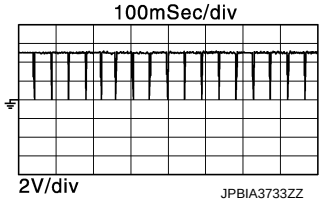
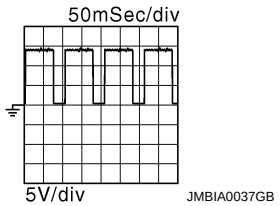
NOTE:
- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT.

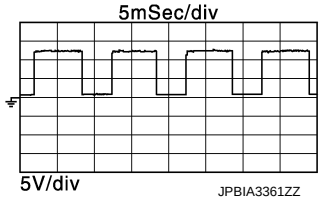
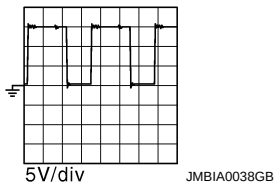
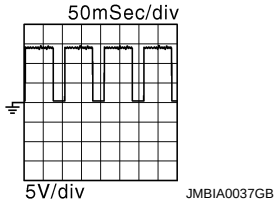
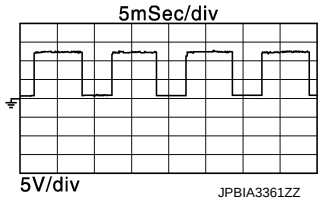
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (R) 2 (R)	175 (B)	Fuel injector No. 8 (HI) Fuel injector No. 5 (HI)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
3 (G) 4 (G)	175 (B)	Fuel injector No. 3 (LO) Fuel injector No. 2 (LO)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
5 (B/R)	—	ECM ground	—	—	—

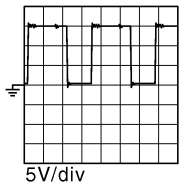
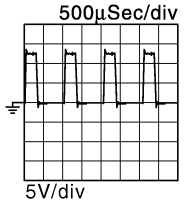
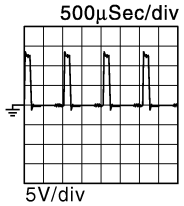
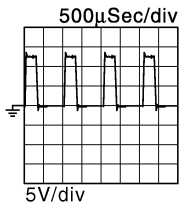
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
6 (R) 7 (R)	175 (B)	Fuel injector No. 3 (HI) Fuel injector No. 2 (HI)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
8 (G) 9 (G)	175 (B)	Fuel injector No. 8 (LO) Fuel injector No. 5 (LO)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
10 (B)	—	ECM ground	—	—	—
11 (BR)	175 (B)	PNP signal	Input	[Ignition switch: ON] • Selector lever: P or N position	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON] • Selector lever: Except above position	0 V

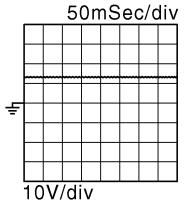
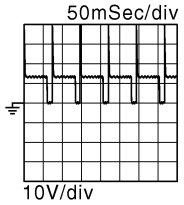
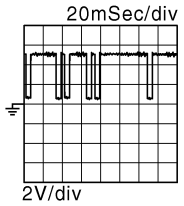
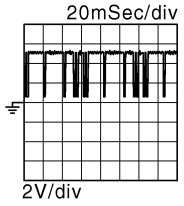
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
12 (Y) 13 (L/B) 14 (BR/ Y) 15 (LG/ R)	175 (B)	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 3 Ignition signal No. 4	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0.1 - 0.4 V★ 
17 (P/L) 18 (Y/R) 19 (G/Y) 20 (O)	175 (B)	Ignition signal No. 5 Ignition signal No. 6 Ignition signal No. 7 Ignition signal No. 8	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0.1 - 0.4 V★ 
21 (G/O)	25 (LG)	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.
22 (BR/ W)	25 (LG)	Mass air flow sensor	Input	[Engine is running] • Warm-up condition • Idle speed	0.7 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.4 - 1.9 V

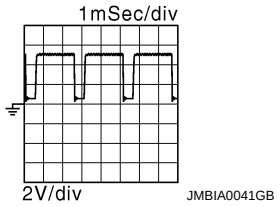
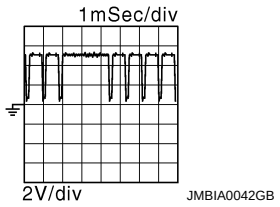
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
23 (V)	45 (L/O)	Low fuel pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	2.4 - 3.6 V 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.4 - 3.6 V 
25 (LG)	—	Sensor ground [Mass air flow sensor/ Intake air temperature sensor]	—	—	—
27 (P)	45 (L/O)	Sensor power supply (Power steering pressure sensor/ Low fuel pressure sensor/ Electrically-controlled cooling fan coupling)	—	[Ignition switch: ON]	5 V
28 (SB)	40 (W/L)	Sensor power supply (Fuel rail pressure sensor/Engine oil pressure sensor)	—	[Ignition switch: ON]	5 V
29 (W)	35 (—)	Knock sensor (bank 1)	Input	[Engine is running] • Idle speed	2.0 V*1
31 (V/W)	40 (W/L)	Fuel rail pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	0.82 - 1.22 V
				[Engine is running] • Warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 - 3.06 V
32 (R)	40 (W/L)	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine coolant temperature.
33 (W)	35 (—)	Knock sensor (bank 2)	Input	[Engine is running] • Idle speed	2.0 V*1
35 (—)	—	Sensor ground (Knock sensor)	—	—	—

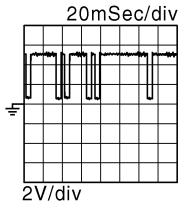
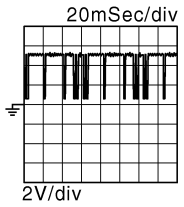
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
37 (V)	175 (B)	Cooling fan speed	Input	[Ignition switch: ON] • Engine stopped	5 V
				[Engine is running] • Idle speed • After warm-up condition	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Idle speed • Before warm-up condition	BATTERY VOLTAGE (11 - 14 V)★ 
39 (P/B)	45 (L/O)	Power steering pressure sensor	Input	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5 V
				[Engine is running] • Steering wheel: Not being turned	0.4 - 0.8 V
40 (W/L)	—	Sensor ground (Fuel rail pressure sensor/Engine coolant temperature sensor/Engine oil temperature sensor)	—	—	—
42 (L/Y)	40 (W/L)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine oil temperature.
45 (L/O)	—	Sensor ground (Power steering pressure sensor/ Low fuel pressure sensor/ Electrically-controlled cooling fan coupling)	—	—	—
46 (SB)	175 (B)	Fuel injector driver power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: OFF]	1.5 V
47 (G)	175 (B)	Heated oxygen sensor 2 heater (bank 1)	Input	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	10 V★ 
				[Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)

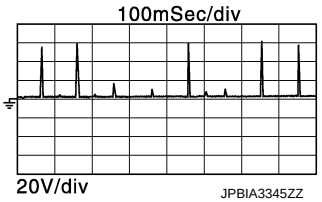
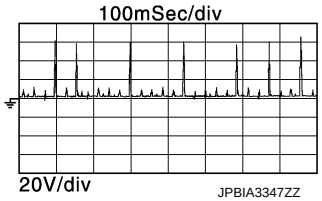
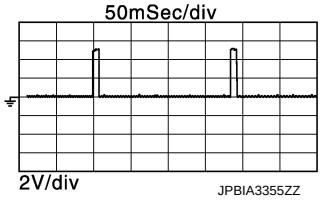
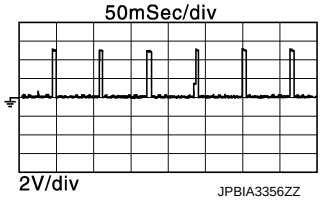
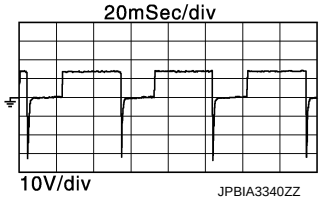
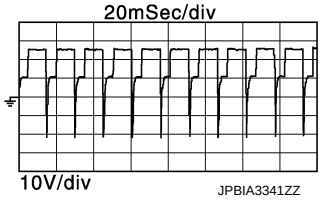
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
48 (L/W)	175 (B)	A/F sensor 1 heater (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★ 
49 (LG/ B)	175 (B)	Intake valve timing control solenoid valve (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★ 
51 (R)	175 (B)	Fuel injector driver power supply	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: OFF]	1.5 V
52 (L/R)	175 (B)	Heated oxygen sensor 2 heater (bank 2)	Output	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	10 V★ 
				[Ignition switch: ON] • Engine: Stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
53 (SB)	175 (B)	A/F sensor 1 heater (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★ 

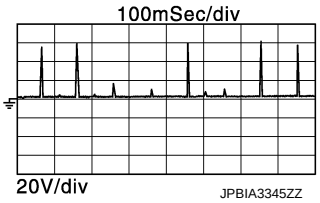
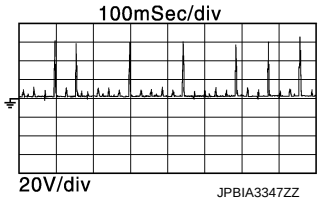
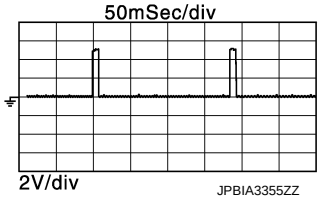
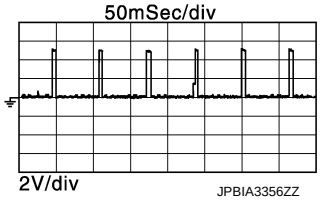
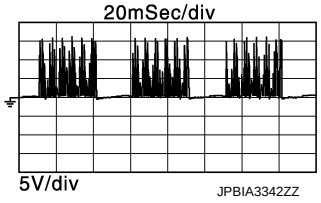
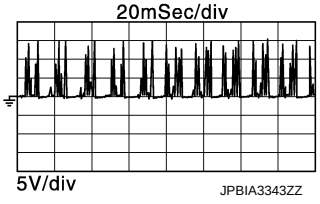
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
54 (G/R)	175 (B)	Intake valve timing control solenoid valve (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★  JMBIA0038GB
57 (W)	175 (B)	Throttle control motor (Open)	Output	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	0 - 14 V★  JMBIA0031GB
				[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	0 - 14 V★  JMBIA0032GB
60 (B)	—	Shield	—	—	—
63 (R)	175 (B)	Throttle control motor (Close)	Output	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: In the middle of releasing operation	0 - 14 V★  JMBIA0031GB

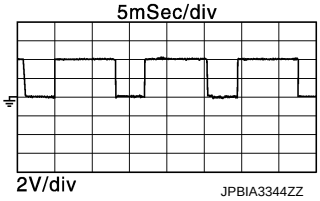
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
64 (V/W)	175 (B)	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)★  JMBIA0039GB
				[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★  JMBIA0040GB
67 (V)	175 (B)	Manifold absolute pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.5 V
68 (BR/ W)	—	Sensor ground [Camshaft position sensor (bank 1)]	—	—	—
70 (W/L)	—	Sensor ground (Manifold absolute pressure sensor)	—	—	—
73 (P)	99 (LG/ B)	Camshaft position sensor (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★  JMBIA0045GB
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★  JMBIA0046GB
74 (L)	175 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	2.5 V
76 (W/ G)	98 (G/ W)	Sensor power supply (Crankshaft position sensor)	—	[Ignition switch: ON]	5 V
77 (Y/R)	68 (BR/ W)	Sensor power supply [Camshaft position sensor (bank 1)]	—	[Ignition switch: ON]	5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
78 (L/R)	175 (B)	A/F sensor 1 (bank 2)	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.2 - 2.8V Output voltage varies with air fuel ratio.
79 (B)	97 (W)	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	Less than 4.75 V
				[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	More than 0.36 V
80 (L/W)	175 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	3.0 V
81 (G)	97 (W)	Sensor power supply [Throttle position sensor (bank 1)]	—	[Ignition switch: ON]	5 V
83 (LG/ R)	99 (LG/ B)	Sensor power supply [Camshaft position sensor (bank 2)]	—	[Ignition switch: ON]	5 V
85 (GR/ R)	70 (W/L)	Sensor power supply (Manifold absolute pressure sensor)	—	[Ignition switch: ON]	5 V
86 (R/ W)	98 (G/ W)	Crankshaft position sensor	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	4.0 - 5.0 V★ 
87 (L/W)	100 (R)	Heated oxygen sensor 2 (bank 2)	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
88 (B)	175 (B)	A/F sensor 1 (bank 1)	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	2.2 - 2.8 V Output voltage varies with air fuel ratio.
90 (W)	175 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	3.0 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
91 (R)	97 (W)	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	More than 0.36 V
				[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	Less than 4.75 V
94 (R)	175 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	2.0 V
95 (L/R)	68 (BR/ W)	Camshaft position sensor (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★  JMBIA0045GB
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★  JMBIA0046GB
96 (W/ R)	100 (R)	Heated oxygen sensor 2 (bank 1)	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
97 (W)	—	Sensor ground [Throttle position sensor (bank 1)]	—	—	—
98 (G/ W)	—	Sensor ground (Crankshaft position sensor)	—	—	—
99 (LG/ B)	—	Sensor ground [Camshaft position sensor (bank 2)]	—	—	—
100 (R)	—	Sensor ground (Heated oxygen sensor 2)	—	—	—

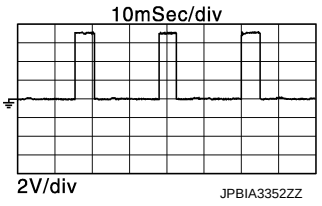
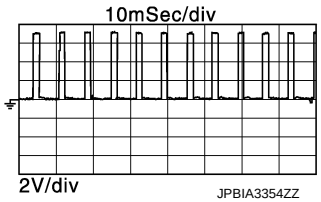
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
101 (R) 102 (R)	175 (B)	Fuel injector No. 1 (HI) Fuel injector No. 6 (HI)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
103 (G) 104 (G)	175 (B)	Fuel injector No. 7 (LO) Fuel injector No. 4 (LO)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
105 (L/W)	175 (B)	High pressure fuel pump (HI)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
106 (R) 107 (R)	175 (B)	Fuel injector No. 7 (HI) Fuel injector No. 4 (HI)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
108 (G) 109 (G)	175 (B)	Fuel injector No. 1 (LO) Fuel injector No. 6 (LO)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
110 (L/B)	175 (B)	High pressure fuel pump (LO)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
111 (R)	175 (B)	Fuel injector driver power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
112 (SB)	175 (B)	Fuel injector driver power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
113 (G)	—	—	—	—	—
114 (B)	—	ECM ground	—	—	—
115 (B)	—	ECM ground	—	—	—
120 (Y)	175 (B)	EVAP canister vent control valve	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
122 (BR/ W)	175 (B)	VVEL actuator motor relay abort signal (VVEL control module)	Input	[Ignition switch: ON]	0 V
123 (V/R)	175 (B)	Throttle control motor relay	Output	[Ignition switch: ON → OFF]	0 - 1.0 V ↓ BATTERY VOLTAGE (11 - 14 V) ↓ 0 V
				[Ignition switch: ON]	0 - 1.0 V
125 (GR)	175 (B)	Fuel pump control module (FPCM)	Output	[When cranking engine]	0 - 0.5 V
				[Engine is running] • Warm-up condition	0 - 4.0 V★ 
126 (O)	129 (P/L)	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released	0.25 - 0.5 V
				[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	2.0 - 2.5 V

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
128 (Y)	175 (B)	ICC steering switch	Input	[Ignition switch: ON] • ICC steering switch: OFF	4.2 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.9 V
				[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3.7 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	3.2 V
				[Ignition switch: ON] • DISTANCE switch: Pressed	2.6 V
				[Ignition switch: ON] • DYNAMIC DRIVER ASSISTANCE switch: Pressed	1.0 V
129 (P/L)	—	Sensor ground (Accelerator pedal position sensor 2)	—	—	—
130 (R)	—	Sensor ground (ICC steering switch)	—	—	—
131 (L/W)	129 (P/L)	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5 V
133 (SB)	150 (R)	Sensor power supply (Refrigerant pressure sensor/ Battery current sensor/EVAP control system pressure sensor)	—	[Ignition switch: ON]	5 V
134 (V/W)	175 (B)	Fuel temperature sensor	Input	[Engine is running] • Warm-up condition	2.8 V
136 (W/ R)	140 (R/Y)	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully released	0.5 - 1.0 V
				[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	4.2 - 4.8 V
137 (W/ G)	140 (R/Y)	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5 V
138 (V)	150 (R)	Battery current sensor	Input	[Engine is running] • Battery: Fully charged*2 • Idle speed	2.6 - 3.5 V
139 (G)	175 (B)	Battery temperature sensor	Input	[Engine is running] • Battery temperature: 25°C • Idle speed	3.3 V
140 (R/Y)	—	Sensor ground (Accelerator pedal position sensor 1)	—	—	—
141 (SB)	175 (B)	Ignition switch	Input	[Ignition switch: OFF]	0 V
				[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
142 (R/ W)	175 (B)	Fuel pump control module (FPCM) check	Input	[When cranking engine]	0 V
				[Engine is running] • Warm-up condition • Idle speed	9 V
143 (L/Y)	150 (R)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	1.8 - 4.8 V
144 (O/B)	150 (R)	Refrigerant pressure sensor	Input	[Engine is running] • Warm-up condition • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0 V
146 (L)	—	CAN communication line	—	—	—
147 (G/Y)	175 (B)	ICC brake switch	Input	[Ignition switch: ON] • Brake pedal: Slightly depressed	0 V
				[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)
150 (R)	—	Sensor ground (Refrigerant pressure sensor/ Battery current sensor/EVAP control system pressure sensor)	—	—	—
151 (P)	—	CAN communication line	—	—	—
156 (L)	175 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
158 (W/B)	175 (B)	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	0 V
				[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
161 (R/ W)	—	ENG communication line	—	—	—
163 (L/G)	175 (B)	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: OFF] • A few seconds after turning ignition switch OFF	0 - 1.5 V
				[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
165 (GR/ R)	—	**NOTE:** Not used	—	—	—
166 (W)	—	ENG communication line	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
169 (G/B)	175 (B)	Engine speed signal output	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 7.0 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0 - 7.0 V★ 
171 (W)	175 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
172 (W)	175 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
173 (O)	175 (B)	Throttle control motor power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
174 (B)	—	ECM ground	—	—	—
175 (B)	—	ECM ground	—	—	—

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

*1: This may vary depending on internal resistance of the tester.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Fail-safe

INFOID:0000000009009345

NON DTC RELATED ITEM

Detected items	Engine operating condition in fail-safe mode	Remarks	Reference page
Malfunction indicator circuit	Engine speed will not rise more than 2,500 rpm due to the fuel cut	When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction.	EC-1028

DTC RELATED ITEM

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>U0113
U1003
U1024</td><td>Can communication circuit</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P0011
P0021</td><td>Intake valve timing control</td><td colspan="2">The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.</td></tr>
<tr><td>P0087</td><td rowspan="2">FRP control system</td><td colspan="2">• Engine torque is limited.
• VVEL value is maintained at a fixed angle.</td></tr>
<tr><td>P0088</td><td colspan="2">Engine speed is limited.</td></tr>
<tr><td>P008A</td><td>Low fuel pressure control system</td><td colspan="2">Engine torque is limited.</td></tr>
<tr><td>P0090</td><td>FRP control system</td><td colspan="2">• Engine torque is limited.
• VVEL value is maintained at a fixed angle.</td></tr>
<tr><td>P0102
P0103</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the following condition.
CONSULT displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided
(CONSULT display)</td></tr>
<tr><td>Just as ignition switch is turned ON or START</td><td>40°C (104°F)</td></tr>
<tr><td>Approx. 4 minutes or more after engine starting</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122
P0123
P0222
P0223
P2135</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
Therefore, the acceleration will be poor.</td></tr>
<tr><td>P0190</td><td>FRP sensor</td><td colspan="2">• Engine speed is limited.
• High pressure fuel pump is activated at maximum discharge pressure.</td></tr>
<tr><td>P0201
P0202
P0203
P0204
P0205
P0206
P0207
P0208</td><td>Injector</td><td colspan="2">• Engine torque is limited.
• Fuel injection shut-off of malfunction cylinder.
• Mixture ratio feedback control does not function.
• Idle engine speed is increased.</td></tr>
<tr><td>P0500</td><td>Vehicle speed sensor</td><td colspan="2">The cooling fan operates (Highest) while engine is running.</td></tr>
<tr><td>P0524</td><td>Engine oil pressure</td><td colspan="2">The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.
Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0605</td><td>ECM</td><td colspan="2">(When ECM calculation function is malfunctioning:)
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P0607</td><td>ECM</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
</table>

DTC No.	Detected items	Engine operating condition in fail-safe mode
P062B	ECM	Type1 • Engine torque is limited. • Idle engine speed is increased. • Fuel injector power supply shut-off. • High fuel pressure limitation.
		Type2 • Engine torque is limited. • Fuel injection shut-off of malfunction cylinder. • Mixture ratio feedback control does not function. • Idle engine speed is increased.
P0643	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1087 P1088	VVEL control function	VVEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
P1089 P1092	VVEL control shaft position sensor	VVEL value is maintained at a fixed angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut
P1197	Out of gas	• Engine torque is limited. • VVEL value is maintained at a fixed angle.
P1608	VVEL control shaft position sensor	VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
P1090 P1093	VVEL actuator motor	VVEL of normal bank is controlled at VVEL angle of abnormal bank. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
		VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
P1091	VVEL actuator motor relay	VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
P1197	Out of gas	• Engine torque is limited. • VVEL value is maintained at a fixed angle.
P2101	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2118	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator because of regulating the throttle opening to 20 degrees or less.
		(When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in the N or P position, and engine speed will not exceed 1,000 rpm or more.
P1290 P2100 P2103	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1606	VVEL control module	VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle. Engine speed will not rise more than 3,500 rpm due to the fuel cut.
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	Engine operating condition in fail-safe mode
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.
P2539	Low fuel pressure sensor	Engine torque is limited.

DTC Inspection Priority Chart

INFOID:0000000009009346

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)
1	• U0101 CAN communication line • U0113 U1003 CAN communication line • U1001 CAN communication line • U1024 VVEL CAN communication line • P0102 P0103 Mass air flow sensor • P0112 P0113 Intake air temperature sensor • P0117 P0118 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0197 P0198 Engine oil temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor • P0340 P0345 Camshaft position sensor • P0500 Vehicle speed sensor • P0527 Cooling fan speed sensor • P0605 P0607 P0611 P062B ECM • P0643 Sensor power supply • P0705 P0850 Transmission range switch • P1089 P1092 P1608 VVEL control shaft position sensor • P1197 Out of gas* • P1220 Fuel pump control module (FPCM) • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1556 P1557 Battery temperature sensor • P1606 P1607 VVEL control module • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor • P2539 Low fuel pressure sensor

Priority	Detected items (DTC)
2	• P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 Air fuel ratio (A/F) sensor 1 • P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 • P0190 FRP sensor • P0444 EVAP canister purge volume control solenoid valve • P0447 EVAP canister vent control valve • P0452 P0453 EVAP control system pressure sensor • P0550 Power steering pressure sensor • P0603 ECM power supply • P0710 P0717 P0720 P0729 P0730 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1715 P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches • P1087 P1088 VVEL system • P1090 P1093 VVEL actuator motor • P1091 VVEL actuator motor relay • P1217 Engine over temperature (OVERHEAT) • P1650 Starter motor relay 2 • P1651 Starter motor relay • P2101 Electric throttle control function • P2118 Throttle control motor • P1805 Brake switch • P2100 P2103 Throttle control motor relay • P2101 Electric throttle control function
3	• P0011 P0021 Intake valve timing control • P0087, P0088, P0090 FRP control system • P008A Low fuel pressure control system • P0171 P0172 P0174 P0175 Fuel injection system function • P0201 - P0208 Injector • P0300 - P0308 Misfire • P0420 P0430 Three way catalyst function • P0506 P0507 Idle speed control system • P0524 Engine oil pressure • P100A P100B VVEL system • P1212 TCS communication line • P1564 ICC steering switch • P1652 Starter motor system communication • P2119 Electric throttle control actuator • P1568 ICC command value • P1572 ICC brake switch

NOTE:

*: If “P1197” is displayed with other DTC in priority 1, perform trouble diagnosis for “P1197” first.

DTC Index

INFOID:0000000009009347

×:Applicable —: Not applicable

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Reference page
CONSULT GST*2	ECM*3					
U0101	0101	LOST COMM (TCM)	—	1	×	EC-749
U0113	0113	CAN COMM CIRCUIT	—	1	×	EC-751
U1001	1001*4	CAN COMM CIRCUIT	—	1 or 2	—	EC-750
U1003	1003	CAN COMM CIRCUIT	—	2	—	EC-751
U1024	1024	VVEL CAN COMM CIRCUIT	—	1	×	EC-753
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	**Blinking***6	**—**

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Reference page
CONSULT GST*2	ECM*3					
P0011	0011	INT/V TIM CONT-B1	×	2	×	EC-755
P0021	0021	INT/V TIM CONT-B2	×	2	×	
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	EC-759
P0032	0032	A/F SEN1 HTR (B1)	—	2	×	
P0037	0037	HO2S2 HTR (B1)	—	2	×	EC-762
P0038	0038	HO2S2 HTR (B1)	—	2	×	
P0051	0051	A/F SEN1 HTR (B2)	—	2	×	EC-759
P0052	0052	A/F SEN1 HTR (B2)	—	2	×	
P0057	0057	HO2S2 HTR (B2)	—	2	×	EC-762
P0058	0058	HO2S2 HTR (B2)	—	2	×	
P0075	0075	INT/V TIM V/CIR-B1	—	2	×	EC-765
P0081	0081	INT/V TIM V/CIR-B2	—	2	×	
P0087	0087	LOW FUEL PRES	—	2	×	EC-767
P0088	0088	HIGH FUEL PRES	—	2	×	EC-771
P008A	008A	LOW FUEL PRES SYS	—	2	×	EC-774
P0090	0090	FUEL PUMP	—	2	×	EC-776
P0102	0102	MAF SEN/CIRCUIT-B1	—	1	×	EC-779
P0103	0103	MAF SEN/CIRCUIT-B1	—	1	×	
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	EC-784
P0113	0113	IAT SEN/CIRCUIT-B1	—	2	×	
P0117	0117	ECT SEN/CIRC	—	1	×	EC-786
P0118	0118	ECT SEN/CIRC	—	1	×	
P0122	0122	TP SEN 2/CIRC-B1	—	1	×	EC-788
P0123	0123	TP SEN 2/CIRC-B1	—	1	×	
P0130	0130	A/F SENSOR1 (B1)	×	2	×	EC-791
P0131	0131	A/F SENSOR1 (B1)	—	2	×	EC-795
P0132	0132	A/F SENSOR1 (B1)	—	2	×	EC-798
P0133	0133	A/F SENSOR1 (B1)	×	2	×	EC-801
P0137	0137	HO2S2 (B1)	×	2	×	EC-806
P0138	0138	HO2S2 (B1)	×	2	×	EC-812
P0139	0139	HO2S2 (B1)	×	2	×	EC-820
P0150	0150	A/F SENSOR1 (B2)	×	2	×	EC-791
P0151	0151	A/F SENSOR1 (B2)	—	2	×	EC-795
P0152	0152	A/F SENSOR1 (B2)	—	2	×	EC-798
P0153	0153	A/F SENSOR1 (B2)	×	2	×	EC-801
P0157	0157	HO2S2 (B2)	×	2	×	EC-806
P0158	0158	HO2S2 (B2)	×	2	×	EC-812
P0159	0159	HO2S2 (B2)	×	2	×	EC-820
P0171	0171	FUEL SYS-LEAN-B1	—	2	×	EC-826
P0172	0172	FUEL SYS-RICH-B1	—	2	×	EC-830
P0174	0174	FUEL SYS-LEAN-B2	—	2	×	EC-826
P0175	0175	FUEL SYS-RICH-B2	—	2	×	EC-830

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Reference page
CONSULT GST*2	ECM*3					
P0190	0190	FUEL PRES SEN/CIRC	—	1	×	EC-834
P0197	0197	EOT SEN/CIRC	—	2	×	EC-837
P0198	0198	EOT SEN/CIRC	—	2	×	
P0201	0201	INJECTOR CIRC-CYL1	—	2	×	EC-839
P0202	0202	INJECTOR CIRC-CYL2	—	2	×	
P0203	0203	INJECTOR CIRC-CYL3	—	2	×	
P0204	0204	INJECTOR CIRC-CYL4	—	2	×	
P0205	0205	INJECTOR CIRC-CYL5	—	2	×	
P0206	0206	INJECTOR CIRC-CYL6	—	2	×	
P0207	0207	INJECTOR CIRC-CYL7	—	2	×	
P0208	0208	INJECTOR CIRC-CYL8	—	2	×	
P0222	0222	TP SEN 1/CIRC-B1	—	1	×	EC-840
P0223	0223	TP SEN 1/CIRC-B1	—	1	×	
P0300	0300	MULTI CYL MISFIRE	—	1 or 2	×	EC-843
P0301	0301	CYL 1 MISFIRE	—	1 or 2	×	
P0302	0302	CYL 2 MISFIRE	—	1 or 2	×	
P0303	0303	CYL 3 MISFIRE	—	1 or 2	×	
P0304	0304	CYL 4 MISFIRE	—	1 or 2	×	
P0305	0305	CYL 5 MISFIRE	—	1 or 2	×	
P0306	0306	CYL 6 MISFIRE	—	1 or 2	×	
P0307	0307	CYL 7 MISFIRE	—	1 or 2	×	
P0308	0308	CYL 8 MISFIRE	—	1 or 2	×	
P0327	0327	KNOCK SEN/CIRC-B1	—	2	—	EC-849
P0328	0328	KNOCK SEN/CIRC-B1	—	2	—	
P0332	0332	KNOCK SEN/CIRC-B2	—	2	—	
P0333	0333	KNOCK SEN/CIRC-B2	—	2	—	
P0335	0335	CKP SEN/CIRCUIT	—	2	×	EC-851
P0340	0340	CMP SEN/CIRC-B1	—	2	×	EC-855
P0345	0345	CMP SEN/CIRC-B2	—	2	×	
P0420	0420	TW CATALYST SYS-B1	×	2	×	EC-859
P0430	0430	TW CATALYST SYS-B2	×	2	×	
P0444	0444	PURG VOLUME CONT/V	—	2	×	EC-864
P0447	0447	VENT CONTROL VALVE	—	2	×	EC-867
P0452	0452	EVAP SYS PRES SEN	—	2	×	EC-871
P0453	0453	EVAP SYS PRES SEN	—	2	×	EC-876
P0500	0500	VEH SPEED SEN/CIRC*5	—	2	×	EC-881
P0506	0506	ISC SYSTEM	—	2	×	EC-883
P0507	0507	ISC SYSTEM	—	2	×	EC-885
P0524	0524	ENGINE OIL PRESSURE	—	2	×	EC-887
P0527	0527	COOLING FAN SPD SEN	—	2	—	EC-890
P0550	0550	PW ST P SEN/CIRC	—	2	—	EC-894
P0603	0603	ECM BACK UP/CIRCUIT	—	2	×	EC-897

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Reference page
CONSULT GST*2	ECM*3					
P0605	0605	ECM	—	1 or 2	× or —	EC-899
P0607	0607	ECM	—	1	×	EC-901
P0611	0611	FIC MODULE	—	2	—	EC-902
P062B	062B	ECM	—	2	× or —	EC-903
P0643	0643	SENSOR POWER/CIRC	—	1	×	EC-904
P0705	0705	T/M RANGE SENSOR A	—	2	×	TM-108
P0710	0710	FLUID TEMP SENSOR*7	—	2	×	TM-109
P0717	0717	INPUT SPEED SENSOR A	—	2	×	TM-112
P0720	0720	OUTPUT SPEED SENSOR*5	—	2	×	TM-113
P0729	0729	6GR INCORRECT RATIO*7	—	2	×	TM-117
P0730	0730	INCORRECT GR RATIO	—	2	×	TM-119
P0731	0731	1GR INCORRECT RATIO*7	—	2	×	TM-121
P0732	0732	2GR INCORRECT RATIO*7	—	2	×	TM-123
P0733	0733	3GR INCORRECT RATIO*7	—	2	×	TM-125
P0734	0734	4GR INCORRECT RATIO*7	—	2	×	TM-127
P0735	0735	5GR INCORRECT RATIO*7	—	2	×	TM-129
P0740	0740	TORQUE CONVERTER	—	2	×	TM-131
P0744	0744	TORQUE CONVERTER	—	2	×	TM-132
P0745	0745	PC SOLENOID A	—	2	×	TM-134
P0750	0750	SHIFT SOLENOID A	—	2	×	TM-135
P0775	0775	PC SOLENOID B	—	2	×	TM-136
P0780	0780	SHIFT	—	1	×	TM-137
P0795	0795	PC SOLENOID C	—	2	×	TM-139
P0850	0850	P-N POS SW/CIRCUIT	—	2	×	EC-906
P100A	100A	VVEL SYSTEM-B1	—	2	—	EC-909
P100B	100B	VVEL SYSTEM-B2	—	2	—	
P1087	1087	VVEL SYSTEM-B1	—	1	×	EC-913
P1088	1088	VVEL SYSTEM-B2	—	1	×	EC-913
P1089	1089	VVEL POS SEN/CIRC-B1	—	1	×	EC-914
P1090	1090	VVEL ACTR MOT-B1	—	1	×	EC-917
P1091	1091	VVEL ACTR MOT PWR	—	1 or 2	×	EC-920
P1092	1092	VVEL POS SEN/CIRC-B2	—	1	×	EC-914
P1093	1093	VVEL ACTR MOT-B2	—	1	×	EC-917
P1197	1197	FUEL RUN OUT	—	2	—	EC-923
P1212	1212	TCS/CIRC	—	2	—	EC-925
P1217	1217	ENG OVER TEMP	—	1	×	EC-926
P1220	1220	FPCM	—	1	—	EC-929
P1225	1225	CTP LEARNING-B1	—	2	—	EC-932
P1226	1226	CTP LEARNING-B1	—	2	—	EC-933
P1550	1550	BAT CURRENT SENSOR	—	2	—	EC-934
P1551	1551	BAT CURRENT SENSOR	—	2	—	EC-938

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Reference page
CONSULT GST*2	ECM*3					
P1552	1552	BAT CURRENT SENSOR	—	2	—	EC-938
P1553	1553	BAT CURRENT SENSOR	—	2	—	EC-942
P1554	1554	BAT CURRENT SENSOR	—	2	—	EC-946
P1556	1556	BAT TMP SEN/CIRC	—	2	—	EC-950
P1557	1557	BAT TMP SEN/CIRC	—	2	—	EC-950
P1564	1564	ASCD SW	—	1	—	EC-953
P1568	1568	ICC COMMAND VALUE	—	1	—	EC-956
P1572	1572	ASCD BRAKE SW	—	1	—	EC-957
P1606	1606	VVEL CONTROL MODULE	—	1 or 2	× or —	EC-963
P1607	1607	VVEL CONTROL MODULE	—	1	×	EC-964
P1608	1608	VVEL SENSOR POWER/CIRC	—	1	×	EC-965
P1610	1610	LOCK MODE	—	2	—	SEC-51
P1611	1611	ID DISCORD IMMU-ECM	—	2	—	SEC-52
P1612	1612	CHAIN OF ECM-IMMU	—	2	—	SEC-53
P1613	1613	ECM INT CIRC-IMMU	—	2	—	SEC-46
P1614	1614	CHAIN OF IMMU-KEY	—	2	—	SEC-54
P1615	1615	DIFFERENCE OF KEY	—	2	—	SEC-46
P1650	1650	STR MTR RELAY 2	—	2	×	EC-967
P1651	1651	STR MTR RELAY	—	2	×	EC-970
P1652	1652	STR MTR SYS COMM	—	1	×	EC-972
P1715	1715	IN PULY SPEED	—	2	—	EC-974
P1730	1730	INTERLOCK	—	2	×	TM-143
P1734	1734	7GR INCORRECT RATIO*7	—	2	×	TM-145
P1805	1805	BRAKE SW/CIRCUIT	—	2	—	EC-975
P2100	2100	ETC MOT PWR-B1	—	1	×	EC-978
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	EC-980
P2103	2103	ETC MOT PWR	—	1	×	EC-978
P2118	2118	ETC MOT-B1	—	1	×	EC-984
P2119	2119	ETC ACTR-B1	—	1	×	EC-986
P2122	2122	APP SEN 1/CIRC	—	1	×	EC-988
P2123	2123	APP SEN 1/CIRC	—	1	×	EC-988
P2127	2127	APP SEN 2/CIRC	—	1	×	EC-991
P2128	2128	APP SEN 2/CIRC	—	1	×	EC-991
P2135	2135	TP SENSOR-B1	—	1	×	EC-995
P2138	2138	APP SENSOR	—	1	×	EC-998
P2539	2539	LOW FUEL PRES SEN	—	2	×	EC-1003
P2713	2713	PRESS CONTROL SOL D	—	2	×	TM-150
P2722	2722	PRESS CONTROL SOL E	—	2	×	TM-151
P2731	2731	PRESS CONTROL SOL F	—	2	×	TM-152
P2807	2807	PRESS CONTROL SOL G	—	2	×	TM-153

*1: 1st trip DTC No. is the same as DTC No.

*2: This number is prescribed by SAE J2012/ISO 15031-6.

*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

*4: The troubleshooting for this DTC needs CONSULT.

*5: When the fail safe operations for both self-diagnoses occur, the MIL illuminates.

*6: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to “How to Display SRT Status”.

*7: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:0000000009325846

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

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
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage
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
FUEL SYSTEM	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
			P0171 or P0172	81H	24H	The number of lambda control clamped
			P117A	82H	03H	Cylinder A/F imbalance monitoring
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	80H	2FH	Long term fuel trim
			P0174 or P0175	81H	24H	The number of lambda control clamped
			P117B	82H	03H	Cylinder A/F imbalance monitoring

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

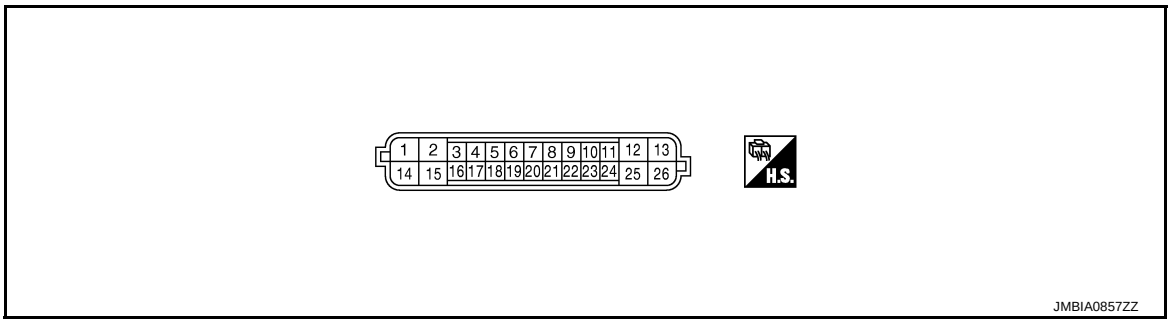
Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A2H	No. 1 cylinder misfire	P0301	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current 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

VVEL CONTROL MODULE

Reference Value

INFOID:0000000009009349

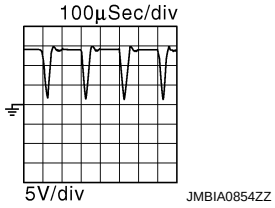
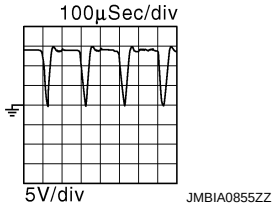
TERMINAL LAYOUT

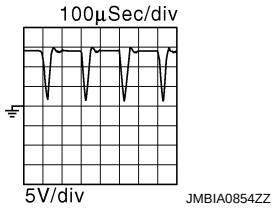
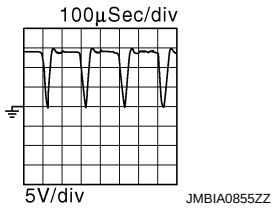


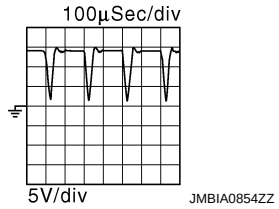
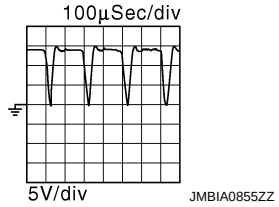
PHYSICAL VALUES

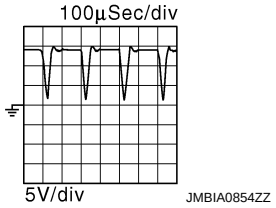
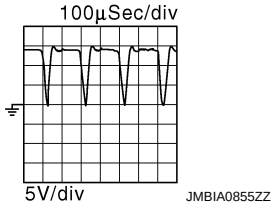
NOTE:

- VVEL control module is located under the battery. Temporarily remove the battery to check voltage of the terminals.
- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT.

