SECTION EC
ENGINE CONTROL SYSTEM

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PRECAUTION

PRECAUTIONS

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

INFOID:0000000007224275

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:

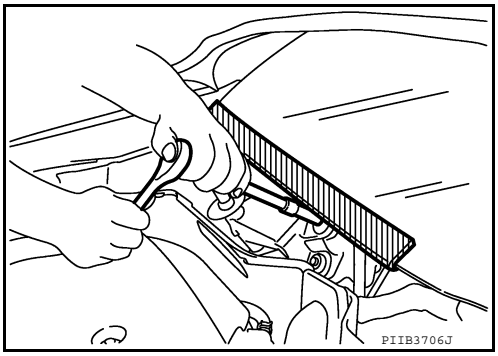
Always observe the following items for preventing accidental activation.

- **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:0000000007224276

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



On Board Diagnostic (OBD) System of Engine and CVT

INFOID:0000000007224277

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

CAUTION:

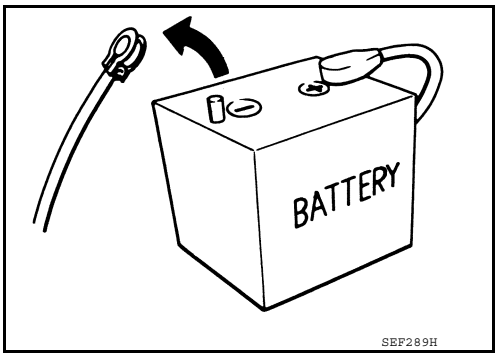
- **Be sure to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MI to light up.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MI to light up due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to XX-XX, "*****".**

- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MI to light up due to the short circuit.**
- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MI to light up due to the malfunction of the fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

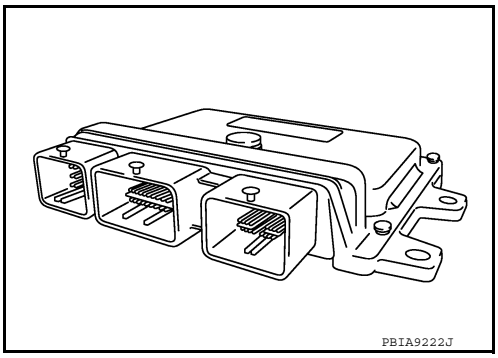
General Precautions

INFOID:0000000007224278

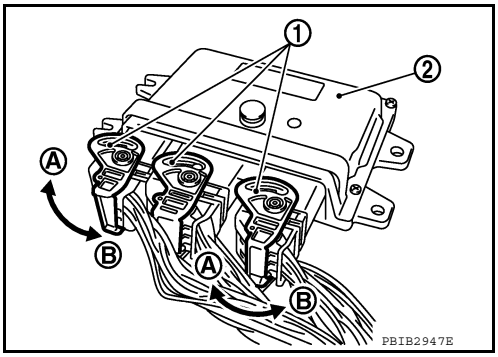
- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because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



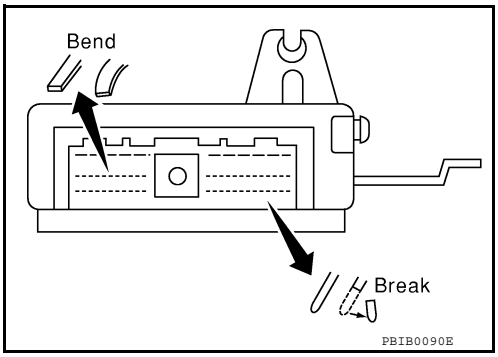
- **Do not disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. So, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.
- **If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.**
  - **Diagnostic trouble codes**
  - **1st trip diagnostic trouble codes**
  - **Freeze frame data**
  - **1st trip freeze frame data**
  - **System readiness test (SRT) codes**
  - **Test values**



- **When connecting ECM harness connector (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.**
  - ECM (2)
  - Loosen (A)