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (R)	14 (B)	VVEL actuator motor power supply (bank 2)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
2 (L/W)	14 (B)	VVEL actuator motor (High lift) (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0 - 14 V★ 
3 (W)	6 (R)	VVEL control shaft position sensor 1 (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	0.25 - 1.40 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
4 (L/W)	—	Sensor ground [VVEL control shaft position sensor 1 (bank 2)]	—	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
5 (L/R)	4 (L/W)	VVEL control shaft position sensor 1 (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	0.25 - 1.40 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
6 (R)	—	Sensor ground [VVEL control shaft position sensor 1 (bank 1)]	—	—	—
7 (B)	6 (R)	Sensor power supply [VVEL control shaft position sensor 1 (bank 1)]	—	[Ignition switch: ON]	5 V
8 (W/L)	14 (B)	Power supply for VVEL control module	—	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
9 (L)	4 (L/W)	Sensor power supply [VVEL position sensor 1 (bank 2)]	—	[Ignition switch: ON]	5 V
11 (W)	—	ENG communication line	Input/ Output	—	—
12 (L/W)	14 (B)	VVEL actuator motor (High lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0 - 14 V★ 
13 (R)	14 (B)	VVEL actuator motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
14 (B)	—	VVEL control module ground	—	—	—

Terminal No. +	Terminal No. –	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
15 (L/B)	14 (B)	VVEL actuator motor (Low lift) (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0 - 14 V★ 
16 (L/R)	19 (L)	VVEL control shaft position sensor 2 (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	3.50 - 4.75 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
17 (O)	—	Sensor ground [VVEL control shaft position sensor 2 (bank 2)]	—	—	—
18 (W/L)	17 (O)	VVEL control shaft position sensor 2 (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	3.50 - 4.75 V
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0.25 - 4.75 V
19 (L)	—	Sensor ground [VVEL control shaft position sensor 2 (bank 1)]	—	—	—
20 (L/W)	19 (L)	Sensor power supply [VVEL control shaft position sensor 2 (bank 1)]	—	[Ignition switch: ON]	5 V
21 (BR/ W)	14 (B)	VVEL actuator motor relay abort signal (ECM)	Input	[Engine is running] • Warm-up condition • Idle speed	0 V
22 (W)	17 (O)	Sensor power supply [VVEL control shaft position sensor 2 (bank 2)]	—	[Ignition switch: ON]	5 V
23 (BR/ Y)	14 (B)	VVEL control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON]	0 - 1.0 V
24 (R/W)	—	ENG communication line	Input/ Output	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
25 (L/B)	14 (B)	VVEL control motor (Low lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 3,000 rpm quickly	0 - 14 V★ 

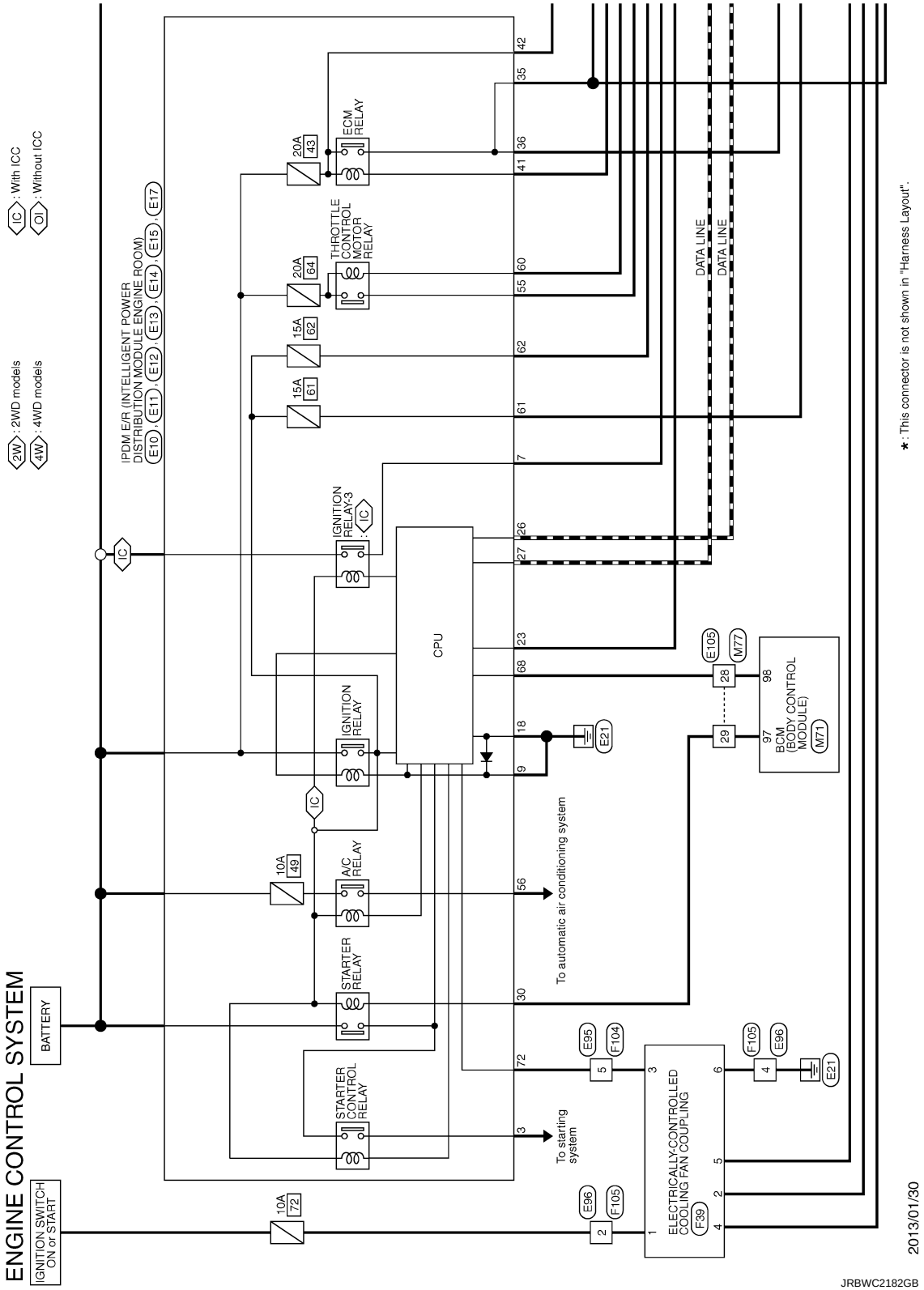
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

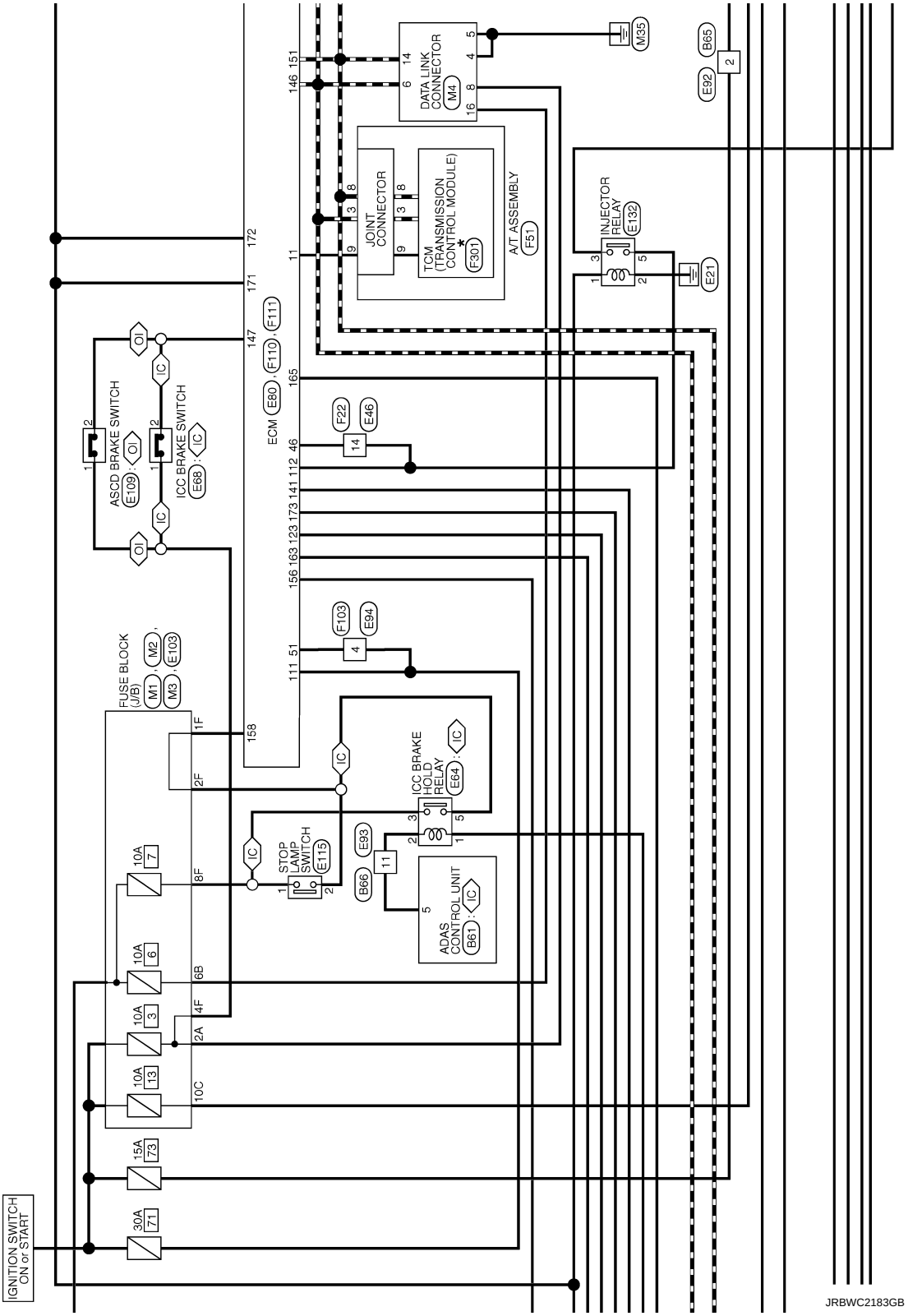
WIRING DIAGRAM

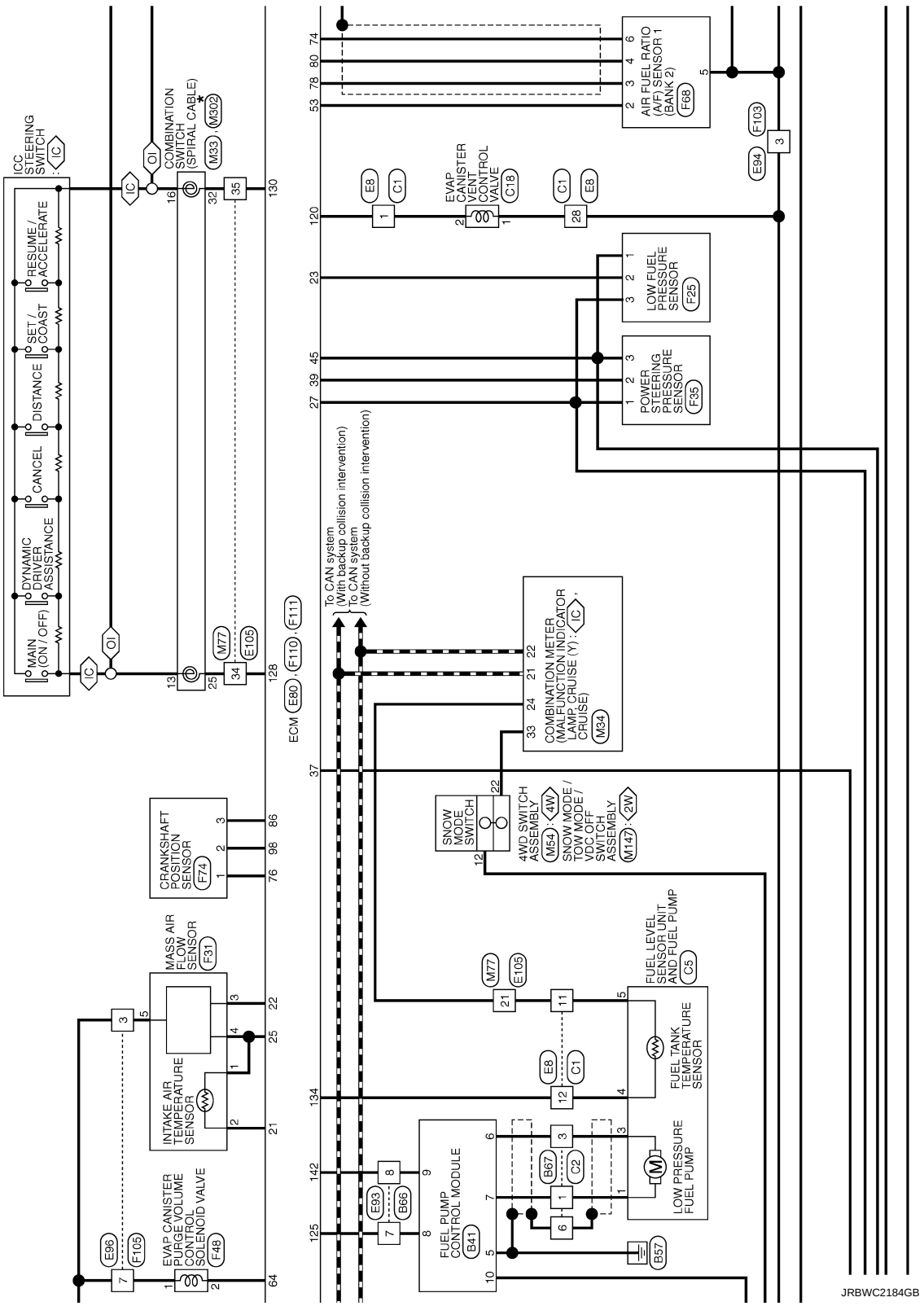
ENGINE CONTROL SYSTEM

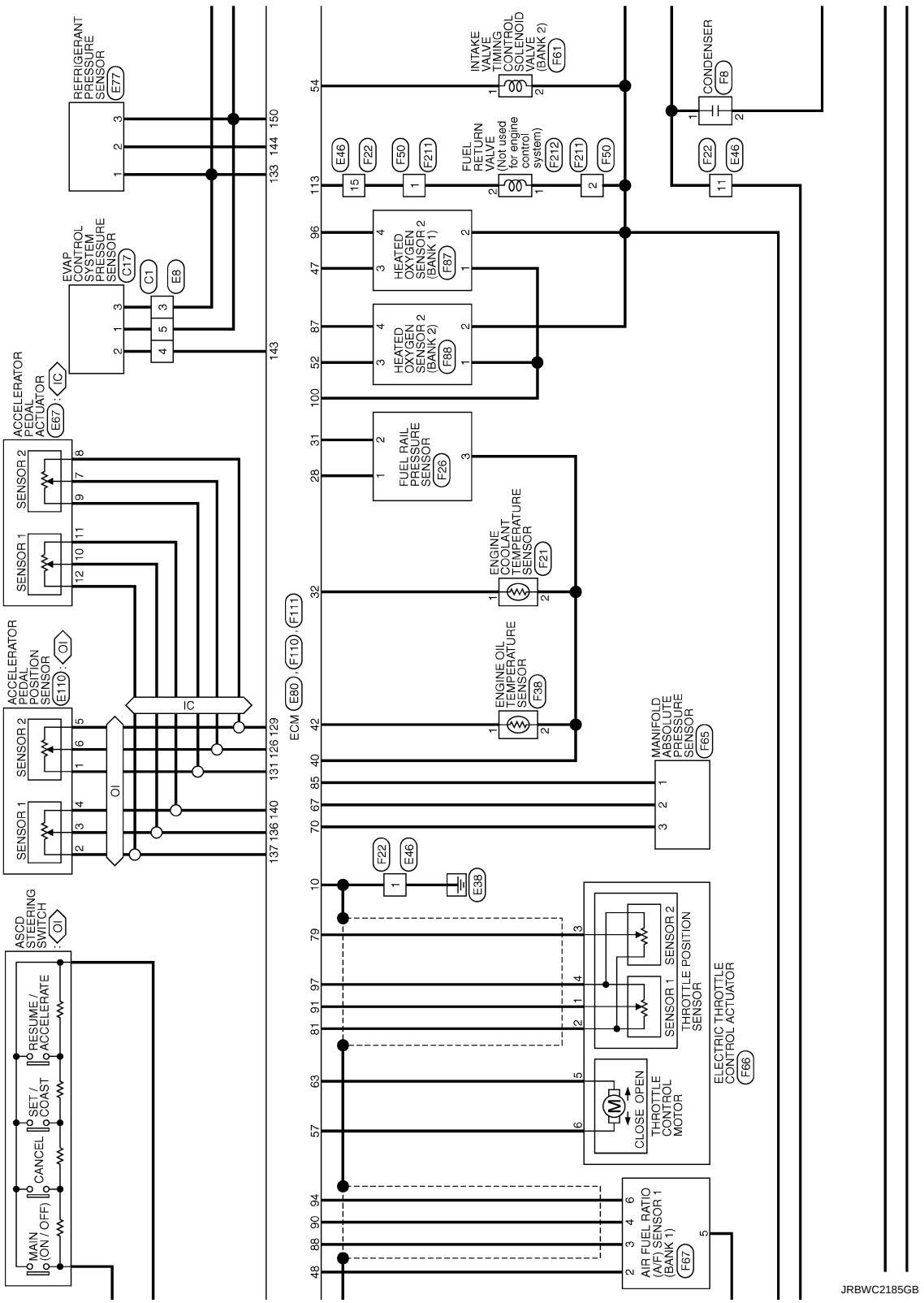
Wiring Diagram

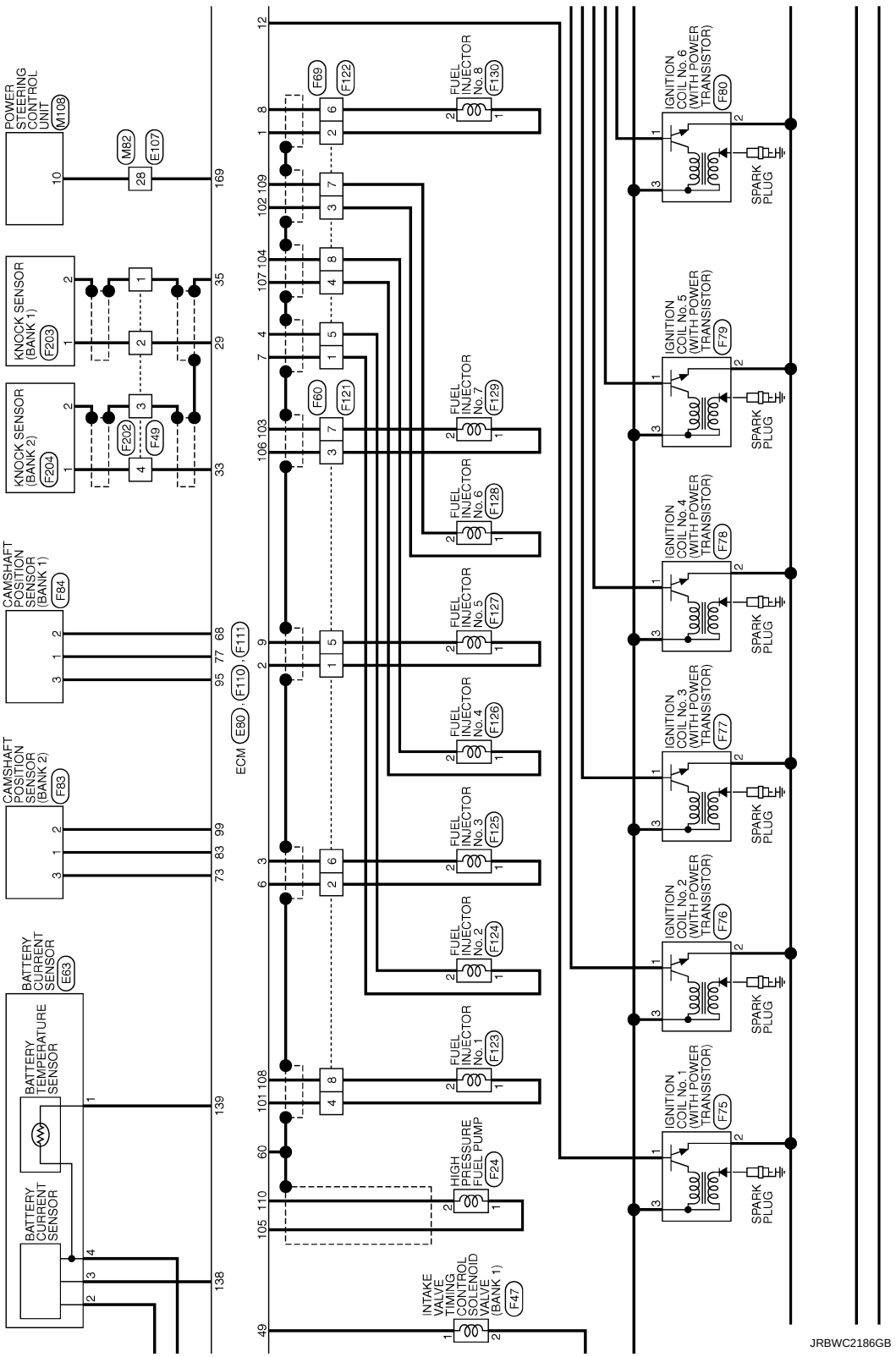
INFOID:0000000009364725

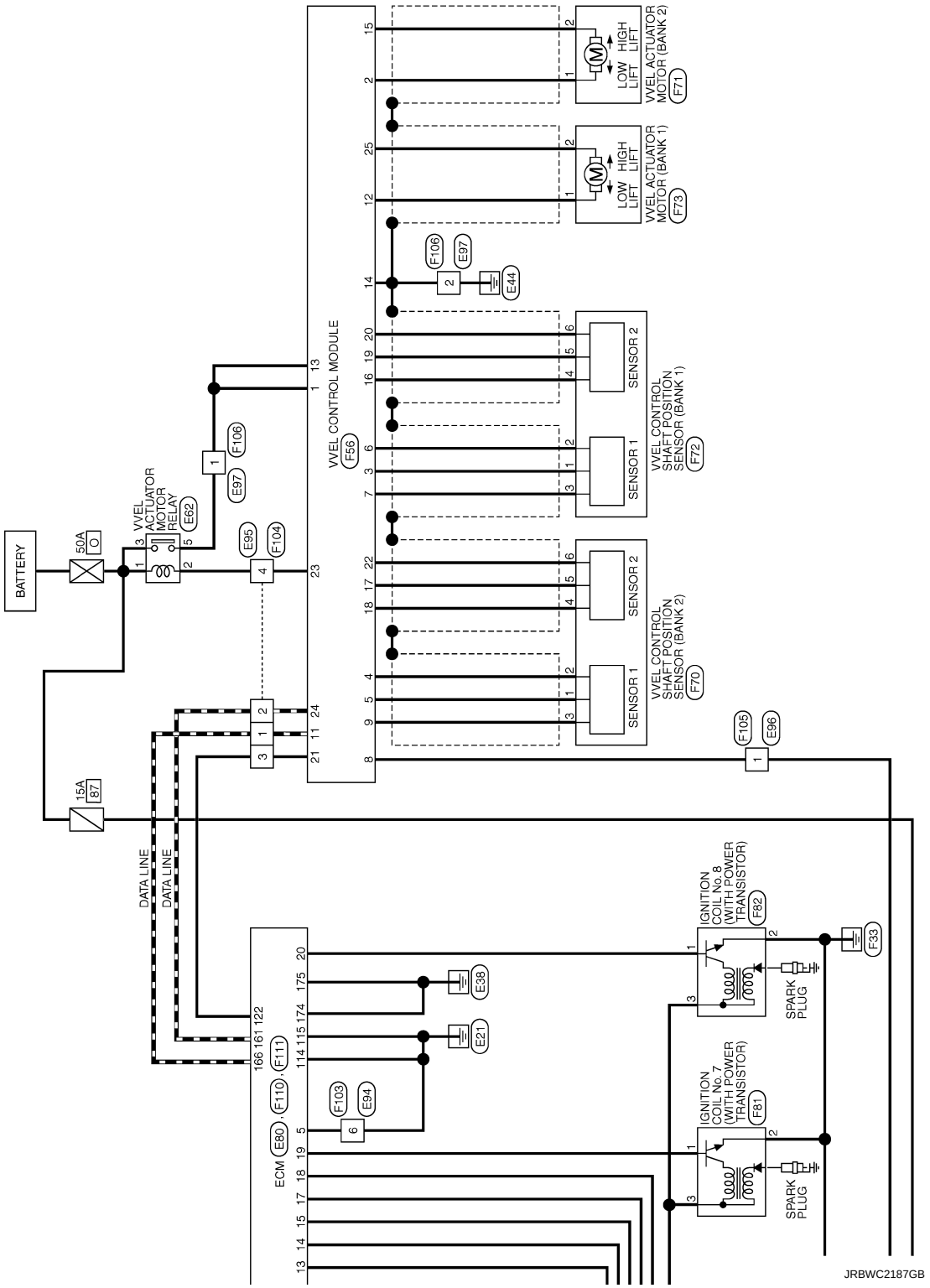


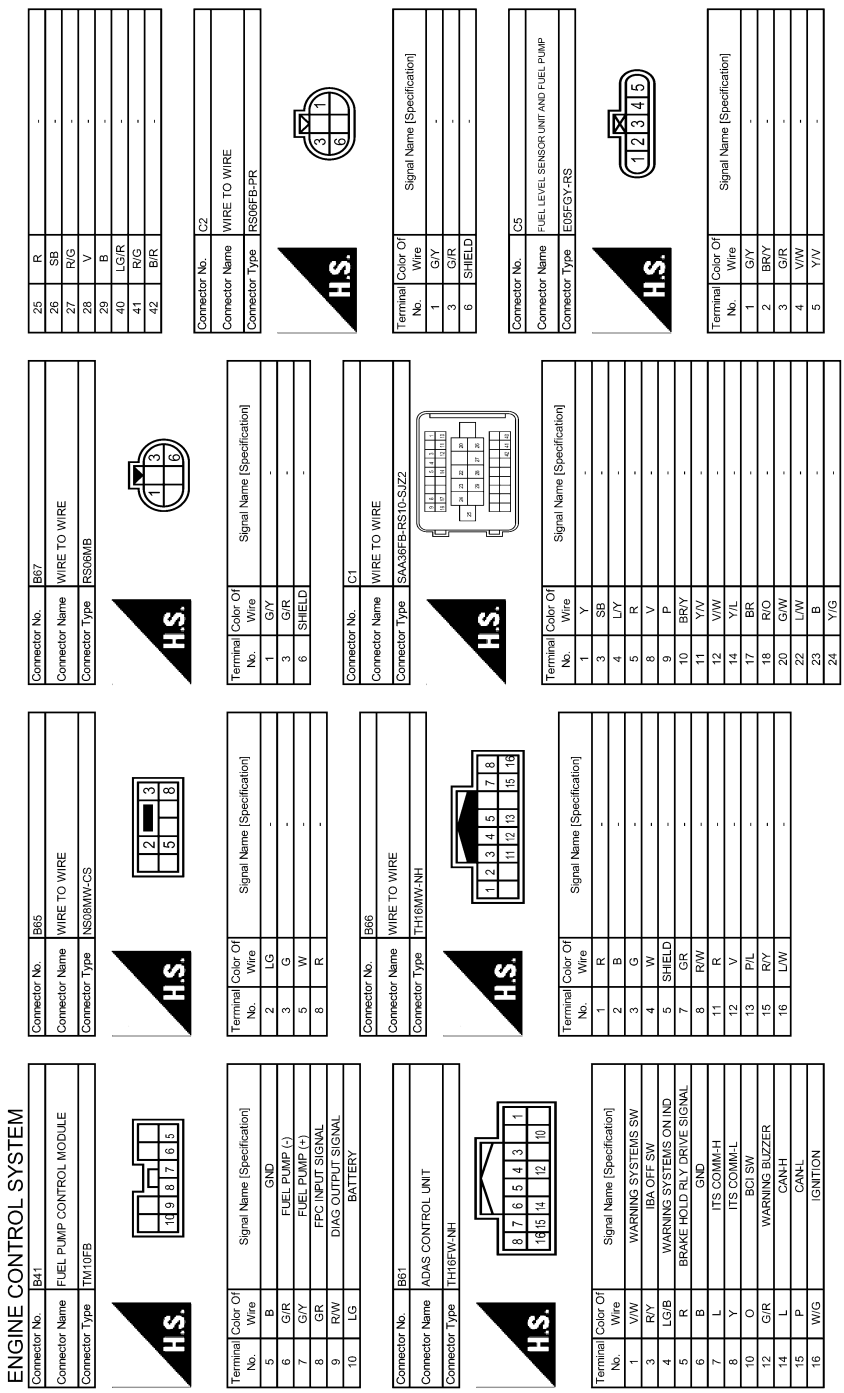

DATA LINK CONNECTOR
M4
M35
B65
E92
2
JOINT CONNECTOR
TCM (TRANSMISSION CONTROL MODULE)
F301
A/T ASSEMBLY
F51
INJECTOR RELAY
E132
E21
ECM
E80
F111
F110
F22
E46
ASCD BRAKE SWITCH
E109
ICC BRAKE SWITCH
E68
FUSE BLOCK (J/B)
M1
M2
M3
E103
F103
E94
ICC BRAKE HOLD RELAY
E64
STOP LAMP SWITCH
E115
E93
B66
ADAS CONTROL UNIT
B61
10A 7
10A 6
10A 3
10A 13
15A 73
30A 71
IGNITION SWITCH ON or START
JRBWC2183GB


ICC STEERING SWITCH
MAIN (ON / OFF)
DYNAMIC DRIVER ASSISTANCE
CANCEL
DISTANCE
SET / COAST
RESUME / ACCELERATE
COMBINATION SWITCH (SPIRAL CABLE)
ECM (E80)
To CAN system (With backup collision intervention)
To CAN system (Without backup collision intervention)
COMBINATION METER (MALFUNCTION INDICATOR LAMP, CRUISE (Y): IC, CRUISE) M34
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2) F68
EVAP CANISTER VENT CONTROL VALVE C18
LOW FUEL PRESSURE SENSOR F25
POWER STEERING PRESSURE SENSOR F35
SNOW MODE SWITCH
4WD SWITCH ASSEMBLY M54 : 4W
SNOW MODE / TOW MODE / VDC OFF SWITCH ASSEMBLY M147 : 2W
CRANKSHAFT POSITION SENSOR F74
MASS AIR FLOW SENSOR F31
INTAKE AIR TEMPERATURE SENSOR
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE F48
FUEL PUMP CONTROL MODULE B41
FUEL LEVEL SENSOR UNIT AND FUEL PUMP C5
FUEL TANK TEMPERATURE SENSOR
LOW PRESSURE FUEL PUMP
JRBWC2184GB


REFRIGERANT PRESSURE SENSOR E77
EVAP CONTROL SYSTEM PRESSURE SENSOR C17
C1
E8
ACCELERATOR PEDAL ACTUATOR E67 : IC
SENSOR 2
SENSOR 1
ACCELERATOR PEDAL POSITION SENSOR E110 : OI
IC
OI
ECM E80 F110 F111
ASCD STEERING SWITCH : OI
MAIN (ON / OFF)
CANCEL
SET / COAST
RESUME / ACCELERATE
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2) F61
FUEL RETURN VALVE (Not used for engine control system) F212
HEATED OXYGEN SENSOR 2 (BANK 1) F87
HEATED OXYGEN SENSOR 2 (BANK 2) F88
FUEL RAIL PRESSURE SENSOR F26
ENGINE COOLANT TEMPERATURE SENSOR F21
ENGINE OIL TEMPERATURE SENSOR F38
MANIFOLD ABSOLUTE PRESSURE SENSOR F65
CONDENSER F8
E46
F22
F50
F211
E38
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
ELECTRIC THROTTLE CONTROL ACTUATOR F66
THROTTLE CONTROL MOTOR
CLOSE OPEN
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1) F67
JRBWC2185GB


POWER STEERING CONTROL UNIT M108
KNOCK SENSOR (BANK 1) F203
KNOCK SENSOR (BANK 2) F204
CAMSHAFT POSITION SENSOR (BANK 1) F84
CAMSHAFT POSITION SENSOR (BANK 2) F83
BATTERY CURRENT SENSOR E63
BATTERY TEMPERATURE SENSOR
BATTERY CURRENT SENSOR
ECM E80
FUEL INJECTOR No.1 F123
FUEL INJECTOR No.2 F124
FUEL INJECTOR No.3 F125
FUEL INJECTOR No.4 F126
FUEL INJECTOR No.5 F127
FUEL INJECTOR No.6 F128
FUEL INJECTOR No.7 F129
FUEL INJECTOR No.8 F130
HIGH PRESSURE FUEL PUMP F24
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1) F47
IGNITION COIL No.1 (WITH POWER TRANSISTOR) F75
IGNITION COIL No.2 (WITH POWER TRANSISTOR) F76
IGNITION COIL No.3 (WITH POWER TRANSISTOR) F77
IGNITION COIL No.4 (WITH POWER TRANSISTOR) F78
IGNITION COIL No.5 (WITH POWER TRANSISTOR) F79
IGNITION COIL No.6 (WITH POWER TRANSISTOR) F80
SPARK PLUG
JRBWC2186GB


BATTERY
50A
VVEL ACTUATOR MOTOR RELAY
E62
F106
E97
E95
F104
VVEL CONTROL MODULE
F56
VVEL ACTUATOR MOTOR (BANK 2)
F71
VVEL ACTUATOR MOTOR (BANK 1)
F73
LOW LIFT
HIGH LIFT
VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
F72
VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
F70
SENSOR 1
SENSOR 2
E44
F105
E96
15A
DATA LINE
ECM
E80
F110
F111
E38
E21
F103
E94
IGNITION COIL No.8 (WITH POWER TRANSISTOR)
F82
IGNITION COIL No.7 (WITH POWER TRANSISTOR)
F81
SPARK PLUG
F33
JRBWC2187GB



JRBWC3492GB

ENGINE CONTROL SYSTEM

Connector No.	C17
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Type	E03FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	GND
2	L/Y	PRESSURE SIGNAL
3	SB	VCC 5V

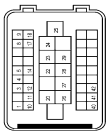
Connector No.	C18
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Type	E02FBI-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	-
2	Y	-

Connector No.	E8
Connector Name	WIRE TO WIRE
Connector Type	SAA36MB-RS10-SJZ2

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
3	SB	-
4	L/Y	-
5	R	-
8	V	-
9	P	-
10	BR/Y	-
11	Y/V	-
12	V/W	-
14	Y/L	-
17	BR	-
18	R/O	-
20	G/W	-
22	L/W	-
23	B	-
24	Y/G	-
25	R	-
26	SB	-
27	R/G	-
28	V	-
29	B	-
40	LG/R	-
41	R/G	-
42	B/R	-

Connector No.	E10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
3	R	-
4	L	-
5	P/L	-
7	W/G	-
8	W	-

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FB-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
9	B	-
14	L	-

Connector No.	E12
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS06FBR-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
18	B	-
19	V	-
20	W	-
21	L	-

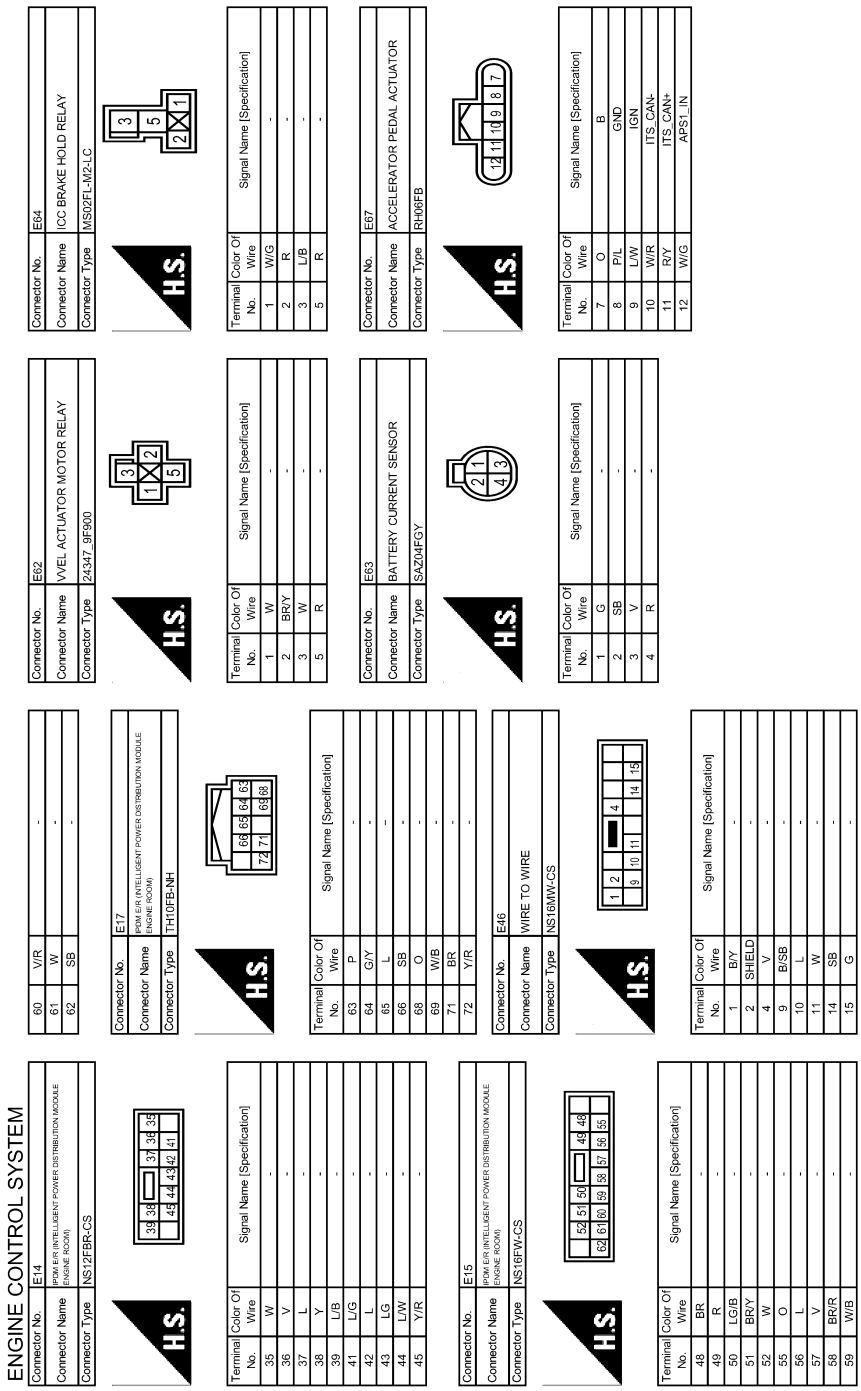
Connector No.	E13
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH12FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
23	GR/R	-
24	W/G	-
25	L/Y	-
26	P	-
27	L	-
30	R/W	-
32	LG	-
33	R	-
34	G	-

JRBWC3493GB

ENGINE CONTROL SYSTEM



JRBWC3494GB

ENGINE CONTROL SYSTEM

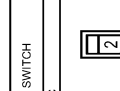
Connector No.	E68
Connector Name	ICC BRAKE SWITCH
Connector Type	M02FBR-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	G/Y	-

Connector No.	E77
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB

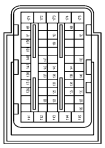
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	-
2	O/B	-
3	R	-

Connector No.	E80
Connector Name	ECM
Connector Type	MA65SFB-MEB10-LH

H.S.

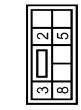


Terminal No.	Color Of Wire	Signal Name [Specification]
111	R	FUEL INJECTOR DRIVER POWER SUPPLY
112	SB	FUEL INJECTOR DRIVER POWER SUPPLY
113	G	-
114	B	ECM GROUND
115	B	ECM GROUND
120	Y	EVAP CANISTER VENT CONTROL VALVE
122	BR/W	VVEL ACTUATOR MOTOR RELAY ABSINT SIGNAL (VVEL CONTROL MODULE)
123	V/R	THROTTLE CONTROL MOTOR RELAY
125	GR	FUEL PUMP CONTROL MODULE (FPCM)
126	O	ACCELERATOR PEDAL POSITION SENSOR 2
128	Y	ASCD/ICC STEERING SWITCH
129	P/L	SENSOR GROUND
130	R	SENSOR GROUND
131	L/W	SENSOR POWER SUPPLY
133	SB	SENSOR POWER SUPPLY
134	V/W	FUEL TEMPERATURE SENSOR
136	W/R	ACCELERATOR PEDAL POSITION SENSOR 1
137	W/G	SENSOR POWER SUPPLY
138	V	BATTERY CURRENT SENSOR
139	G	BATTERY TEMPERATURE SENSOR
140	R/Y	SENSOR GROUND
141	SB	IGNITION SWITCH
142	R/W	FUEL PUMP CONTROL MODULE (FPCM) CHECK
143	L/Y	EVAP CONTROL SYSTEM PRESSURE SENSOR
144	O/B	REFRIGERANT PRESSURE SENSOR
146	L	CAN COMMUNICATION LINE
147	G/Y	ASCD/ICC BRAKE SWITCH
150	R	SENSOR GROUND
151	P	CAN COMMUNICATION LINE
156	L	POWER SUPPLY FOR ECM (BACK-UP)
158	W/B	STOP LAMP SWITCH
161	R/W	ECM COMMUNICATION LINE
163	L/G	ECM RELAY (SELF SHUT-OFF)
165	GR/R	-
166	W	ECM COMMUNICATION LINE
169	G/B	ENGINE SPEED SIGNAL OUTPUT

171	W	POWER SUPPLY FOR ECM
172	W	POWER SUPPLY FOR ECM
173	O	THROTTLE CONTROL MOTOR POWER SUPPLY
174	B	ECM GROUND
175	B	ECM GROUND

Connector No.	E92
Connector Name	WIRE TO WIRE
Connector Type	NS08FW-CS

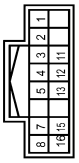
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
2	LG	-
3	G	-
5	W	-
8	R	-

Connector No.	E93
Connector Name	WIRE TO WIRE
Connector Type	TH16FW-NH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	B	-
3	G	-
4	W	-
5	SHIELD	-
7	GR	-
8	R/W	-
11	R	-
12	V	-

13	P/L	-
15	R/Y	-
16	L/W	-

Connector No.	E94
Connector Name	WIRE TO WIRE
Connector Type	M06MW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/Y	-
2	R	-
3	V	-
4	R	-
5	G/R	-
6	B/R	-

Connector No.	E95
Connector Name	WIRE TO WIRE
Connector Type	RH08MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R/W	-
3	BR/W	-
4	BR/Y	-
5	Y/R	-

JRBWC3495GB

ENGINE CONTROL SYSTEM

Connector No.	E96
Connector Name	WIRE TO WIRE
Connector Type	RS08MGY-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/L	-
2	L/W	-
3	GR	-
4	B/R	-
5	R	-
6	L	-
7	W	-

Connector No.	E97
Connector Name	WIRE TO WIRE
Connector Type	X02MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	B	-

Connector No.	E103
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
10F	G	-
14F	Y	-
15F	G	-
1F	W/B	-
2F	R	-
4F	G	-
6F	Y/G	-
8F	L/B	-
9F	Y	-

Connector No.	E105
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
2	L/W	-
3	R/B	-
4	L	-
5	Y	-
7	W/G	-
8	P/B	-
9	W/B	-
10	G	-
11	L	-
12	P	-

13	P/B	-
14	BR	-
15	L/B	-
16	SB	-
18	BR	-
19	Y/G	-
20	BR/Y	-
21	Y/V	-
22	L	-
23	Y	-
24	L/W	-
28	O	-
29	R/W	-
30	L/B	-
31	Y	-
32	GR/R	-
34	Y	-
35	R	-
36	B/R	-
37	G/Y	-
38	G	-
40	SB	-
41	W/R	-
42	R	-
43	V	-
51	L/O	-
52	BR/W	-
53	BR/Y	-
54	GR/L	-
60	W	-
61	B	-
62	R	-
63	G	-
64	SHIELD	-
91	BR	-
92	L/W	-
94	Y/B	-
95	G/R	-
97	R	-
98	G/B	-
100	W/R	-

Connector No.	E107
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
4	V/W	-
5	G/R	-
6	P	-
9	GR/L	-
10	Y/R	-
11	L/R	-
12	W/G	-
13	BR/Y	-
14	LG	-
15	BR/W	-
16	B/Y	-
17	W/B	-
18	GR/R	-
20	W/R	-
21	B	-
22	R/L	-
23	G/R	-
24	R/W	-
25	W/L	-
26	R	-
27	L	-
28	G/B	-
35	G	-
36	Y	-
37	R	-
38	G/Y	-
39	O	-
40	W	-
41	R	-
42	B	-
43	G	-
44	SHIELD	-
46	B	-
47	W	-
48	SHIELD	-

JRBWC3496GB

ENGINE CONTROL SYSTEM

49	W
50	SHIELD
51	Y/R
52	GR
53	LG/B
54	LG/R
55	R/G
56	B/R
57	SB
60	G
61	B
62	W
63	R
64	SHIELD
65	L/Y
66	V
67	B/W
91	G/R
95	SB
96	G/R
97	GR/L
98	G/W
99	R/Y
100	L

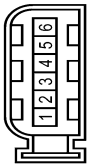
Connector No.	E109
Connector Name	ASCD BRAKE SWITCH
Connector Type	M02FBR-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	G/Y	-

Connector No.	E110
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	AEY06FB-RH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	SENSOR POWER SUPPLY
2	W/G	SENSOR POWER SUPPLY
3	W/R	ACCELERATOR PEDAL POSITION SENSOR 1
4	R/Y	SENSOR GROUND
5	P/L	SENSOR GROUND
6	O	ACCELERATOR PEDAL POSITION SENSOR 2

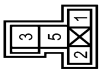
Connector No.	E115
Connector Name	STOP LAMP SWITCH
Connector Type	M04FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/B	-
2	R	-
3	G	-
4	L/R	-

Connector No.	E132
Connector Name	INJECTOR RELAY
Connector Type	MS02FL-M2-LC

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	B	-
3	G	-
5	SB	-

Connector No.	F8
Connector Name	CONDENSER
Connector Type	M02FW-GY-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	B	-

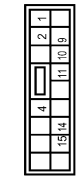
Connector No.	F21
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	SIGNAL
2	W/L	GND

Connector No.	F22
Connector Name	WIRE TO WIRE
Connector Type	NS16FW-CS

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	-
2	SHIELD	-
4	V	-
9	B	-
10	L/W	-
11	W	-
14	SB	-
15	G	-

JRBWC3497GB

ENGINE CONTROL SYSTEM

Connector No.	F24
Connector Name	HIGH PRESSURE FUEL PUMP
Connector Type	HS02FLGY-VR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	DRIVE SIG
2	L/B	GND

Connector No.	F25
Connector Name	LOW FUEL PRESSURE SENSOR
Connector Type	RH03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/O	GND
2	V	SIGNAL
3	P	VCC

Connector No.	F26
Connector Name	FUEL RAIL PRESSURE SENSOR
Connector Type	AFZ03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	VCC 5V
2	V/W	VOUT
3	W/L	GND

Connector No.	F31
Connector Name	MASS AIR FLOW SENSOR
Connector Type	RH06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	-
2	G/O	-
3	BR/W	-
4	LG	-
5	GR	-

Connector No.	F35
Connector Name	POWER STEERING PRESSURE SENSOR
Connector Type	RK03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	-
2	P/B	-
3	L/O	-

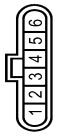
Connector No.	F38
Connector Name	ENGINE OIL TEMPERATURE SENSOR
Connector Type	E02FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/Y	-
2	W/L	-

Connector No.	F39
Connector Name	ELECTRICALLY-CONTROLLED COOLING FAN COUPLING
Connector Type	AAC06FB-WP

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	-
2	P	-
3	Y/R	-
4	L/O	-
5	V	-
6	B/R	-

Connector No.	F47
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
Connector Type	E02FG-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG/B	-
2	V	-

JRBWC3498GB

ENGINE CONTROL SYSTEM

Connector No.	F48
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	HS02FL

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	V/W	-

Connector No.	F49
Connector Name	WIRE TO WIRE
Connector Type	RS04FB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	SHIELD	-
2	W	-
3	SHIELD	-
4	W	-

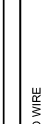
Connector No.	F50
Connector Name	WIRE TO WIRE
Connector Type	RS02MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	V	-

Connector No.	F51
Connector Name	A/T ASSEMBLY
Connector Type	RK10FG

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	IGNITION POWER SUPPLY
2	P	BATTERY POWER SUPPLY
3	L	CAN-H
4	SB	K-LINE
5	B	GROUND
6	V	IGNITION POWER SUPPLY
7	R	BACK-UP LAMP RELAY
8	P	CAN-L
9	BR	STARTER RELAY
10	B	GROUND

Connector No.	F56
Connector Name	VVEL CONTROL MODULE
Connector Type	RH18FB-AJZ8-RH-S

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 2)
2	L/W	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK2)
3	W	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)
4	L/W	SENSOR GROUND
5	L/R	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)
6	R	SENSOR GROUND
7	B	SENSOR POWER SUPPLY
8	W/L	POWER SUPPLY FOR VVEL CONTROL MODULE
9	L	SENSOR POWER SUPPLY
11	W	ENG COMMUNICATION LINE
12	L/W	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 1)
13	R	VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 1)
14	B	VVEL CONTROL MODULE GROUND
15	L/B	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 2)
16	L/R	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)
17	O	SENSOR GROUND
18	W/L	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)
19	L	SENSOR GROUND
20	L/W	SENSOR POWER SUPPLY
21	BR/W	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL (ECM)
22	W	SENSOR POWER SUPPLY
23	BR/Y	VVEL CONTROL MOTOR RELAY
24	R/W	ENG COMMUNICATION LINE
25	L/B	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 1)

Connector No.	F60
Connector Name	WIRE TO WIRE
Connector Type	RS08FB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	R	-
3	R	-
4	R	-
5	G	-
6	G	-
7	G	-
8	G	-

Connector No.	F61
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
Connector Type	E02FG-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/R	-
2	V	-

JRBWC3499GB

ENGINE CONTROL SYSTEM

Connector No.	F65
Connector Name	MANIFOLD ABSOLUTE PRESSURE SENSOR
Connector Type	R403FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR/R	-
2	V	-
3	W/L	-

Connector No.	F66
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Type	HS06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	INPUT
2	G	OUTPUT1
3	B	OUTPUT2
4	W	GND
5	R	MOTOR2 (CLOSE)
6	W	MOTOR1 (OPEN)

Connector No.	F67
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
Connector Type	AFZ06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	L/W	-
3	B	-
4	W	-
5	V	-
6	R	-

Connector No.	F68
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
Connector Type	AFZ06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
2	SB	-
3	L/R	-
4	L/W	-
5	V	-
6	L	-

Connector No.	F69
Connector Name	WIRE TO WIRE
Connector Type	RS08FB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	R	-
3	R	-
4	R	-
5	G	-
6	G	-
7	G	-
8	G	-

Connector No.	F70
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
Connector Type	RH06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/R	-
2	L/W	-
3	L	-
4	W/L	-
5	O	-
6	W	-

Connector No.	F71
Connector Name	VVEL ACTUATOR MOTOR (BANK 2)
Connector Type	X02FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	-
2	L/B	-

Connector No.	F72
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
Connector Type	RH06FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R	-
3	B	-
4	L/R	-
5	L	-
6	L/W	-

JRBWC3500GB

ENGINE CONTROL SYSTEM

Connector No.	F73
Connector Name	VVEL ACTUATOR MOTOR (BANK 1)
Connector Type	X02FB

H.S.

1 2

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	-
2	L/B	-

Connector No.	F74
Connector Name	CRANKSHAFT POSITION SENSOR
Connector Type	RH03FB

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/G	-
2	G/W	-
3	R/W	-

Connector No.	F75
Connector Name	IGNITION COIL No. 1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
2	B	-
3	W	-

Connector No.	F76
Connector Name	IGNITION COIL No. 2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/B	-
2	B	-
3	W	-

Connector No.	F77
Connector Name	IGNITION COIL No. 3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR/Y	-
2	B	-
3	W	-

Connector No.	F78
Connector Name	IGNITION COIL No. 4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG/R	-
2	B	-
3	W	-

Connector No.	F79
Connector Name	IGNITION COIL No. 5 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P/L	-
2	B	-
3	W	-

Connector No.	F80
Connector Name	IGNITION COIL No. 6 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

1 2 3

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y/R	-
2	B	-
3	W	-

JRBWC3501GB

ENGINE CONTROL SYSTEM

Connector No.	F81
Connector Name	IGNITION COIL No. 7 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/Y	-
2	B	-
3	W	-

Connector No.	F82
Connector Name	IGNITION COIL No. 8 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	O	-
2	B	-
3	W	-

Connector No.	F83
Connector Name	CAMSHAFT POSITION SENSOR (BANK 2)
Connector Type	RH03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG/R	-
2	LG/B	-
3	P	-

Connector No.	F84
Connector Name	CAMSHAFT POSITION SENSOR (BANK 1)
Connector Type	RH03FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y/R	-
2	BR/W	-
3	L/R	-

Connector No.	F87
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 1)
Connector Type	AFZ04FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	V	-
3	G	-
4	W/R	-

Connector No.	F88
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 2)
Connector Type	AFZ04FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	V	-
3	L/R	-
4	L/W	-

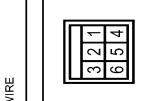
Connector No.	F103
Connector Name	WIRE TO WIRE
Connector Type	M06FW-LC

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G/Y	-
2	R	-
3	V	-
4	R	-
5	G/R	-
6	B/R	-

Connector No.	F104
Connector Name	WIRE TO WIRE
Connector Type	RH08FB

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R/W	-
3	BR/W	-
4	BR/Y	-
5	Y/R	-

JRBWC3502GB

ENGINE CONTROL SYSTEM

Connector No.	F105
Connector Name	WIRE TO WIRE
Connector Type	RS08FGY-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W/L	-
2	L/W	-
3	GR	-
4	B/R	-
5	R	-
6	L	-
7	W	-

Connector No.	F106
Connector Name	WIRE TO WIRE
Connector Type	X02FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	B	-

Connector No.	F110
Connector Name	ECM
Connector Type	MAB35FBR-MEB20-LH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
57	W	THROTTLE CONTROL MOTOR (OPEN)
60	B	SHIELD
63	R	THROTTLE CONTROL MOTOR (CLOSE)
64	V/W	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
67	V	MANIFOLD ABSOLUTE PRESSURE SENSOR
68	BR/W	SENSOR GROUND
70	W/L	SENSOR GROUND
73	P	CAMSHAFT POSITION SENSOR (BANK 2)
74	L	A/F SENSOR 1 (BANK 2)
76	W/G	SENSOR POWER SUPPLY
77	Y/R	SENSOR POWER SUPPLY
78	L/R	A/F SENSOR 1 HEATER (BANK 2)
79	B	THROTTLE POSITION SENSOR 2
80	L/W	A/F SENSOR 1 (BANK 2)
81	G	SENSOR POWER SUPPLY
83	LG/R	SENSOR POWER SUPPLY
85	GR/R	SENSOR POWER SUPPLY
86	R/W	CRANKSHAFT POSITION SENSOR
87	L/W	HEATED OXYGEN SENSOR 2 (BANK 2)
88	B	A/F SENSOR 1 (BANK 1)
90	W	A/F SENSOR 1 (BANK 1)
91	R	THROTTLE POSITION SENSOR 1
94	R	A/F SENSOR 1 (BANK 1)
95	L/R	CAMSHAFT POSITION SENSOR (BANK 1)
96	W/R	HEATED OXYGEN SENSOR 2 (BANK 1)
97	W	SENSOR GROUND
98	G/W	SENSOR GROUND
99	LG/B	SENSOR GROUND
100	R	SENSOR GROUND
101	R	FUEL INJECTOR NO. 1 (HI)
102	R	FUEL INJECTOR NO. 6 (HI)
103	G	FUEL INJECTOR NO. 7 (LO)
104	G	FUEL INJECTOR NO. 4 (LO)
105	L/W	HIGH PRESSURE FUEL PUMP (HI)
106	R	FUEL INJECTOR NO. 7 (HI)
107	R	FUEL INJECTOR NO. 4 (HI)
108	G	FUEL INJECTOR NO. 1 (LO)
109	G	FUEL INJECTOR NO. 6 (LO)
110	L/B	HIGH PRESSURE FUEL PUMP (LO)

Connector No.	F111
Connector Name	ECM
Connector Type	MAB35FB-MEB20-LH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	FUEL INJECTOR NO. 8 (HI)
2	R	FUEL INJECTOR NO. 5 (HI)
3	G	FUEL INJECTOR NO. 3 (LO)
4	G	FUEL INJECTOR NO. 2 (LO)
5	B/R	ECM GROUND
6	R	FUEL INJECTOR NO. 3 (HI)
7	R	FUEL INJECTOR NO. 2 (HI)
8	G	FUEL INJECTOR NO. 8 (LO)
9	G	FUEL INJECTOR NO. 5 (LO)
10	B	ECM GROUND
11	BR	PNP SIGNAL
12	Y	IGNITION SIGNAL NO. 1
13	L/B	IGNITION SIGNAL NO. 2
14	BR/Y	IGNITION SIGNAL NO. 3
15	LG/R	IGNITION SIGNAL NO. 4
17	P/L	IGNITION SIGNAL NO. 5
18	Y/R	IGNITION SIGNAL NO. 6
19	G/Y	IGNITION SIGNAL NO. 7
20	O	IGNITION SIGNAL NO. 8
21	G/O	INTAKE AIR TEMPERATURE SENSOR
22	BR/W	MASS AIR FLOW SENSOR
23	V	LOW FUEL PRESSURE SENSOR
25	LG	SENSOR GROUND
27	P	SENSOR POWER SUPPLY
28	SB	SENSOR POWER SUPPLY
29	W	KNOCK SENSOR (BANK 1)
31	V/W	FUEL RAIL PRESSURE SENSOR
32	R	ENGINE COOLANT TEMPERATURE SENSOR
33	W	KNOCK SENSOR (BANK 2)
35	SHIELD	SHIELD
37	V	COOLING FAN SPEED
39	P/B	POWER STEERING PRESSURE SENSOR
40	W/L	SENSOR GROUND
42	L/Y	ENGINE OIL TEMPERATURE SENSOR
45	L/O	SENSOR GROUND
46	SB	FUEL INJECTOR DRIVER POWER SUPPLY
47	G	HEATED OXYGEN SENSOR 2 HEATER (BANK 1)
48	L/W	A/F SENSOR 1 HEATER (BANK 1)
49	LG/B	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
51	R	FUEL INJECTOR DRIVER POWER SUPPLY
52	L/R	HEATED OXYGEN SENSOR 2 HEATER (BANK 2)
53	SB	A/F SENSOR 1 HEATER (BANK 2)
54	G/R	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)

Connector No.	F121
Connector Name	WIRE TO WIRE
Connector Type	RS08MB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	-
2	BR	-
3	G	-
4	W	-
5	O	-
6	LG	-
7	Y	-
8	R	-

JRBWC3503GB

ENGINE CONTROL SYSTEM

Connector No.	F122
Connector Name	WIRE TO WIRE
Connector Type	RS08MB-PR

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
2	R	-
3	V	-
4	GR	-
5	L	-
6	G	-
7	W	-
8	SB	-

Connector No.	F123
Connector Name	FUEL INJECTOR No. 1
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	R	-

Connector No.	F124
Connector Name	FUEL INJECTOR No. 2
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	-
2	L	-

Connector No.	F125
Connector Name	FUEL INJECTOR No. 3
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR	-
2	LG	-

Connector No.	F126
Connector Name	FUEL INJECTOR No. 4
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	-
2	SB	-

Connector No.	F127
Connector Name	FUEL INJECTOR No. 5
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	-
2	O	-

Connector No.	F128
Connector Name	FUEL INJECTOR No. 6
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	-
2	W	-

Connector No.	F129
Connector Name	FUEL INJECTOR No. 7
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	Y	-

JRBWC3504GB

ENGINE CONTROL SYSTEM

Connector No.	F130
Connector Name	FUEL INJECTOR No. 8
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	-
2	G	-

Connector No.	F202
Connector Name	WIRE TO WIRE
Connector Type	RS04MB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	SHIELD	-
2	W	-
3	SHIELD	-
4	W	-

Connector No.	F203
Connector Name	KNOCK SENSOR (BANK 1)
Connector Type	BS02FGY_B-AHY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	SHIELD	-

Connector No.	F204
Connector Name	KNOCK SENSOR (BANK 2)
Connector Type	BS02FGY_B-AHY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	SHIELD	-

Connector No.	F211
Connector Name	WIRE TO WIRE
Connector Type	RS02FB

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	V	-

Connector No.	F212
Connector Name	FUEL RETURN VALVE
Connector Type	HS02FGY

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	-
2	G	-

Connector No.	F301
Connector Name	TCM (TRANSMISSION CONTROL MODULE)
Connector Type	SP10FG

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	-	IGNITION POWER SUPPLY
2	-	BATTERY POWER SUPPLY
3	-	CAN-H
4	-	K-LINE
5	-	GROUND
6	-	IGNITION POWER SUPPLY
7	-	BACK-UP LAMP RELAY
8	-	CAN-L
9	-	STARTER RELAY
10	-	GROUND

Connector No.	M1
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FW-M2

H.S.

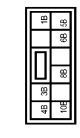
Terminal No.	Color Of Wire	Signal Name [Specification]
1A	Y	-
2A	GR	-
3A	W	-
4A	Y/G	-
5A	V	-
6A	L/W	-
7A	LG	-
8A	W	-

JRBWC3505GB

ENGINE CONTROL SYSTEM

Connector No.	M2
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS10FW-CS

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1B	R	-
3B	R	-
4B	B	-
5B	BR	-
6B	Y	-
9B	L/O	-
10B	W/B	-

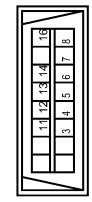
Connector No.	M3
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS12FW-CS

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
10C	GR	-
11C	R/L	-
12C	GR/L	-
6C	R	-
7C	B	-
8C	W	-

Connector No.	M4
Connector Name	DATA LINK CONNECTOR
Connector Type	BD16FW

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3	LG	-
4	B	-
5	B	-
6	L	-
7	SB	-
8	GR	-
11	SB	-
12	R	-
13	L	-
14	P	-
16	Y	-

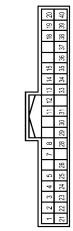
Connector No.	M33
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY-1V

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
24	Y/G	-
25	Y	-
26	B	-
31	Y/L	-
32	R	-
33	B	-
34	P/B	-

Connector No.	M34
Connector Name	COMBINATION METER
Connector Type	TH40FW-NH

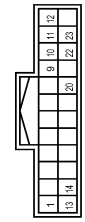
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	BATTERY POWER SUPPLY
2	GR	IGNITION SIGNAL
3	B	GROUND
4	B	ILL GND
5	B	ILL CONTROL OUTPUT
7	R	TOW MODE SIGNAL
8	P/L	TRIP RESET SWITCH SIGNAL
11	G	ENTER SWITCH SIGNAL
12	O	SELECT SWITCH SIGNAL
13	W/R	ILLUMINATION CONTROL SWITCH SIGNAL (+)
14	R	ILLUMINATION CONTROL SWITCH SIGNAL (-)
15	R/W	AIR BAG SIGNAL
18	W/R	AMBIENT SENSOR SIGNAL
19	V/W	A/C AUTO AMP. CONNECTION RECOGNITION SIGNAL
20	B	AMBIENT SENSOR GROUND
21	L	CAN-H
22	P	CAN-L
23	B	GROUND
24	V	FUEL LEVEL SENSOR GROUND
25	O/L	ALTERNATOR SIGNAL
26	W	PARKING BRAKE SWITCH SIGNAL
28	GR/R	SECURITY SIGNAL
29	BR	WASHER LEVEL SWITCH SIGNAL
30	SB	VEHICLE SPEED SIGNAL (2-PULSE)
31	BR/W	VEHICLE SPEED SIGNAL (8-PULSE)
33	W	SNOW MODE SIGNAL
34	BR/Y	FUEL LEVEL SENSOR SIGNAL
35	O/B	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)
36	G/Y	PASSENGER SEAT BELT WARNING SIGNAL
37	R/Y	NON-MANUAL MODE SIGNAL
38	L/W	MANUAL MODE SHIFT DOWN SIGNAL
39	Y/B	MANUAL MODE SHIFT UP SIGNAL
40	G/W	MANUAL MODE SIGNAL

Connector No.	M54
Connector Name	4WD SWITCH ASSEMBLY
Connector Type	TH24FW-NH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	VDC OFF SW
9	W/R	AUTO SW
10	R	4H SW
11	V	4L SW
12	GR	IGN
13	L/W	LIGHT SW
14	B/O	ILL CONT
20	B	GND
22	W	SNOW SW
23	R	TOW

Connector No.	M71
Connector Name	BCM (BODY CONTROL MODULE)
Connector Type	TH40FW-NH

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
72	P	PUDDLE LAMP CONT
73	W	ON IND
74	Y/B	TRAILER TURN SIG RH CONT
75	LG/R	DRIVER DOOR REQUEST SW
76	SB	PUSH SW
77	O/L	TRAILER TURN SIG LH CONT
78	P/B	DRIVER DOOR ANT+
79	V	DRIVER DOOR ANT-
80	LG/B	PASSENGER DOOR ANT+
81	Y/R	PASSENGER DOOR ANT-

JRBWC3506GB

ENGINE CONTROL SYSTEM

82	W/G	BACK DOOR ANT+
83	B/W	BACK DOOR ANT-
84	BR	ROOM ANT1+
85	Y	ROOM ANT1-
86	W	ROOM ANT2+
87	B	ROOM ANT2-
88	V	LAGGAGE ROOM ANT+
89	G	LAGGAGE ROOM ANT-
90	Y	PUSH-BTN IGN SW ILL PWR
91	O	LOCK IND
92	L	LOW SIDE PUSH LED
93	GR/R	I-KEY WARN BUZZER
96	BR	ACC RELAY CONT
97	R/W	STARTER RELAY CONT
98	O	IGN RELAY (IPDM E/R) CONT
99	R	IGN RELAY (F/B) CONT
100	P/L	PASSENGER DOOR REQUEST SW
101	W/B	IGN PWR SPLY 2
102	BR	SHIFT N/P
104	R/B	A/T SHIFT SELECT PWR SPLY
105	O/L	STOP LAMP SW 2
106	Y/G	BLWR FAN MTR RELAY CONT
109	L/W	ACC IND

Connector No.	M77
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	-
2	L/W	-
3	R/B	-
4	L	-
5	Y	-
6	SB	-
7	W/G	-
8	P/B	-
9	W/B	-
10	G	-
11	L	-
12	P	-
13	P/B	-
14	BR	-
15	O/L	-
16	SB	-
18	BR	-
19	Y/G	-
20	BR/Y	-
21	V	-
22	L	-
23	Y	-
24	L/W	-
28	O	-
29	R/W	-
30	O/L	-
31	Y	-
32	GR/R	-
34	Y	-
35	R	-
36	B/O	-
37	G/Y	-
38	G	-
40	SB	-
41	W/R	-
42	R	-
43	V	-
51	L/O	-
52	BR/W	-
53	BR/Y	-
54	GR/L	-
60	W	-
61	B	-
62	G	-
63	R	-
64	SHIELD	-
91	BR	-
92	L/W	-
94	Y/B	-
95	L/R	-
97	R	-
98	O/L	-
100	W/B	-

Connector No.	M82
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	-
4	V/W	-
5	G/R	-
6	P	-
9	GR/L	-
10	Y/R	-
11	L/R	-
12	W/G	-
13	BR/Y	-
14	LG	-
15	BR/W	-
16	B/Y	-
17	W/B	-
18	GR/R	-
20	W/R	-
21	B	-
22	R/L	-
23	G/R	-
24	R/W	-
25	W/L	-
26	R	-
27	L	-
28	B/SB	-
35	G	-
36	Y	-
37	R	-
38	G/Y	-
39	O	-
40	W	-
41	R	-
42	B	-
43	G	-
44	SHIELD	-
46	B	-
47	W	-
48	SHIELD	-
49	W	-
50	SHIELD	-
51	Y/R	-
52	G/R	-
53	LG/B	-
54	LG/R	-
55	R/G	-
56	B/O	-
57	SB	-
60	G	-
61	B	-
62	W	-
63	R	-
64	SHIELD	-
65	L/Y	-
66	V	-
67	B/W	-
91	G/R	-
95	SB	-
96	G/R	-
97	GR/L	-
98	G/W	-
99	P	-
100	L	-

Connector No.	M108
Connector Name	POWER STEERING CONTROL UNIT
Connector Type	TH12FW-NH

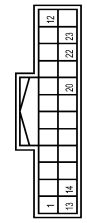
H.S.

Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	EPS SOL SUPLLY
3	GR	IGN
5	L	EPS SOL GND
6	B	GND
8	SB	VEHICLE SPEED (2P)
10	B/SB	ENG TACHO

JRBWC3507GB

ENGINE CONTROL SYSTEM

Connector No.	M147
Connector Name	SNOW MODE / TOW MODE / VDC OFF SWITCH ASSEMBLY
Connector Type	TH24FW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/W	VDC OFF SW
12	GR	IGN
13	L/W	LIGHT SW
14	B/O	ILL CONT
20	B	GND
22	W	SNOW SW
23	R	TOW

Connector No.	M302
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY

Terminal No.	Color Of Wire	Signal Name [Specification]
13	-	-
14	-	-
15	-	-
16	-	-
17	-	-
18	-	-
19	-	-
20	-	-

JRBWC3508GB

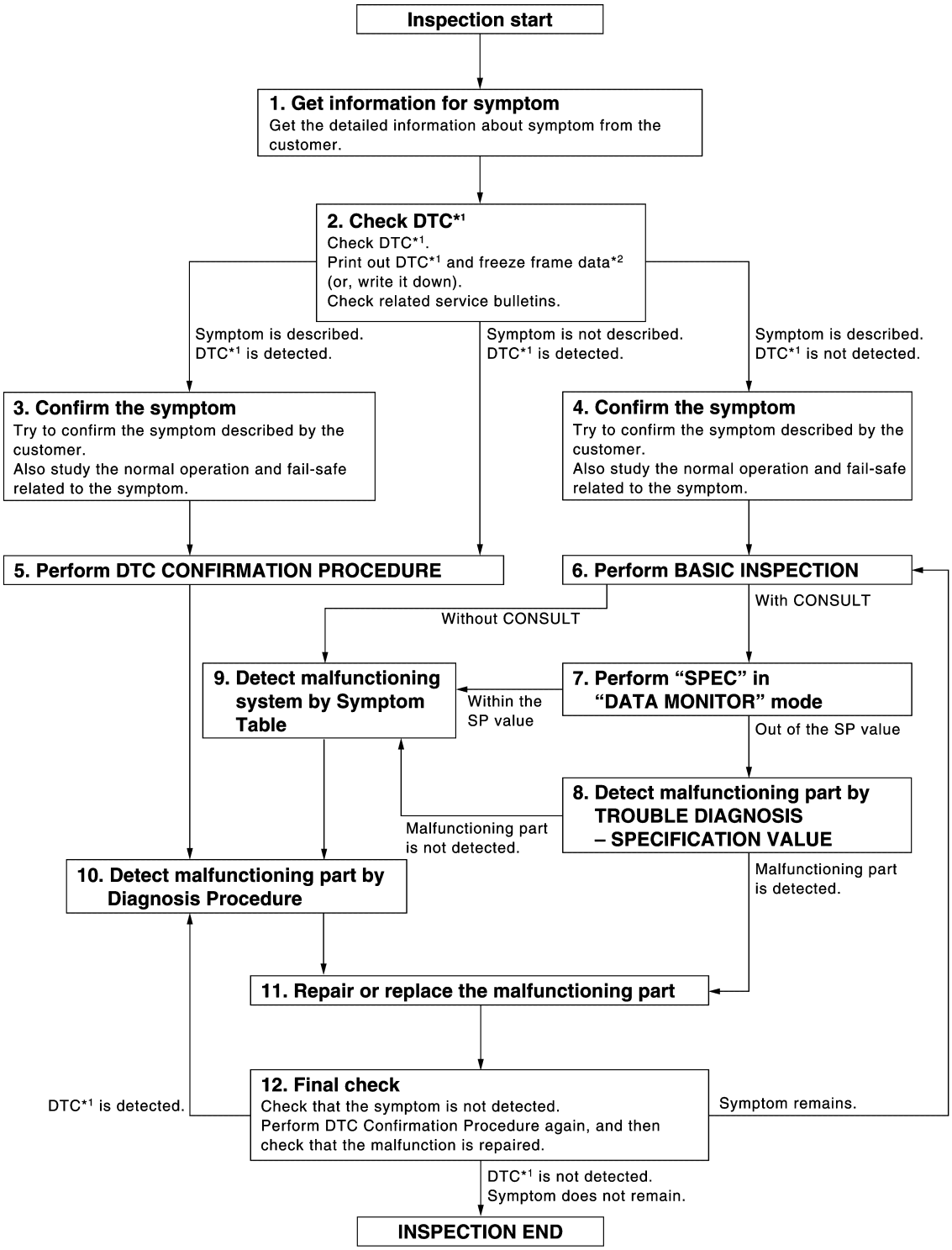
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000009009351

OVERALL SEQUENCE



*1: Include 1st trip DTC.
*2: Include 1st trip freeze frame data.

JSBIA1228GB

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-715, "Diagnostic Work Sheet".)

>> GO TO 2.

2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.

- Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
- Erase DTC. (Refer to “How to Erase DTC and 1st Trip DTC” in EC-638, "CONSULT Function" or EC-635, "On Board Diagnosis Function".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Matrix Chart is useful. Refer to EC-1041, "Symptom Table".)

3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

Symptom is described, DTC is detected>>GO TO 3.
Symptom is described, DTC is not detected>>GO TO 4.
Symptom is not described, DTC is detected>>GO TO 5.

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).
Also study the normal operation and fail-safe related to the symptom. Refer to EC-1046, "Description" and EC-668, "Fail-safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail-safe related to the symptom. Refer to EC-1046, "Description" and EC-668, "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-671, "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-43, "Intermittent Incident".

6.PERFORM BASIC INSPECTION

Perform EC-716, "Work Procedure".

Will CONSULT be used?

YES >> GO TO 7.
NO >> GO TO 9.

7. PERFORM SPEC IN DATA MONITOR MODE

WITH CONSULT
Check that “MAS A/F SE-B1”, “B/FUEL SCHDL”, “A/F ALPHA-B1” and “A/F ALPHA-B2” are within the SP value using “SPEC” in “DATA MONITOR” mode with CONSULT. Refer to EC-739, "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-740, "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-1041, "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-46, "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-647, "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. Refer to “How to Erase DTC and 1st Trip DTC” in EC-638, "CONSULT Function" or EC-635, "On Board Diagnosis Function".

>> GO TO 12.

12. FINAL CHECK

When DTC was detected in step 2, perform DTC CONFIRMATION PROCEDURE or Component Function Check again, and then check that the malfunction have been completely repaired.
When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and check that the symptom is not detected.

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.
YES-2 >> Symptom remains: GO TO 6.
NO >> Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). (Refer to “How to Erase DTC and 1st Trip DTC” in EC-638, "CONSULT Function" or EC-635, "On Board Diagnosis Function".) If the completion of SRT is

needed, drive vehicle under the specific driving pattern. Refer to EC-735, "SRT Set Driving Pattern".

Diagnostic Work Sheet

INFOID:0000000009009352

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 [ ]	
Symptoms – ☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
Symptoms – ☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
Symptoms – ☐ 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 conditions – Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
Weather conditions – 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

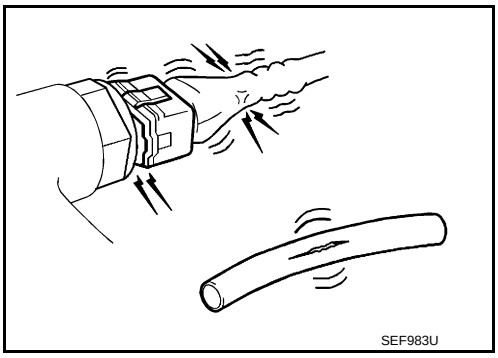
BASIC INSPECTION

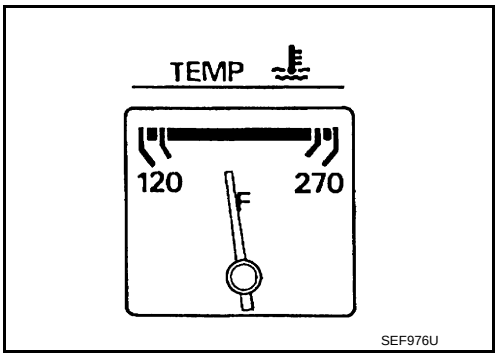
Work Procedure

INFOID:0000000009009353

1.INSPECTION START

1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leakage
- Air cleaner clogging
- Gasket
3. Check that electrical or mechanical loads are not applied.
- Headlamp switch is OFF.
- Air conditioner switch is OFF.
- Rear window defogger switch is OFF.
- Steering wheel is in the straight-ahead position, etc.
4. Start engine and warm it up until engine coolant temperature indicator points to the middle of gauge.
   Check that engine stays below 1,000 rpm.


SEF983U

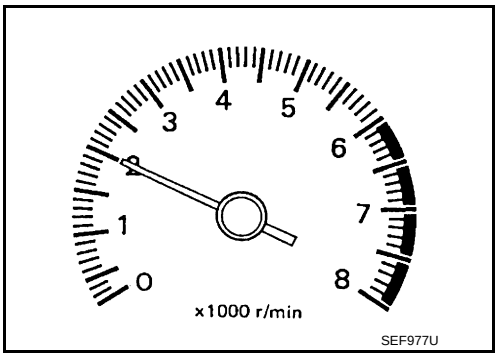


SEF976U

5. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.
6. Check that no DTC is displayed with CONSULT or GST.

Are any DTCs detected?

YES >> GO TO 2.
NO >> GO TO 3.



SEF977U

2.REPAIR OR REPLACE

Repair or replace components as necessary according to corresponding Diagnosis Procedure.

>> GO TO 3

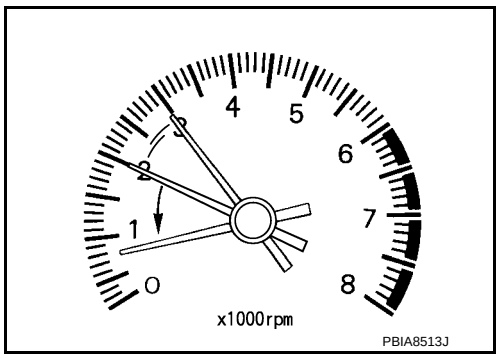
3.CHECK IDLE SPEED

1. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.

2. Rev engine between 2,000 and 3,000 rpm 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.
3. Check idle speed.
   For procedure, refer to EC-1047, "Inspection".
   For specification, refer to EC-1055, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 4.



4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-724, "Work Procedure".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-725, "Work Procedure".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-726, "Work Procedure".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 7.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

7. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-1047, "Inspection".
   For specification, refer to EC-1055, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor and circuit. Refer to EC-855, "DTC Logic".
- Check crankshaft position sensor and circuit. Refer to EC-851, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace malfunctioning part. Then GO TO 4.

9. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-49, "ECM : Work Procedure".

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.
   For procedure, refer to EC-1048, "Inspection".

For specification, refer to EC-1055, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-724, "Work Procedure".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-725, "Work Procedure".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-726, "Work Procedure".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 14.
NO >> Follow the instruction of Idle Air Volume Learning. Then GO TO 4.

14. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-1047, "Inspection".
   For specification, refer to EC-1055, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
   For procedure, refer to EC-1048, "Inspection".
   For specification, refer to EC-1055, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-64, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Repair the timing chain installation. Then GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor and circuit. Refer to EC-855, "DTC Logic".
- Check crankshaft position sensor and circuit. Refer to EC-851, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 18.
NO >> Repair or replace malfunctioning part. Then GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)

2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-49, "ECM : Work Procedure".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, perform EC-720, "Work Procedure".

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING ECM

Description

INFOID:0000000009009354

When replacing ECM, the following procedure must be performed. (For details, refer to EC-720, "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.

BEFORE REPLACEMENT

When replacing ECM, perform “SAVING DATA FOR REPLC CPU” in “WORK SUPPORT” of “ENGINE” by using CONSULT to save current ECM data before replacement.

AFTER REPLACEMENT

After replacing ECM, the following items must be performed:
- Write data after replace CPU
- Accelerator pedal released position learning
- Throttle valve closed position learning
- Idle air volume learning

Work Procedure

INFOID:0000000009009355

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-1052, "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-1052, "Removal and Installation".

>> GO TO 6.

6.PERFORM INITIALIZATION OF IVIS (NATS) SYSTEM AND REGISTRATION OF ALL IVIS (NATS) IGNITION KEY IDS

Refer to SEC-49, "ECM : Work Procedure".

>> GO TO 7.

7.CHECK ECM DATA STATUS

Check if the data is successfully copied from the ECM at Step 1 (before replacement) and saved in CONSULT.

Is the data saved successfully?

YES >> GO TO 8.
NO >> GO TO 9.

8.WRITE ECM DATA

With CONSULT
1. Select “WRITING DATA FOR REPLC CPU” in “WORK SUPPORT” mode of “ENGINE” using CONSULT.
2. Follow the instruction of CONSULT display.

NOTE:
The data saved by “SAVING DATA FOR REPLC CPU” is written to ECM.

>> GO TO 10.

9.PERFORM VIN REGISTRATION

Refer to EC-723, "Work Procedure".

>> GO TO 10.

10.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Perform Accelerator Pedal Released Position Learning. Refer to EC-724, "Work Procedure".

>> GO TO 11.

11.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform Throttle Valve Closed Position Learning. Refer to EC-725, "Work Procedure".

>> GO TO 12.

12.PERFORM IDLE AIR VOLUME LEARNING

Perform Idle Air Volume Learning. Refer to EC-726, "Work Procedure".

>> END

ADDITIONAL SERVICE WHEN REPLACING VVEL CONTROL MODULE

Description

INFOID:0000000009009356

When replacing VVEL control module, the following procedure must be performed.

Work Procedure

INFOID:0000000009009357

1.PERFORM IDLE AIR VOLUME LEARNING

Perform idle air volume learning. Refer to EC-726, "Work Procedure".

>> END

VIN REGISTRATION

Description

INFOID:0000000009009358

VIN Registration is an operation to register VIN in ECM. It must be performed each time ECM is replaced.

Work Procedure

INFOID:0000000009009359

1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to GI-23, "Information About Identification or Model Code".

>> GO TO 2.

2.PERFORM VIN REGISTRATION

WITH CONSULT

1. Turn ignition switch ON with engine stopped.
2. Select “VIN REGISTRATION” in “WORK SUPPORT” mode.
3. Follow the instructions on the CONSULT display.

>> END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description

INFOID:0000000009009360

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected.

Work Procedure

INFOID:0000000009009361

1.START

1. Check that accelerator pedal is fully released.
2. Turn ignition switch ON and wait at least 2 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and wait at least 2 seconds.
5. Turn ignition switch OFF and wait at least 10 seconds.

>> END

THROTTLE VALVE CLOSED POSITION LEARNING

Description

INFOID:0000000009009362

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time the harness connector of the electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned.

Work Procedure

INFOID:0000000009009363

1.START

WITH CONSULT
1. Turn ignition switch ON.
2. Select “CLSD THL POS LEARN” in “WORK SUPPORT” mode.
3. Follow the instructions on the CONSULT display.
4. Turn ignition switch OFF and wait at least 10 seconds.
   Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

WITHOUT CONSULT
1. Start the engine.
   NOTE:
   Engine coolant temperature is 25°C (77°F) or less before engine starts.
2. Warm up the engine.
   NOTE:
   Raise engine coolant temperature until it reaches 65°C (149°F) or more.
3. Turn ignition switch OFF and wait at least 10 seconds.
   Check that throttle valve moves during the above 10 seconds by confirming the operating sound.

>> END

IDLE AIR VOLUME LEARNING

Description

INFOID:0000000009009364

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within the specific range. It must be performed under the following conditions:
- Each time the electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of the specification.

Work Procedure

INFOID:0000000009009365

1.PRECONDITIONING

Check that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.
- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 105°C (158 - 221°F)
- Selector lever position: P or N
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not illuminate.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT: Drive vehicle until “ATF TEMP 2” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9 V.
- Without CONSULT: Drive vehicle for 10 minutes.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 3.

2.PERFORM IDLE AIR VOLUME LEARNING

WITH CONSULT
1. Perform Accelerator Pedal Released Position Learning. Refer to EC-724, "Work Procedure".
2. Perform Throttle Valve Closed Position Learning. EC-725, "Work Procedure".
3. Start engine and warm it up to normal operating temperature.
4. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
5. Touch “START” and wait 20 seconds.

Is “CMPLT” displayed on CONSULT screen?

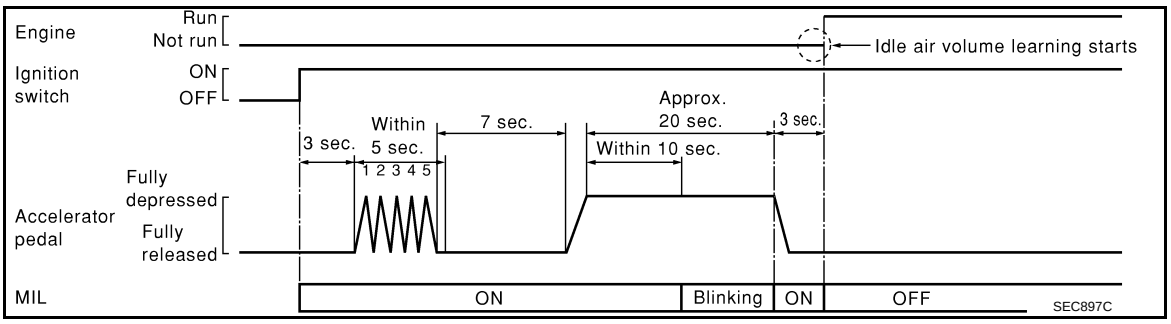
YES >> GO TO 4.
NO >> GO TO 5.

3.PERFORM IDLE AIR VOLUME LEARNING

WITHOUT CONSULT
NOTE:
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform Accelerator Pedal Released Position Learning. Refer to EC-724, "Work Procedure".
2. Perform Throttle Valve Closed Position Learning. EC-725, "Work Procedure".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly 5 times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and turns ON.
8. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.

9. Start engine and let it idle.
10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up engine two or three times and check that idle speed and ignition timing are within the specifications.
For procedure, refer to EC-1047, "Inspection" and EC-1048, "Inspection".
For specifications, refer to EC-1055, "Idle Speed" and EC-1055, "Ignition Timing".

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART-I

Check the following
- Check that throttle valve is fully closed.
- Check PCV valve operation.
- Check that downstream of throttle valve is free from air leakage.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace malfunctioning part.

6. DETECT MALFUNCTIONING PART-II

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.
It is useful to perform “TROUBLE DIAGNOSIS - SPECIFICATION VALUE”. Refer to EC-739, "Description".
If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:
- Engine stalls.
- Incorrect idle.

>> INSPECTION END

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Description

INFOID:0000000009009366

VVEL control shaft position sensor adjustment is an operation to adjust the initial position of the VVEL control shaft position sensor.
It must be performed each time VVEL ladder assembly is replaced.

CAUTION:

- **It must be performed only on the replaced bank side.**
- **It must not be performed except when VVEL ladder assembly is replaced. If by any chance the adjustment is performed, replace VVEL ladder assembly.**

Work Procedure

INFOID:0000000009009367

1.START

Will CONSULT be used?

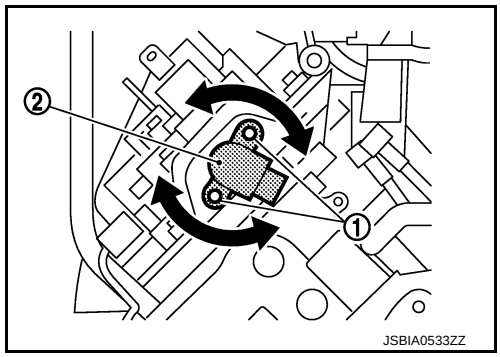
Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 3.

2.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

WITH CONSULT

1. Turn ignition switch ON.
2. Select “VVEL POS SEN ADJ PREP” in “WORK SUPPORT” mode with CONSULT.
3. Touch “Start” and wait a few seconds.
4. Check that “CMPLT” is displayed on CONSULT screen.
5. Select “VVEL POSITION SEN-B1” or “VVEL POSITION SEN-B2” in “DATA MONITOR” mode with CONSULT.
6. Loosen the VVEL control shaft position sensor mounting bolts (1).
7. Turn the VVEL control shaft position sensor (2) clockwise and counterclockwise while monitoring the output voltage of “VVEL POSITION SEN-B1” or “VVEL POSITION SEN-B2” and adjust the output voltage to be within the standard value.



Voltage: 500 ± 48 mV

8. Tighten the VVEL control shaft position sensor mounting bolts.

: 7.0 N·m (0.71 kg-m, 62 in-lb)

9. Reconfirm that the output voltage of “VVEL POSITION SEN-B1” or “VVEL POSITION SEN-B2” is within the standard value.

Voltage: 500 ± 48 mV

NOTE:
If it varies from the standard value after the mounting bolts are tightened, perform steps 6 to 8 again.

10. Turn ignition switch OFF and wait at least 10 seconds.
11. Start engine and warm it up to normal operating temperature.
12. Turn ignition switch OFF and wait at least 10 seconds.
13. Perform idle air volume learning. Refer to EC-726, "Work Procedure".

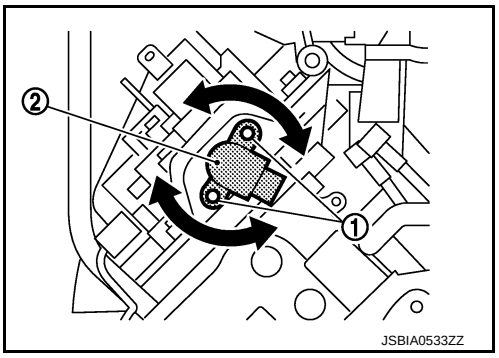
>> INSPECTION END

3.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

WITHOUT CONSULT

1. Disconnect VVEL control shaft position sensor harness connector.
2. Remove VVEL actuator motor relay.
3. Turn ignition switch ON, wait at least 5 seconds and then turn it OFF.

4. Reconnect all harness connectors disconnected.
5. Install VVEL actuator motor relay.
6. Turn ignition switch ON and wait at least 5 seconds.
7. Loosen the VVEL control shaft position sensor mounting bolts (1).
8. Turn the VVEL control shaft position sensor (2) clockwise and counterclockwise while monitoring the output voltage between the VVEL control module terminals with a tester and adjust the output voltage to be within the standard value.



VVEL control module				Voltage
Bank	Connector	+	–	
		Terminal	Terminal	
1	F56	3	6	500 ± 48 mV
2		5	4	

9. Tighten the VVEL control shaft position sensor mounting bolts.

: **7.0 N·m (0.71 kg-m, 62 in-lb)**

10. Reconfirm that the output voltage of VVEL control shaft position sensor is within the standard value.

VVEL control module				Voltage
Bank	Connector	+	–	
		Terminal	Terminal	
1	F56	3	6	500 ± 48 mV
2		5	4	

NOTE:
If it varies from the standard value after the mounting bolts are tightened, perform steps 7 to 9 again.

11. Turn ignition switch OFF and wait at least 10 seconds.
12. Start engine and warm it up to normal operating temperature.
13. Turn ignition switch OFF and wait at least 10 seconds.
14. Perform Idle Air Volume Learning. Refer to EC-726, "Work Procedure".

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description

INFOID:0000000009009368

This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instructions in “Diagnosis Procedure”.

Work Procedure

INFOID:0000000009009369

1.START

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT.
3. Clear mixture ratio self-learning value by touching “CLEAR”.

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Select Service $03 with GST. Check DTC P0102 is detected.
7. Select Service $04 with GST to erase the DTC P0102.

>> END

FUEL PRESSURE

Work Procedure

INFOID:0000000009009370

FUEL PRESSURE RELEASE

WITH CONSULT

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with 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 in IPDM E/R.
   NOTE:
   - For the fuse number, refer to EC-689, "Wiring Diagram".
   - For the fuse arrangement, refer to PG-99, "Fuse, Connector and Terminal Arrangement".
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
4. Turn ignition switch OFF.
5. Reinstall fuel pump fuse after servicing fuel system.

LOW FUEL PRESSURE CHECK

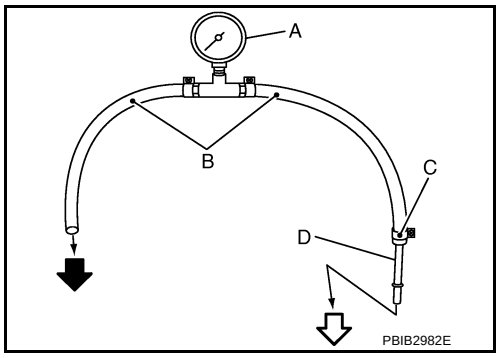
CAUTION:

- **Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.**
- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.**

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out.

1. Release fuel pressure to zero.
2. Prepare fuel hose for fuel pressure check (B) and fuel tube adapter [SST (KV10118400)] (D), then connect fuel pressure gauge (A).



⇦ **To quick connector**

⬅ **To fuel tube (engine side)**

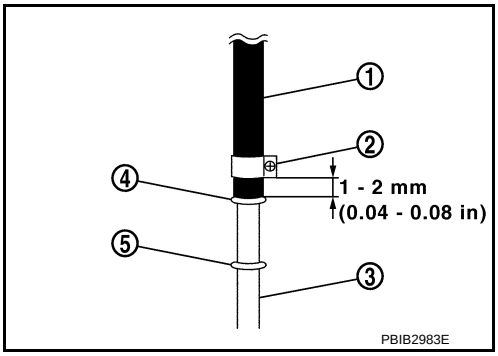
C : Hose clamp

CAUTION:

- **Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).**
- **To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.**
- **Do not use the fuel hose for checking fuel pressure with damage or cracks on it.**
- **Use Pressure Gauge to check fuel pressure.**

3. Disconnect fuel feed hose from fuel tube. Refer to EM-44, "Exploded View".
   CAUTION:
   Do not twist or kink fuel hose because it is plastic hose.