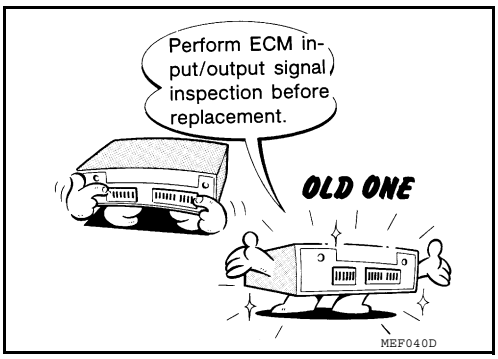


- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system mal-**

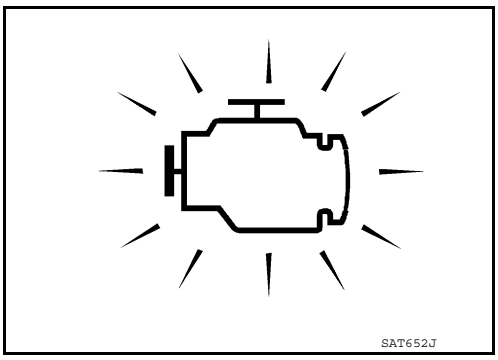


functions due to receiving external noise, degraded operation of ICs, etc.

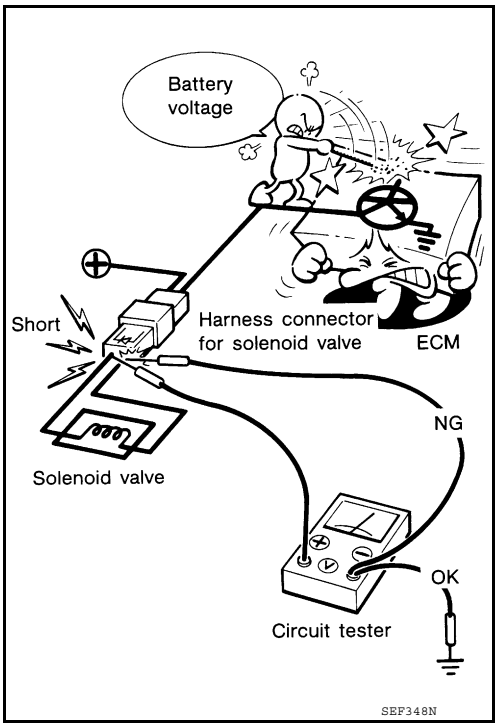
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-56, "Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Do not clean mass air flow sensor with any type of detergent.**
- **Do not disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Do not shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**



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

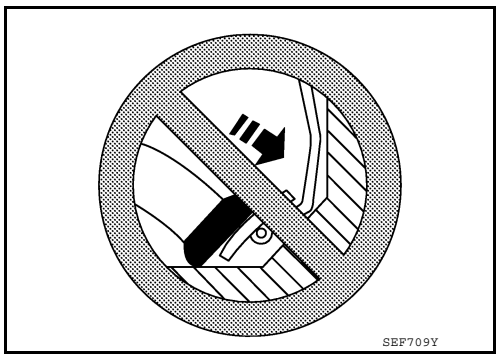


- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.

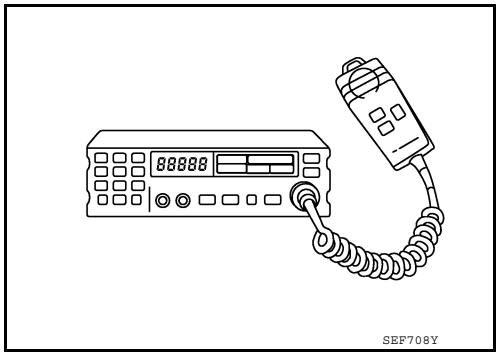


- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

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



- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
  - **Keep the antenna as far as possible from the electronic control units.**
  - **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
    Do not let them run parallel for a long distance.
  - **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**
  - **Be sure to ground the radio to vehicle body.**

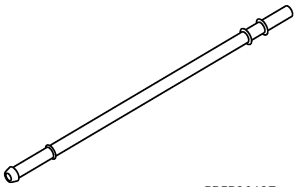
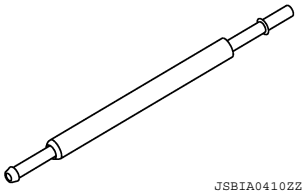