4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.



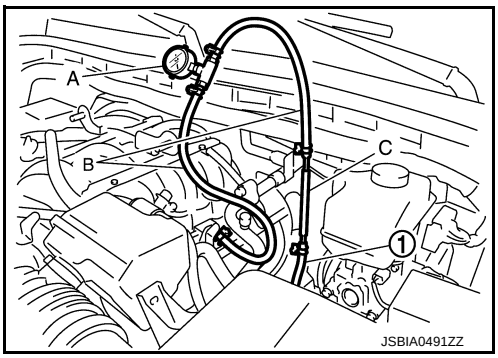
5 : No.2 spool

CAUTION:
- **Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.**
- **Apply proper amount of gasoline between top of the fuel tube (3) and No.1 spool (4).**
- **Insert fuel hose for fuel pressure check until it touches the No.1 spool on fuel tube.**
- **Use NISSAN genuine hose clamp (part number: 16439 N4710 or 16439 40U00).**
- **When reconnecting fuel line, always use new clamps.**
- **Use a torque driver to tighten clamps.**
- **Install hose clamp to the position within 1 - 2 mm (0.04 - 0.08 in).**

Tightening torque : 1.0 - 1.5 N·m (0.1 - 0.15 kg-m, 9 - 13 in-lb)

- **Make sure that clamp screw does not contact adjacent parts.**

5. Connect fuel tube adapter (C) to fuel feed hose (1) in the same manner as instructed in Step 4.



A : Fuel pressure gauge

B : Fuel hose for fuel pressure check

6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
7. Reinstall the part removed at Step 3.
   NOTE:
   Install the part to allow smooth engine starts.
8. Turn ignition switch ON and check for fuel leakage.
9. Start engine and check for fuel leakage.
10. Read the indication of fuel pressure gauge.
    CAUTION:
    - **Do not perform fuel pressure check with system operating. Fuel pressure gauge may indicate false readings.**
    - **During fuel pressure check, confirm for fuel leakage from fuel connection every 3 minutes.**

At idling : Approximately 450 kPa (4.5 bar, 4.6 kg/cm^2, 65 psi)

HIGH FUEL PRESSURE CHECK

NOTE:
Since the fuel pressure gauge kit cannot be connected, follow the method shown below to check high fuel pressure.

WITH CONSULT

1. Start engine.
2. Check “FUEL PRES SEN V” in “DATA MONITOR” mode with CONSULT.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Idle	980 – 1,200 mV
	Revving engine from idle to 4,000 rpm quickly	1,100 – 2,900 mV

⊗WITHOUT CONSULT
1. Start the engine.
2. Check fuel rail pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Fuel rail pressure sensor				
Connector	Terminal			
F26	2	Ground	Engine speed: idle	0.98 – 1.2 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	1.1 – 2.9 V

HOW TO SET SRT CODE

Description

INFOID:0000000009009371

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

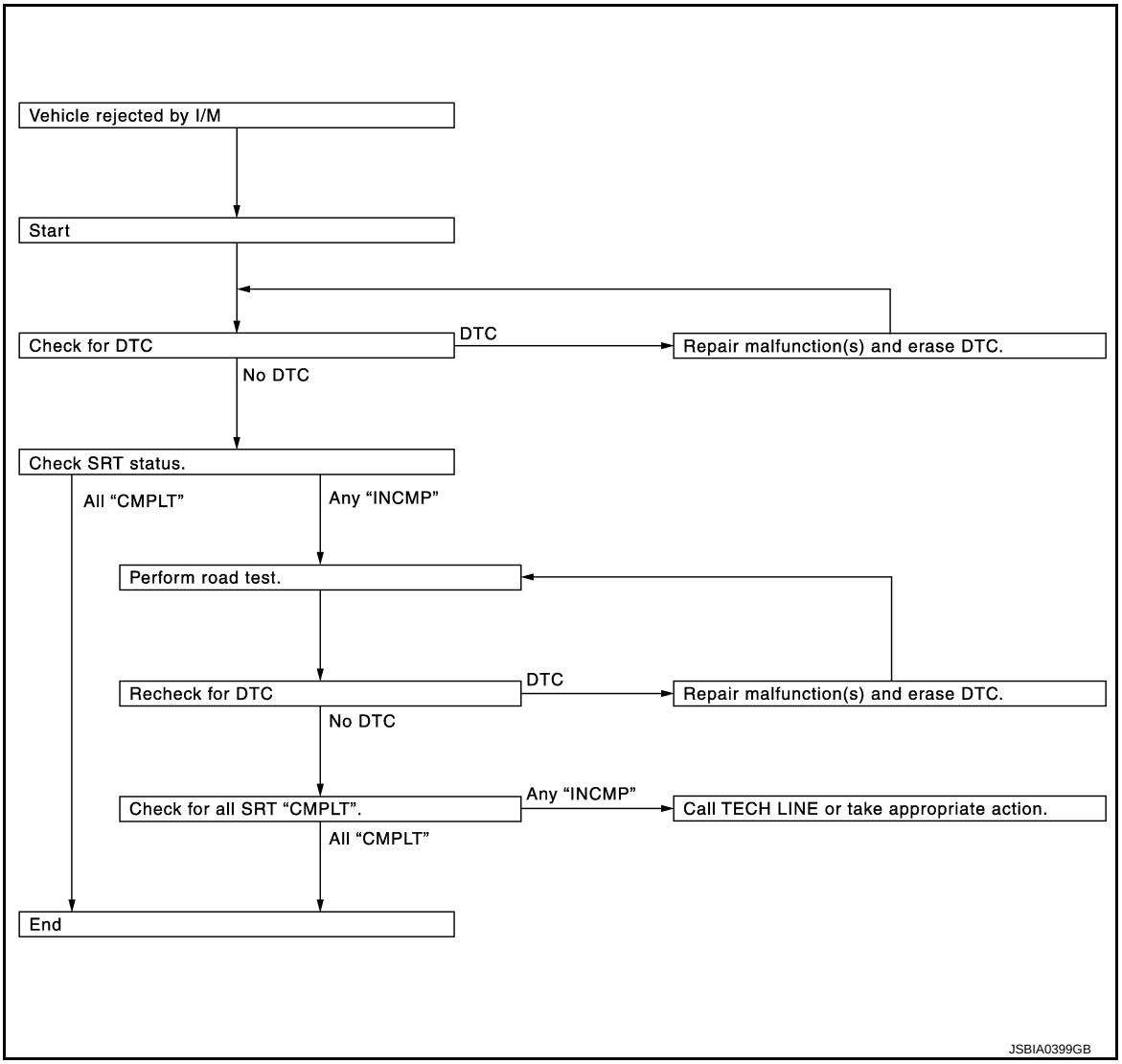
The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item*1 (CONSULT indication)	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	Three way catalyst function	P0420, P0430
HO2S	Air fuel ratio (A/F) sensor 1	P0130, P0133, P0150, P0153
	Heated oxygen sensor 2	P0137, P0157
	Heated oxygen sensor 2	P0138, P0158
	Heated oxygen sensor 2	P0139, P0159
EGR/VVT SYSTEM	Intake value timing control function	P0011, P0021

*1: Though displayed on the CONSULT 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.

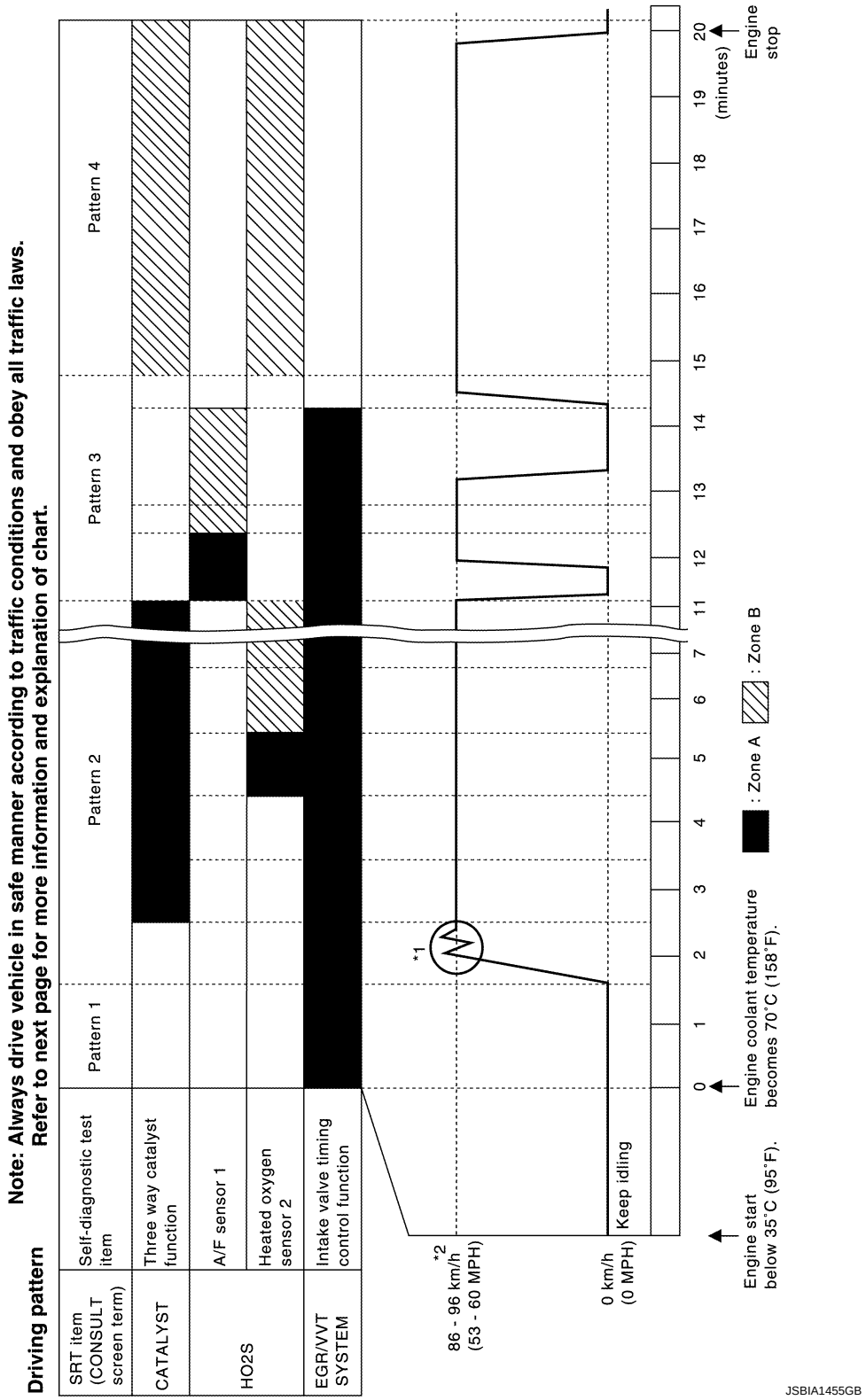


SRT Set Driving Pattern

INFOID:0000000009009372

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 refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.

Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

- Sea level
- Flat road
- Ambient air temperature: 20 - 30°C (68 - 86°F)
- Diagnosis is performed as quickly as possible under normal conditions.
  Under different conditions [For example: ambient air temperature other than 20 - 30°C (68 - 86°F)], diagnosis may also be performed.

Work Procedure

INFOID:0000000009009373

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-672, "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-635, "On Board Diagnosis Function".
WITH GST
Select Service $01 with GST.

Is SRT code(s) set?

YES >> END
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-734, "Description".
3. Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-672, "DTC Index".
NO >> GO TO 9.

4.PERFORM ROAD TEST

- Check the “Performance Priority” in the “SRT ITEM” table. Refer to EC-734, "Description".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to EC-735, "SRT Set Driving Pattern".
  In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

1. Check the vehicle condition;
- Engine coolant temperature is –10 to 35°C (14 to 95°F).
- Fuel tank temperature is more than 0°C (32°F).
2. Start the engine.
3. Keep engine idling until the engine coolant temperature is greater than 70°C (158°F)

NOTE:
ECM terminal voltage is follows;

- Engine coolant temperature
- –10 to 35°C (14 to 95°F): 3.0 - 4.3 V
- 70°(158°F): Less than 1.4 V

• Fuel tank temperature: Less than 4.1 V
Refer to EC-647, "Reference Value".

>> GO TO 6.

6. PATTERN 2

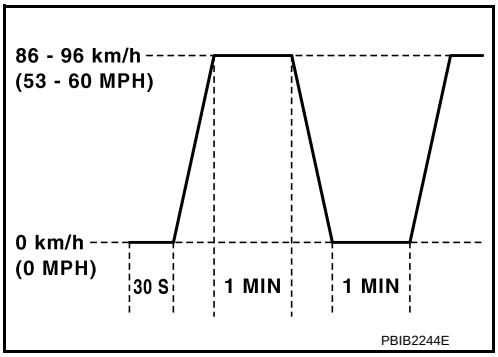
1. Drive the vehicle. And depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH), then release the accelerator pedal and keep it released for more than 10 seconds.
2. Depress the accelerator pedal until vehicle speed is 90 km/h (56 MPH) again

NOTE:
• Checking the vehicle speed with GST is advised.
• When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

7. PATTERN 3

• Operate vehicle following the driving pattern shown in the figure.
• Release the accelerator pedal during deceleration of vehicle speed from 90 km/h (56 MPH) to 0 km/h (0 MPH).



>> GO TO 8.

8. PATTERN 4

• The accelerator pedal must be held very steady during steady-state driving.
• If the accelerator pedal is moved, the test must be conducted again.

>> GO TO 9.

9. CHECK SRT STATUS

WITH CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode with CONSULT.
WITHOUT CONSULT
Perform “SRT status” mode with EC-635, "On Board Diagnosis Function".
WITH GST
Select Service $01 with GST.

Is SRT(s) set?

YES >> END
NO >> Call TECH LINE or take appropriate action.

DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000009009374

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” in “DATA MONITOR” mode of CONSULT during normal operation of the Engine Control System. When the value in “SPEC” in “DATA MONITOR” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “SPEC” in “DATA MONITOR” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.
The SP value will be displayed for the following items:
- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1/B2 (The signal voltage of the mass air flow sensor)
- IDLE FUEL PRES MAX/MIN (the signal voltage of the fuel rail pressure sensor)

Component Function Check

INFOID:0000000009009375

1. PRECONDITIONING

Check that all of the following conditions are satisfied.
TESTING CONDITION
- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (0.983 - 1.043 bar, 1.003 - 1.064 kg/cm^2, 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up
- After the engine is warmed up to normal operating temperature, drive vehicle until “ATF TEMP 2” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
- Rear window defogger switch, air conditioner switch and lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle
- Gear position: Neutral (or parking)

>> GO TO 2.

2. PERFORM SPEC IN DATA MONITOR MODE

WITH CONSULT
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform EC-716, "Work Procedure".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, “A/F ALPHA-B2”, “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode with CONSULT.
3. Check that monitor items are within the SP value.

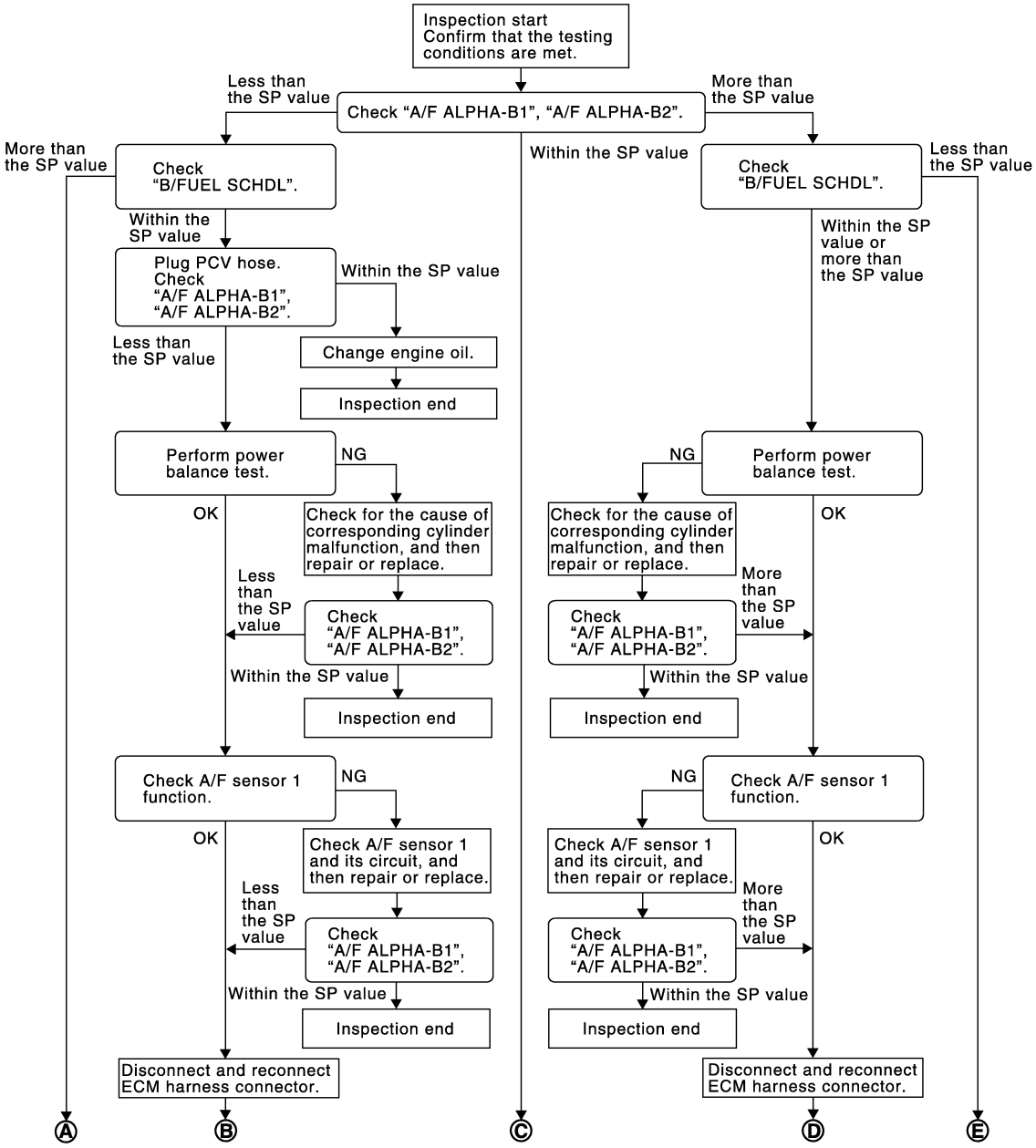
Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Proceed to EC-740, "Diagnosis Procedure".

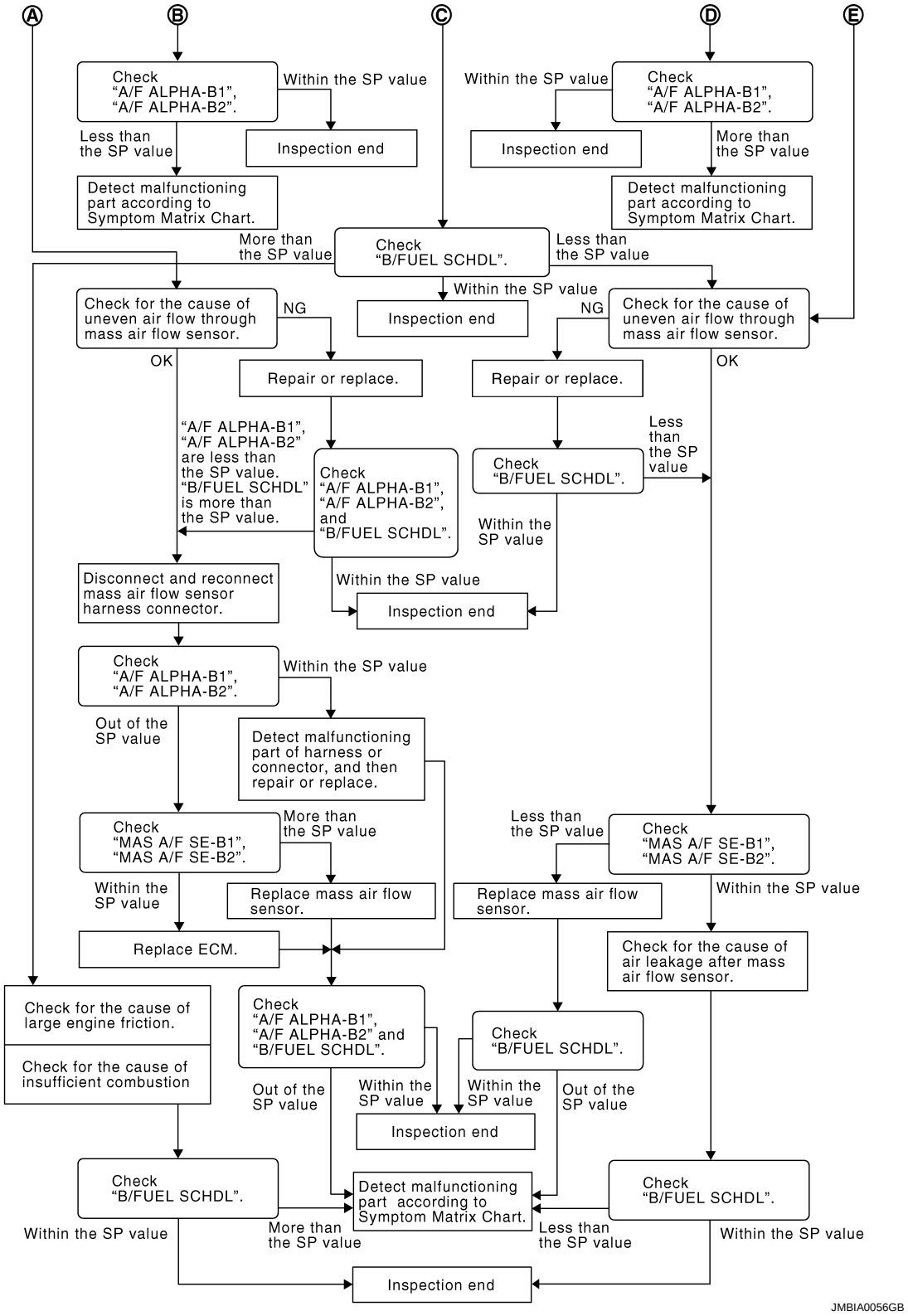
Diagnosis Procedure

INFOID:0000000009009376

OVERALL SEQUENCE



JSBIA0519GB



DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1" AND "A/F ALPHA-B2"

WITH CONSULT

1. Start engine.
2. Check that the testing conditions are met. Refer to EC-739, "Component Function Check".
3. Select "A/F ALPHA-B1" and "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

NOTE:
Check “A/F ALPHA-B1” and “A/F ALPHA-B2” for approximately 1 minute because they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

YES >> GO TO 14.
NO-1 >> Less than the SP value: GO TO 2.
NO-2 >> More than the SP value: GO TO 3.

2. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 4.
NO >> More than the SP value: GO TO 16.

3. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 6.
NO-1 >> More than the SP value: GO TO 6.
NO-2 >> Less than the SP value: GO TO 22.

4. CHECK “A/F ALPHA-B1”, “A/F ALPHA-B2”

1. Stop the engine.
2. Disconnect PCV hose, and then plug it.
3. Start engine.
4. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 5.
NO >> GO TO 6.

5. CHANGE ENGINE OIL

1. Stop the engine.
2. Change engine oil.

NOTE:
This symptom may occur when a large amount of gasoline is mixed with engine oil because of driving conditions (such as when engine oil temperature does not rise enough since a journey distance is too short during winter). The symptom will not be detected after changing engine oil or changing driving conditions.

>> INSPECTION END

6. PERFORM POWER BALANCE TEST

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode.
2. Check that each cylinder produces a momentary engine speed drop.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following below.
- Ignition coil and its circuit (Refer to EC-1020, "Component Function Check".)
- Fuel injector and its circuit (Refer to EC-1012, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to EM-16, "Inspection".)

Is the inspection result normal?

YES >> Replace fuel injector and then GO TO 8.
NO >> Repair or replace malfunctioning part and then GO TO 8.

8. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> GO TO 9.

9. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.
- For DTC P0130, P0150, refer to EC-791, "DTC Logic".
- For DTC P0131, P0151, refer to EC-795, "DTC Logic".
- For DTC P0132, P0152, refer to EC-798, "DTC Logic".
- For DTC P0133, P0153, refer to EC-801, "DTC Logic".

Are any DTCs detected?

YES >> GO TO 10.
NO >> GO TO 12.

10. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnosis Procedure according to corresponding DTC.

>> GO TO 11.

11. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> GO TO 12.

12. 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 13.

13. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-1041, "Symptom Table".

14. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO-1 >> More than the SP value: GO TO 15.
NO-2 >> Less than the SP value: GO TO 22.

15. DETECT MALFUNCTIONING PART

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 27.

16. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system

Is the inspection result normal?

YES >> GO TO 18.
NO >> Repair or replace malfunctioning part, and then GO TO 17.

17. CHECK “A/F ALPHA-B1”, “A/F ALPHA-B2” AND “B/FUEL SCHDL”

Select “A/F ALPHA-B1”, “A/F ALPHA-B2” and “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> “B/FUEL SCHDL” is more, “A/F ALPHA-B1” and “A/F ALPHA-B2” are less than the SP value: GO TO 18.

18. 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 19.

19. CHECK “A/F ALPHA-B1” AND “A/F ALPHA-B2”

1. Start engine.
2. Select “A/F ALPHA-B1” and “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-779, "Diagnosis Procedure". Then GO TO 26.
NO >> GO TO 20.

20. CHECK “MAS A/F SE-B1”

Select “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 21.
NO >> More than the SP value: Replace malfunctioning mass air flow sensor, and then GO TO 26.

21. REPLACE ECM

1. Replace ECM.
2. Perform EC-720, "Work Procedure".

>> GO TO 26.

22. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal in air cleaner element
- Uneven dirt in air cleaner element
- Improper specification in intake air system

Is the inspection result normal?

YES >> GO TO 24.
NO >> Repair or replace malfunctioning part, and then GO TO 23.

23. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Less than the SP value: GO TO 24.

24. CHECK “MAS A/F SE-B1”

Select “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode, and check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 25.
NO >> Less than the SP value: Replace malfunctioning mass air flow sensor, and then GO TO 27.

25. CHECK INTAKE SYSTEM

Check for the cause of air leakage after the mass air flow sensor. Refer to the following.
- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks in PCV valve
- Disconnection or cracks in EVAP purge hose, stuck open EVAP canister purge volume control solenoid valve
- Malfunctioning seal in rocker cover gasket
- Disconnection, looseness, or cracks in hoses, such as a vacuum hose, connecting to intake air system parts
- Malfunctioning seal in intake air system, etc.

>> GO TO 27.

26. CHECK “A/F ALPHA-B1”, “A/F ALPHA-B2” AND “B/FUEL SCHDL”

Select “A/F ALPHA-B1”, “A/F ALPHA-B2” and “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-1041, "Symptom Table".

27. CHECK “B/FUEL SCHDL”

Select “B/FUEL SCHDL” in “SPEC” of “DATA MONITOR” mode, and then check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-1041, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000009009377

1.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and ground.

ECM		Ground	Continuity
Connector	Terminal		
F111	10	Ground	Existed
E80	174		
	175		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and ground

>> Repair open circuit or short to power in harness or connectors.

3.CHECK ECM POWER SUPPLY CIRCUIT-I

1. Reconnect ECM harness connector.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector terminals.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	141	175	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- 15 A fuse (No. 62)
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and fuse

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK ECM POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	171	175	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.
	172		

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 8.

6. CHECK ECM POWER SUPPLY CIRCUIT-III

1. Turn ignition switch ON.
2. Check the voltage between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Voltage
Connector	Terminal		
E15	61	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

8. CHECK ECM POWER SUPPLY CIRCUIT-IV

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	163	175	Battery voltage

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 9.

9. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E80	163	E14	41	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK 20 A FUSE

1. Disconnect 20 A fuse (No. 43) from IPDM E/R.
2. Check 20 A fuse.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace 15 A fuse.

12. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E80	171	E14	35	Existed
	172			

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

U0101 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009009378

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U0101	LOST COMM (TCM) (Lost communication with TCM)	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with TCM for 2 seconds or more.	• CAN communication line between TCM and ECM (CAN communication line is open or shorted)

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

YES >> EC-749, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009379

Perform the trouble diagnosis for CAN communication system. Refer to LAN-22, "Trouble Diagnosis Flow Chart".

U1001 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009009380

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U1001	CAN COMM CIRCUIT (CAN communication line)	When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more.	• Harness or connectors (CAN communication line is open or shorted)

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-750, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009381

Perform the trouble diagnosis for CAN communication system. Refer to LAN-22, "Trouble Diagnosis Flow Chart".

U0113, U1003 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009009382

DTC DETECTION LOGIC

NOTE:
If DTC U0113 or U1003 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.
Refer to EC-901, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U0113	CAN COMM CIRCUIT (Lost communication with VVEL control module)	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) with VVEL control module for 2 seconds or more.	• Harness or connectors (VVEL CAN communication line is open or shorted) • ECM • VVEL control module
U1003		When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) with VVEL control module for 2 seconds or more.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-751, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009383

1.CHECK VVEL CAN COMMUNICATION CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect VVEL control module harness connector.
4. Check the continuity between ECM harness connector and VVEL control module harness connector.

ECM		VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	
E80	161	F56	24	Existed
	166		11	

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace.

4.REPLACE VVEL CONTROL MODULE

Replace VVEL control module. Refer to EC-1053, "Removal and Installation".

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select “SELF DIAGNOSTIC RESULT” mode with CONSULT.
4. Touch “ERASE”.
5. Perform DTC Confirmation Procedure.
   See EC-751, "DTC Logic".

WITH GST
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select Service $04 with GST.
4. Perform DTC Confirmation Procedure.
   See EC-751, "DTC Logic".

Is the DTC U0113 or U1003 displayed again?

YES >> GO TO 6.
NO >> INSPECTION END

6.REPLACE ECM

Replace ECM. Refer to EC-1052, "Removal and Installation".

>> INSPECTION END

U1024 CAN COMM CIRCUIT

DTC Logic

INFOID:0000000009009384

DTC DETECTION LOGIC

NOTE:
If DTC U1024 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.
Refer to EC-901, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
U1024	VVEL CAN COMM CIRCUIT (VVEL CAN communication)	• When VVEL control module cannot transmitting or receiving CAN communication signal with ECM for 2 seconds or more. • When detecting error during the initial diagnosis of CAN controller of VVEL control module.	• Harness or connectors (CAN communication line is open or shorted) • ECM • VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-753, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009385

1.CHECK VVEL CAN COMMUNICATION CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect VVEL control module harness connector.
4. Check the continuity between ECM harness connector and VVEL control module harness connector.

ECM		VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	
E80	161	F56	24	Existed
	166		11	

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace.

4.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-722, "Work Procedure".

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select “SELF DIAGNOSTIC RESULT” mode with CONSULT.
4. Touch “ERASE”.
5. Perform DTC Confirmation Procedure.
   See EC-753, "DTC Logic".

WITH GST
1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Select Service $04 with GST.
4. Perform DTC Confirmation Procedure.
   See EC-753, "DTC Logic".

Is the DTC U1024 displayed again?

YES >> GO TO 6.
NO >> INSPECTION END

6.REPLACE ECM

1. Replace ECM.
2. Perform additional service when replacing ECM. Refer to EC-720, "Work Procedure".

>> INSPECTION END

P0011, P0021 IVT CONTROL

DTC Logic

INFOID:0000000009009386

DTC DETECTION LOGIC

NOTE:
If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to EC-765, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	Detecting condition	Possible cause
P0011	INT/V TIM CONT-B1 [Intake valve timing control performance (bank 1)]	There is a gap between angle of target and phase-control angle degree.	• Crankshaft position sensor • Camshaft position sensor • Intake valve timing control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control
P0021	INT/V TIM CONT-B2 [Intake valve timing control performance (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT
1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds.
   Hold the accelerator pedal as steady as possible.

ENG SPEED	Less than 2,000 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	P or N position

4. Let engine idle for 25 seconds.
5. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-756, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

WITH CONSULT
1. Select “DATA MONITOR” mode with CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,500 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)

Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-756, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

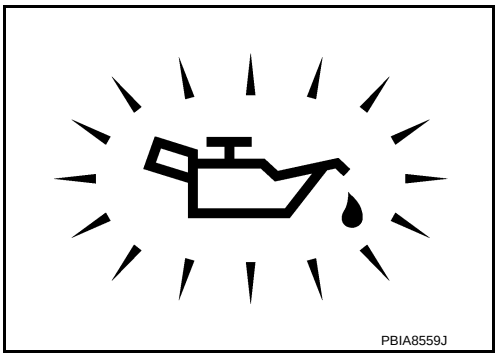
INFOID:0000000009009387

1.CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check that oil pressure warning lamp is not illuminated.

Is oil pressure warning lamp illuminated?

YES >> Go to LU-8, "Inspection".
NO >> GO TO 2.



2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-757, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

3.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor. Refer to EM-115, "Exploded View".

4.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".

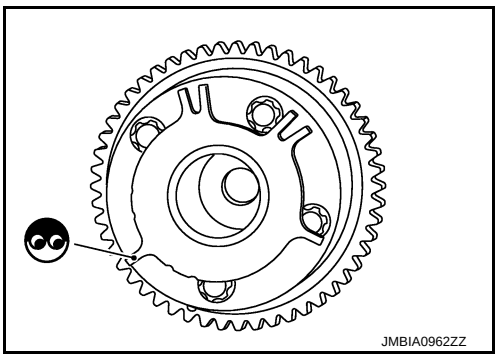
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor. Refer to EM-115, "Exploded View".

5.CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris on the signal plate of camshaft front end
- Chipping signal plate of camshaft front end



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-63, "Exploded View" or EM-80, "Removal and Installation".

6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misalignment.

Are there any service records that may cause timing chain misalignment?

YES >> Check timing chain installation. Refer to EM-80, "Removal and Installation".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000009009388

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as per the following.

Terminals	Resistance
1 and 2	7.0 - 7.7 Ω [at 20°C (68°F)]
1 or 2 and ground	∞ Ω (Continuity should not exist)

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.

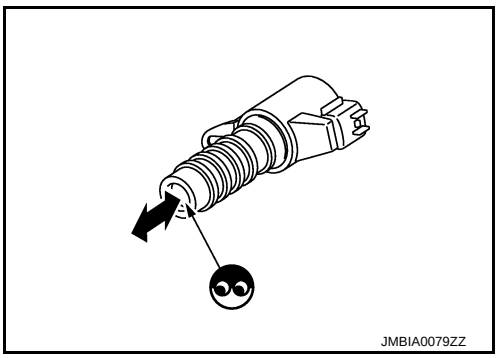
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:

Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

NOTE:

Always replace O-ring when intake valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

DTC Logic

INFOID:0000000009009389

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0031	A/F SEN1 HTR (B1) [A/F sensor 1 heater (bank 1) control circuit low]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0032	A/F SEN1 HTR (B1) [A/F sensor 1 heater (bank 1) control circuit high]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater
P0051	A/F SEN1 HTR (B2) [A/F sensor 1 heater (bank 2) control circuit low]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0052	A/F SEN1 HTR (B2) [A/F sensor 1 heater (bank 2) control circuit high]	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-759, "Diagnosis Procedure".
NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009390

1.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0031, P0032	1	F67	5	Ground	Battery voltage
P0051, P0052	2	F68	5		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- 20 A fuse (No. 43)
- Harness for open or short between A/F sensor 1 and fuse
- Loose or poor connection for each connector and harness

>> Repair or replace harness or connectors.

3.CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0031, P0032	1	F67	2	F110	48	Existed
P0051, P0052	2	F68	2		53	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK A/F SENSOR 1 HEATER

Refer to EC-760, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Exploded View".

CAUTION:
- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (A/F Sensor 1 Heater)

INFOID:0000000009009391

1.CHECK AIR FUEL RATIO (A/F) SENSOR 1

1. Turn ignition switch OFF.
2. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
3. Check resistance between A/F sensor 1 terminals as per the following.

Terminal	Resistance
2 and 5	2.0 - 3.2 Ω [at 25°C (77°F)]

Terminal	Resistance
2 and 3, 4, 6	∞ Ω (Continuity should not exist)
5 and 3, 4, 6	

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0037, P0038, P0057, P0058 HO2S2 HEATER

DTC Logic

INFOID:0000000009009392

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0037	HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit low]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0038	HO2S2 HTR (B1) [Heated oxygen sensor 2 heater (bank 1) control circuit high]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater
P0057	HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit low]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0058	HO2S2 HTR (B2) [Heated oxygen sensor 2 heater (bank 2) control circuit high]	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-762, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009393

1.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S2 harness connector and ground.

DTC	HO2S2			Ground	Voltage
	Bank	Connector	Terminal		
P0037, P0038	1	F87	2	Ground	Battery voltage
P0057, P0058	2	F88	2		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.
- 20 A fuse (No. 43)
- Harness for open or short between heated oxygen sensor 2 and fuse
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0037, P0038	1	F87	3	F111	47	Existed
P0057, P0058	2	F88	3		52	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HO2S2 HEATER

Refer to EC-764, "Component Inspection (HO2 Sensor 2 Heater)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Removal and Installation".

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 Sensor 2 Heater)

INFOID:0000000009009394

1.CHECK HEATED OXYGEN SENSOR 2 HEATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Check resistance between HO2S2 terminals as follows.

Terminal	Resistance
2 and 3	3.4 - 4.4 Ω [at 25°C (77°F)]
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Removal and Installation".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0075, P0081 IVT CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000009009395

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0075	INT/V TIM V/CIR-B1 [Intake valve timing control solenoid valve (bank 1) circuit]	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve
P0081	INT/V TIM V/CIR-B2 [Intake valve timing control solenoid valve (bank 2) circuit]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-765, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009396

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between IVT control solenoid valve harness connector and ground.

DTC	IVT control solenoid valve			Ground	Voltage
	Bank	Connector	Terminal		
P0075	1	F47	2	Ground	Battery voltage
P0081	2	F61	2		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between IVT control solenoid valve and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK IVT CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect ECM harness connector.
3. Check the continuity between IVT control solenoid valve harness connector and ECM harness connector.

DTC	IVT control solenoid valve			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0075	1	F47	1	F111	49	Existed
P0081	2	F61	1		54	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK IVT CONTROL SOLENOID VALVE

Refer to EC-766, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning IVT control solenoid valve. Refer to EM-63, "Exploded View".

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Valve Timing Control Solenoid Valve)

INFOID:0000000009009397

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as per the following.

Terminals	Resistance
1 and 2	7.0 - 7.7 Ω [at 20°C (68°F)]
1 or 2 and ground	∞ Ω (Continuity should not exist)

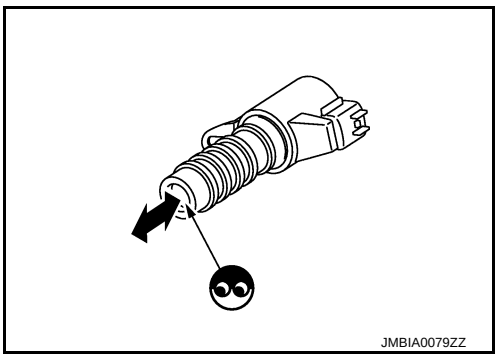
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
NOTE:
Always replace O-ring when intake valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-63, "Exploded View".

P0087 FRP CONTROL SYSTEM

DTC Logic

INFOID:0000000009009398

DTC DETECTION LOGIC

NOTE:

- **If DTC P0087 is displayed with DTC P0090 and/or P1197, first perform the trouble diagnosis for DTC P0090 and/or P1197.**
- DTC P0087 may be displayed when running out of gas or air accumulation.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0087	LOW FUEL PRES (High fuel pressure too low)	• Fuel rail pressure does not reach 1.3 MPa (13 bar, 13.3 kg/cm2, 188.5 psi) at engine cold start [water temperature 5°C (41°F) – 40°C (104°F)]. • Fuel rail pressure remains at 8.5 MPa (85 bar, 86.7 kg/cm2, 1232.8 psi) or less for 1 second or more during engine idle condition after cold start [water temperature 5°C (41°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 bar, 27.5 kg/cm2, 392 psi).	• Fuel system • Leakage in fuel line • High pressure fuel pump • Low pressure fuel pump • Damage in lifter

DTC CONFIRMATION PROCEDURE

1.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 2.
NO >> Repair or replace error-detected parts.

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 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.PERFORM 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	**: 5 – 40°C (41 – 104°F)**

WITH GST
Follow the above steps for “WITH CONSULT”.

Is the condition satisfied?

YES >> GO TO 4.
NO >> 1. Satisfy the condition.
2. Retry from step 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-2

WITH CONSULT
1. Start the engine and let it idle for 10 seconds.
2. Check 1st trip DTC.

WITH GST
Follow the above steps for “WITH CONSULT”.

Is 1st trip DTC detected?

YES >> Proceed to EC-768, "Diagnosis Procedure".
NO >> GO TO 5.

5.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 (104°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-768, "Diagnosis Procedure".
NO >> INSPECTION END.

Diagnosis Procedure

INFOID:0000000009009399

1.BLEED THE FUEL LINE

1. Start the engine, and let the engine run at idle at least for 10 minutes.
2. Perform DTC confirmation procedure of DTC P0087.

Is 1st trip DTC detected?

YES >> GO TO 2.
NO >> GO TO 6.

2.CHECK LOW FUEL PRESSURE

WITH CONSULT
1. Start the engine.
2. Check “L/FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
L/FUEL PRES SEN V	Engine speed: idle	3,000 –3,300 mV
	Engine speed: 3,000 rpm (no load)	

WITHOUT CONSULT
1. Start the engine.
2. Check low fuel pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Low fuel pressure sensor				
Connector	Terminal			
F25	2	Ground	Engine speed: idle	3.0 –3.3 V
			Engine speed: 3,000 rpm (no load)	

Is inspection result normal?

YES >> GO TO 3.
NO >> Check low fuel pressure system. Refer to EC-1025, "Diagnosis Procedure".

3. CHECK LOW PRESSURE FUEL LINE FOR INTERNAL LEAKAGE

WITH CONSULT
1. Turn ignition switch OFF.
2. Turn ignition switch ON.
3. Select “L/FUEL PRES SEN” in “DATA MONITOR” of “ECM” with CONSULT.
4. Check the following value 30 minutes after turning the ignition switch ON.

L/FUEL PRES SEN : More than 0.20 MPa

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Connect fuel pressure gauge. Refer to EC-731, "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 (2.1 bar, 2.2 kgf/cm2, 30 psi) or more

Is inspection result normal?

YES >> GO TO 4.
NO >> Replace low pressure fuel pump. Refer to FL-5, "Exploded View".

4. CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-770, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace the error-detected parts.

5. CHECK LIFTER

Check lifter. Refer to EM-44, "Removal and Installation".

Does the lifter top surface have scratches and/or dents?

YES >> Replace the error-detected parts.
NO >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".

6. CHECK LOW PRESSURE FUEL LINE FOR INTERNAL LEAKAGE

WITH CONSULT
1. Turn ignition switch OFF.
2. Turn ignition switch ON.
3. Select “L/FUEL PRES SEN” in “DATA MONITOR” mode of “ECM” using CONSULT.
4. Check the following value 30 minutes after turning the ignition switch ON.

L/FUEL PRES SEN : More than 0.20 MPa

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Connect fuel pressure gauge. Refer to EC-731, "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 (2.1 bar, 2.2 kgf/cm2, 30 psi) or more

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace low pressure fuel pump. Refer to FL-5, "Exploded View".

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000009009400

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.

+	–	Condition		Resistance (Approx.)
High pressure fuel pump Terminal				
1	2	Temperature °C (°F)	20 – 30 (68 - 86)	9 - 11 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

2. CHECK HIGH PRESSURE FUEL PUMP-2

WITH CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check “FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Voltage (Approx.)
FUEL PRES SEN V	Engine speed: idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check FRP sensor signal voltage.

ECM			Condition	Value (Approx.)
Connector	+	–		
	Terminal			
F111	31	40	Engine speed: idle	0.82 – 1.22 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

P0088 FRP CONTROL SYSTEM

DTC Logic

INFOID:0000000009009401

DTC DETECTION LOGIC

NOTE:
If DTC P0088 is displayed with DTC P0090, first perform the trouble diagnosis for DTC P0090.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0088	HIGH FUEL PRES (High fuel pressure too high)	• Fuel rail pressure remains at more than 16.5 MPa (165 bar, 168.3 kg/cm2, 2392.5 psi) for 1 second or more during engine idle condition after cold start [water temperature 5°C (41°F) - 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 bar, 27.5 kg/cm^2, 392 psi)	• Harness or connector (The high pressure fuel pump circuit is open or shorted) • High pressure fuel pump

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

1. 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 “COOLAN TEMP/S” on “DATA MONITOR” mode of “ENGINE” using CONSULTIII reaches at least 70°C (158°F).
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-776, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

1. Cool the engine until the engine coolant temperature reaches 60°C (140°F) or less.
2. Start the engine and wait at least 40 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-776, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009402

1.CHECK LOW FUEL PRESSURE

WITH CONSULT

1. Start the engine.
2. Check “L/FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
L/FUEL PRES SEN V	Engine speed: idle	3,000 –3,300 mV
	Engine speed: 3,000 rpm (no load)	

WITHOUT CONSULT
1. Start the engine.
2. Check low fuel pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Low fuel pressure sensor				
Connector	Terminal			
F25	2	Ground	Engine speed: idle	3.0 –3.3 V
			Engine speed: 3,000 rpm (no load)	

Is inspection result normal?

YES >> GO TO 2.
NO >> Check low fuel pressure system. Refer to EC-1025, "Diagnosis Procedure".

2.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-772, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> GO TO 3.
NO >> Replace error-detected parts.

3.CHECK FUEL LEAKAGE

1. Start the engine.
2. 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-4, "Inspection".
NO >> Replace or replace the error-detected parts.

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000009009403

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.

+	–	Condition		Resistance (Approx.)
High pressure fuel pump Terminal				
1	2	Temperature °C (°F)	20 – 30 (68 - 86)	9 - 11 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

2.CHECK HIGH PRESSURE FUEL PUMP-2

WITH CONSULT
1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check “FUEL PRES SEN V” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
FUEL PRES SEN V	Engine speed: idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

⊗WITHOUT CONSULT
1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check FRP sensor signal voltage.

ECM			Condition	Value (Approx.)
Connector	+	–		
	Terminal			
F111	31	40	Engine speed: idle	0.82 – 1.22 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

P008A LOW FUEL PRESSURE CONTROL SYSTEM

DTC Logic

INFOID:0000000009009404

DTC DETECTION LOGIC

NOTE:
If DTC P008A is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197. Refer to EC-923, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P008A	Low fuel pressure too low	A condition of low fuel pressure 0.23 MPa (2.3 bar, 2.346 kg/cm^2, 33.35 psi) or less continues for 5 seconds or more after warming up the engine.	• Harness or connectors (The low pressure fuel pump circuit is open or shorted.) • Low pressure fuel pump • Fuel pressure regulator • Low pressure fuel system • Out of gas

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Check that the fuel tank is 1/8 full of fuel.
2. Start the engine and warm it up to the normal operating temperature.
   NOTE:
   When replacing ECM, warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
3. Let the engine at idle for 60 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-924, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009405

1.PERFORM LOW PRESSURE FUEL PUMP COMPONENT FUNCTION CHECK

Refer to EC-1025, "Component Function Check".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform low pressure fuel pump diagnosis. Refer to EC-1025, "Diagnosis Procedure".

2.CHECK FUEL LEAKAGE

1. Start the engine.
2. Visually check that the low fuel pressure system has no fuel leakage.

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK LOW PRESSURE FUEL PIPING AND HOSE

1. Turn ignition switch OFF.

2. Check that the low pressure fuel piping and hose have no breakage, bend, and crush. Refer to FL-4, "Inspection".

Is inspection result normal?

YES >> Replace fuel level sensor unit and fuel pump (fuel pressure regulator malfunction). Refer to FL-5, "Removal and Installation".

NO >> Repair or replace error-detected parts.

P0090 HIGH PRESSURE FUEL PUMP

DTC Logic

INFOID:0000000009009406

DTC DETECTION LOGIC

NOTE:
- If DTC P0090 is displayed with DTC P1197, first perform the trouble diagnosis for DTC P1197.
- DTC P0090 may be displayed when running out of gas.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0090	FUEL PUMP (High pressure fuel pump circuit)	• Fuel rail pressure remains at 1.5 MPa (15 bar, 15.3 kg/ cm^2, 217.5 psi) or less for 3 seconds or more during engine rev. • Fuel rail pressure remains at 18.5 MPa (185 bar, 188.7 kg/ cm^2, 2682.5 psi) or more for 0.3 seconds or more during engine rev.	• Harness or connectors (The fuel pump circuit is open or shorted.) • High pressure fuel pump

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Before performing the following procedure, check that the fuel tank is 1/8 full of fuel.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT
1. Start engine.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode of “ENGNE” using CONSULT.
3. Maintain the following condition for 5 seconds or more at idle.

COOLAN TEMP/S	**: 70°C (104°F) or more**

4. Check 1st trip DTC.

WITH GST
Follow the above steps for “WITH CONSULT”.

Is 1st trip DTC detected?

YES >> Proceed to EC-776, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009407

1.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.

+		–		Value (Approx.)
ECM		High pressure fuel pump		
Connector	Terminal	Connector	Terminal	
F110	110	F24	2	Existed
	105		1	

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace the error-detected parts.

2.CHECK HIGH PRESSURE FUEL PUMP

Check high pressure fuel pump. Refer to EC-777, "Component Inspection (High Pressure Fuel Pump)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace the error-detected parts.

Component Inspection (High Pressure Fuel Pump)

INFOID:0000000009009408

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.

+	–	Condition		Resistance (Approx.)
High pressure fuel pump				
Terminal				
1	2	Temperature °C (°F)	20 – 30 (68 - 86)	9 - 11 Ω

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

2.CHECK HIGH PRESSURE FUEL PUMP-2

WITH CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check “FUEL PRES SEN” in “DATA MONITOR” mode of “ECM” using CONSULT.

Monitor item	Condition	Value (Approx.)
FUEL PRES SEN V	Engine speed: idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT

1. Reconnect high pressure fuel pump harness connector.
2. Start the engine.
3. Check FRP sensor signal voltage.

ECM			Condition	Value (Approx.)
Connector	+	–		
	Terminal			
F111	31	40	Engine speed: idle	0.82 – 1.22 V
			Engine speed: Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Exploded View".

P0102, P0103 MAF SENSOR

DTC Logic

INFOID:0000000009009409

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0102	MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The mass air flow sensor circuit is open or shorted.) • Intake air leakage • Mass air flow sensor
P0103	MAF SEN/CIRCUIT-B1 (Mass air flow sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The mass air flow sensor circuit is open or shorted.) • Mass air flow sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-779, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-I

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-779, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0103-II

1. Start engine and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-779, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009410

1.INSPECTION START

Confirm the detected DTC.

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 MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

MAF sensor		Ground	Voltage
Connector	Terminal		
F31	5	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F31	4	F111	25	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAF sensor harness connector and ECM harness connector.

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	3	F111	22	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Refer to EC-781, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace mass air flow sensor. Refer to EM-28, "Exploded View".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAF Sensor)

INFOID:0000000009009411

1. CHECK MASS AIR FLOW SENSOR-I

WITH CONSULT
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1”, and check the indication.

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 (MAF sensor signal)	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system parts

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.CHECK MASS AIR FLOW SENSOR-II

WITH CONSULT
1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT and select “DATA MONITOR” mode.
4. Select “MAS A/F SE-B1””, and check the indication.

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

WITHOUT CONSULT
1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 (MAF sensor signal)	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4.CHECK MASS AIR FLOW SENSOR-III

WITH CONSULT
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1”, and check the indication.

Monitor item	Condition	Indication (V)
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
	Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F111	22 (MAF sensor signal)	25	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.4 - 1.9
			Idle to about 4,000 rpm	0.7 - 1.2 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to about 4,000 rpm.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace malfunctioning mass air flow sensor. Refer to EM-28, "Removal and Installation".

P0112, P0113 IAT SENSOR

DTC Logic

INFOID:0000000009009412

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0112	IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The intake air temperature sensor circuit is open or shorted.) • Intake air temperature sensor
P0113	IAT SEN/CIRCUIT-B1 (Intake air temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-784, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009413

1.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor (intake air temperature sensor is built-in) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAF sensor harness connector and ground.

MAF sensor		Ground	Voltage (V)
Connector	Terminal		
F31	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F31	1	F111	25	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-785, "Component Inspection (Intake Air Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace mass air flow sensor (with intake air temperature sensor).

4. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Intake Air Temperature Sensor)

INFOID:0000000009009414

1. CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector.
3. Check resistance between mass air flow sensor terminals as per the following.

Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	25 (77)	1.94 - 2.06

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to EM-28, "Removal and Installation".

P0117, P0118 ECT SENSOR

DTC Logic

INFOID:0000000009009415

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0117	ECT SEN/CIRC (Engine coolant temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The engine coolant temperature sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118	ECT SEN/CIRC (Engine coolant temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-786, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009416

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine coolant temperature (ECT) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between ECT sensor harness connector and ground.

ECT sensor		Ground	Voltage (V)
Connector	Terminal		
F21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECT sensor harness connector and ECM harness connector.

ECT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F21	2	F111	40	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-787, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace engine coolant temperature sensor.

4. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

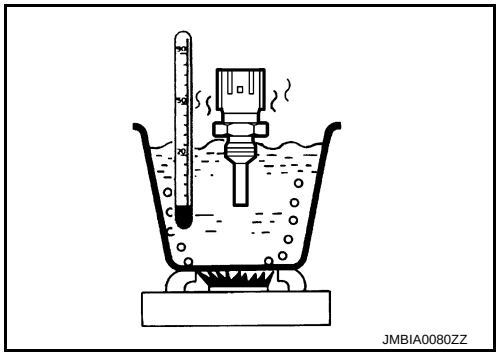
>> INSPECTION END

Component Inspection (Engine Coolant Temperature Sensor)

INFOID:0000000009009417

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor.
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 - 2.73
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor. Refer to EM-92, "Exploded View".

P0122, P0123 TP SENSOR

DTC Logic

INFOID:0000000009009418

DTC DETECTION LOGIC

NOTE:
If DTC P0122 or P0123 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-904, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0122	TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit low input)	An excessively low voltage from the TP sensor 2 is sent to ECM.	• Harness or connectors (TP sensor 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 2)
P0123	TP SEN 2/CIRC-B1 (Throttle position sensor 2 circuit high input)	An excessively high voltage from the TP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-788, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009419

1.CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle control actuator		Ground	Voltage
Connector	Terminal		
F66	2	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	4	F110	97	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	3	F110	79	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR

Refer to EC-789, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000009009420

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-725, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F110	91 (TP sensor 1 signal)	97 (Sensor ground)	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	79 (TP sensor 2 signal)			Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P0130, P0150 A/F SENSOR 1

DTC Logic

INFOID:0000000009009421

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible Cause
P0130	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit]	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 1.5 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V.	
P0150	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit]	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 1.5 V.	
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-793, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> With GST: GO TO 7.

3.CHECK AIR FUEL RATIO (A/F) SENSOR 1 FUNCTION

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” or “A/F SEN1 (B2)” in “DATA MONITOR” mode with CONSULT.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.

Does the indication fluctuate around 1.5 V?

YES >> GO TO 4.
NO >> Go to EC-793, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

1. Select “A/F SEN1 (B1) P1276” (for DTC P0130) or “A/F SEN1 (B2) P1286” (for DTC P0150) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT.
2. Touch “START”.
3. When the following conditions are met, “TESTING” will be displayed on the CONSULT screen.

ENG SPEED	1,750 - 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 mph)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	D position

If “TESTING” is not displayed after 20 seconds, retry from step 2.
CAUTION:
Always drive vehicle at a safe speed.

Is “TESTING” displayed on CONSULT screen?

YES >> GO TO 5.
NO >> Check A/F sensor 1 function again. GO TO 3.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

Release accelerator pedal fully.
NOTE:
Never apply brake when releasing the accelerator pedal.

Which does “TESTING” change to?

COMPLETED>>GO TO 6.
OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III

Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

YES >> INSPECTION END
NO >> Go to EC-793, "Diagnosis Procedure".

7. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

WITH GST
Perform component function check. Refer to EC-792, "Component Function Check".
NOTE:
Use component function check to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-793, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009422

1. PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever position to D, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   Never apply brake when releasing the accelerator pedal.
4. Repeat steps 2 and 3 for 5 times.
5. Stop the vehicle and turn ignition switch OFF.
6. Wait at least 10 seconds and turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for 5 times.
10. Stop the vehicle.
11. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-793, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009423

1. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Removal and Installation".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0131, P0151 A/F SENSOR 1

DTC Logic

INFOID:0000000009009424

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P0131	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage]	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0151	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” or “A/F SEN1 (B2)” in “DATA MONITOR” mode with CONSULT.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.

WITH GST

Follow the procedure “With CONSULT” above.

Is the indication constantly approx. 0 V?

YES >> Go to EC-796, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:

- **Keep the accelerator pedal as steady as possible during cruising.**

- **If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.**

7. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-796, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009425

1.CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Removal and Installation".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0132, P0152 A/F SENSOR 1

DTC Logic

INFOID:0000000009009426

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P0132	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage]	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0152	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Select “A/F SEN1 (B1)” or “A/F SEN1 (B2)” in “DATA MONITOR” mode with CONSULT.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.

WITH GST

Follow the procedure “With CONSULT” above.

Is the indication constantly approx. 5 V?

YES >> Go to EC-799, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:

- **Keep the accelerator pedal as steady as possible during cruising.**

- **If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.**

7. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-799, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009427

1.CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace malfunctioning part.

5.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Removal and Installation".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0133, P0153 A/F SENSOR 1

DTC Logic

INFOID:0000000009009428

DTC DETECTION LOGIC

To judge the malfunction of A/F sensor 1, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P0133	A/F SENSOR1 (B1) [Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response]	• The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks • PCV • Mass air flow sensor
P0153	A/F SENSOR1 (B2) [Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 5.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. 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 “A/F SEN1(B1) P1278/P1279” (for DTC P0133) or “A/F SEN1(B2) P1288/P1289” (for DTC P0153) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT.
8. Touch “START”.

Is “COMPLETED” displayed on CONSULT screen?

YES >> GO TO 3
NO >> GO TO 4.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-802, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. After perform the following procedure, “TESTING” will be displayed on the CONSULT screen.
- Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
- Fully release accelerator pedal and then let engine idle for approximately 10 seconds.

If “TESTING” is not displayed after 10 seconds, refer to EC-739, "Component Function Check".

2. Wait for approximately 20 seconds at idle under the condition that “TESTING” is displayed on the CONSULT screen.
3. Check that “TESTING” changes to “COMPLETED”.

If “TESTING” changed to “OUT OF CONDITION”, refer to EC-739, "Component Function Check".

4. Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-802, "Diagnosis Procedure".

5.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Calculate the total value of “Short term fuel trim” and “Long term fuel trim” indications.

Is the total percentage within ±15%?

YES >> GO TO 7.
NO >> GO TO 6.

6.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.

7.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
5. Fully release accelerator pedal and then let engine idle for approximately 1 minute.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-802, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009429

1.RETIGHTEN AIR FUEL RATIO SENSOR 1

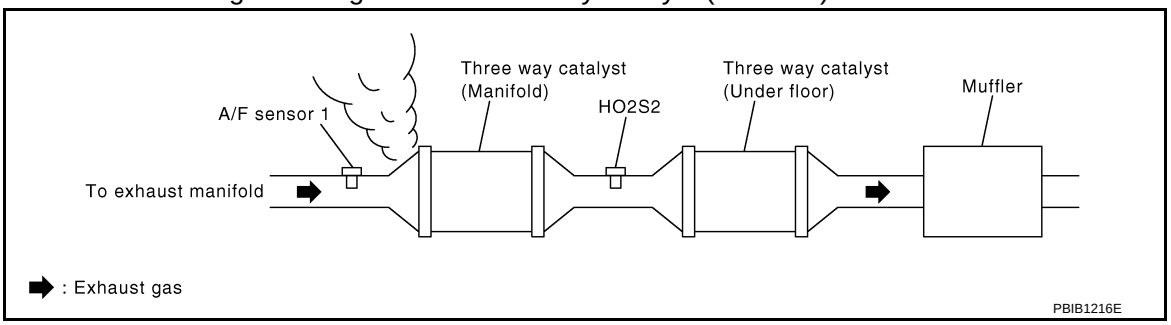
Loosen and retighten the air fuel ratio (A/F) sensor 1. Refer to EM-41, "Exploded View".

>> GO TO 2.

2.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.

2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 4.

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-730, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-826, "DTC Logic" or EC-830, "DTC Logic".
NO >> GO TO 5.

5. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0133	1	F67	4	Ground	3.0 V
P0153	2	F68	4		

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 A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0133	1	F67	3	F110	88	Existed
P0153	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0133	1	F67	3	F110	88	Ground	Not existed
P0153	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0133	1	F67	6	F111	94	Existed
P0153	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK A/F SENSOR 1 HEATER

Refer to EC-760, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 12.

9. CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor.
Refer to EC-781, "Component Inspection (MAF Sensor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace malfunctioning mass air flow sensor. Refer to EM-31, "Removal and Installation".

10. CHECK PCV VALVE

Refer to EC-1051, "Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace PCV valve.

11. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace malfunctioning part.

12. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

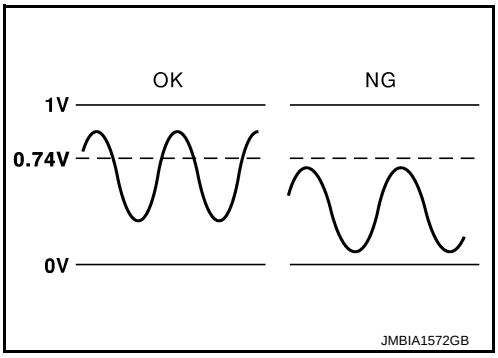
P0137, P0157 HO2S2

DTC Logic

INFOID:0000000009009430

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0137	HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit low voltage]	The maximum voltage from the sensor does not reach the specified voltage.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks
P0157	HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit low voltage]		

DTC CONFIRMATION PROCEDURE

1.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.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

TESTING CONDITION:

For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. 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 “DATA MONITOR” mode with CONSULT.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1147” (for DTC P0137) or “HO2S2 (B2) P1167” (for DTC P0157) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
11. Follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-808, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 2.

4.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform component function check. Refer to EC-807, "Component Function Check".

NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-808, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009431

1.PERFORM COMPONENT FUNCTION CHECK-I

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F110	96	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure.
P0157		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F110	96	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure.
P0157		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F110	96	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure.
P0157		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-808, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009432

1.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-730, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to EC-826, "DTC Logic".
NO >> GO TO 2.

2.CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F87	1	F110	100	Existed
P0157	2	F88	1			

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F87	4	F110	96	Existed
P0157	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0137	1	F87	4	F110	96	Ground	Not existed
P0157	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-809, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000009009433

1. INSPECTION START

Will CONSULT be used?

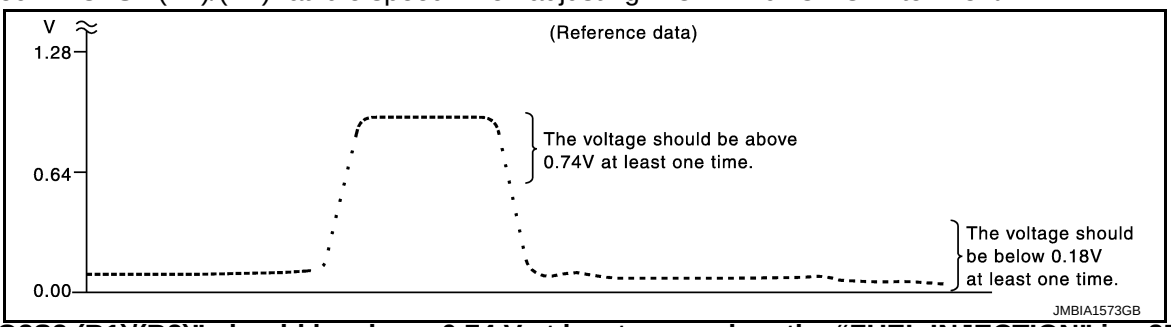
Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
5. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0138, P0158 HO2S2

DTC Logic

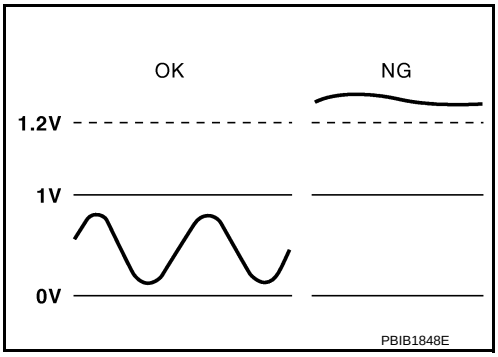
INFOID:0000000009009434

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

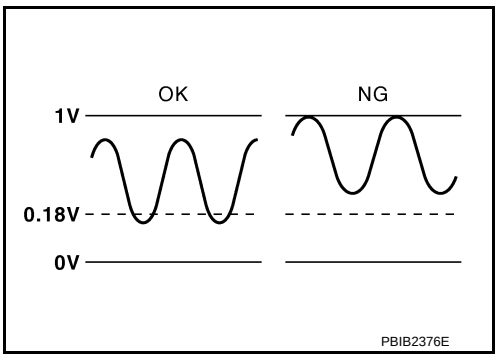
MALFUNCTION A

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0138	HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit high voltage]	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector
P0158	HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit high voltage]	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 2 minutes.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-814, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> With GST: GO TO 5.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

WITH CONSULT

NOTE:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1146” (for DTC P0138) or “HO2S2 (B2) P1166” (for DTC P0158) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
11. Follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-814, "Diagnosis Procedure".
CON NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

WITH GST

Perform component function check. Refer to EC-814, "Component Function Check".

NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-814, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009435

1. PERFORM COMPONENT FUNCTION CHECK-I

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F110	96	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be below 0.18 V at least once during this procedure.
P0158		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F110	96	100	Keeping engine at idle for 10 minutes	The voltage should be below 0.18 V at least once during this procedure.
P0158		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F110	96	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be below 0.18 V at least once during this procedure.
P0158		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-814, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009436

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-812, "DTC Logic".

Which malfunction is detected?

A >> GO TO 2
B >> GO TO 8.

2.CHECK HEATED OXYGEN SENSOR 2 CONNECTOR

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace harness or connectors.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	1	F110	100	Existed
P0158	2	F88	1			

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	4	F110	96	Existed
P0158	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0138	1	F87	4	F110	96	Ground	Not existed
P0158	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-817, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

8.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-730, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-830, "DTC Logic".
NO >> GO TO 9.

9.CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	1	F110	100	Existed
P0158	2	F88	1			

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F87	4	F110	96	Existed
P0158	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0138	1	F87	4	F110	96	Ground	Not existed
P0158	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-817, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000009009437

1. INSPECTION START

Will CONSULT be used?

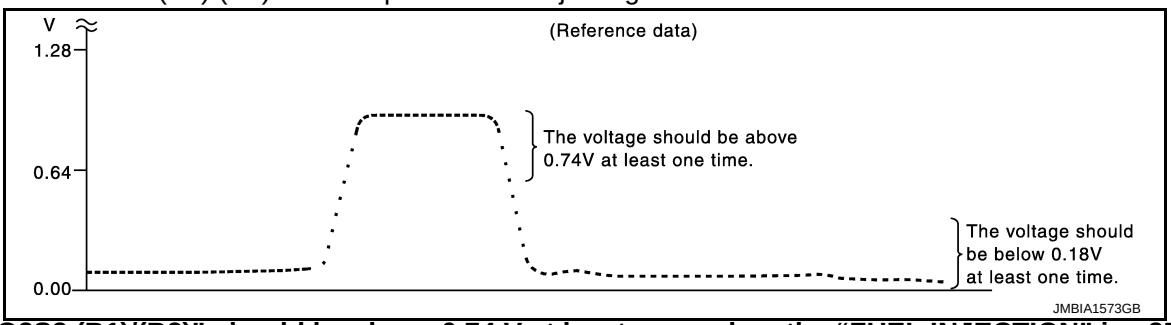
Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

WITH CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
5. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is –25%.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

WITHOUT CONSULT

1. Start engine and warm it up to the normal operating temperature.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**

- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

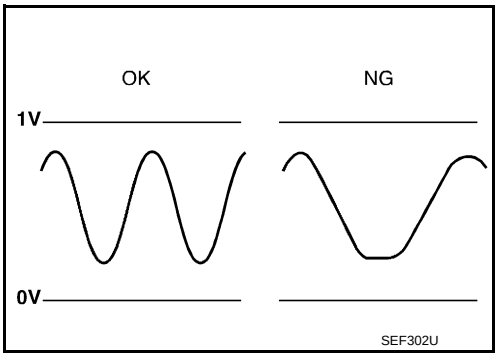
P0139, P0159 HO2S2

DTC Logic

INFOID:0000000009009438

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0139	HO2S2 (B1) [Heated oxygen sensor 2 (bank 1) circuit slow response]	It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors (The heated oxygen sensor 2 circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks
P0159	HO2S2 (B2) [Heated oxygen sensor 2 (bank 2) circuit slow response]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT

TESTING CONDITION:

For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. 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 “DATA MONITOR” mode with CONSULT.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P0139” or “HO2S2 (B2) P0159” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
11. Start engine and follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-822, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 2.

4.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform component function check. Refer to EC-821, "Component Function Check".

NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-822, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009439

1.PERFORM COMPONENT FUNCTION CHECK-I

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F110	96	100	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F110	96	100	Keeping engine at idle for 10 minutes	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F110	96	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		87			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-822, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009440

1.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-730, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-826, "DTC Logic" or EC-830, "DTC Logic".
NO >> GO TO 2.

2.CHECK HEATED OXYGEN SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F87	1	F110	100	Existed
P0159	2	F88	1			

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F87	4	F110	96	Existed
P0159	2	F88	4		87	

2. Check the continuity between HO2S2 harness connector and ground, or ECM harness connector and ground.

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0139	1	F87	4	F110	96	Ground	Not existed
P0159	2	F88	4		87		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-823, "Component Inspection (HO2 sensor 2)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

6. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (HO2 sensor 2)

INFOID:0000000009009441

1. INSPECTION START

Will CONSULT be used?

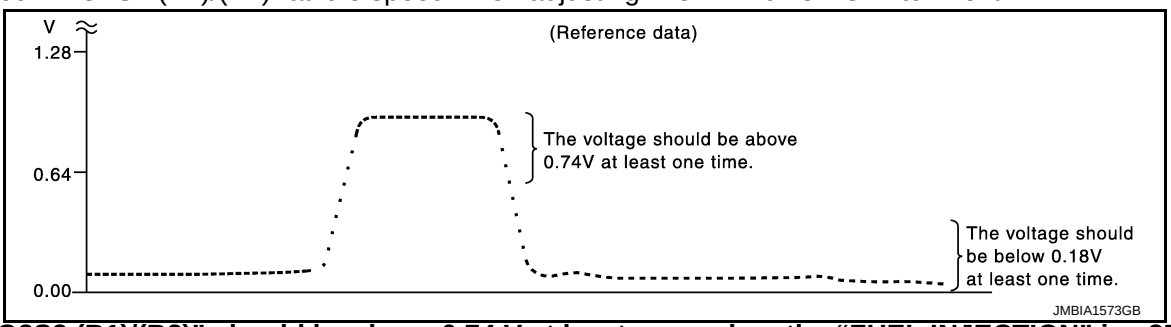
Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

WITH CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
5. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is –25%.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

⊗ WITHOUT CONSULT
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 5.

5. CHECK HEATED OXYGEN SENSOR 2-III

Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F110	96 [HO2S2 (bank 1)]	100	Coasting from 80 km/h (50 MPH) with selector lever in the D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 6.

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-41, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000009009442

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0171	FUEL SYS-LEAN-B1 [Fuel injection system too lean (bank 1)]	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leakage • A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection
P0174	FUEL SYS-LEAN-B2 [Fuel injection system too lean (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-730, "Work Procedure".
2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.
NO >> GO TO 4.

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Proceed to EC-827, "Diagnosis Procedure".
NO >> Check exhaust and intake air leakage visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-827, "Diagnosis Procedure".

NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine.
5. Maintain the following conditions for at least 10 consecutive minutes.
   Hold the accelerator pedal as steady as possible.

Vehicle speed	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

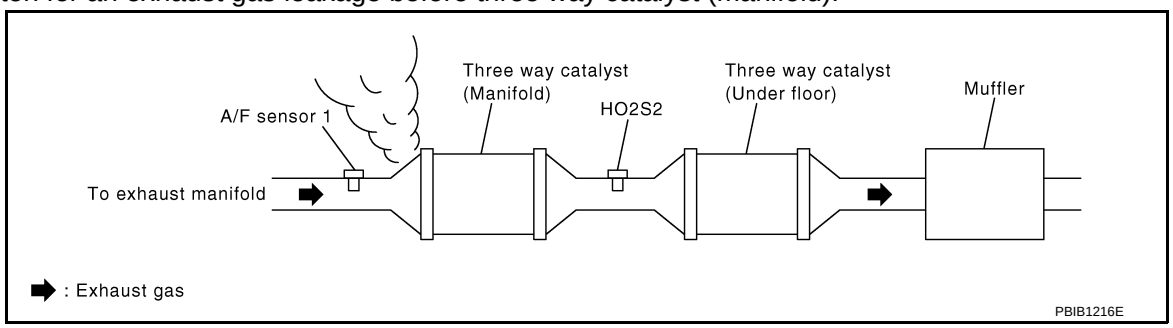
YES >> Proceed to EC-827, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009443

1. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAKAGE

1. Listen for an intake air leakage after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK A/F SENSOR 1 CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0171	1	F67	3	F110	88	Existed
			4		90	
			6		94	
P0174	2	F68	3		78	
			4		80	
			6		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Continuity	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0171	1	F67	3	F110	88	Existed	Not existed
			4		90		
			6		94		
P0174	2	F68	3		78		
			4		80		
			6		74		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-731, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”. Refer to FL-5, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

WITH CONSULT
1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT.
   For specification, refer to EC-1055, "Mass Air Flow Sensor".

WITH GST
1. Install all removed parts.
2. Check mass air flow sensor signal in Service $01 with GST.
   For specification, refer to EC-1055, "Mass Air Flow Sensor".

Is the measurement value within the specification?

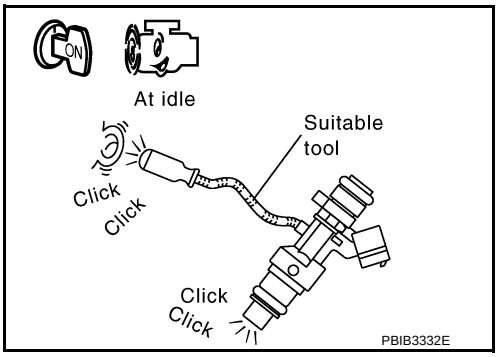
YES >> GO TO 7.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-779, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

WITH CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT
1. Start engine and let it idle.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for fuel injector, refer to EC-1012, "Diagnosis Procedure".

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace fuel injector. Refer to EM-49, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000009009444

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0172	FUEL SYS-RICH-B1 [Fuel injection system too rich (bank 1)]	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Mass air flow sensor
P0175	FUEL SYS-RICH-B2 [Fuel injection system too rich (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-730, "Work Procedure".
2. Start engine.

Is it difficult to start engine?

YES >> GO TO 3.
NO >> GO TO 4.

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Proceed to EC-831, "Diagnosis Procedure".
NO >> Remove spark plugs and check for fouling, etc.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-831, "Diagnosis Procedure".
NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine.
5. Maintain the following conditions for at least 10 consecutive minutes.
   Hold the accelerator pedal as steady as possible.

Vehicle speed	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

6. Check 1st trip DTC.

Is 1st trip DTC detected?

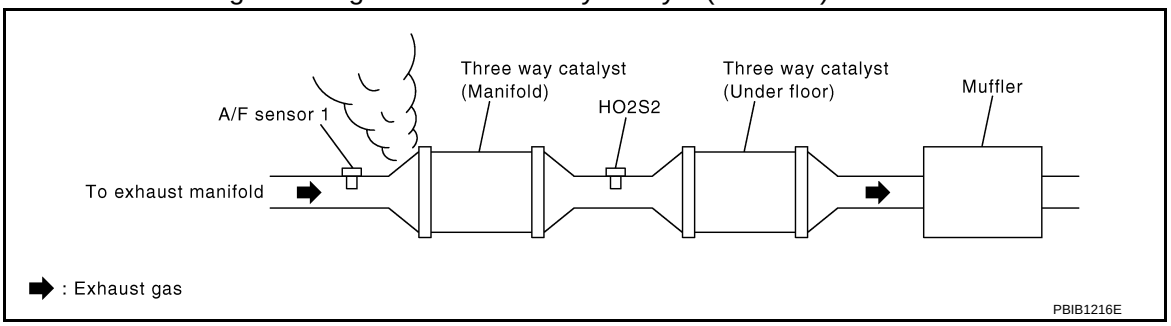
YES >> Proceed to EC-831, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009445

1. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 2.

2. CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3. CHECK A/F SENSOR 1 CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0171	1	F67	3	F110	88	Existed
			4		90	
			6		94	
P0174	2	F68	3		78	
			4		80	
			6		74	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Continuity	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0171	1	F67	3	F110	88	Existed	Not existed
			4		90		
			6		94		
P0174	2	F68	3		78		
			4		80		
			6		74		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

Check fuel pressure. Refer to EC-731, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filter and fuel pump assembly". Refer to FL-5, "Removal and Installation".

5. CHECK MASS AIR FLOW SENSOR

WITH CONSULT
1. Install all removed parts.
2. Check "MASS AIR FLOW" in "DATA MONITOR" mode with CONSULT.
   For specification, refer to EC-1055, "Mass Air Flow Sensor".

WITH GST
1. Install all removed parts.
2. Check mass air flow sensor signal in "Service $01" with GST.
   For specification, refer to EC-1055, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 6.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-779, "Diagnosis Procedure".

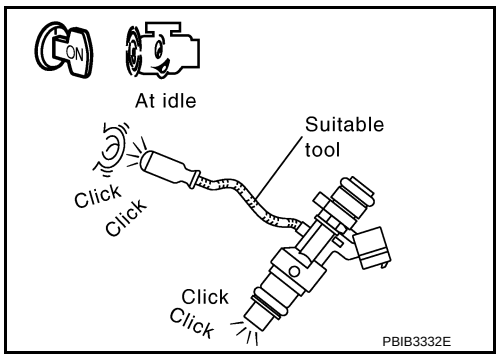
6. CHECK FUNCTION OF FUEL INJECTOR

WITH CONSULT
1. Start engine.
2. Perform "POWER BALANCE" in "ACTIVE TEST" mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT
1. Start engine and let it idle.

2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> GO TO 7.
NO >> Perform trouble diagnosis for fuel injector, refer to EC-1012, "Diagnosis Procedure".

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace fuel injector. Refer to EM-49, "Removal and Installation".
NO >> Repair or replace malfunctioning part.

P0190 FRP SENSOR

DTC Logic

INFOID:0000000009009446

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0190	Fuel rail pressure sensor circuit low input and high input	Signal voltage from the fuel rail pressure sensor remains at more than 4.84 V / less than 0.2 V for 5 seconds or more.	• Harness or connectors (Fuel rail pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Low fuel pressure sensor circuit is open or shorted.) (The electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Low fuel pressure sensor • Electrically-controlled cooling fan coupling

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine ON and wait at least 60 seconds.
2. Check DTC or 1st trip DTC.

Is DTC or 1st trip DTC detected?

YES >> Proceed to EC-834, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009447

1.CHECK FRP SENSOR POWER SUPPLY-I

1. Turn ignition switch OFF.
2. Disconnect FRP sensor connector.
3. Turn ignition switch ON.
4. Check the voltage between FRP sensor harness connector terminals.

FRP sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F26	1	3	5 V

Inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK FRP SENSOR POWER SUPPLY-II

Check the voltage between FRP sensor harness connector and the ground.

+		–	Voltage (Approx.)
FRP sensor			
Connector	Terminal		
F26	1	Ground	5 V

Is inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-746, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4. 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.

+		–		Continuity
FRP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F26	3	F111	40	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5. CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and the ground.

ECM		Ground	Continuity
Connector	Terminal		
F111	5	Ground	Existed
E80	114		
	115		
	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

6.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.

+		–		Continuity
FRP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F26	2	F111	31	Existed

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK FRP SENSOR

Refer to EC-836, "Component Inspection (Fuel Rail Pressure Sensor)".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

Component Inspection (Fuel Rail Pressure Sensor)

INFOID:0000000009009448

1.CHECK FRP SENSOR

WITH CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Select “DATA MONITOR” mode with CONSULT.
5. Check that the “FUEL PRES SEN V” indication.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Engine speed: Idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Check FRP sensor signal voltage.

+		–		Condition	Value (Approx.)
ECM					
Connector	Terminal	Connector	Terminal		
F111	31	F111	40	[Engine is running] • Warm-up condition • Idle speed	0.82 – 1.22 V
				[Engine is running] • Warm-up condition • Revving engine from idle to 4,000 rpm quickly	0.82 – 3.06 V

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Replace FRP sensor. Refer to EM-49, "Exploded View".

P0197, P0198 EOT SENSOR

DTC Logic

INFOID:0000000009009449

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC Detecting Condition	Possible Cause
P0197	EOT SEN/CIRC (Engine oil temperature sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The engine oil temperature sensor circuit is open or shorted.) • Engine oil temperature sensor
P0198	EOT SEN/CIRC (Engine oil temperature sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-837, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009450

1.CHECK ENGINE OIL TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine oil temperature (EOT) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between EOT sensor harness connector and ground.

EOT sensor		Ground	Voltage (V)
Connector	Terminal		
F38	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK EOT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
F38	2	F111	40	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-838, "Component Inspection (Engine Oil Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace engine oil temperature sensor. Refer to EM-56, "Exploded View".

4.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

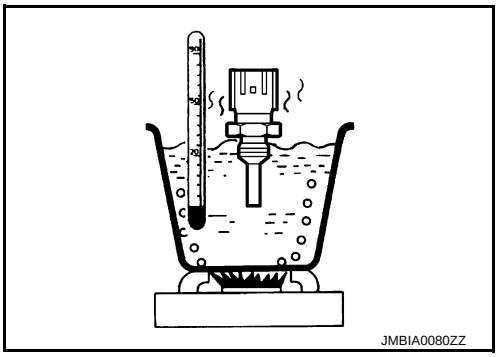
>> INSPECTION END

Component Inspection (Engine Oil Temperature Sensor)

INFOID:0000000009009451

1.CHECK ENGINE OIL TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine oil temperature sensor harness connector.
3. Remove engine oil temperature sensor.
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.35 - 2.73
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine oil temperature sensor. Refer to EM-56, "Exploded View".

P0201, P0202, P0203, P0204, P0205, P0206, P0207, P0208 INJECTOR

DTC Logic

INFOID:0000000009009452

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0201	No.1 fuel injector circuit	ECM detects No. 1 injector circuit is open or shorted.	• The fuel injector circuit is open or shorted • Fuel injector • ECM
P0202	No. 2 fuel injector circuit	ECM detects No. 2 injector circuit is open or shorted.	
P0203	No. 3 fuel injector circuit	ECM detects No. 3 injector circuit is open or shorted.	
P0204	No. 4 fuel injector circuit	ECM detects No. 4 injector circuit is open or shorted.	
P0205	No. 5 fuel injector circuit	ECM detects No. 5 injector circuit is open or shorted.	
P0206	No. 6 fuel injector circuit	ECM detects No. 6 injector circuit is open or shorted.	
P0207	No. 7 fuel injector circuit	ECM detects No. 7 injector circuit is open or shorted.	
P0208	No. 8 fuel injector circuit	ECM detects No. 8 injector circuit is open or shorted.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine and let it idle at least 30 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-839, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009453

1.PERFORM TROUBLE DIAGNOSIS FOR INJECTOR

Refer to EC-1012, "Component Function Check".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

P0222, P0223 TP SENSOR

DTC Logic

INFOID:0000000009009454

DTC DETECTION LOGIC

NOTE:
If DTC P0222 or P0223 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-904, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0222	TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit low input)	An excessively low voltage from the TP sensor 1 is sent to ECM.	• Harness or connectors (TP sensor 1 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1)
P0223	TP SEN 1/CIRC-B1 (Throttle position sensor 1 circuit high input)	An excessively high voltage from the TP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-840, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009455

1.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle control actuator		Ground	Voltage (V)
Connector	Terminal		
F66	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	4	F110	97	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	1	F110	91	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR

Refer to EC-841, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000009009456

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-725, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F110	91 (TP sensor 1 signal)	97 (Sensor ground)	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	79 (TP sensor 2 signal)			Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P0300, P0301, P0302, P0303, P0304, P0305, P0306, P0307, P0308 MISFIRE

DTC Logic

INFOID:0000000009009457

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the 1st trip that a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
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 signal every 1,000 engine revolutions.
   A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0300	MULTI CYL MISFIRE (Multiple cylinder misfires detected)	Multiple cylinders misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector circuit is open or shorted • Fuel injector • Intake air leakage • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • A/F sensor 1 • Incorrect PCV hose connection
P0301	CYL 1 MISFIRE (No.1 cylinder misfire detected)	No. 1 cylinder misfires.	
P0302	CYL 2 MISFIRE (No. 2 cylinder misfire detected)	No. 2 cylinder misfires.	
P0303	CYL 3 MISFIRE (No. 3 cylinder misfire detected)	No. 3 cylinder misfires.	
P0304	CYL 4 MISFIRE (No. 4 cylinder misfire detected)	No. 4 cylinder misfires.	
P0305	CYL 5 MISFIRE (No. 5 cylinder misfire detected)	No. 5 cylinder misfires.	
P0306	CYL 6 MISFIRE (No. 6 cylinder misfire detected)	No. 6 cylinder misfires.	
P0307	CYL 7 MISFIRE (No. 7 cylinder misfire detected)	No. 7 cylinder misfires.	
P0308	CYL 8 MISFIRE (No. 8 cylinder misfire detected)	No. 8 cylinder misfires.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and let it idle for about 15 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-844, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.
   Hold the accelerator pedal as steady as possible.
   Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.
   CAUTION:
   Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

Engine speed	Engine speed in the freeze frame data ± 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 × (1 ± 0.1)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

Driving time varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-844, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009458

1.CHECK FOR INTAKE AIR LEAKAGE AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leakage.
3. Check PCV hose connection.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.
NO >> GO TO 2.

2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 3.
YES-2 >> Without CONSULT: GO TO 4.
NO >> Repair or replace malfunctioning part.

3. PERFORM POWER BALANCE TEST

WITH CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

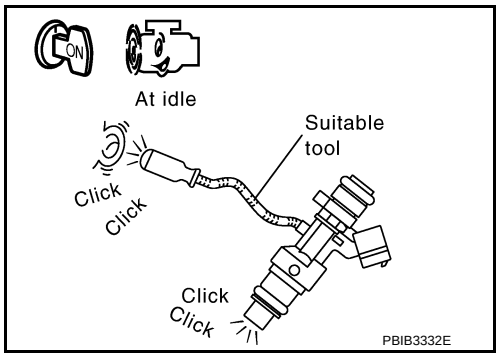
Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 4.

4. CHECK FUNCTION OF FUEL INJECTOR-I

1. Start engine and let it idle.
2. Listen to each fuel injector operation.

Clicking sound should be heard.



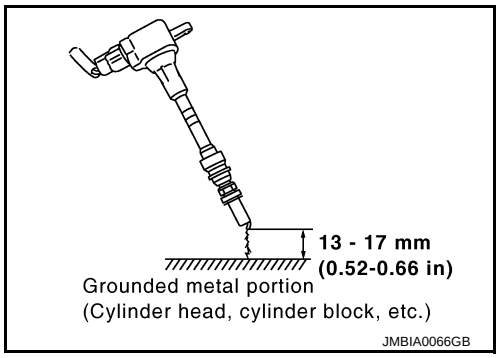
Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-1012, "Diagnosis Procedure".

5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse No. in IPDM E/R to release fuel pressure.
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **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 9.
NO >> GO TO 6.

6. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

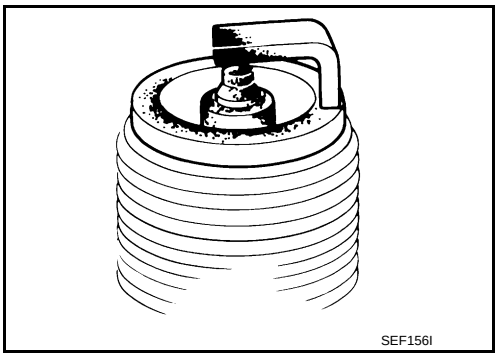
YES >> GO TO 7.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-1020, "Diagnosis Procedure".

7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-140, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 8.



8. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-140, "Spark Plug".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-16, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Check fuel pressure. Refer to EC-731, "Work Procedure".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”.
NO >> Repair or replace malfunctioning part.

12. CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.
For procedure, refer to EC-1047, "Inspection" and EC-1048, "Inspection".
For specification, refer to EC-1055, "Idle Speed" and EC-1055, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Follow the EC-716, "Work Procedure".

13. CHECK AIR FUEL RATIO SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F67	4	Ground	3.0 V
P0150	2	F68	4		

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

14. CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	3	F110	88	Existed
P0150	2	F68	3		78	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0130	1	F67	3	F110	88	Ground	Not existed
P0150	2	F68	3		78		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

15. CHECK A/F SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F67	6	F110	94	Existed
P0150	2	F68	6		74	

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 16.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

16. CHECK A/F SENSOR 1 HEATER

Refer to EC-760, "Component Inspection (A/F Sensor 1 Heater)".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace malfunctioning A/F sensor 1. Refer to EX-5, "Exploded View".