PREPARATION

PREPARATION

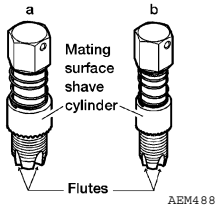
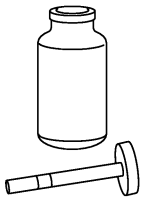
Special Service Tools

INFOID:0000000007224279

Tool number Tool name	Description
KV10118400 Fuel tube adapter  PBIB3043E	Measuring fuel pressure
KV10120000 Fuel tube adapter  JSBIA0410ZZ	

Commercial Service Tools

INFOID:0000000007224280

Tool name	Description
Oxygen sensor thread cleaner  AEM488	Reconditioning 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	Lubricating oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

SYSTEM DESCRIPTION

COMPONENT PARTS

ENGINE CONTROL SYSTEM

ENGINE CONTROL SYSTEM : Component Parts Location

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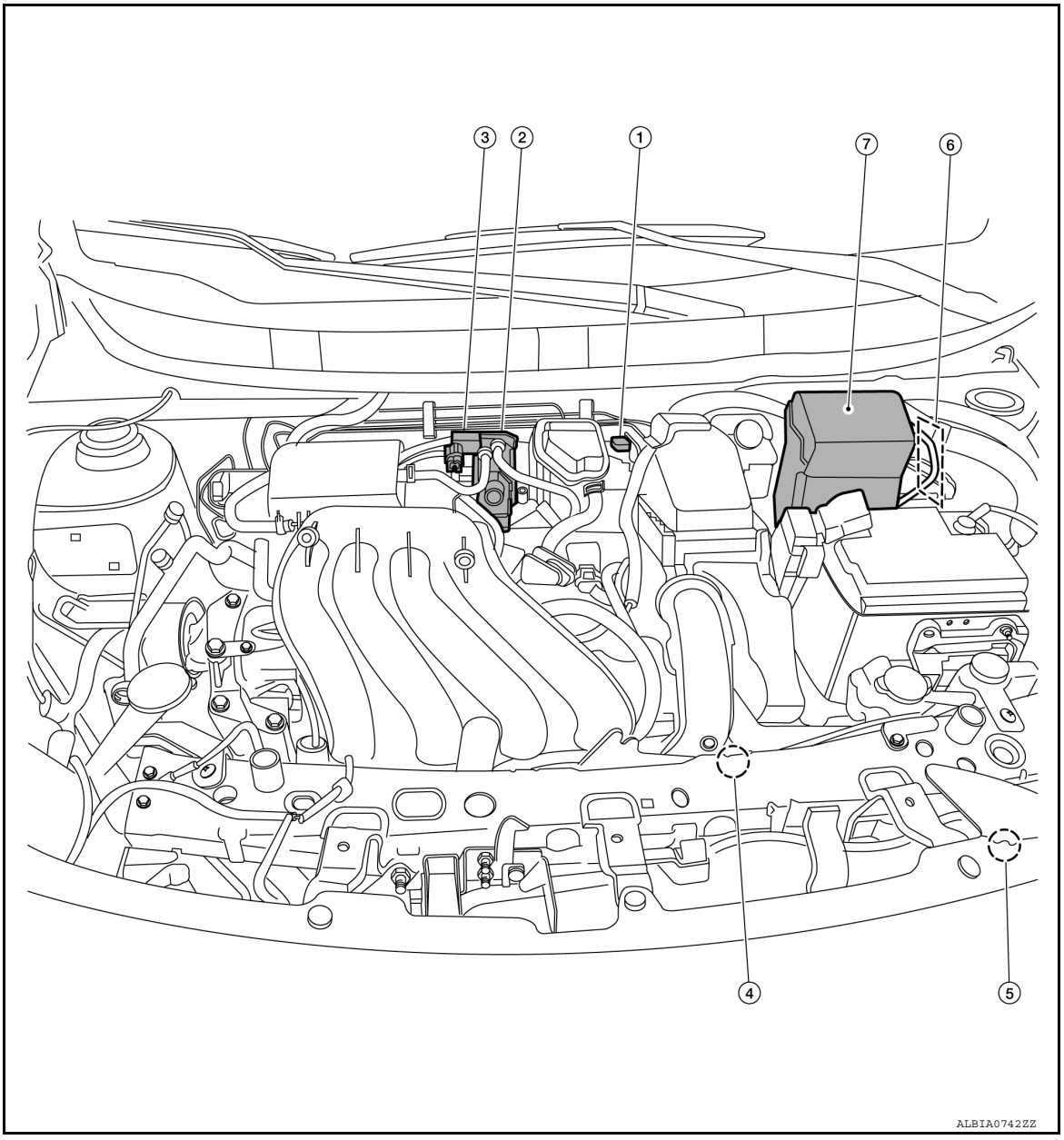