17. CHECK MASS AIR FLOW SENSOR

WITH CONSULT
Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT.
For specification, refer to EC-1055, "Mass Air Flow Sensor".

WITH GST
Check mass air flow sensor signal in Service $01 with GST.
For specification, refer to EC-1055, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 18.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-779, "Diagnosis Procedure".

18. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-1041, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 19.
NO >> Repair or replace malfunctioning part.

19. 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-638, "CONSULT Function" or EC-635, "On Board Diagnosis Function".

>> GO TO 20.

20. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0327, P0328, P0332, P0333 KS

DTC Logic

INFOID:0000000009009459

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detected condition	Possible cause
P0327	KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit low input]	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The knock sensor circuit is open or shorted.) • Knock sensor
P0328	KNOCK SEN/CIRC-B1 [Knock sensor (bank 1) circuit high input]	An excessively high voltage from the sensor is sent to ECM.	
P0332	KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit low input]	An excessively low voltage from the sensor is sent to ECM.	
P0333	KNOCK SEN/CIRC-B2 [Knock sensor (bank 2) circuit high input]	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-849, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009460

1.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector and ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

DTC	Knock sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0327, P0328	1	F203	2	F111	35	Existed
P0332, P0333	2	F204	2			

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between knock sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit or short to power in harness or connectors.

3.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between knock sensor harness connector and ECM harness connector.

DTC	Knock sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0327, P0328	1	F203	1	F111	29	Existed
P0332, P0333	2	F204	1		33	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and knock sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK KNOCK SENSOR

Refer to EC-850, "Component Inspection (Knock Sensor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning knock sensor. Refer to EM-115, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Knock Sensor)

INFOID:0000000009009461

1.CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as per the following.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Terminals	Resistance
1 and 2	Approx. 532 - 588 kΩ [at 20°C (68°F)]

CAUTION:
Never use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning knock sensor. Refer to EM-115, "Exploded View".

P0335 CKP SENSOR

DTC Logic

INFOID:0000000009009462

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0335	CKP SEN/CIRCUIT (Crankshaft position sensor circuit)	• The crankshaft position sensor signal is not detected by the ECM during the first few seconds of engine cranking. • The proper pulse signal from the crankshaft position sensor is not sent to ECM while the engine is running. • The crankshaft position sensor signal is not in the normal pattern during engine running.	• Harness or connectors (Crankshaft position sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Refrigerant pressure sensor circuit is open or shorted.) (EVAP control system pressure sensor circuit is open or shorted.) • Crankshaft position sensor • Accelerator pedal position sensor • Battery current sensor • Camshaft position sensor (bank 1) • Refrigerant pressure sensor • EVAP control system pressure sensor • Signal plate

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10.5 V or more with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-851, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009463

1.CHECK CRANKSHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect crankshaft position (CKP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CKP sensor harness connector and ground.

CKP sensor		Ground	Voltage (V)
Connector	Terminal		
F74	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK CKP SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch ON.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor harness connector and ECM harness connector.

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F74	1	F110	76	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	CKP sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (With ICC)	E67	9
	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.
- Battery current sensor (Refer to EC-936, "Component Inspection (Battery Current Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

7.CHECK CKP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor harness connector and ECM harness connector.

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F74	2	F110	98	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK CKP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor harness connector and ECM harness connector.

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F74	3	F110	86	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace crankshaft position sensor.

10.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace the signal plate.

11.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

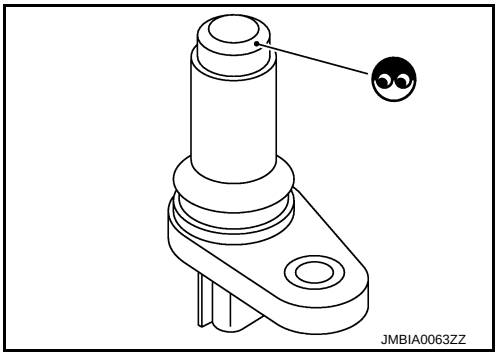
Component Inspection (Crankshaft Position Sensor)

INFOID:0000000009009464

1.CHECK CRANKSHAFT POSITION SENSOR-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect crankshaft position sensor harness connector.
4. Remove the sensor.

5. Visually check the sensor for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor. Refer to EM-59, "Exploded View".

2. CHECK CRANKSHAFT POSITION SENSOR-II

Check resistance between crankshaft position sensor terminals as per the following.

Terminals (Polarity)	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace crankshaft position sensor. Refer to EM-59, "Exploded View".

P0340, P0345 CMP SENSOR

DTC Logic

INFOID:0000000009009465

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0340	CMP SEN/CIRC-B1 [Camshaft position sensor (bank 1) circuit]	• The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. • The cylinder No. signal is not sent to ECM during engine running. • The cylinder No. signal is not in the normal pattern during engine running.	• Harness or connectors [Camshaft position sensor (bank 1) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) [Crankshaft position sensor circuit is shorted.] (Refrigerant pressure sensor circuit is open or shorted.) (EVAP control system pressure sensor circuit is open or shorted.) • Camshaft position sensor (bank 1) • Accelerator pedal position sensor • Battery current sensor • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery
P0345	CMP SEN/CIRC-B2 [Camshaft position sensor (bank 2) circuit]		• Harness or connectors [Camshaft position sensor (bank 2) circuit is open or shorted.] • Camshaft position sensor (bank 2) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10.5 V or more with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-856, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Maintain engine speed at more than 800 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-856, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009466

1.CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.
NO >> Check starting system. (Refer to STR-10, "Work Flow (With GR8-1200 NI)", or STR-13, "Work Flow (Without GR8-1200 NI)". For the details of the GR8-1200 NI, refer to STR-3, "Special Service Tools".)

2.CHECK CAMSHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect camshaft position (CMP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CMP sensor harness connector and ground.

DTC	CMP sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P0340	1	F84	1	Ground	Approx. 5
P0345	2	F83	1		

Is the inspection result normal?

YES >> GO TO 8.
NO-1 >> P0340: GO TO 3.
NO-2 >> P0345: Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK CMP SENSOR POWER SUPPLY CIRCUIT-II

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
Bank	Connector	Terminal	Connector	Terminal	
1	F84	1	F110	77	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	CKP sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (With ICC)	E67	9
	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.
- Battery current sensor (Refer to EC-936, "Component Inspection (Battery Current Sensor)".)
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8.CHECK CMP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CMP sensor harness connector and ECM harness connector.

DTC	CMP sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F84	2	F110	68	Existed
P0345	2	F83	2		99	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK CMP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CMP sensor harness connector and ECM harness connector.

DTC	CMP sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F84	3	F110	95	Existed
P0345	2	F83	3		73	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK CAMSHAFT POSITION SENSOR

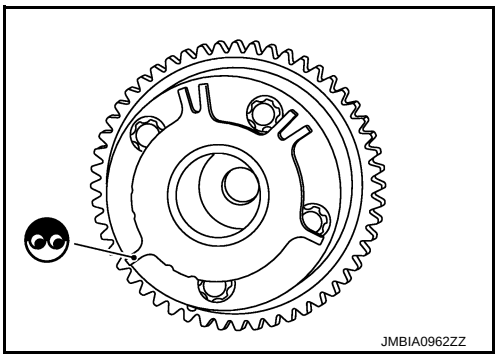
Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 11
NO >> Replace malfunctioning camshaft position sensor. Refer to EM-63, "Exploded View".

11. CHECK CAMSHAFT (INT)

Check the following.
- Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end



Is the inspection result normal?

YES >> GO TO 12.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

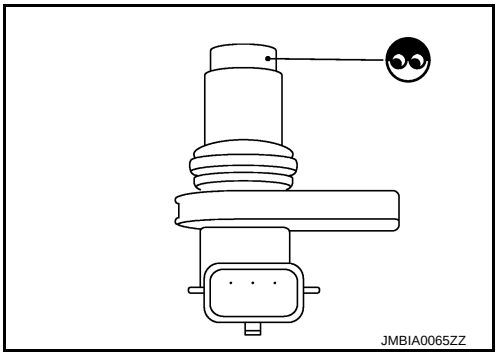
>> INSPECTION END

Component Inspection (Camshaft Position Sensor)

INFOID:0000000009009467

1. CHECK CAMSHAFT POSITION SENSOR-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position sensor harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning camshaft position sensor.

2. CHECK CAMSHAFT POSITION SENSOR-II

Check resistance camshaft position sensor terminals as per the following.

Terminals (Polarity)	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning camshaft position sensor. Refer to EM-63, "Exploded View".

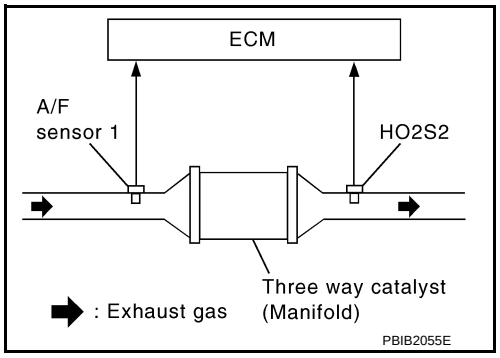
P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

INFOID:0000000009009468

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0420	TW CATALYST SYS-B1 [Catalyst system efficiency below threshold (bank 1)]	• Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity.	• Three way catalyst (manifold) • Exhaust tube • Intake air leakage • Fuel injector • Fuel injector leakage • Spark plug • Improper ignition timing
P0430	TW CATALYST SYS-B2 [Catalyst system efficiency below threshold (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

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.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 6.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

WITH CONSULT

TESTING CONDITION:

Do not maintain engine speed for more than the specified minutes below.

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT.
11. Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of “CATALYST”.

Which is displayed on CONSULT screen?

CMPLT >> GO TO 5.
INCMP >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Wait 5 seconds at idle.
2. Rev engine between 2,000 and 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).

Does the indication change to “CMPLT”?

YES >> GO TO 5.
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 2.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-861, "Diagnosis Procedure".
NO >> INSPECTION END

6.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform component function check. Refer to EC-860, "Component Function Check".
NOTE:
Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-861, "Diagnosis Procedure"

Component Function Check

INFOID:0000000009009469

1.PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Open engine hood.
6. Check the voltage between ECM harness connector terminals under the following conditions.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0420	F110	96 [HO2S2 (bank 1)]	100	Keeping engine speed at 2,500 rpm constant under no load	The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0
P0430		87 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-861, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009470

1.CHECK EXHAUST SYSTEM

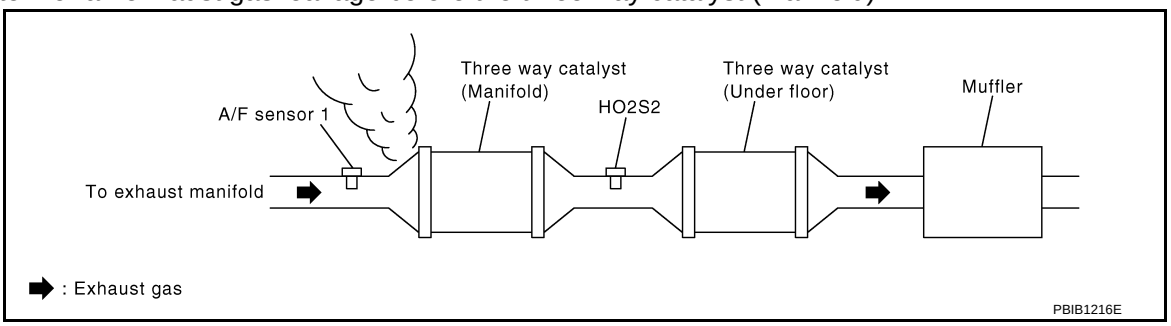
Visually check exhaust tubes and muffler for dents.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before the three way catalyst (manifold).



Is exhaust gas leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 3.

3.CHECK INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Repair or replace malfunctioning part.
NO >> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.
For procedure, refer to EC-1047, "Inspection" and EC-1048, "Inspection".
For specification, refer to EC-1055, "Idle Speed" and EC-1055, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-716, "Work Procedure".

5.CHECK FUEL INJECTORS

Refer to EC-1012, "Component Function Check".

Is the inspection result normal?

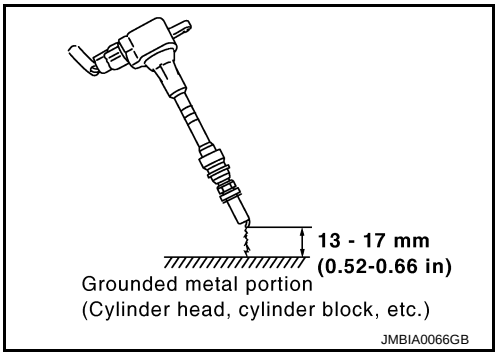
YES >> GO TO 6.
NO >> Perform EC-1012, "Diagnosis Procedure".

6.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
   NOTE:
   - For the fuse number, refer to EC-689, "Wiring Diagram".
   - For the fuse arrangement, refer to PG-96, "Fuse, Connector and Terminal Arrangement".
   - Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.

6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

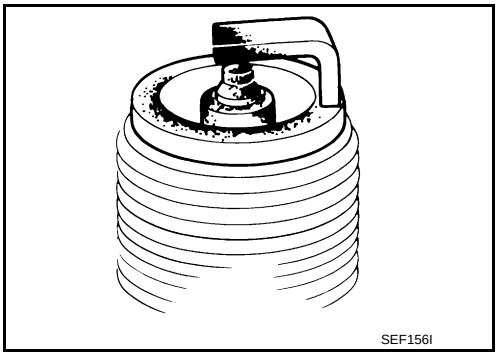
YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-1020, "Diagnosis Procedure".

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-140, "Spark Plug".
NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-140, "Spark Plug".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to EM-49, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.
6. Check that fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping.
NO >> GO TO 11.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace three way catalyst assembly.
NO >> Repair or replace harness or connector.

P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000009009471

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0444	PURG VOLUME CONT/V (EVAP canister purge volume control solenoid valve circuit open)	An excessively low voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is open or shorted.) • EVAP canister purge volume control solenoid valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-864, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009472

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister purge volume control solenoid valve harness connector and ground.

EVAP canister purge volume control solenoid valve		Ground	Voltage
Connector	Terminal		
F48	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT

FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
F48	2	F110	64	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 4.
YES-2 >> Without CONSULT: GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

WITH CONSULT
1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 6.
NO >> GO TO 5.

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-865, "Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace EVAP canister purge volume control solenoid valve.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Canister Purge Volume Control Solenoid Valve)

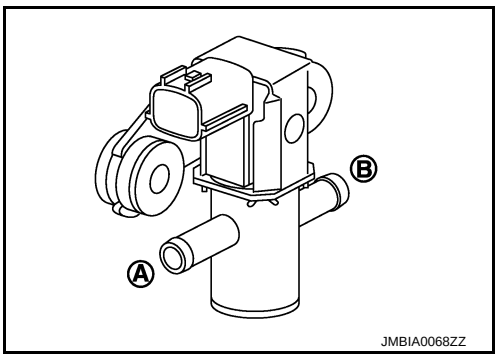
INFOID:0000000009009473

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. Turn ignition switch ON.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.

6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

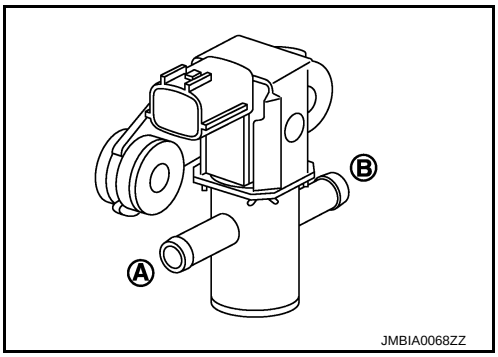
Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed



WITHOUT CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-11, "Hydraulic Layout".

P0447 EVAP CANISTER VENT CONTROL VALVE

DTC Logic

INFOID:0000000009009474

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0447	VENT CONTROL VALVE (EVAP canister vent control valve circuit open)	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	• Harness or connectors (The valve circuit is open or shorted.) • EVAP canister vent control valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-867, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009475

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

WITH CONSULT
1. Turn ignition switch OFF and then ON.
2. Select “VENT CONTROL/V” in “ACTIVE TEST” mode with CONSULT.
3. Touch “ON/OFF” on CONSULT screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

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.

EVAP canister vent control valve		Ground	Voltage
Connector	Terminal		
C18	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP canister vent control valve and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister vent control valve harness connector and ECM harness connector.

EVAP canister vent control valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
C18	2	E80	120	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. 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 8.
NO >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-869, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

9. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Canister Vent Control Valve)

INFOID:0000000009009476

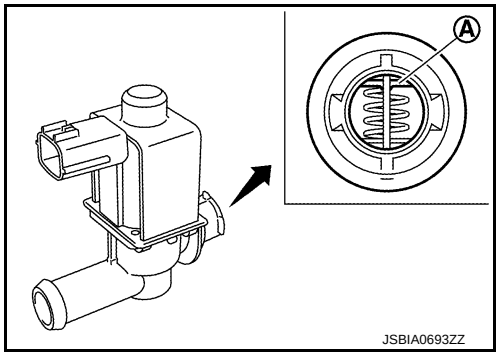
1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

NO >> GO TO 2.



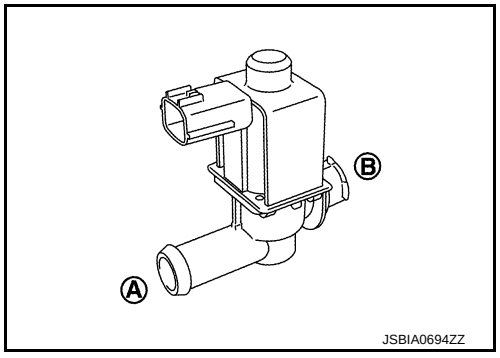
2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

WITH CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time.
   Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.



WITHOUT CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
   Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> GO TO 3.

NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

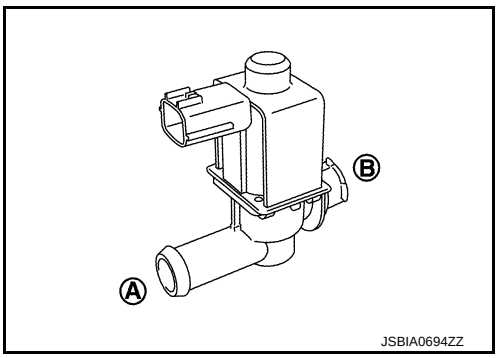
WITH CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

3. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.



WITHOUT CONSULT
1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:0000000009009477

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0452	EVAP SYS PRES SEN (EVAP control system pressure sensor low input)	An excessively low voltage from the sensor is sent to ECM.	• (EVAP control system pressure sensor circuit is shorted.) Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “DATA MONITOR” mode with CONSULT.
7. Check that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.

ECM		
Connector	+	–
	Terminal	Terminal
E80	134 (Fuel tank temperature sensor signal)	175

3. Check that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.

8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-872, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009478

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
C17	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
C17	3	E80	133	Existed

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between ECM and EVAP control system pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

5.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E80	133	EVAP control system pressure sensor	C17	3
		Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair short to ground or short to power in harness or connectors.

6. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-936, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.
Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system)
Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
C17	1	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP control system pressure sensor and ECM

• Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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	
C17	2	E80	143	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
• Harness for open or short between EVAP control system pressure sensor and ECM
• Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000009009479

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	143	150	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:
• **Always calibrate the vacuum pump gauge when using it.**

- **Never apply below -93.3 kPa (-0.952 kg/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.

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

DTC Logic

INFOID:0000000009009480

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0453	EVAP SYS PRES SEN (EVAP control system pressure sensor high input)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (EVAP control system pressure sensor circuit is shorted.) (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • Crankshaft position sensor • Camshaft position sensor (bank 1) • Accelerator pedal position sensor 2 • Battery current sensor • Refrigerant pressure sensor • EVAP canister vent control valve • EVAP canister • Rubber hose from EVAP canister vent control valve to vehicle frame

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “DATA MONITOR” mode with CONSULT.
7. Check that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

WITH GST
1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.

ECM		Ground
Connector	+	–
	Terminal	Terminal
E80	134 (Fuel tank temperature sensor signal)	175

3. Check that the voltage is less than 4.2 V.

4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-877, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009481

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace harness connector.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
C17	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
C17	3	E80	133	Existed

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between ECM and EVAP control system pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

5.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- Battery current sensor (Refer to EC-949, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.
Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system)
Refer to ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
C17	1	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP control system pressure sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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	
C17	2	E80	143	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between EVAP control system pressure sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve. Refer to FL-11, "Hydraulic Layout".
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

14. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-869, "Component Inspection (EVAP Canister Vent Control Valve)".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace EVAP canister vent control valve. Refer to FL-12, "Exploded View".

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor. Refer to FL-12, "Exploded View".

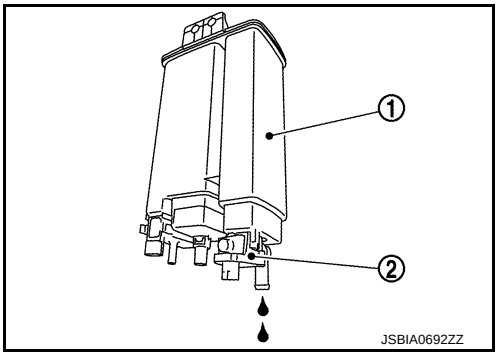
16. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Check if water will drain from the EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from EVAP canister?

YES >> GO TO 17.
NO >> GO TO 19.



17. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.5 kg (5.5 lb).

Is the inspection result normal?

YES >> GO TO 19.
NO >> GO TO 18.

18. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-11, "Hydraulic Layout".

19. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (EVAP Control System Pressure Sensor)

INFOID:0000000009009482

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+ Terminal	– Terminal		
E80	143	150	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:
- **Always calibrate the vacuum pump gauge when using it.**
- **Never apply below -93.3 kPa (-0.952 kg/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.

P0500 VSS

Description

INFOID:0000000009009483

The vehicle speed signal is sent to the “combination meter” from the “ABS actuator and electric unit (control unit)” by CAN communication line. The “combination meter” then sends a signal to the ECM by CAN communication line.

DTC Logic

INFOID:0000000009009484

DTC DETECTION LOGIC

NOTE:

- **If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0500	VEH SPEED SEN/CIRC (Vehicle speed sensor)	The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The vehicle speed signal circuit is open or shorted) • Wheel sensor • Combination meter • ABS actuator and electric unit (control unit)

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

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.

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 4.

2.CHECK VEHICLE SPEED SIGNAL

NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT

1. Start engine (VDC switch OFF).
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT.
   The vehicle speed on CONSULT should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to EC-882, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT.
2. Warm engine up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	More than 1,500 rpm
COOLAN TEMP/S	More than 70°C (158°F)

B/FUEL SCHDL	5.5 - 31.8 msec
Selector lever	Except P or N position
PW/ST SIGNAL	OFF

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-882, "Diagnosis Procedure".
NO >> INSPECTION END

4.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform Component Function Check. Refer to EC-882, "Component Function Check".
Use Component Function Check to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-882, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009485

1.PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in Service $01 with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-882, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009486

1.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-39, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK DTC WITH “COMBINATION METER”

Refer to MWI-31, "CONSULT Function".

>> INSPECTION END

P0506 ISC SYSTEM

Description

INFOID:0000000009009487

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000009009488

DTC DETECTION LOGIC

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0506	ISC SYSTEM (Idle speed control system RPM lower than expected)	The idle speed is less than the target idle speed by 100 rpm or more.	• Electric throttle control actuator • Intake air leakage

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the target idle speed is out of the specified value, perform EC-726, "Work Procedure", before conducting DTC Confirmation Procedure.
TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-883, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009489

1.CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.

NO >> GO TO 2.

2.REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform additional service when replacing ECM. Refer to EC-720, "Work Procedure".

>> INSPECTION END

P0507 ISC SYSTEM

Description

INFOID:0000000009009490

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000009009491

DTC DETECTION LOGIC

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0507	ISC SYSTEM (Idle speed control system RPM higher than expected)	The idle speed is more than the target idle speed by 200 rpm or more.	• Electric throttle control actuator • Intake air leakage • PCV system

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the target idle speed is out of the specified value, perform EC-726, "Work Procedure", before conducting DTC Confirmation Procedure.
TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**
- **Always perform the test at a temperature above −10°C (14°F).**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-885, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009492

1.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

Is intake air leakage detected?

YES >> Discover air leakage location and repair.
NO >> GO TO 3.

3.REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform additional service when replacing ECM. Refer to EC-720, "Work Procedure".

>> INSPECTION END

P0524 ENGINE OIL PRESSURE

DTC Logic

INFOID:0000000009009493

DTC DETECTION LOGIC

NOTE:
If DTC P0524 is displayed with DTC P0075 or P0081, perform trouble diagnosis for DTC P0075 or P0081 first. Refer to EC-765, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	Detecting condition	Possible cause
P0524	ENGINE OIL PRESSURE (Engine oil pressure too low)	Engine oil pressure is low because there is a gap between angle of target and phase-control angle.	• Engine oil pressure or level too low • Crankshaft position sensor • Camshaft position sensor • Intake valve timing control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-I

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-8, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Proceed to LU-8, "Inspection".

3.PERFORM DTC CONFIRMATION PROCEDURE

WITH CONSULT
1. Select “DATA MONITOR” mode with CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	More than 1,700 rpm
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

WITH GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-888, "Diagnosis Procedure"

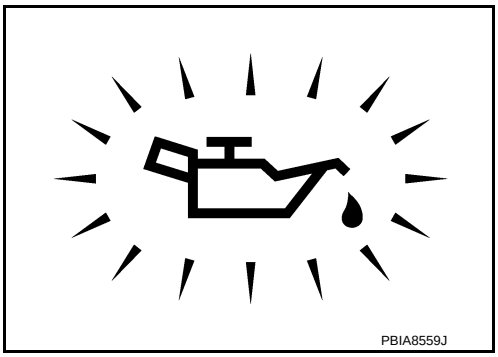
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009494

1.CHECK OIL PRESSURE WARNING LAMP

1. Start engine.
2. Check oil pressure warning lamp and confirm it is not illuminated.



Is oil pressure warning lamp illuminated?

YES >> Proceed to LU-8, "Inspection".
NO >> GO TO 2.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-757, "Component Inspection (Intake Valve Timing Control Solenoid Valve)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve.

3.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor.

4.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".

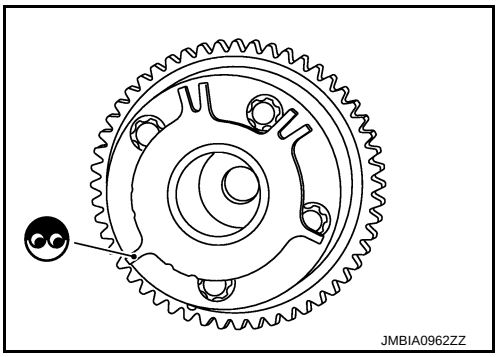
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor.

5.CHECK CAMSHAFT SPROCKET (SIGNAL PLATE)

Check the following.

- Accumulation of debris to the signal plate of camshaft sprocket (INT)
- Chipping signal plate of camshaft sprocket (INT)



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft sprocket (INT) or replace camshaft sprocket (INT). Refer to EM-63, "Exploded View".

6.CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-63, "Exploded View".
NO >> GO TO 7.

7.CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to LU-8, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0527 COOLING FAN SPEED SENSOR

DTC Logic

INFOID:0000000009009495

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0527	Cooling fan speed sensor circuit range/performance	The number of fan speed signals is 16 rpm or less during engine rev.	• Harness or connectors (The Fuel rail pressure sensor circuit is open or shorted.) (The Power steering pressure sensor circuit is open or shorted) (The Electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Cooling fan speed sensor • Electrically-controlled cooling fan coupling • Cooling fan • IPDM E/R

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Keep the engine speed approximately 1,000 rpm at no load.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-890, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009496

1.CHECK COOLING FAN SPEED SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect electrically-controlled cooling fan coupling harness connector.
3. Turn ignition switch ON.
4. Check the voltage between electrically-controlled cooling fan coupling harness connector terminals.

Electrically-controlled cooling fan coupling			Voltage (Approx.)
Connector	+	–	
	terminal		
F39	2	4	5 V

Is inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK COOLING FAN SPEED SENSOR POWER SUPPLY CIRCUIT-II

1. Check the voltage between electrically-controlled cooling fan coupling harness connector and the ground.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	terminal		
F39	2	Ground	5 V

Is inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-746, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.CHECK COOLING FAN SPEED SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electrically-controlled cooling fan coupling harness connector and ECM harness connector.

+		–		Continuity
Electrically-controlled cooling fan coupling		ECM		
Connector	Terminal	Connector	Terminal	
F39	4	F111	45	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and the ground.

+		–	Continuity
ECM			
Connector	Terminal		
F111	10	Ground	Existed
E80	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

6.CHECK COOLING FAN SPEED SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electrically-controlled cooling fan coupling harness connector and ECM harness connector.

+		–		Continuity
Electrically-controlled cooling fan coupling		ECM		
Connector	Terminal	Connector	Terminal	
F39	5	F111	37	Existed

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK COOLING FAN SPEED SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform cooling fan speed sensor component inspection. Refer to EC-892, "Component Inspection (Cooling Fan Speed Sensor)".

Is inspection result normal?

YES >> GO TO 8.
NO >> Replace electrically-controlled cooling fan coupling.

8.CHECK COOLING FAN ROTATIONAL CONDITION

Rotate the cooling fan by hand.

Dose the cooling fan rotates smoothly?

YES >> GO TO 9.
NO >> Check that the cooling fan is not interfered with other parts.

9.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING SYSTEM

Refer to EC-1009, "Diagnosis Procedure".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or replace error-detected parts.

Component Inspection (Cooling Fan Speed Sensor)

INFOID:0000000009009497

1.CHECK COOLING FAN SPEED SENSOR

1. Turn ignition switch OFF.
2. Disconnect electrically-controlled cooling fan coupling harness connector.
3. Rotate the electrically-controlled cooling fan coupling slowly with hand and check the voltage between electrically-controlled cooling fan coupling connector terminals under the following conditions.

+	–	Condition	Voltage (V) (Approx.)
Electrically-controlled cooling fan coupling			
Terminal			
5	4	• 5V direct current supply to terminal 2 • Terminal 4 connect to ground	0 ⇔ 5 **NOTE:** The voltage is in waveform

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace Electrically-controlled cooling fan coupling.

P0550 PSP SENSOR

DTC Logic

INFOID:0000000009009498

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0550	PW ST P SEN/CIRC (Power steering pressure sensor circuit)	An excessively low or high voltage from the sensor is sent to ECM.	• Harness or connectors (The Fuel rail pressure sensor circuit is open or shorted.) (The Power steering pressure sensor circuit is open or shorted) (The Electrically-controlled cooling fan coupling circuit is open or shorted) • Fuel rail pressure sensor • Power steering pressure sensor • Electrically-controlled cooling fan coupling

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-894, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009499

1.CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect power steering pressure (PSP) sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between PSP sensor harness connector terminals.

PSP sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F35	1	3	5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK POWER STEERING PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Check the voltage between PSP sensor harness connector and the ground.

+		–	Voltage (Approx.)
PSP sensor			
Connector	terminal		
F35	1	Ground	5 V

Is inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Low fuel pressure sensor	F25	3
		Power steering pressure sensor	F35	1
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-746, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4. CHECK PSP SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between PSP sensor harness connector and ECM harness connector.

+		–		Continuity
PSP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F35	3	F111	45	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5. CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and the ground.

+		–	Continuity
ECM			
Connector	Terminal		
F111	10	Ground	Existed
E80	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

6.CHECK PSP SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between PSP sensor harness connector and ECM harness connector.

+		–		Continuity
PSP sensor		ECM		
Connector	Terminal	Connector	Terminal	
F35	2	F111	39	Existed

4. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK PSP SENSOR

Refer to EC-896, "Component Inspection (Power Steering Pressure Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace PSP sensor.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Power Steering Pressure Sensor)

INFOID:0000000009009500

1.CHECK POWER STEERING PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and let it idle.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F111	39	45	Steering wheel	Being turned	0.5 - 4.5
				Not being turned	0.4 - 0.8

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace power steering pressure sensor.

P0603 ECM POWER SUPPLY

DTC Logic

INFOID:0000000009009501

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0603	ECM BACK UP/CIRCUIT (ECM power supply circuit)	ECM back up RAM system does not function properly.	• Harness or connectors [ECM power supply (back up) circuit is open or shorted.] • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON wait at least 10 seconds.
2. Turn ignition switch OFF and wait at least 5 minutes.
3. Turn ignition switch ON, wait at least 10 seconds.
4. Repeat step 2 and 3 for five times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-897, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009502

1.CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the voltage between ECM harness connector terminals.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
E80	156	E80	175	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- 20 A fuse (No. 43)
- Harness for open or short between ECM and battery
- Loose or poor connection for each connector and harness

>> Repair or replace harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace harness or connectors.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-897, "DTC Logic".

Is the 1st trip DTC P0603 displayed again?

YES >> GO TO 5.
NO >> INSPECTION END

5. REPLACE ECM

Replace ECM.

>> INSPECTION END

P0605 ECM

DTC Logic

INFOID:0000000009009503

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605	Engine control module	A)	ECM calculation function is malfunctioning.	ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	
		D)	ECM temperature sensor is malfunctioning.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND D

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-899, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-899, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Repeat step 2 for 32 times.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-899, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009504

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-899, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

Replace ECM. Refer to EC-1052, "Removal and Installation".

>> INSPECTION END

P0607 ECM

DTC Logic

INFOID:0000000009009505

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0607	ECM (CAN communication bus)	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-901, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009506

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-901, "DTC Logic".
4. Check DTC.

Is the DTC P0607 displayed again?

YES >> Replace ECM. Refer to EC-1052, "Removal and Installation".
NO >> INSPECTION END

P0611 ECM PROTECTION

Description

INFOID:0000000009009507

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 Logic

INFOID:0000000009009508

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0611	ECM PROTECTION	ECM overheat protection control is activated.	ECM overheated

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-902, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009509

1.INSPECTION START

1. Perform DTC confirmation procedure. Refer to EC-902, "DTC Logic".
2. Check 1st trip DTC.

Is DTC P0605 detected?

YES >> Proceed to EC-899, "Diagnosis Procedure".
NO >> Explain the customer about the activation of the protection function.

P062B ECM

Description

INFOID:0000000009009510

This DTC is detected when the ECM-integrated injector driver unit has a malfunction. For injector driver unit, refer to EC-600, "ECM".

DTC Logic

INFOID:0000000009009511

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P062B	Internal control module fuel injector control performance	Injector driver unit is malfunctioning.	• Harness and connectors (Injector circuit is open or shorted) • Battery power supply • ECM (injector driver unit)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and keep the engine speed at idle for 30 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-903, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009512

1.CHECK FUEL INJECTOR

Perform fuel injector. Refer to EC-1012, "Component Function Check".

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure again. Refer to EC-903, "DTC Logic".
4. Check 1st trip DTC.

Is the DTC P062B displayed again?

YES >> Replace ECM. Refer to EC-1052, "Removal and Installation".
NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000009009513

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0643	SENSOR POWER/CIRC (Sensor power supply circuit short)	ECM detects that the voltage of power source for sensor is excessively low or high.	• Harness or connectors (Accelerator pedal position sensor 1 circuit is shorted.) [Camshaft position sensor (bank 2) circuit is shorted.] [Manifold absolute pressure (MAP) sensor circuit is shorted.] (Throttle position sensor circuit is shorted.) • Accelerator pedal position sensor 1 • Camshaft position sensor (bank 2) • Manifold absolute pressure (MAP) sensor • Throttle position sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-904, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009514

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	2	Ground	Approx. 5
E67 (With ICC)	12		

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	81	Electric throttle control actuator	F66	2
	83	Camshaft position sensor (bank 2)	F83	1
	85	Manifold absolute pressure (MAP) sensor	F65	1
E80	137	APP sensor 1 (Without ICC)	E110	2
	137	APP sensor 1 (With ICC)	E67	12

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair short to ground or short to power in harness or connectors.

3.CHECK COMPONENTS

Check the following.
- Camshaft position sensor (bank 2) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- Manifold absolute pressure (MAP) sensor (Refer to EC-1030, "Component Inspection (MAP sensor)".)

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace malfunctioning component.

4.CHECK THROTTLE POSITION SENSOR

Refer to EC-789, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6.CHECK ACCELERATOR PEDAL POSITION SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P0850 PNP SWITCH

Description

INFOID:0000000009009515

When the selector lever position is P or N, park/neutral position (PNP) signal is sent to ECM from TCM.

DTC Logic

INFOID:0000000009009516

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0850	P-N POS SW/CIRCUIT (Park/neutral position switch)	The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started.	• Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] • TCM

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT be used?

Will CONSULT be used?

YES >> GO TO 2.
NO >> GO TO 5.

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.

>> GO TO 3.

3.CHECK PNP SIGNAL

WITH CONSULT

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT. Then check the “P/N POSI SW” signal under the following conditions.

Position (Selector lever)	Known-good signal
N or P position	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-907, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	1,300 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.0 - 31.8 msec

VHCL SPEED SE	More than 64 km/h (40 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-907, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

WITH GST
Perform Component Function Check. Refer to EC-907, "Component Function Check".
NOTE:
Use Component Function Check to check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-907, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009517

1.PERFORM COMPONENT FUNCTION CHECK

WITH GST
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F111	11	175	Selector lever	P or N position	Battery voltage
				Except above position	Approx. 0

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-907, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009518

1.CHECK DTC WITH TCM

Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.
NO >> Check DTC with BCM. Refer to BCS-57, "DTC Index".

3.CHECK PNP SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/T assembly harness connector and ECM harness connector.

A/T assembly		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F301	9	F111	11	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between A/T assembly and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

P100A, P100B VVEL SYSTEM

DTC Logic

INFOID:0000000009009519

DTC DETECTION LOGIC

NOTE:
If DTC P100A or P100B is displayed with DTC P1090 or P1093, first perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-917, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P100A	VVEL SYSTEM-B1 [VVEL response malfunction (bank 1)]	Actual event response to target is poor.	• Harness or connectors (VVEL actuator motor circuit is open or shorted.) • VVEL actuator motor assembly • VVEL actuator housing assembly • VVEL ladder assembly • VVEL control module
P100B	VVEL SYSTEM-B2 [VVEL response malfunction (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.
3. Wait at idle for 5 seconds or more.
4. Repeat steps 2 to 3 for three times.
5. Check 1st trip DTC.

Is DTC detected?

YES >> Go to EC-909, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009520

1.VVEL ACTUATOR MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect VVEL control module harness connector.
2. Disconnect VVEL actuator motor harness connector.
3. Check the continuity between VVEL control module harness connector and VVEL actuator motor assembly harness connector.

DTC No.	VVEL control module			VVEL actuator motor assembly		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P100A	1	F56	12	F73	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P100B	2		2	F71	1	Existed
					2	Not existed
			15		1	Not existed
					2	Existed

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL actuator motor assembly and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK VVEL ACTUATOR MOTOR ASSEMBLY

Refer to EC-911, "Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.REPLACE VVEL ACTUATOR MOTOR ASSEMBLY

Replace VVEL actuator motor assembly. Refer to EM-37, "Removal and Installation".

>> INSPECTION END

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-1053, "Removal and Installation".
2. Perform additional service when replacing VVEL control module. Refer to EC-722, "Work Procedure".

>> GO TO 7.

7.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase 1st trip DTC.
3. Perform DTC Confirmation Procedure.
   See EC-909, "DTC Logic".

Is the DTC P100A or P100B displayed again?

YES >> GO TO 8.
NO >> INSPECTION END

8.CHECK VVEL ACTUATOR HOUSING ASSEMBLY

Refer to EC-911, "Component Inspection (VVEL ACTUATOR HOUSING ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

10.CHECK VVEL LADDER ASSEMBLY

Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.REPLACE VVEL LADDER ASSEMBLY

Replace VVEL ladder assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

12.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)

INFOID:0000000009009521

1.CHECK VVEL ACTUATOR MOTOR ASSEMBLY

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor assembly harness connector.
3. Check resistance between VVEL actuator motor assembly terminals as per the following.

VVEL actuator motor assembly	Resistance
Terminal	
1 and 2	16 Ω or less

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR MOTOR ASSEMBLY

Replace VVEL actuator motor assembly. Refer to EM-37, "Removal and Installation".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR HOUSING ASSEMBLY)

INFOID:0000000009009522

1.CHECK VVEL ACTUATOR HOUSING ASSEMBLY

1. Turn ignition switch OFF.
2. Remove VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".
3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

P1087, P1088 VVEL SYSTEM

DTC Logic

INFOID:0000000009009523

DTC DETECTION LOGIC

NOTE:
If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.
Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-917, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1087	VVEL SYSTEM-B1 [VVEL small event angle malfunction (bank 1)]	The event angle of VVEL control shaft is always small.	• Harness or connectors (VVEL actuator motor assembly circuit is open or shorted.) • VVEL actuator motor assembly • VVEL actuator housing assembly • VVEL ladder assembly • VVEL control module
P1088	VVEL SYSTEM-B2 [VVEL small event angle malfunction (bank 2)]		

Diagnosis Procedure

INFOID:0000000009009524

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.
Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-917, "DTC Logic".

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

DTC Logic

INFOID:0000000009009525

DTC DETECTION LOGIC

NOTE:
If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608.
Refer to EC-965, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1089	VVEL POS SEN/CIRC-B1 [VVEL control shaft position sensor (bank 1) circuit]	• An excessively low voltage from the sensor is sent to VVEL control module. • An excessively high voltage from the sensor is sent to VVEL control module. • Rationally incorrect voltage is sent to VVEL control module compared with the signals from VVEL control shaft position sensor 1 and VVEL control shaft position sensor 2.	• Harness or connectors (VVEL control shaft position sensor circuit is open or shorted.) • VVEL control shaft position sensor • VVEL control module
P1092	VVEL POS SEN/CIRC-B2 [VVEL control shaft position sensor (bank 2) circuit]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-914, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009526

1.VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect VVEL control shaft position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

DTC No.	VVEL control shaft position sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P1089	1	F72	3	Ground	Approx. 5
			6		
P1092	2	F70	3		
			6		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK VVEL CONTROL SHAFT POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect VVEL control module harness connector.
3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1089	1	F72	2	F56	6	Existed
			5		19	
P1092	2	F70	2		4	
			5		17	

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. VVEL CONTROL SHAFT POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1089	1	F72	1	F56	3	Existed
			4		16	
P1092	2	F70	1		5	
			4		18	

2. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace.

8. REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-722, "Work Procedure".

>> GO TO 9.

9. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-914, "DTC Logic".

Is the DTC P1089 or P1092 displayed again?

YES >> GO TO 10.
NO >> INSPECTION END

10. REPLACE VVEL ACTUATOR LADDER ASSEMBLY

Replace VVEL actuator ladder assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

P1090, P1093 VVEL ACTUATOR MOTOR

DTC Logic

INFOID:0000000009009527

DTC DETECTION LOGIC

NOTE:
If DTC P1090 or P1093 is displayed with DTC P1091, first perform the trouble diagnosis for DTC P1091. Refer to EC-920, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1090	VVEL ACTR MOT-B1 [VVEL system performance (bank 1)]	• Event angle difference between the actual and the target is detected. • Abnormal current is sent to VVEL actuator motor assembly.	• Harness or connectors (VVEL actuator motor assembly circuit is open or shorted.) • VVEL actuator motor assembly • VVEL actuator housing assembly • VVEL ladder assembly • VVEL control module
P1093	VVEL ACTR MOT-B2 [VVEL system performance (bank 2)]		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 10 second.
2. Keep the engine speed at approximately 3,500 rpm for at least 10 seconds under no load.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-917, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009528

1.VVEL ACTUATOR MOTOR ASSEMBLY OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect VVEL control module harness connector.
2. Disconnect VVEL actuator motor assembly harness connector.
3. Check the continuity between VVEL control module harness connector and VVEL actuator motor assembly harness connector.

DTC No.	VVEL control module			VVEL actuator motor assembly		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1090	1	F56	12	F73	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P1093	2		2	F71	1	Existed
					2	Not existed
			15		1	Not existed
					2	Existed

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL actuator motor assembly and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK VVEL ACTUATOR MOTOR ASSEMBLY

Refer to EC-919, "Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.REPLACE VVEL ACTUATOR MOTOR ASSEMBLY

Replace VVEL actuator motor assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-722, "Work Procedure".

>> GO TO 7.

7.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-917, "DTC Logic".

Is the DTC P1090 or P1093 displayed again?

YES >> GO TO 8.
NO >> INSPECTION END

8.CHECK VVEL ACTUATOR HOUSING ASSEMBLY

Refer to EC-919, "Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

10.CHECK VVEL LADDER ASSEMBLY

Refer to EM-83, "Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. REPLACE VVEL LADDER ASSEMBLY

Replace VVEL ladder assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR ASSEMBLY)

INFOID:0000000009009529

1. CHECK VVEL ACTUATOR MOTOR

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor harness connector.
3. Check resistance between VVEL actuator motor terminals as per the following.

VVEL actuator motor	Resistance
Terminal	
1 and 2	16Ω or less

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE VVEL ACTUATOR SUB ASSEMBLY

Replace VVEL actuator sub assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR HOUSING ASSEMBLY)

INFOID:0000000009009530

1. CHECK VVEL ACTUATOR HOUSING ASSEMBLY

1. Turn ignition switch OFF.
2. Remove VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".
3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE VVEL ACTUATOR HOUSING ASSEMBLY

Replace VVEL actuator housing assembly. Refer to EM-80, "Removal and Installation".

>> INSPECTION END

P1091 VVEL ACTUATOR MOTOR RELAY

DTC Logic

INFOID:0000000009009531

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1091	VVEL ACTR MOT PWR [VVEL actuator motor relay circuit]	• VVEL control module detects the VVEL actuator motor relay is stuck OFF. • VVEL control module detects the VVEL actuator motor relay is stuck ON.	• Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.) • VVEL actuator motor relay • VVEL control module • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and wait at least 1 seconds.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-920, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009532

1.VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor relay.
3. Check the voltage between VVEL actuator motor relay harness connector and ground.

VVEL actuator motor relay		Ground	Voltage
Connector	Terminal		
E62	1	Ground	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- 50A fusible link (letter O)
- Harness for open or short between VVEL actuator motor relay and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect VVEL control module harness connector.
2. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module		VVEL actuator motor relay		Continuity
Connector	Terminal	Connector	Terminal	
F56	23	E62	2	Existed

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

4. VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module			VVEL actuator motor relay		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F56	13	E62	5	Existed
2		1			

2. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK VVEL ACTUATOR MOTOR RELAY

Refer to EC-922, "Component Inspection (VVEL Actuator Motor Relay)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace VVEL actuator motor relay.

6. CHECK ABORT CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between VVEL control module harness connector and ECM harness connector.

VVEL control module		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F56	21	E80	122	Existed

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open and short between ECM and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace.

9. REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module.
2. Perform additional service when replacing VVEL control module. Refer to EC-722, "Work Procedure".

>> GO TO 10.

10. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-920, "DTC Logic".

Is the DTC P1091 displayed again?

YES >> Replace ECM. Refer to EC-1052, "Removal and Installation".
NO >> INSPECTION END

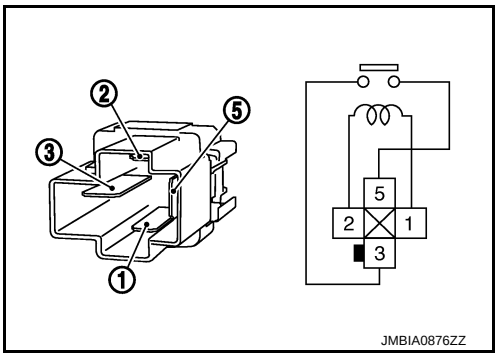
Component Inspection (VVEL Actuator Motor Relay)

INFOID:0000000009009533

1. CHECK VVEL ACTUATOR MOTOR RELAY

1. Turn ignition switch OFF.
2. Remove VVEL actuator motor relay.
3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.

Terminal	Condition	Continuity
3 and 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace VVEL actuator motor relay.

P1197 OUT OF GAS

Description

INFOID:0000000009009534

This diagnosis result is detected when the fuel level of the fuel tank is extremely low and the engine does not run normally.

DTC Logic

INFOID:0000000009009535

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1197	FUEL RUN OUT (Out of gas)	• Fuel rail pressure remains at 1.5 MPa (15 bar, 15.3 kg/cm^2, 217.5 psi) or less for 3 seconds or more with the fuel level too low. • Fuel rail pressure remains 2.7 MPa (27 bar, 27.5 kg/cm^2, 392 psi) lower than a target fuel pressure for 5 seconds or more with the fuel level too low. • Fuel rail pressure remains at 0.23 MPa (2.3 bar, 2.346 kg/cm^2, 33.35 psi) or less for 5 seconds or more with the fuel level too low. **NOTE:** Allow engine coolant temperature to reach 70°C (158°F) or more once.	• Out of gas • Harness or connectors (The low pressure fuel pump circuit is open or shorted.) • Low pressure fuel pump • Fuel pressure regulator • Low pressure fuel system • Low fuel pressure sensor • Harness or connectors (The high pressure fuel pump circuit is shorted.) • High pressure fuel pump • High pressure fuel system • Fuel rail pressure sensor • Disconnection of the fuel hose

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

Start the engine.

Does the engine start?

YES >> GO TO 3.
NO >> Proceed to EC-924, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Warm up the engine to the normal operating temperature.
   NOTE:
   For best results, warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
2. Keep the engine speed at 3,500 rpm for 5 seconds and let it idle at least 60 seconds.
3. Check the 1st trip DTC.
   NOTE:
   If the fuel tank has sufficient fuel, this diagnosis result may not be detected.

Is 1st trip DTC detected?

YES >> Proceed to EC-924, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009536

1.REFUEL THE VEHICLE

1. Refuel 10 liter (10 US qt, 8 imp qt).
   CAUTION:
   Never refuel more than 10 liter.
2. Start the engine and keep the engine speed at 3,000 rpm for 30 seconds.
   NOTE:
   For best results, warm up the engine until “COOLAN TEMP/S” on “DATA MONITOR” of CONSULT reaches at least 70°C (158°F).
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Turn ignition switch ON.
7. Erase the DTC.
8. Start the engine and let it idle at least 60 seconds.
9. Perform the confirmation procedure again. Refer to EC-923, "DTC Logic".

Is 1st trip DTC detected?

YES >> GO TO 2.
NO >> INSPECTION END

2.CHECK LOW PRESSURE FUEL PUMP

Refer to EC-1025, "Component Function Check".

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK HIGH PRESSURE FUEL PUMP

Refer to EC-1015, "Component Function Check".

Is inspection result normal?

YES >> Check the fuel hose for disconnection and looseness.
NO >> Repair or replace error-detected parts.

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000009009537

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and “ABS actuator and electric unit (control unit)”.
Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000009009538

DTC DETECTION LOGIC

NOTE:
- **If DTC P1212 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1212 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607.**

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1212	TCS/CIRC (TCS communication line)	ECM cannot receive the information from “ABS actuator and electric unit (control unit)” continuously.	• Harness or connectors (The CAN communication line is open or shorted.) • ABS actuator and electric unit (control unit) • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10.5 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-925, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009539

Perform the trouble diagnosis for TCS. Refer to BRC-58, "Work Flow".
NOTE:
If DTC P1212 is displayed with DTC UXXXX and/or P0607, perform the following trouble diagnosis.
- Trouble diagnosis for DTC UXXXX Refer to EC-672, "DTC Index".
- Trouble diagnosis for DTC P0607 Refer to EC-901, "DTC Logic".

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000009009540

DTC DETECTION LOGIC

NOTE:

- **If DTC P1217 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1217 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".**
- **If DTC P1217 is displayed with DTC P0527, perform the trouble diagnosis for DTC P0527. Refer to EC-890, "DTC Logic".**

If the cooling fan or any of other components in the cooling system has a malfunction, engine coolant temperature increases.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over temperature (Overheat)	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant is not within the specified quantity.	• Harness or connectors (The cooling fan circuit is open or shorted.) • IPDM E/R • Electrically-controlled cooling fan coupling • Cooling fan speed sensor • Radiator hose • Radiator • Reservoir tank cap • Water pump • Thermostat

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to CO-8, "Draining" and CO-9, "Refilling". Also, replace the engine oil. Refer to LU-9, "Draining" and LU-9, "Refilling".

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to MA-18, "FOR MEXICO : Engine Coolant Mixture Ratio".**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-926, "Component Function Check".

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-927, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009541

1.PERFORM COMPONENT FUNCTION CHECK-I

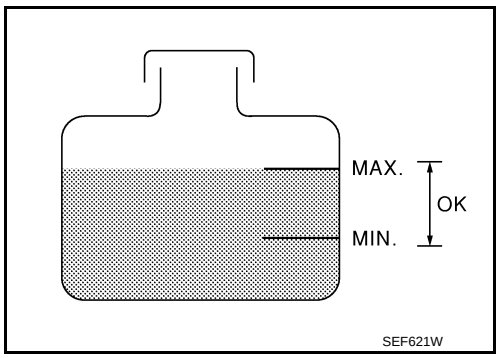
WARNING:

Never remove the reservoir tank 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.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Proceed to EC-927, "Diagnosis Procedure".
NO >> GO TO 2.



2. PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Proceed to EC-927, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

WITH CONSULT
1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Check that cooling fan speed varies according to the percentage.
   NOTE:
   Fan speed changes as the percentage changes.

WITHOUT CONSULT
1. Start the engine.
2. Perform IPDM E/R auto active test. Refer to PCS-10, "Diagnosis Description".
3. Check that cooling fan speed increase.
   NOTE:
   Speed changes gradually when performing the auto active test.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-927, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009542

1. CHECK COOLING FAN OPERATION

WITH CONSULT
1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Check that cooling fan speed varies according to the percentage.
   NOTE:
   Speed changes gradually as the percentage changes.

WITHOUT CONSULT
1. Start the engine.
2. Perform IPDM E/R auto active test and check cooling fan operation, refer to PCS-10, "Diagnosis Description".
3. Check that cooling fan speed increase.
   NOTE:
   Speed changes gradually when performing the auto active test.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-1009, "Diagnosis Procedure".

2. CHECK ENGINE COOLANT LEAKAGE-I

Check cooling system for leakage. Refer to CO-8, "Inspection".

Is leakage detected?

YES >> GO TO 3.
NO >> GO TO 4.

3. CHECK ENGINE COOLANT LEAKAGE-II

Check the following for leakage.
- Hose
- Radiator
- Water pump

>> Repair or replace malfunctioning part.

4. CHECK RESERVOIR TANK CAP

Check reservoir tank cap. Refer to CO-12, "RESERVOIR TANK CAP : Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace reservoir tank cap.

5. CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat. Refer to CO-22, "Removal and Installation".

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-787, "Component Inspection (Engine Coolant Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor. Refer to EM-92, "Exploded View".

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the CO-6, "Troubleshooting Chart".

>> INSPECTION END

P1220 FUEL PUMP CONTROL MODULE (FPCM)

DTC Logic

INFOID:0000000009009543

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1220	FPCM (Fuel pump control module)	During engine cranking, the signal voltage of the FPCM to the ECM is too low.	• Harness or connectors (FPCM circuit is open or shorted) (Fuel pump circuit is open or shorted) • FPCM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is between 12 - 15 V at idle.**
- **Before performing the following procedure, check that the engine coolant temperature is –10°C (14°F) or more.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 5 seconds.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-929, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009544

1.CHECK FPCM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect FPCM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FPCM harness connector and ground.

FPCM		Ground	Voltage
Connector	Terminal		
B41	10	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 3.

2.DETECT MALFUNCTIONING PART

Check the following.

- 15 A fuse (No.73)
- Harness for open or short between FPCM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between FPCM harness connector and ground.

FPCM		Ground	Continuity
Connector	Terminal		
B41	5	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to power in harness or connectors.

4. CHECK FPCM INPUT AND OUTPUT CIRCUITS FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between FPCM harness connector and ECM harness connector.

FPCM		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B41	8	E80	125	Existed
	9		142	

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between FPCM and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK FUEL PUMP CONTROL CIRCUIT FOR OPEN AND SHORT

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump harness connector.

FPCM		Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
B41	6	C5	3	Existed
	7		1	

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK FPCM

Refer to EC-931, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace FPCM.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (FPCM)

INFOID:0000000009009545

1.CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Check the voltage between FPCM terminals under the following conditions.

FPCM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
B41	7	6	For 1 second after turning ignition switch ON	Approx. 8.5 V
			More than 1 second after turning ignition switch ON	Approx. 0 V
			Idle speed	Approx. 8.5 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace FPCM.

P1225 TP SENSOR

DTC Logic

INFOID:0000000009009546

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1225	CTP LEARNING-B1 (Closed throttle position learning performance)	Closed throttle position learning value is excessively low.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
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 >> Go to EC-932, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009547

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-725, "Work Procedure".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P1226 TP SENSOR

DTC Logic

INFOID:0000000009009548

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1226	CTP LEARNING-B1 (Closed throttle position learning performance)	Closed throttle position learning is not performed successfully, repeatedly.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
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 >> Go to EC-933, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009549

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-725, "Work Procedure".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P1550 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009550

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1550	BAT CURRENT SENSOR (Battery current sensor circuit range/performance)	The output voltage of the battery current sensor remains within the specified range while engine is running.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-934, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009551

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-1037, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK BATTERY CURRENT SENSOR

Refer to EC-936, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Current Sensor)

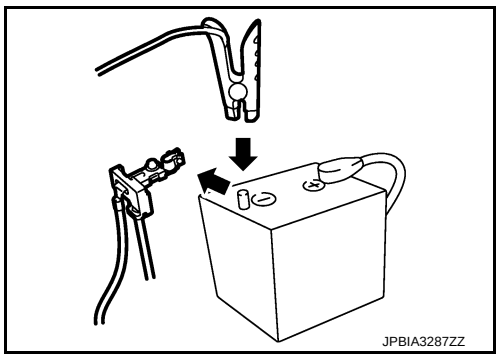
INFOID:0000000009009552

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.

3. Disconnect battery negative cable.

⬅: To body ground



4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1551, P1552 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009553

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1551	BAT CURRENT SENSOR (Battery current sensor circuit low input)	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor
P1552	Battery current sensor circuit high input (BAT CURRENT SENSOR)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more with ignition switch ON

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-938, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009554

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-1037, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-949, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Current Sensor)

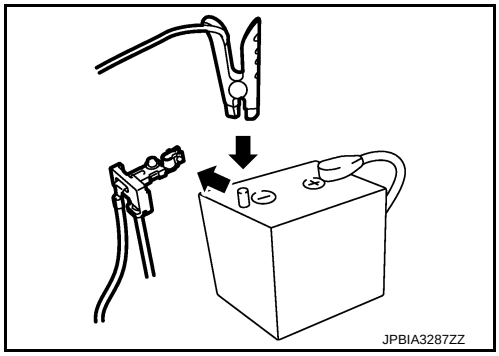
INFOID:0000000009009555

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.

: To body ground

4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1553 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009556

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1553	BAT CURRENT SENSOR (Battery current sensor performance)	The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-942, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009557

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5. CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-1037, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6. CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-949, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Current Sensor)

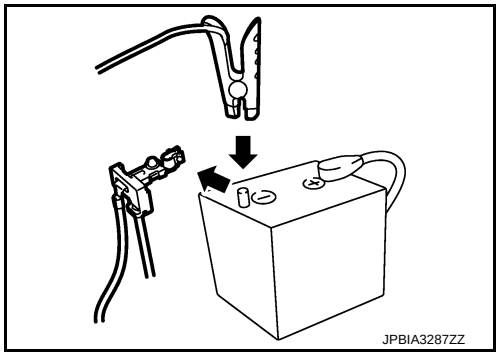
INFOID:0000000009009558

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.

: To body ground

4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1554 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000009009559

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1554	BAT CURRENT SENSOR (Battery current sensor performance)	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor • Accelerator pedal position sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform Component Function Check. Refer to EC-946, "Component Function Check".

NOTE:

Use Component Function Check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-947, "Diagnosis Procedure".

Component Function Check

INFOID:0000000009009560

1.PRECONDITIONING

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is 12.8 V or more at idle.**
- **Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.**

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

WITH CONSULT

1. Start engine and let it idle.
2. Select “BAT CUR SEN” in “DATA MONITOR” mode with CONSULT.
3. Check “BAT CUR SEN” indication for 10 seconds.
   “BAT CUR SEN” should be above 2,300 mV at least once.

WITHOUT CONSULT

1. Start engine and let it idle.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-947, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009561

1. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	2	E80	133	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E80	133	EVAP control system pressure sensor	C17	3
		Refrigerant pressure sensor	E77	1
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- EVAP control system pressure sensor (Refer to EC-1037, "Component Function Check".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

8.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	3	E80	138	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between battery current sensor and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK BATTERY CURRENT SENSOR

Refer to EC-949, "Component Inspection (Battery Current Sensor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace battery negative cable assembly.

13. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

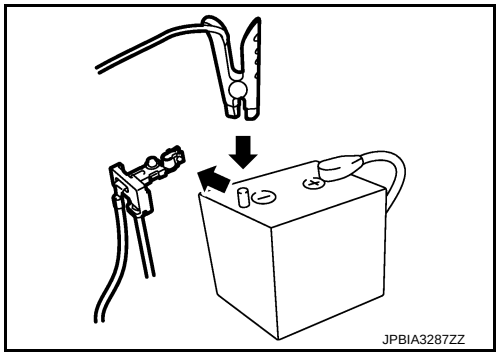
Component Inspection (Battery Current Sensor)

INFOID:0000000009009562

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.

⬅: To body ground



4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	138 (Battery current sensor signal)	150	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-114, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1556, P1557 BATTERY TEMPERATURE SENSOR

DTC Logic

INFOID:0000000009009563

DTC DETECTION LOGIC

NOTE:
If DTC P1556 or P1557 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-904, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1556	BAT TMP SEN/CIRC (Battery temperature sensor circuit low input)	Signal voltage from Battery temperature sensor remains 0.16V or less for 5 seconds or more.	• Harness or connectors [Battery current sensor (Battery temperature sensor) circuit is shorted.] (Crankshaft position sensor circuit is open or shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Accelerator pedal position sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Battery current sensor (Battery temperature sensor) • Crankshaft position sensor • Camshaft position sensor (bank 1) • Accelerator pedal position sensor 2 • Refrigerant pressure sensor • EVAP control system pressure sensor
P1557	BAT TMP SEN/CIRC (Battery temperature sensor circuit high input)	Signal voltage from Battery temperature sensor remains 4.84V or more for 5 seconds or more.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start the engine and let it idle at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-950, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009564

1.CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E63	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK BATTERY TEMPERATURE SENSOR INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch ON.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	1	E80	139	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3
	131	APP sensor 2 (Without ICC)	E110	1
		APP sensor 2 (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- CKP sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Battery current sensor (Refer to EC-945, "Component Inspection (Battery Current Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Diagnosis Procedure".)
- EVAP control system pressure sensor (Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly.

>> INSPECTION END

7.CHECK BATTERY TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E63	4	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY TEMPERATURE SENSOR

Refer to EC-952, "Component Inspection (Battery Temperature Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Battery Temperature Sensor)

INFOID:0000000009009565

1.CHECK BATTERY TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect battery current sensor.
3. Check the resistance between battery current sensor connector terminals.

Battery current sensor		Resistance
+	–	
Terminal		
1	4	continuity with the resistance value 100 Ω or more

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1564 ICC STEERING SWITCH

DTC Logic

INFOID:0000000009009566

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-899, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1564	ASCD SW (ICC steering switch)	• An excessively high voltage signal from the ICC steering switch is sent to ECM. • ECM detects that input signal from the ICC steering switch is out of the specified range. • ECM detects that the ICC steering switch is stuck ON.	• Harness or connectors (The switch circuit is open or shorted.) • ICC steering switch • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press LDP switch for at least 10 seconds, then release it at wait at least 10 seconds.
8. Check DTC.

Is DTC detected?

YES >> Go to EC-953, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009567

1.CHECK ICC STEERING SWITCH CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
E80	128 (ICC steering switch signal)	130	MAIN switch: Pressed	Approx. 0
			DYNAMIC DRIVER ASSISTANCE switch: Pressed	Approx. 1.0
			CANCEL switch: Pressed	Approx. 1.9
			DISTANCE switch: Pressed	Approx. 2.6
			SET/COAST switch: Pressed	Approx. 3.2
			RESUME/ACCELERATE switch: Pressed	Approx. 3.7
			All ICC steering switches: Released	Approx. 4.2

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 2.

2.CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector.
4. Check the continuity between combination switch and ECM harness connector.

Combination switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
—	32	E80	130	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK ICC STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

Combination switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
—	25	E80	130	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK ICC STEERING SWITCH

Refer to EC-955, "Component Inspection (ICC Steering Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace ICC steering switch. Refer to ST-33, "Removal and Installation".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Steering Switch)

INFOID:0000000009009568

1.CHECK ICC STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector M302.
3. Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance (Ω)
Connector	Terminals		
M302	13 and 16	MAIN switch: Pressed	Approx. 0
		DYNAMIC DRIVER ASSISTANCE switch: Pressed	Approx. 270
		CANCEL switch: Pressed	Approx. 620
		DISTANCE switch: Pressed	Approx. 1,100
		SET/COAST switch: Pressed	Approx. 1,810
		RESUME/ACCELERATE switch: Pressed	Approx. 3,000
		All ICC steering switches: Released	Approx. 5,420

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC steering switch. Refer to ST-33, "Removal and Installation".

P1568 ICC FUNCTION

DTC Logic

INFOID:0000000009009569

DTC DETECTION LOGIC

NOTE:

- **If DTC P1568 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1568 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-899, "DTC Logic".**
- **If DTC P1568 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC Detecting Condition	Possible Cause
P1568	ICC COMMAND VALUE (ICC function)	ECM detects a difference between signals from ADAS control unit is out of specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • ADAS control unit • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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:

Step 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Press MAIN switch on ICC steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Press SET/COAST switch.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-956, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009570

1.REPLACE ADAS CONTROL UNIT

1. Replace ADAS control unit. Refer to DAS-72, "Removal and Installation".
2. Check DTC of ADAS control unit. Refer to DAS-45, "DTC Index".

>> INSPECTION END

P1572 ICC BRAKE SWITCH

DTC Logic

INFOID:0000000009009571

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-899, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P1572	ASCD BRAKE SW (ICC brake switch)	A)	ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time.	• Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ICC brake switch circuit is shorted.) • Stop lamp switch • ICC brake switch • ICC brake hold relay • Incorrect stop lamp switch installation • Incorrect ICC brake switch installation • ECM
		B)	ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Press MAIN switch and check that CRUISE indicator is displayed in combination meter.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   CAUTION:

   Always drive vehicle at a safe speed.

   NOTE:

   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-958, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

   CAUTION:

Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-958, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009572

1.CHECK OVERALL FUNCTION-I

With CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

Without CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	147 (ICC brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0
			Brake pedal	Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

With CONSULT
Select “BRAKE SW2” and check indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW2 (Stop lamp switch)	Brake pedal	Slightly depressed	ON
		Fully released	OFF

Without CONSULT
Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	158 (Stop lamp switch signal)	175	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

3.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E68	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

5.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E68	2	E80	147	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK ICC BRAKE SWITCH

Refer to EC-961, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

8. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Disconnect ICC brake hold relay harness connector.
4. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E115	1	Ground	Battery voltage

5. Check the voltage between ICC brake hold relay harness connector and ground.

ICC brake hold relay		Ground	Voltage
Connector	Terminal		
E64	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between battery and stop lamp switch
- Harness for open or short between battery and ICC brake hold relay

>> Repair open circuit or short to ground in harness or connectors.

10. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E115	2	E80	158	Existed

3. Check the continuity between ICC brake hold relay harness connector and ECM harness connector.

ICC brake hold relay		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E64	5	E80	158	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- Harness for open or short between ECM and stop lamp switch
- Harness for open or short between ECM and ICC brake hold relay

>> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK STOP LAMP SWITCH

Refer to EC-961, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

13. CHECK ICC BRAKE HOLD RELAY

Refer to EC-962, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace ICC brake hold relay.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000009009573

1. CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-7, "Inspection and Adjustment".
2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

Component Inspection (Stop Lamp Switch)

INFOID:0000000009009574

1. CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 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-II

1. Adjust stop lamp switch installation. Refer to BR-7, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

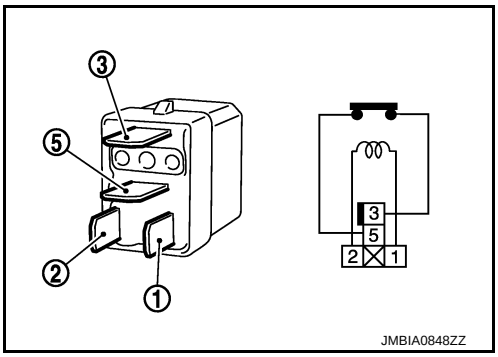
Component Inspection (ICC Brake Hold Relay)

INFOID:0000000009009575

1.CHECK ICC BRAKE HOLD RELAY

1. Turn ignition switch OFF.
2. Remove ICC brake hold relay.
3. Check the continuity between ICC brake hold relay terminals under the following conditions.

Terminals	Condition	Continuity
3 and 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



JMBIA0848ZZ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake hold relay

P1606 VVEL CONTROL MODULE

DTC Logic

INFOID:0000000009009576

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1606	VVEL CONTROL MODULE (VVEL control module)	• VVEL control module calculation function is malfunctioning. • VVEL EEP-ROM system is malfunctioning.	• VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-963, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009577

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-963, "DTC Logic".

Is the DTC P1606 displayed again?

YES >> Replace VVEL control module. Refer to EC-1053, "Removal and Installation".
NO >> INSPECTION END

P1607 VVEL CONTROL MODULE

DTC Logic

INFOID:0000000009009578

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1607	VVEL CONTROL MODULE (VVEL control module circuit)	• The internal circuit of the VVEL control module is malfunctioning.	• VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-964, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009579

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-964, "DTC Logic".

Is the DTC P1607 displayed again?

YES >> Replace VVEL control module. Refer to EC-1053, "Removal and Installation".
NO >> INSPECTION END

P1608 VVEL SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000009009580

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1608	VVEL SENSOR POWER/CIRC (VVEL sensor power supply circuit)	VVEL control module detects a voltage of power source for sensor is excessively low or high.	• Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) • VVEL control shaft position sensor • VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-965, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009581

1.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect VVEL control shaft position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

VVEL control shaft position sensor			Ground	Voltage
Bank	Connector	Terminal		
1	F72	3	Ground	Approx. 5V
		6		
2	F70	3		
		6		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 2.

2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect VVEL control module harness connector.
3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

VVEL control shaft position sensor			VVEL control module		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F72	3	F56	7	Existed
		6		20	
2	F70	3		9	
		6		22	

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between VVEL control shaft position sensor and VVEL control module
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace VVEL control module. Refer to EC-1053, "Removal and Installation".
NO >> Repair or replace.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6.REPLACE VVEL LADDER ASSEMBLY

Replace VVEL ladder assembly. Refer to EM-80, "Removal and Installation".

>> NSPECTION END

P1650 STARTER MOTOR RELAY 2

Description

INFOID:0000000009009582

ECM controls ON/OFF state of the starter relay, according to the engine and vehicle condition. Models with no Intelligent Key System transmit a control signal directly to IPDM E/R. On the other hand, models with the Intelligent Key System transmit a control signal to IPDM E/R by way of BCM via CAN communication.
Under normal conditions, ECM controls and maintains the starter relay in OFF state during engine running or “D” position.
When detecting a decrease in engine speed due to rapid deceleration or heavy load condition, ECM controls and reactivates the starter relay.
IPDM E/R detects a control state of starter relay and starter control relay and transmits a feedback signal to ECM via CAN communication.

DTC Logic

INFOID:0000000009009583

DTC DETECTION LOGIC

NOTE:

- If DTC P1650 is displayed with DTC U1001, perform the trouble diagnosis for DTC U1001. Refer to EC-750, "DTC Logic".
- If DTC P1650 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".
- If DTC P1650 is displayed with B209F or B20A0 of IPDM E/R, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-103, "DTC Logic" or SEC-105, "DTC Logic".
- If DTC P1650 is displayed with B26F9 or B26FA of BCM, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-95, "DTC Logic" or SEC-97, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P1650	STR MTR RELAY 2 (Starter relay circuit)	A	Starter relay is stuck ON.	• Harness and connectors (Between IPDM E/R harness connector and ECM harness connector is shorted to ground.) (Between IPDM E/R harness connector and BCM harness connector is shorted to ground.) • IPDM E/R
		B	Starter relay power supply circuit is excessively high voltage.	• Harness and connectors (Between IPDM E/R harness connector and ECM harness is open or shorted to power.) (Between IPDM E/R harness connector and BCM harness is open or shorted to power.) (Between IPDM E/R harness connector and battery is open.) • IPDM E/R
		C	Starter relay circuit is excessively low voltage	• Harness and connectors (Starter relay circuit is open or shorted.) • IPDM E/R

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND C

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. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-968, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT

CAUTION:

Always drive at a safe speed.

1. Start the engine.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Start the engine and warm it up to normal operating temperature.
5. Turn ignition switch OFF.
6. Lift up drive wheels.
7. Turn ignition switch ON.
8. Select “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
9. Restart the engine and let it idle at least 10 seconds.
10. Shift the selector lever to D position while depressing fully the brake pedal.
11. Select 1 - 4 cylinders in “POWER BALANCE” and cut the fuel of all cylinders.
12. Check 1st trip DTC.

Without CONSULT

CAUTION:

Always drive at a safe speed.

1. Start the engine.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Start the engine and warm it up to normal operating temperature.
5. Turn ignition switch OFF.
6. Lift up drive wheels.
7. Restart the engine and let it idle at least 10 seconds.
8. Shift the selector lever to D position while depressing fully the brake pedal.
9. Remove vacuum hoses from intake manifold.
10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-968, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009584

1. CHECK STARTER RELAY POWER SUPPLY CIRCUIT

Check the starter motor relay power supply circuit. Refer to PCS-33, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2. CHECK STARTER RELAY CONTROL SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Disconnect BCM harness connector.
4. Check the continuity between IPDM E/R harness connector and BCM harness connector.

+		–		Continuity
IPDM E/R		BCM		
Connector	Terminal	Connector	Terminal	
E13	30	M71	97	Existed

5. Also check harness for short to ground to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace error-detected parts.

P1651 STARTER MOTOR RELAY

Description

INFOID:0000000009009585

ECM controls ON/OFF state of the starter relay, according to the engine and vehicle condition. Models with no Intelligent Key System transmit a control signal directly to IPDM E/R. On the other hand, models with the Intelligent Key System transmit a control signal to IPDM E/R by way of BCM via CAN communication.
Under normal conditions, ECM controls and maintains the starter relay in OFF state during engine running or “D” position.
When detecting a decrease in engine speed due to rapid deceleration or heavy load condition, ECM controls and reactivates the starter relay.
IPDM E/R detects a control state of starter relay and starter control relay and transmits a feedback signal to ECM via CAN communication.

DTC Logic

INFOID:0000000009009586

DTC DETECTION LOGIC

NOTE:

- If DTC P1651 is displayed with DTC U1001, perform the trouble diagnosis for DTC U1001. Refer to EC-750, "DTC Logic".
- If DTC P1651 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".
- If DTC P1651 is displayed with B209F or B20A0 of IPDM E/R, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-103, "DTC Logic" or SEC-105, "DTC Logic".
- If DTC P1651 is displayed with B26F9 or B26FA of BCM, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-95, "DTC Logic" or SEC-97, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	
P1651	STR MTR RELAY (Starter control relay circuit)	A correlated error is detected for 2 seconds or more between a control signal transmitted from ECM and a feedback signal transmitted from IPDM E/R via CAN communication line.	• Harness or connectors (Between ECM harness connector and IPDM E/R harness connector is shorted to power.) • IPDM E/R • BCM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start the engine and let it idle at least 30 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-970, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009587

1.INSPECTION START

Check the starter motor operation.

Is the starter motor operated?

YES >> GO TO 3.
NO >> GO TO 2.

2. CHECK DTC WITH IPDM E/R

Check DTC with IPDM E/R. Refer to PCS-12, "CONSULT Function (IPDM E/R)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for DTC indicated.

3. CHECK DTC WITH BCM

Check DTC with BCM. Refer to BCS-30, "BCM : CONSULT Function (BCM - BCM)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform trouble diagnosis for DTC indicated.

4. CHECK CRANKING REQUEST SIGNAL CIRCUIT-

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

+		–		Continuity
ECM		IPDM E/R		
Connector	Terminal	Connector	Terminal	
E80	165	E13	23	Existed

5. Also check harness for short to ground to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5. CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace error-detected parts.

P1652 STARTER MOTOR SYSTEM COMM

Description

INFOID:0000000009009588

ECM controls ON/OFF state of the starter relay, according to the engine and vehicle condition. Models with no Intelligent Key System transmit a control signal directly to IPDM E/R. On the other hand, models with the Intelligent Key System transmit a control signal to IPDM E/R by way of BCM via CAN communication.
Under normal conditions, ECM controls and maintains the starter relay in OFF state during engine running or “D” position.
When detecting a decrease in engine speed due to rapid deceleration or heavy load condition, ECM controls and reactivates the starter relay.
IPDM E/R detects a control state of starter relay and starter control relay and transmits a feedback signal to ECM via CAN communication.

DTC Logic

INFOID:0000000009009589

DTC DETECTION LOGIC

NOTE:

- If DTC P1652 is displayed with DTC U1001, perform the trouble diagnosis for DTC U1001. Refer to EC-750, "DTC Logic".
- If DTC P1652 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".
- If DTC P1652 is displayed with B209F or B20A0 of IPDM E/R, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-103, "DTC Logic" or SEC-105, "DTC Logic".
- If DTC P1652 is displayed with B26F9 or B26FA of BCM, perform the trouble diagnosis for B209F or B20A0. Refer to SEC-95, "DTC Logic" or SEC-97, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	
P1652	STR MTR SYS COMM (Starter motor communication line)	ECM detects malfunction in starter motor drive circuit of the IPDM E/R.	IPDM E/R

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 5 minutes.
3. Check DTC.

Is DTC detected?

YES >> Proceed to EC-972, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009590

1.INSPECTION START

1. Erase DTC.
2. Perform DTC confirmation procedure. Refer to EC-972, "DTC Logic".
3. Check DTC.

Is the P1652 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.CHECK INTERMITTENT INCIDENT

Perform GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NG >> Repair or replace error-detected parts.

P1715 INPUT SPEED SENSOR

Description

INFOID:0000000009009591

ECM receives input speed sensor signal from TCM by the CAN communication line. ECM uses this signal for engine control.

DTC Logic

INFOID:0000000009009592

DTC DETECTION LOGIC

NOTE:

- **If DTC P1715 is displayed with DTC UXXXX, perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1715 is displayed with DTC P0335, perform the trouble diagnosis for DTC P0335. Refer to EC-851, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0340, perform the trouble diagnosis for DTC P0340. Refer to EC-855, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0605, perform the trouble diagnosis for DTC P0605. Refer to EC-899, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0607, perform the trouble diagnosis for DTC P0607. Refer to EC-901, "DTC Logic".**

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1715	IN PULY SPEED [Input speed sensor (TCM output)]	Input speed sensor signal is different from the theoretical value calculated by ECM from output speed sensor signal and engine rpm signal.	• Harness or connectors (The CAN communication line is open or shorted) (Input speed sensor circuit is open or shorted) • TCM

Diagnosis Procedure

INFOID:0000000009009593

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-64, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform Diagnosis Procedure corresponding to DTC indicated.

2.REPLACE TCM

Replace TCM. Refer to TM-191, "Removal and Installation".

>> INSPECTION END

P1805 BRAKE SWITCH

DTC Logic

INFOID:0000000009009594

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P1805	BRAKE SW/CIRCUIT (Brake switch)	A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	• Harness or connectors (Stop lamp switch circuit is open or shorted.) • Stop lamp switch

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-975, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009595

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check for stop lamp illumination under the following conditions.

Condition		Stop lamp
Brake pedal	Fully released	Not illuminated
	Slightly depressed	Illuminated

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.
2. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E115	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 7)
- Harness for open or short between stop lamp switch and battery
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect stop lamp switch harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E115	2	E80	158	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and stop lamp switch
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK STOP LAMP SWITCH

Refer to EC-976, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace stop lamp switch. Refer to BR-20, "Removal and Installation".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000009009596

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 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-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Removal and Installation".

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

INFOID:0000000009009597

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2100	ETC MOT PWR-B1 [Throttle control motor relay circuit open (bank 1)]	ECM detects that the voltage of power source for throttle control motor is excessively low.	• Harness or connectors (Throttle control motor relay circuit is open) • Throttle control motor relay
P2103	ETC MOT PWR (Throttle control motor relay circuit short)	ECM detects that the throttle control motor relay is stuck ON.	• Harness or connectors (Throttle control motor relay circuit is shorted) • Throttle control motor relay

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

Which DTC is detected?

P2100 >> GO TO 2.
P2103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-978, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-978, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009598

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E15.
4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	60	E80	123	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Check the continuity between IPDM E/R sensor harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	55	E80	173	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK FUSE

1. Disconnect 20 A fuse (No. 64) from IPDM E/R.
2. Check if 20 A fuse is blown.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 20 A fuse.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace harness or connectors.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000009009599

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor and it provides feedback to the ECM. ECM controls the throttle valve opening angle in response to driving condition via the throttle control motor.

DTC Logic

INFOID:0000000009009600

DTC DETECTION LOGIC

NOTE:

- **If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to EC-978, "DTC Logic".**
- **If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to EC-986, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101	Electric throttle control performance	Electric throttle control function does not operate properly.	• Harness or connectors (Throttle control motor circuit is open or shorted) • Electric throttle control actuator

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-980, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009601

1.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check the voltage between ECM harness connector and ground under the following conditions.

ECM		Ground	Condition	Voltage
Connector	Terminal			
E80	173	Ground	Ignition switch: OFF	Approx. 0 V
			Ignition switch: ON	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
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.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	60	E80	123	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Check the continuity between ECM harness connector and IPDM E/R harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E15	55	E80	173	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R
- Loose or poor connection for each connector and harness

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUSE

1. Disconnect 20 A fuse (No. 64) from IPDM E/R.
2. Check 20 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace 20 A fuse.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-34, "Removal and Installation".
NO >> Repair or replace harness or connectors.

8. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.

2. Disconnect electric throttle control actuator harness connector.
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	
F66	5	F110	57	Not existed
			63	Existed
	6		57	Existed
			63	Not existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace.

9. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-725, "Work Procedure".

10. CHECK THROTTLE CONTROL MOTOR

Refer to EC-982, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 12.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace harness or connectors.

12. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunction electric throttle control actuator. Refer to EM-31, "Removal and Installation".
2. Perform EC-983, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000009009602

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.

Terminals	Resistance
5 and 6	Approx. 1 - 15 Ω [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".
2. Perform EC-983, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000009009603

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-725, "Work Procedure".

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-726, "Work Procedure".

>> END

P2118 THROTTLE CONTROL MOTOR

DTC Logic

INFOID:0000000009009604

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2118	ETC MOT-B1 (Throttle control motor circuit short)	ECM detects short in both circuits between ECM and throttle control motor.	• Harness or connectors (Throttle control motor circuit is shorted.) • Electric throttle control actuator (Throttle control motor)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-984, "DTC Logic".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009605

1.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.
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	
F66	5	F110	57	Not existed
			63	Existed
	6		57	Existed
			63	Not existed

4. 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-985, "Component Inspection (Electric Throttle Control Motor)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace harness or connectors.

4. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

Component Inspection (Electric Throttle Control Motor)

INFOID:0000000009009606

1. CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Check resistance between electric throttle control actuator terminals as per the following.

Terminals	Resistance
5 and 6	Approx. 1 - 15 Ω [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic

INFOID:0000000009009607

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition		Possible cause
P2119	ETC ACTR-B1 (Electric throttle control actuator)	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	• Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detects that the throttle valve is stuck open.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always 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. Selector lever position is D and wait at least 3 seconds.
3. Selector lever position is P.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Selector lever position is D and wait at least 3 seconds.
7. Selector lever position is P.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to EC-986, "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. Selector lever position is D and wait at least 3 seconds.
3. Selector lever position is N or P.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-986, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009608

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve and the housing.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Remove the foreign matter and clean the electric throttle control actuator inside, then perform throttle valve closed position learning. Refer to EC-725, "Work Procedure".

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P2122, P2123 APP SENSOR

DTC Logic

INFOID:0000000009009609

DTC DETECTION LOGIC

NOTE:
If DTC P2122 or P2123 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-904, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2122	APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit low input)	An excessively low voltage from the APP sensor 1 is sent to ECM.	• Harness or connectors (APP sensor 1 circuit is open or shorted.) • Accelerator pedal position sensor (APP sensor 1)
P2123	APP SEN 1/CIRC (Accelerator pedal position sensor 1 circuit high input)	An excessively high voltage from the APP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-988, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009610

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	2	Ground	Approx. 5
E67 (With ICC)	12		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	4	E80	140	Existed
E67 (With ICC)	11			

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	3	E80	136	Existed
E67 (With ICC)	10			

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK APP SENSOR

Refer to EC-990, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000009009611

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	136 (APP sensor 1)	140	Accelerator pedal	Fully released	0.5 - 1.0
				Fully depressed	4.2 - 4.8
	126 (APP sensor 2)	129		Fully released	0.25 - 0.5
				Fully depressed	2.0 - 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

P2127, P2128 APP SENSOR

DTC Logic

INFOID:0000000009009612

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2127	APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit low input)	An excessively low voltage from the APP sensor 2 is sent to ECM.	• Harness or connectors (Accelerator pedal position sensor 2 circuit is open or shorted.) (Battery current sensor circuit is shorted.) [Camshaft position sensor (bank 1) circuit is shorted.] (Crankshaft position sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • Battery current sensor • Camshaft position sensor (bank 1) • Crankshaft position sensor • Refrigerant pressure sensor • EVAP control system pressure sensor
P2128	APP SEN 2/CIRC (Accelerator pedal position sensor 2 circuit high input)	An excessively high voltage from the APP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-991, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009613

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	1	Ground	Approx. 5
E67 (With ICC)	9		

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	1	E80	131	Existed
E67 (With ICC)	9			

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1
E80	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3
	131	APP sensor (Without ICC)	E110	1
		APP sensor (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	5	E80	129	Existed
E67 (With ICC)	8			

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	6	E80	126	Existed
E67 (With ICC)	7			

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and APP sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK APP SENSOR

Refer to EC-994, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000009009614

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	136 (APP sensor 1)	140	Accelerator pedal	Fully released	0.5 - 1.0
				Fully depressed	4.2 - 4.8
	126 (APP sensor 2)	129		Fully released	0.25 - 0.5
				Fully depressed	2.0 - 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

P2135 TP SENSOR

DTC Logic

INFOID:0000000009009615

DTC DETECTION LOGIC

NOTE:
If DTC P2135 is displayed with DTC P0643, perform the trouble diagnosis for DTC P0643. Refer to EC-904, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2135	TP SENSOR-B1 (Throttle position sensor circuit range/performance)	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	• Harness or connector (TP sensor 1 or 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1 or 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-995, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009616

1.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check the voltage between electric throttle control actuator harness connector and ground.

Electric throttle control actuator		Ground	Voltage (V)
Connector	Terminal		
F66	2	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

2.CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	4	F110	97	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F66	1	F110	91	Existed
	3		79	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR

Refer to EC-996, "Component Inspection (Throttle Position Sensor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Throttle Position Sensor)

INFOID:0000000009009617

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-725, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F110	91 (TP sensor 1 signal)	97 (Sensor ground)	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	79 (TP sensor 2 signal)			Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to EM-31, "Removal and Installation".

>> INSPECTION END

P2138 APP SENSOR

DTC Logic

INFOID:0000000009009618

DTC DETECTION LOGIC

NOTE:
If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-904, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2138	APP SENSOR (Accelerator pedal position sensor circuit range/performance)	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	• Harness or connectors (APP sensor 1 or 2 circuit is open or shorted.) [CKP sensor circuit is shorted.] [CMP sensor (bank 1) circuit is shorted.] (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 or 2) • Crankshaft position sensor • Camshaft position sensor (bank 1) • Refrigerant pressure sensor • Battery current sensor • EVAP control system pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 8 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-998, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009619

1.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	2	Ground	Approx. 5
E67 (With ICC)	12		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.
- Loose or poor connection for each connector and harness
- Harness for open or short between ECM and APP sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E110 (Without ICC)	1	Ground	Approx. 5
E67 (With ICC)	9		

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 4.

4. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	1	E80	131	Existed
E67 (With ICC)	9			

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit.

6. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F110	76	Crankshaft position sensor	F74	1
	77	Camshaft position sensor (bank 1)	F84	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
E80	133	Battery current sensor	E63	2
		Refrigerant pressure sensor	E77	1
		EVAP control system pressure sensor	C17	3
	131	APP sensor (Without ICC)	E110	1
		APP sensor (with ICC)	E67	9

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair short to ground or short to power in harness or connectors.

7.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-853, "Component Inspection (Crankshaft Position Sensor)".)
- Camshaft position sensor (bank 1) (Refer to EC-858, "Component Inspection (Camshaft Position Sensor)".)
- Refrigerant pressure sensor (Refer to EC-1037, "Component Function Check".)
- EVAP control system pressure sensor (Refer to EC-874, "Component Inspection (EVAP Control System Pressure Sensor)".)

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	4	E80	140	Existed
	5		129	
E67 (With ICC)	11	E80	140	Existed
	8		129	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110 (Without ICC)	3	E80	136	Existed
	6		126	
E67 (With ICC)	10	E80	136	Existed
	7		126	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and accelerator pedal position sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR

Refer to EC-1001, "Component Inspection (Accelerator Pedal Position Sensor)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13. REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

14. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Accelerator Pedal Position Sensor)

INFOID:0000000009009620

1. CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	136 (APP sensor 1)	140	Accelerator pedal	Fully released	0.5 - 1.0
				Fully depressed	4.2 - 4.8
	126 (APP sensor 2)	129		Fully released	0.25 - 0.5
				Fully depressed	2.0 - 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "MODELS WITHOUT DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (Without distance control assist system) or ACC-4, "MODELS WITH DISTANCE CONTROL ASSIST SYSTEM : Removal and Installation" (With distance control assist system).

>> INSPECTION END

P2539 LOW FUEL PRESSURE SENSOR

DTC Logic

INFOID:0000000009009621

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P2539	LOW FUEL PRES SEN (Low fuel pressure sensor circuit low input and high input)	Signal voltage from the low fuel pressure sensor remains at more than 4.84 V / less than 0.3 V for 5 seconds or more.	• Harness or connectors (Low fuel pressure sensor circuit is open or shorted.) (Power steering pressure sensor circuit is open or shorted.) (Cooling fan speed sensor circuit is open or shorted.) (FRP sensor circuit is open or shorted.) • Low fuel pressure sensor • Power steering pressure sensor • Cooling fan speed sensor • FRP sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-1003, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009622

1.CHECK LOW FUEL PRESSURE SENSOR POWER SUPPLY-I

1. Turn ignition switch OFF.
2. Disconnect low fuel pressure sensor connector.
3. Turn ignition switch ON.
4. Check the voltage between low fuel pressure sensor harness connector terminals.

Low fuel pressure sensor			Voltage (Approx.)
Connector	+	–	
	terminal		
F25	3	1	5 V

Inspection result normal?

YES >> GO TO 6.
NO >> GO TO 2.

2.CHECK LOW FUEL PRESSURE SENSOR POWER SUPPLY-II

Check the voltage between low fuel pressure sensor harness connector and the ground.

+		–	Voltage (Approx.)
Low fuel pressure sensor			
Connector	Terminal		
F25	3	Ground	5 V

Is inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F111	27	Power steering pressure sensor	F35	1
		Low fuel pressure sensor	F25	3
		Cooling fan speed sensor	F39	2
	28	FRP sensor	F26	1

Is inspection result normal?

YES >> Perform the trouble diagnosis for power supply circuit. Refer to EC-746, "Diagnosis Procedure".
NO >> Repair or replace error-detected parts.

4.CHECK LOW FUEL PRESSURE SENSOR GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between low fuel pressure sensor harness connector and ECM harness connector.

+		–		Continuity
Low fuel pressure sensor		ECM		
Connector	Terminal	Connector	Terminal	
F25	1	F111	45	Existed

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK ECM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ECM harness connector and the ground.

ECM		Ground	Continuity
Connector	Terminal		
F111	5	Ground	Existed
E80	114		
	115		
	174		
	175		

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".

NO >> Repair or replace error-detected parts.

6.CHECK LOW FUEL PRESSURE SENSOR SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between low fuel pressure sensor harness connector and ECM harness connector.

+		–		Continuity
Low fuel pressure sensor		ECM		
Connector	Terminal	Connector	Terminal	
F25	2	F111	23	Existed

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace error-detected parts.

7.CHECK LOW FUEL PRESSURE SENSOR

Refer to EC-1005, "Component Inspection".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace low fuel pressure sensor.

Component Inspection

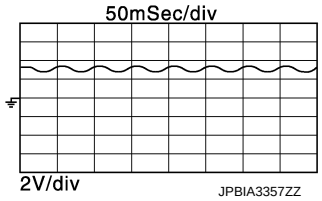
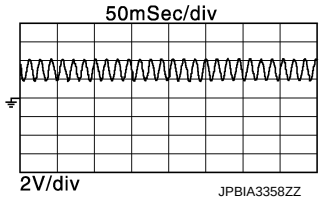
INFOID:0000000009009623

1.CHECK LOW FUEL PRESSURE SENSOR

WITH CONSULT
1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Select “DATA MONITOR” mode with CONSULT.
5. Check that the “L/FUEL PRES SEN V” value.

Data monitor item	Condition	Value (Approx.)
L/FUEL PRES SEN V	Engine speed: idle	3,000 –3,300 mV
	Engine speed: 3,000 rpm (no load)	

WITHOUT CONSULT
1. Turn ignition switch OFF.
2. Reconnect harness connector disconnected.
3. Start the engine.
4. Check low fuel pressure sensor signal voltage.

+		–	Condition	Value (Approx.)
Low fuel pressure sensor		Ground		
Connector	Terminal			
F25	2	Ground	[Engine is running] • Warm-up condition • Idle speed	
			[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Replace low fuel pressure sensor. Refer to EM-44, "Removal and Installation".

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000009009624

The electrical load signal (Rear window defogger switch signal, headlamp switch signal, heater fan switch signal, etc.) is transferred via the CAN communication line.

Component Function Check

INFOID:0000000009009625

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with 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 >> Go to EC-1007, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check “LOAD SIGNAL” indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Lighting switch	ON at 2nd position	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to EC-1007, "Diagnosis Procedure".

3.CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select “HEATER FAN SW” and check indication under the following conditions.

Monitor item	Condition		Indication
HEATER FAN SW	Heater fan control switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1007, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009626

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to EC-1007, "Component Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2.
Headlamp>>GO TO 3.
Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-23, "Work Flow".

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Refer to EXL-60, "Work Flow".

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to HAC-64, "Work Flow".

>> INSPECTION END

ELECTRICALLY-CONTROLLED COOLING FAN COUPLING

Component Function Check

INFOID:0000000009009627

1.CHECK COOLING FAN FUNCTION

WITH CONSULT
1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Check that cooling fan speed varies according to the percentage.

NOTE:
Speed changes gradually as the percentage changes.

WITHOUT CONSULT
1. Start the engine and warm up the engine until engine coolant temperature reaches at least 98°C (209°F).
2. Check that cooling fan speed increase.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-1009, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009628

1.CHECK DRIVE BELT

1. Turn ignition switch OFF.
2. Check that the drive belt is not broken.

Is inspection result normal?

YES >> GO TO 2.
NO >> Replace drive belt.

2.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING POWER SUPPLY

1. Disconnect electrically-controlled cooling fan coupling harness connector.
2. Turn ignition switch ON.
3. Check the voltage between electrically-controlled cooling fan coupling harness connector and ground.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	1	Ground	Battery voltage

Is inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for power supply circuit.

3.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between electrically-controlled cooling fan coupling harness connector and ground.

+		–	Continuity
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	6	Ground	Existed

Is inspection result normal?

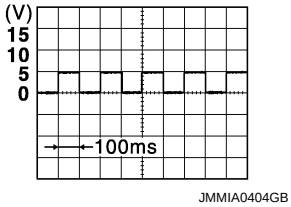
YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING CONTROL SIGNAL

WITH CONSULT

1. Start the engine.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode of “ECM” with CONSULT.
3. Set the Duty value to 100%.
4. Check the voltage between electrically-controlled cooling fan coupling harness connector and ground.

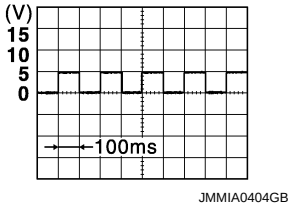
CAUTION:
Wait for 1 minute or more to measure.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	3	Ground	 JMMIA0404GB 2. 5 V

WITHOUT CONSULT

1. Start the engine and warm up the engine until engine coolant temperature reaches at least 98°C (209°F).
2. Check the voltage between electrically-controlled cooling fan coupling harness connector and ground.

CAUTION:
Wait for 1 minute or more to measure.

+		–	Voltage (Approx.)
Electrically-controlled cooling fan coupling			
Connector	Terminal		
F39	3	Ground	 JMMIA0404GB 2. 5 V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 5.

5. CHECK ELECTRICALLY-CONTROLLED COOLING FAN COUPLING CONTROL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between electrically-controlled cooling fan coupling harness connector and IPDM E/R harness connector.

+		–		Continuity
Electrically-controlled cooling fan coupling		IPDM E/R		
Connector	Terminal	Connector	Terminal	
F39	3	E17	72	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 CAN COMMUNICATION

Refer to LAN-22, "Trouble Diagnosis Flow Chart".

Is inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Repair or Replace error-detected parts.

7. CHECK COOLING FAN SPEED SENSOR

Refer to EC-890, "Diagnosis Procedure".

Is inspection result normal?

YES >> Replace electrically-controlled cooling fan coupling. Refer to CO-18, "Removal and Installation".
NO >> Repair or replace error-detected parts.

FUEL INJECTOR

Component Function Check

INFOID:0000000009009629

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

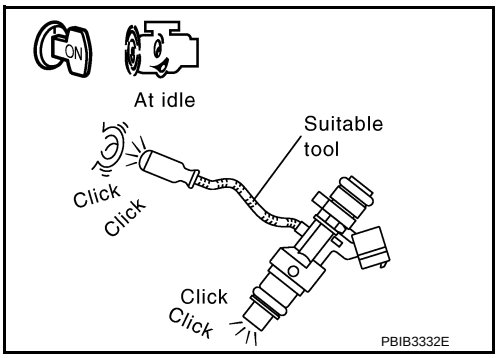
YES >> GO TO 2.
NO >> Proceed to EC-1012, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

WITH CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

WITHOUT CONSULT
1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-1012, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009630

1.CHECK FUEL INJECTOR POWER SUPPLY

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

+		–	Voltage
ECM			
Connector	Terminal		
F111	46	Ground	Battery voltage
	51		
E80	111		
	112		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E46, E94, F22 or F103
- 15 A fuse (No. 87)
- 30 A fuse (No. 71)
- Harness for open or short between ECM and fuse
- Fuel injector relay. Refer to EC-1014, "Component Inspection (Fuel Injector Relay)"

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK FUEL INJECTOR CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector and ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

Cylinder	+		–		Continuity
	Fuel injector		ECM		
	Connector	Terminal	Connector	Terminal	
1	F123	1	F110	101	Existed
		2		108	
2	F124	1	F111	7	
		2		4	
3	F125	1	F111	6	
		2		3	
4	F126	1	F110	107	
		2		104	
5	F127	1	F111	2	
		2		9	
6	F128	1	F110	102	
		2		109	
7	F129	1	F110	106	
		2		103	
8	F130	1	F111	1	
		2		8	

4. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK ECM GROUND CIRCUIT

Check the continuity between ECM harness connector and ground.

+		–	Continuity
ECM			
Connector	Terminal		
F111	5	Ground	Exsisted
E80	114		
	115		

Is inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK FUEL INJECTOR

Refer to EC-1014, "Component Inspection (Fuel Injector)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace malfunctioning fuel injector. Refer to EM-49, "Removal and Installation".

Component Inspection (Fuel Injector)

INFOID:0000000009009631

1. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check the resistance between fuel injector terminals as per the following.

Injector		Condition		Resistance
+	–			
Terminal				
1	2	Temperature	10 - 60°C (50 - 140°F)	1.44 - 1.73 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector. Refer to EM-49, "Removal and Installation".

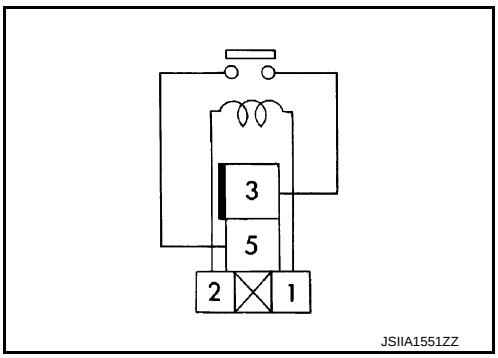
Component Inspection (Fuel Injector Relay)

INFOID:0000000009009632

1. CHECK FUEL INJECTOR RELAY

1. Turn ignition switch OFF.
2. Remove fuel injector relay.
3. Check the continuity between fuel injector relay terminals under the following conditions.

Fuel injector relay	Condition	Continuity
Terminal		
3 and 5	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed



JSIIA1551ZZ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel injector relay.

HIGH PRESSURE FUEL PUMP

Component Function Check

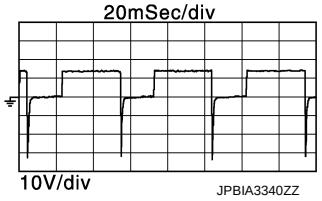
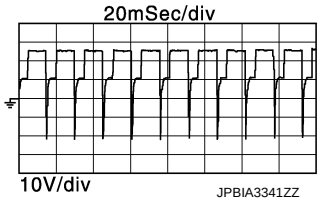
INFOID:0000000009009633

1.CHECK HIGH PRESSURE FUEL PUMP FUNCTION

WITH CONSULT
1. Start engine.
2. Check “FUEL PRES SEN V” in “DATA MONITOR” mode with CONSULT.

Monitor Item	Condition	Values/Status
FUEL PRES SEN V	Engine speed: Idle	820 – 1,220 mV
	Engine speed: Revving engine from idle to 4,000 rpm quickly	820 – 3,060 mV

WITHOUT CONSULT
1. Start engine.
2. Check the voltage between ECM harness connector and ground.

ECM				Condition	Voltage
+		–			
Connector	Terminal	Connector	Terminal		
F110	105	E80	175	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  JPBIA3340ZZ
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  JPBIA3341ZZ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-1015, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009634

1.CHECK HIGH PRESSURE FUEL PUMP SOLENOID CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector and high pressure fuel pump harness connector.
3. Check the continuity between ECM harness connector and high pressure fuel pump harness connector.

+		–		Continuity
ECM		High pressure fuel pump		
Connector	Terminal	Connector	Terminal	
F110	105	F24	1	Existed
	110		2	

4. Also check harness for short to ground and to power.

Is inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace error-detected parts.

2.CHECK HIGH PRESSURE FUEL PUMP SOLENOID

Refer to EC-1016, "Component Inspection".

Is inspection result normal?

YES >> GO TO 3.
NO >> Replace high pressure fuel pump. Refer to EM-44, "Removal and Installation".

3.CHECK HIGH PRESSURE FUEL PUMP INSTALLATION CONDITION

1. Turn ignition switch OFF.
2. Check that the high pressure fuel pump is installed with no backlash and looseness.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK CAMSHAFT

1. Remove camshaft. Refer to EM-80, "Removal and Installation".
2. Check camshaft. Refer to EM-83, "Inspection".

Is inspection result normal?

YES >> INSPECTION END
NO >> Replace camshaft. Refer to EM-80, "Removal and Installation".

Component Inspection

INFOID:0000000009009635

1.CHECK HIGH PRESSURE FUEL PUMP SOLENOID

1. Turn ignition switch OFF.
2. Disconnect high pressure fuel pump harness connector.
3. Check the resistance between high pressure fuel pump connector terminals as per the following.

+	–	Condition		Resistance
High pressure fuel pump Terminal				
1	2	Temperature	20 – 30°C (68 – 86°F)	9 – 11 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace high pressure fuel pump. Refer to EM-44, "Removal and Installation".

ICC BRAKE SWITCH

Component Function Check

INFOID:0000000009009636

1.CHECK ICC BRAKE SWITCH FUNCTION

WITH CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage
Connector	+	–			
	Terminal	Terminal			
E80	147 (ICC brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0 V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1017, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009637

1.CHECK DTC WITH ADAS CONTROL UNIT

Refer to DAS-25, "CONSULT Function (ICC/ADAS)" and DAS-45, "DTC Index".

Are any DTCs detected?

YES >> Perform the Diagnosis Procedure corresponding to the detected DTC.
NO >> GO TO 2.

2.CHECK OVERALL FUNCTION

WITH CONSULT
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

WITHOUT CONSULT
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
E80	147 (ICC brake switch signal)	175	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 3.

3. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E68	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-II

Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E68	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ICC brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

6. CHECK ICC BRAKE SWITCH

Refer to EC-1019, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace ICC brake switch. Refer to BR-20, "Removal and Installation".

7. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E68	2	E80	147	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ICC brake switch and ECM
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000009009638

1. CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2. CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake switch. Refer to BR-20, "Removal and Installation".

IGNITION SIGNAL

Component Function Check

INFOID:0000000009009639

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT: GO TO 2.
YES-2 >> Without CONSULT: GO TO 3.
NO >> Go to EC-1020, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

WITH CONSULT

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
2. Check that each circuit produces a momentary engine speed drop.

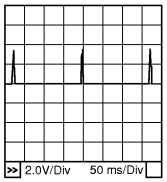
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1020, "Diagnosis Procedure".

3.CHECK IGNITION SIGNAL FUNCTION

WITHOUT CONSULT

1. Let engine idle.
2. Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

ECM					Voltage signal
Cylinder	+		–		
	Connector	Terminal	Connector	Terminal	
1	F111	12	E80	175	 PBIB0044E
2		13			
3		14			
4		15			
5		17			
6		18			
7		19			
8		20			

NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1020, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009640

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
E80	171	175	Battery voltage
	172		

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-746, "Diagnosis Procedure".

2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Turn ignition switch ON.
4. Check the voltage between condenser harness connector and ground.

Condenser		Ground	Voltage
Connector	Terminal		
F8	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 3.

3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E7.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
E15	61	F8	1	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Go to EC-746, "Diagnosis Procedure".
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between IPDM E/R and condenser
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between condenser harness connector and ground.

Condenser		Ground	Continuity
Connector	Terminal		
F8	2	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to power in harness or connectors.

6.CHECK CONDENSER

Refer to EC-1024, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace condenser.

7.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

1. Reconnect all harness connectors disconnected.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

Ignition coil			Ground	Voltage
Cylinder	Connector	Terminal		
1	F75	3	Ground	Battery voltage
2	F76	3		
3	F77	3		
4	F78	3		
5	F79	3		
6	F80	3		
7	F81	3		
8	F82	3		

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F22 and E46
- Harness for open or short between ignition coil and harness connector F22

>> Repair or replace harness or connectors.

9.CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

Ignition coil			Ground	Continuity
Cylinder	Connector	Terminal		
1	F75	2	Ground	Existed
2	F76	2		
3	F77	2		
4	F78	2		
5	F79	2		
6	F80	2		
7	F81	2		
8	F82	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to power in harness or connectors.

10. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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	F75	1	F111	12	Existed
2	F76	1		13	
3	F77	1		14	
4	F78	1		15	
5	F79	1		17	
6	F80	1		18	
7	F81	1		19	
8	F82	1		20	

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

11. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1023, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace malfunctioning ignition coil with power transistor.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000009009641

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.

Terminals	Resistance [at 25°C (77°F)]
1 and 2	Except 0 or ∞ Ω
1 and 3	Except 0 Ω
2 and 3	

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor.

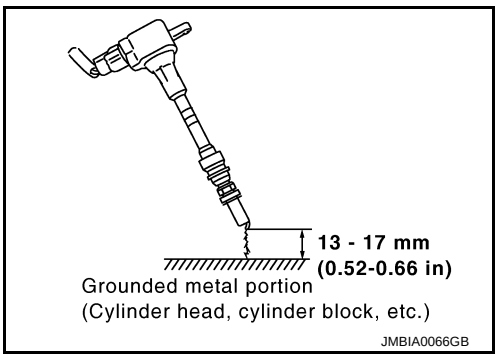
2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.

3. Remove fuel pump fuse in IPDM E/R to release fuel pressure.
NOTE:
- For the fuse number, refer to EC-689, "Wiring Diagram".
- For the fuse arrangement, refer to PG-99, "Fuse, Connector and Terminal Arrangement".
- Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.

4. Start engine.
5. After engine stalls, crank it 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.
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

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 >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor.

Component Inspection (Condenser)

INFOID:0000000009009642

1. CHECK CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as per the following.

Terminals	Resistance
1 and 2	Above 1 MΩ [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace condenser.

LOW PRESSURE FUEL PUMP

Component Function Check

INFOID:0000000009009643

1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

NOTE:
Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.

Is the inspection result normal?

YES >> INSPECTION END
NO >> EC-1025, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009644

1.CHECK FPCM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect FPCM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FPCM harness connector and ground.

+		–	Voltage
FPCM			
Connector	Terminal		
B41	10	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform the trouble diagnosis for power supply circuit. Refer to EC-746, "Diagnosis Procedure".

2.CHECK FPCM GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between FPCM harness connector and ground.

+		–	Continuity
FPCM			
Connector	Terminal		
B41	5	Ground	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to power in harness or connectors.

3.CHECK FPCM INPUT AND OUTPUT CIRCUIT

1. Disconnect ECM harness connector.
2. Check the continuity between FPCM harness connector and ECM harness connector.

+		–		Continuity
FPCM		ECM		
Connector	Terminal	Connector	Terminal	
B41	8	E80	125	Existed
	9		142	

3. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK FUEL PUMP CONTROL CIRCUIT

1. Disconnect fuel level sensor unit and fuel pump harness connector.
2. Check the continuity between FPCM harness connector and fuel level sensor unit and fuel pump harness connector.

+		–		Continuity
FPCM		Fuel level sensor unit and fuel pump		
Connector	Terminal	Connector	Terminal	
B41	6	C5	3	Existed
	7		1	

3. Also check harness for short to ground and to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5.CHECK LOW PRESSURE FUEL PUMP

Refer to EC-1026, "Component Inspection (Low Pressure Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace fuel level sensor unit and fuel pump. Refer to FL-5, "Removal and Installation".

6.CHECK FPCM

Refer to EC-1027, "Component Inspection (FPCM)".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-43, "Intermittent Incident".
NO >> Replace FPCM. Refer to EC-1054, "Removal and Installation".

Component Inspection (Low Pressure Fuel Pump)

INFOID:0000000009009645

1.CHECK FUEL PRESSURE REGULATOR

1. Turn ignition switch OFF.
2. Check low fuel pressure. Refer to EC-731, "Work Procedure".

Is inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK LOW PRESSURE FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect fuel level sensor unit and fuel pump.
3. Check resistance between fuel level sensor unit and fuel pump terminals as follows.

+	–	Condition	Resistance
Fuel level sensor unit and fuel pump			
Terminals			
1	3	Temperature: 25°C (77°F)	0.2 - 5.0 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel level sensor unit and fuel pump. Refer to FL-5, "Removal and Installation".

Component Inspection (FPCM)

INFOID:0000000009009646

1. CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Check the voltage between FPCM terminals under the following conditions.

FPCM		Condition	Voltage
+	–		
Terminal	Terminal		
7	6	For 1 second after turning ignition switch ON	Approx. 8.5 V
		More than 1 second after turning ignition switch ON	Approx. 0 V
		Idle speed	Approx. 8.5 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace FPCM. Refer to EC-1054, "Removal and Installation".

MALFUNCTION INDICATOR LAMP

Component Function Check

INFOID:0000000009009647

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Check that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1028, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009648

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis for DTC indicated.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace malfunctioning part.

MANIFOLD ABSOLUTE PRESSURE SENSOR

Component Function Check

INFOID:0000000009009649

1.CHECK MANIFOLD ABSOLUTE PRESSURE SENSOR FUNCTION

WITH CONSULT
1. Start engine.
2. Check “MAP SENSOR” in “DATA MONITOR” mode with CONSULT.

Monitor Item	Condition		Values/Status
MAP SENSOR	• Engine: After warming up • Selector lever: P or N position • A/C switch: OFF • No load	Idle	Approx. 1.0 V
		2,000 rpm	Approx. 1.35 V

WITHOUT CONSULT
1. Start engine.
2. Check the voltage between ECM harness connector and ground.

ECM				Condition	Voltage
+		–			
Connector	Terminal	Connector	Terminal		
F110	67	E80	175	[Engine is running] • Warm-up condition • Idle speed	1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.5 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-1029, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009650

1.CHECK INTAKE SYSTEM

Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21 and E38. Refer to Ground Inspection in GI-46, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace ground connection.

3.CHECK MAP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect manifold absolute pressure (MAP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between MAP sensor harness connector and ground.

MAP sensor		Ground	Voltage (V)
Connector	Terminal		
F65	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK MAP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between MAP sensor harness connector and ECM harness connector.

MAP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F65	3	F110	70	Existed

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK MAP SENSOR INTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between MAP sensor harness connector and ECM harness connector.

MAP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F65	2	F110	67	Existed

2. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

6. CHECK MAP SENSOR

Refer to EC-1030, "Component Inspection (MAP sensor)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace MAP sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection (MAP sensor)

INFOID:0000000009009651

1. CHECK MAP SENSOR-I

1. Turn ignition switch OFF.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF, wait at least 5 seconds and then turn ON.
4. Check the voltage between ECM harness connector terminals as follows.

ECM			
+		–	
Connector	Terminal	Connector	Terminal
F110	67	F110	70

NOTE:
- To avoid the influence of intake manifold vacuum, check the voltage 1 or more minutes past after engine is stopped.
- Because the sensor is absolute pressure sensor, output value may differ depending on atmospheric pressure and altitude.

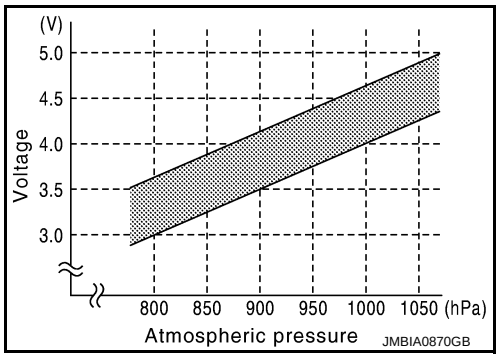
5. Measure the atmospheric pressure.

NOTE:
As the atmospheric pressure described on the synoptic chart is the value at sea level, compensate the pressure with the following chart.

Altitude (m)	Compensated pressure (hPa)
0	0
200	-24
400	-47
600	-70
800	-92
1000	-114
1500	-168
2000	-218

6. Check the manifold absolute pressure sensor value corresponding to the atmospheric pressure.

Atmospheric pressure (hPa)	Voltage (V)
800	3.1 – 3.7
850	3.3 – 3.9
900	3.5 – 4.1
950	3.8 – 4.3
1000	4.0 – 4.6
1050	4.2 – 4.8



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace MAP sensor.

2.CHECK MAP SENSOR-II

1. Start engine and let it idle.
2. Check intake manifold vacuum.
3. Check the voltage between ECM harness connector terminals as per the following.

ECM			
+		–	
Connector	Terminal	Connector	Terminal
F110	67	F110	70

4. Confirm the difference of the voltage when engine is stopped and at idling is within the values shown in the following chart.

Intake manifold vacuum [kPA (mmHg)]	Voltage difference (V)
-40 (-300)	1.5 – 2.0
-53.3 (-400)	2.0 – 2.6
-66.7 (-500)	2.6 – 3.2
-80 (-600)	3.2 – 3.8

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace MAP sensor.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Component Function Check

INFOID:0000000009009652

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-1033, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000009009653

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 2.5 kg (5.5 lb).

Is the inspection result normal?

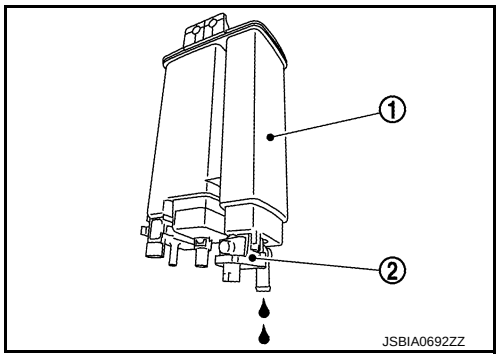
YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1035, "Component Inspection (EVAP Vapor Cut Valve)".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

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 2.5 kg (5.5 lb).

Is the inspection result normal?

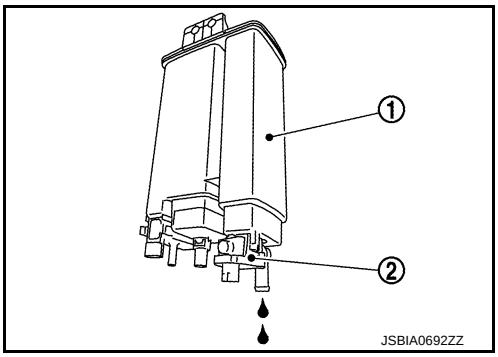
YES >> GO TO 8.
NO >> GO TO 9.

8. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).
- EVAP canister vent control valve (2)

Does water drain from the EVAP canister?

YES >> GO TO 9.
NO >> GO TO 11.



9. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

11. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace hoses and tubes.

12. CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace filler neck tube.

13. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-1035, "Component Inspection (EVAP Vapor Cut Valve)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-I

Check one-way fuel valve for clogging.

Is the inspection result normal?

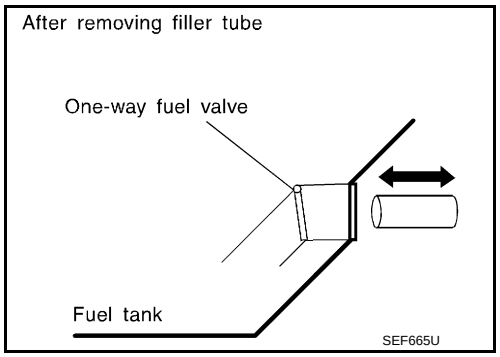
YES >> GO TO 16.
NO >> Repair or replace one-way fuel valve with fuel tank.

16. CHECK ONE-WAY FUEL VALVE-II

1. Check that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as per the following.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



Component Inspection (EVAP Vapor Cut Valve)

INFOID:0000000009009654

1. CHECK REFUELING EVAP VAPOR CUT VALVE

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-9, "Removal and Installation".
3. Drain fuel from the tank as per the following:

- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container.

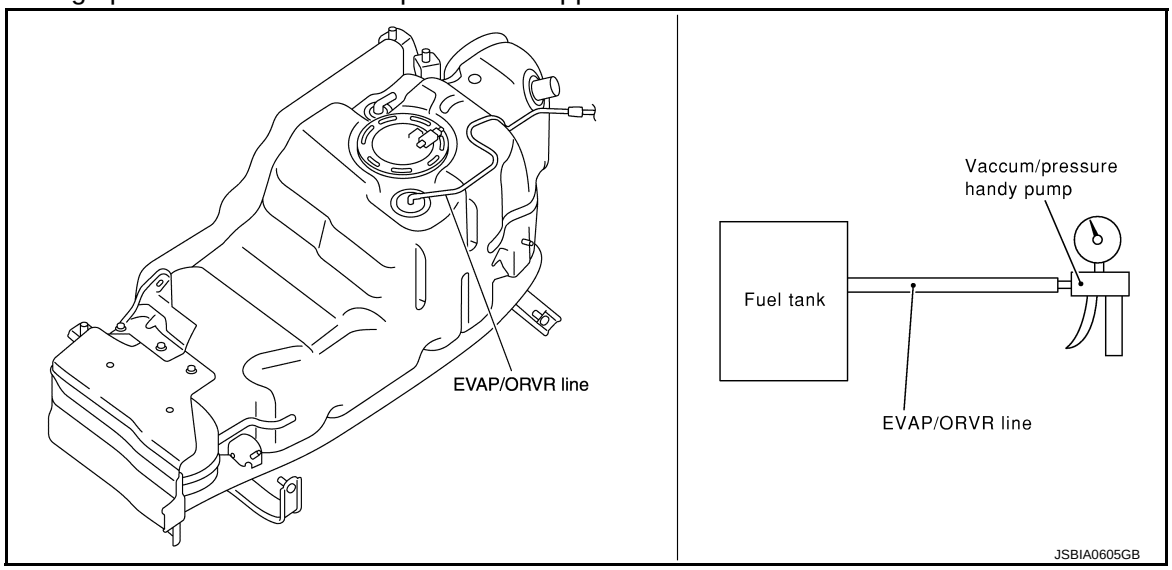
4. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as per the following.

- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.

- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^3, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:0000000009009655

1.CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
E80	144 (Refrigerant pressure sensor signal)	150	1.0 - 4.0

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1037, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009656

1.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pressure sensor		Ground	Voltage (V)
Connector	Terminal		
E77	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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	
E77	3	E80	150	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E77	2	E80	144	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor
- Loose or poor connection for each connector and harness

>> Repair open circuit, short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to HA-40, "REFRIGERANT PRESSURE SENSOR : Removal and Installation".
NO >> Repair or replace malfunctioning part.

SNOW MODE SWITCH

Description

INFOID:0000000009009657

The snow mode switch signal is sent to the combination meter from the snow mode switch. The combination meter then sends the signal to the ECM via the CAN communication line.
The snow mode is used for driving or starting the vehicle on snowy roads or slippery areas. If the snow mode is activated, the vehicle speed will not accelerate as quickly as normal to avoid vehicle slip. In other words, ECM controls rapid engine torque change by controlling the electric throttle control actuator operating speed.

Component Function Check

INFOID:0000000009009658

1.CHECK SNOW MODE SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “SNOW MODE SW” in “DATA MONITOR” mode with CONSULT.
3. Check “SNOW MODE SW” indication under the following conditions.

Monitor item	Condition		Indication
SNOW MODE SW	Snow mode switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-1039, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000009009659

1.CHECK DTC WITH COMBINATION METER

Refer to MWI-31, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to MWI-59, "Work flow".

2.CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect 4WD switch assembly harness connector.
3. Turn ignition switch ON.
4. Check the voltage between 4WD switch assembly harness connector and ground.

4WD switch assembly		Ground	Voltage
Connector	Terminal		
M54	12	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block harness connector M3
- 10 A fuse (No. 13)
- Harness for open or short between 4WD switch assembly and fuse.

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK SNOW MODE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect combination meter harness connector.
3. Check the continuity between 4WD switch assembly harness connector and combination meter harness connector.

4WD switch assembly		Combination meter		Continuity
Connector	Terminal	Connector	Terminal	
M54	22	M34	33	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connector.

5.CHECK SNOW MODE SWITCH

Refer to EC-1040, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 4WD switch assembly. Refer to IP-25, "Removal and Installation".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-43, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000009009660

1.CHECK SNOW MODE SWITCH

1. Turn ignition switch OFF.
2. Disconnect 4WD switch assembly harness connector.
3. Check the continuity between 4WD switch assembly terminals under the following conditions.

Terminals	Condition		Continuity
12 and 22	Snow mode switch	ON	Existed
		OFF	Not Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace 4WD switch assembly. Refer to IP-25, "Removal and Installation".

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000009009661

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	Low pressure fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-1025
	Low fuel pressure sensor circuit			4		4									EC-1003
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-774
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-1012
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-1049
	FRP sensor circuit	1	1	2	2	2		2	2			2			EC-834
	High pressure fuel pump circuit			4		3									EC-1015
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-1051
	Incorrect idle speed adjustment						1	1	1	1		1			EC-716
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-980 EC-986
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-716
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1020
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-746

	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	
Mass air flow sensor circuit	1			2										EC-779
Engine coolant temperature sensor circuit						3			3					EC-786
Air fuel ratio (A/F) sensor 1 circuit		1	2	3	2		2	2			2			EC-759 EC-791 EC-795 EC-798 EC-801
Throttle position sensor circuit						2			2					EC-788 EC-840 EC-932 EC-933 EC-995
Accelerator pedal position sensor circuit			3	2	1									EC-988 EC-991 EC-998
Knock sensor circuit			2								3			EC-849
Engine oil temperature sensor			4		2						3			EC-837
Crankshaft position sensor circuit	2	2												EC-851
Camshaft position sensor circuit	3	2												EC-855
Vehicle speed signal circuit		2	3		3						3			EC-881
Power steering pressure sensor circuit		2					3	3						EC-894
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-899 EC-901 EC-903
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-765
VVEL control module	3		4	4	3									EC-963 EC-964
VVEL actuator motor	3		4	4	3									EC-917
VVEL actuator motor relay	3		4	4	3									EC-920
VVEL control shaft position sensor	3		4	4	3									EC-914
PNP signal circuit			3		3		3	3			3			EC-906
Refrigerant pressure sensor circuit		2				3			3		4			EC-1037
Electrical load signal circuit							3							EC-1007
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-64
ABS actuator and electric unit (control unit)			4											BRC-58

	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	
Manifold absolute pressure sensor circuit											3			EC-1029
Battery current sensor						4	5	5					3	EC-934 EC-942 EC-946
Heated oxygen sensor 2			6		6		6	6			5			EC-806 EC-812 EC-820

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

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	5												FL-4
	Fuel piping			5	5	5		5	5			5			FL-4
	Vapor lock														—
	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-28
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5			5		5			5					EM-29
	Electric throttle control actuator														EC-980
	Air leakage from intake manifold/ Collector/Gasket														EM-31
Cranking	Battery	1	1	1		1		1	1			1		1	PG-114
	Generator circuit														CHG-12 (With EXP-800 NI or GR8-1200 NI)*, CHG-16 (Without EXP-800 NI or GR8-1200 NI)*.
	Starter circuit	3													STR-10(With GR8-1200 NI)*, STR-13 (Without GR8-1200 NI)*.
	Signal plate	6													EM-115
	PNP signal	4													EC-906
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-98
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-123
	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-77
	Camshaft														EM-83
	Intake valve timing control														EM-63
	Intake valve												3		EM-98
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-43 EX-6
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-58 EM-62 LU-11 LU-14 LU-16
	Oil level (Low)/Filthy oil														LU-8
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-12 CO-12
	Thermostat									5					CO-23
	Water pump														CO-21
	Water gallery														EM-123
	Cooling fan									5					CO-19
	Coolant level (Low)/Contaminated coolant														CO-8
IVIS (INFINITI Vehicle Immobilizer System — NATS)		1	1												SEC-46

1 - 6: The numbers refer to the order of inspection.

*: For the details of the EXP-800 NI or GR8-1200 NI, refer to CHG-4, "Special Service Tools".

NORMAL OPERATING CONDITION

Description

INFOID:0000000009009662

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 1,800 rpm under no load (for example, the selector lever position is neutral and engine speed is over 1,800 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under direct injection gasoline System, EC-613, "DIRECT INJECTION GASOLINE SYSTEM : System Description".

PERIODIC MAINTENANCE

IDLE SPEED

Inspection

INFOID:0000000009009663

1.CHECK IDLE SPEED

WITH CONSULT
Check idle speed in “DATA MONITOR” mode with CONSULT.
WITH GST
Check idle speed with Service $01 of GST.

>> INSPECTION END

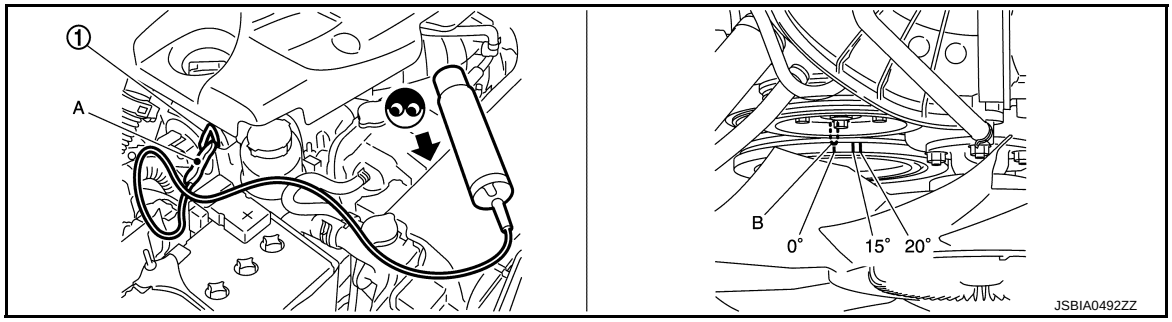
IGNITION TIMING

Inspection

INFOID:0000000009009664

1.CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



1. Loop wire
A. Timing light
B. Timing indicator

2. Check ignition timing.

>> INSPECTION END

EVAP LEAK CHECK

Inspection

INFOID:0000000009009665

CAUTION:

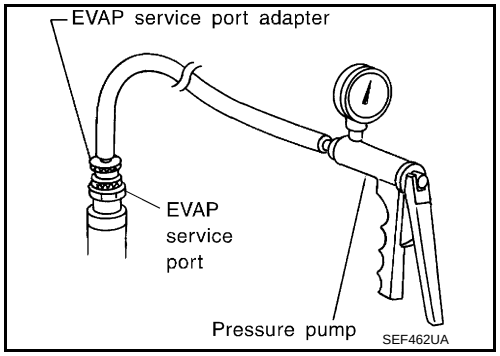
- **Do not use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

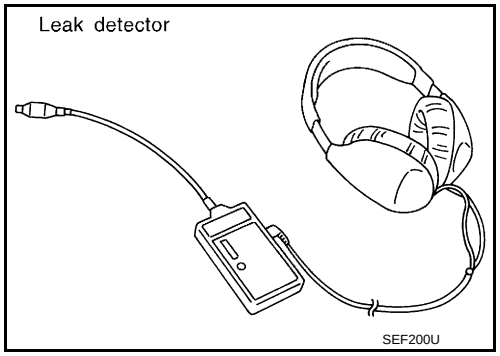
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leak.

WITH CONSULT

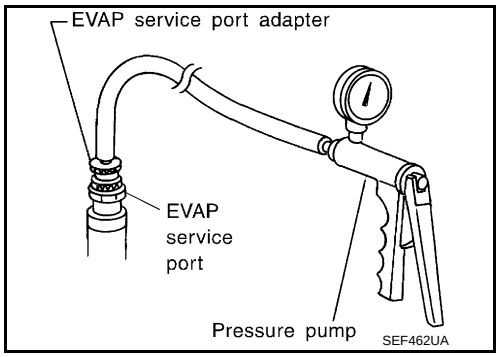
1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Turn ignition switch ON.
3. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT.
4. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump.
7. Locate the leak using a leak detector (commercial service tool). Refer to EC-622, "EVAPORATIVE EMISSION SYSTEM : System Diagram".



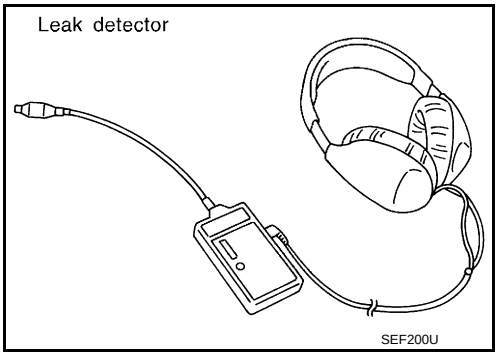


WITHOUT CONSULT

1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
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) and hose with pressure pump.



5. Locate the leak using a leak detector (commercial service tool). Refer to EC-622, "EVAPORATIVE EMISSION SYSTEM : System Diagram".



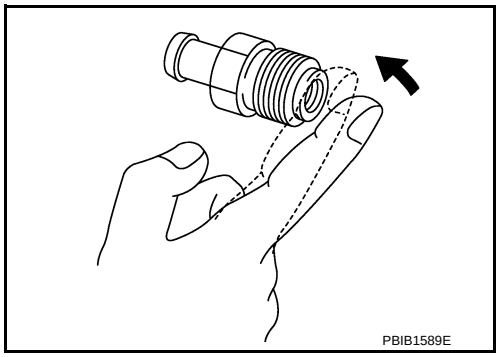
POSITIVE CRANKCASE VENTILATION

Inspection

INFOID:0000000009009666

1.CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace PCV valve. Refer to EM-34, "Exploded View".

REMOVAL AND INSTALLATION

ECM

Removal and Installation

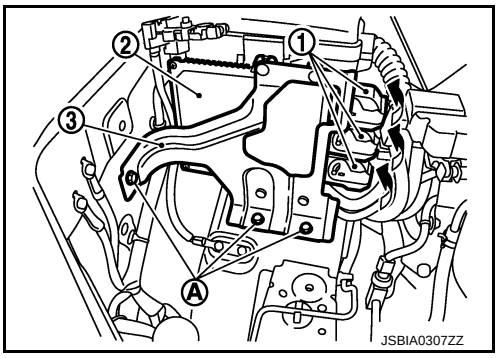
INFOID:0000000009009667

REMOVAL

CAUTION:

Perform ADDITIONAL SERVICE WHEN REPLACING ECM. Refer to EC-720, "Work Procedure".

1. Remove the battery and battery tray. Refer to PG-122, "Removal and Installation".
2. Disconnect ECM harness connectors (1) as shown in the figure.
3. Remove ECM bracket bolts (A).
4. Separate ECM (2) and ECM bracket (3).



INSTALLATION

Install in the reverse order of removal.

VVEL CONTROL MODULE

Removal and Installation

INFOID:0000000009009668

REMOVAL

1. Disconnect VVEL control module harness connector.
2. Remove the fix bolts. And then remove VVEL control module.

INSTALLATION

Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing VVEL control module. Refer to EC-722, "Work Procedure".

FUEL PUMP CONTROL MODULE (FPCM)

Removal and Installation

INFOID:0000000009009669

REMOVAL

1. Remove the luggage side finisher lower (LH). Refer to INT-36, "LUGGAGE SIDE LOWER FINISHER : Removal and Installation".
2. Disconnect fuel pump control module (FPCM) connector.
3. Remove mounting bolts and then remove fuel pump control module (FPCM).

INSTALLATION

Install in the reverse order of removal.

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000009009670

Condition	Specification
No load* (in P or N position)	600 ± 50 rpm

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:0000000009009671

Condition	Specification
No load* (in P or N position)	12 ± 2°BTDC

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000009009672

Condition	Specification (Using CONSULT or GST)
At idle	5 – 35%
At 2,500 rpm	5 – 35%

Mass Air Flow Sensor

INFOID:0000000009009673

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.7 – 1.2 V*
Mass air flow (Using CONSULT or GST)	1.0 – 5.0 g/s at idle* 7.0 – 20.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.