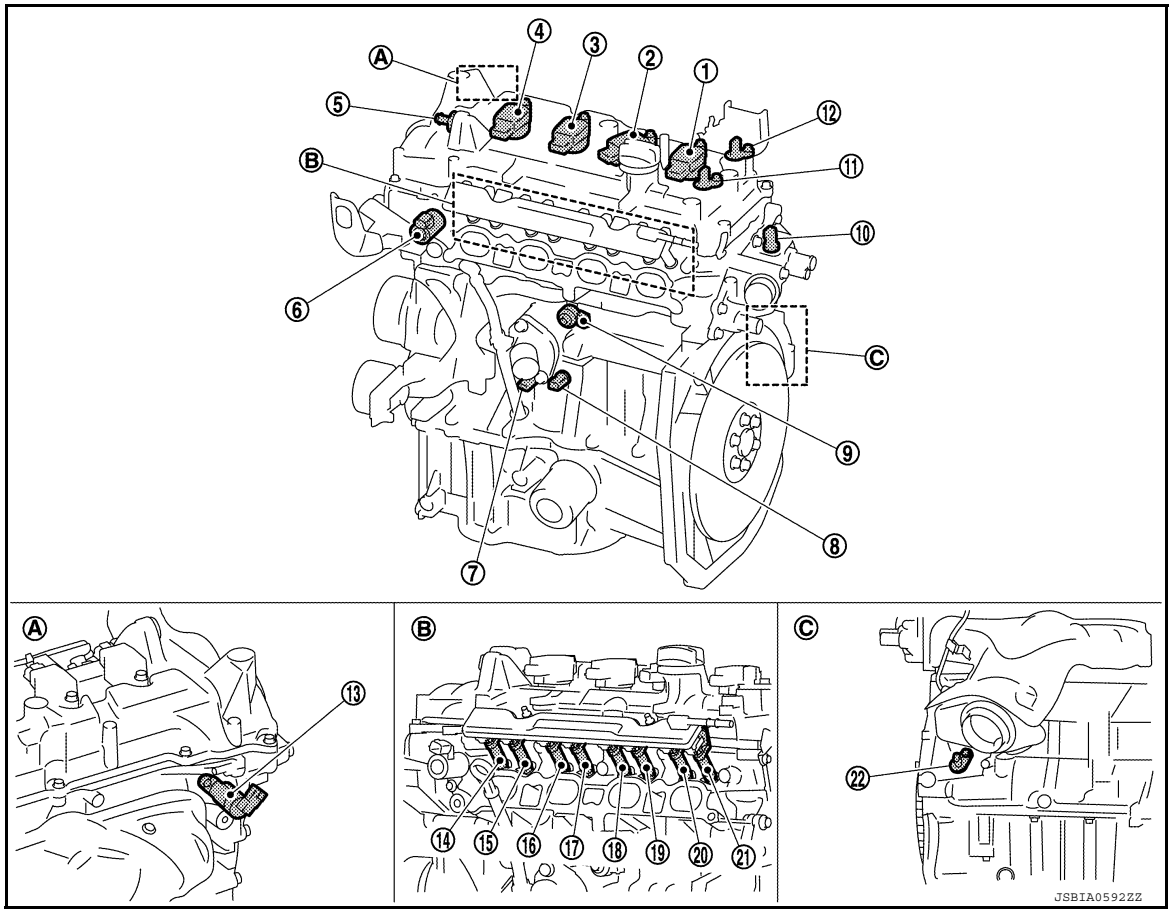
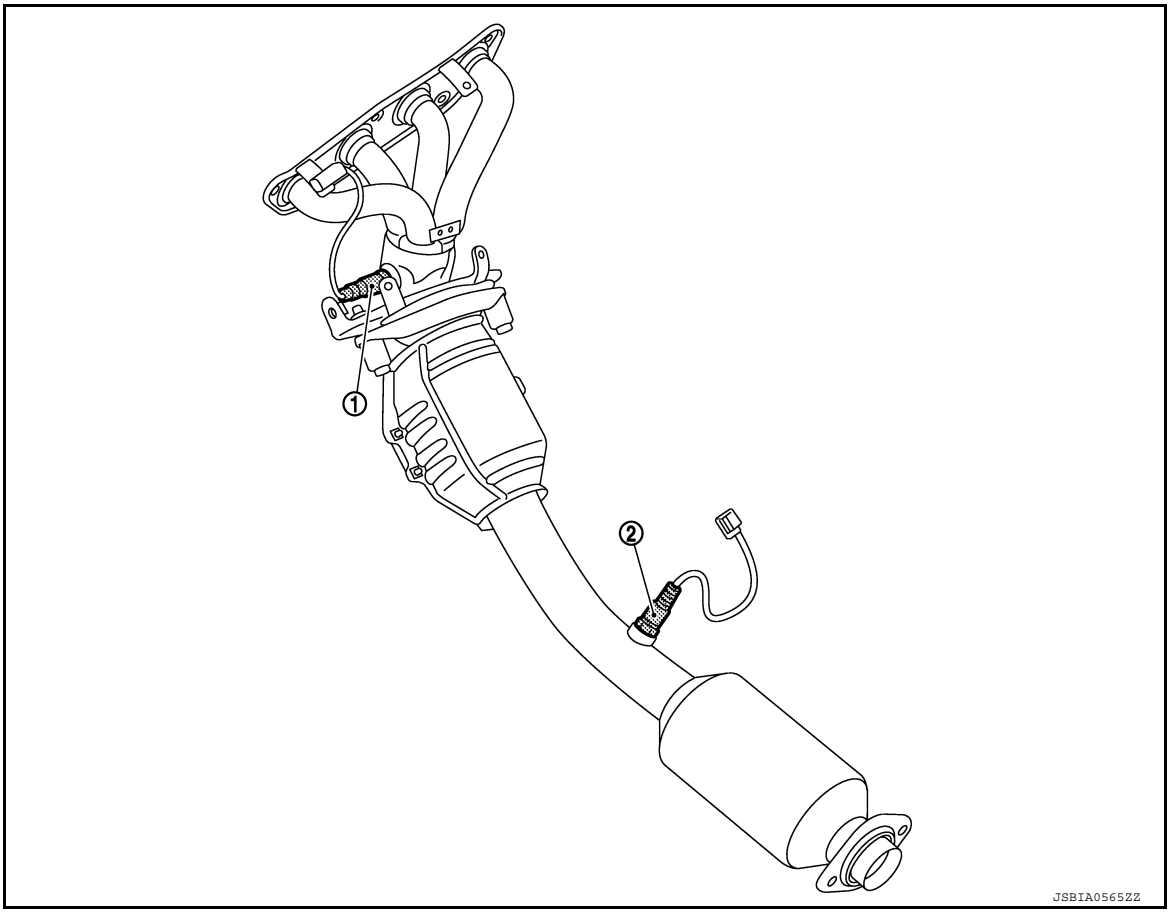


1. Mass air flow sensor (with intake air temperature sensor)
2. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
3. EVAP canister purge volume control solenoid valve
4. Cooling fan motor
5. Refrigerant pressure sensor Refer to XX-XX, "*****".
6. ECM
7. IPDM E/R Refer to XX-XX, "*****".

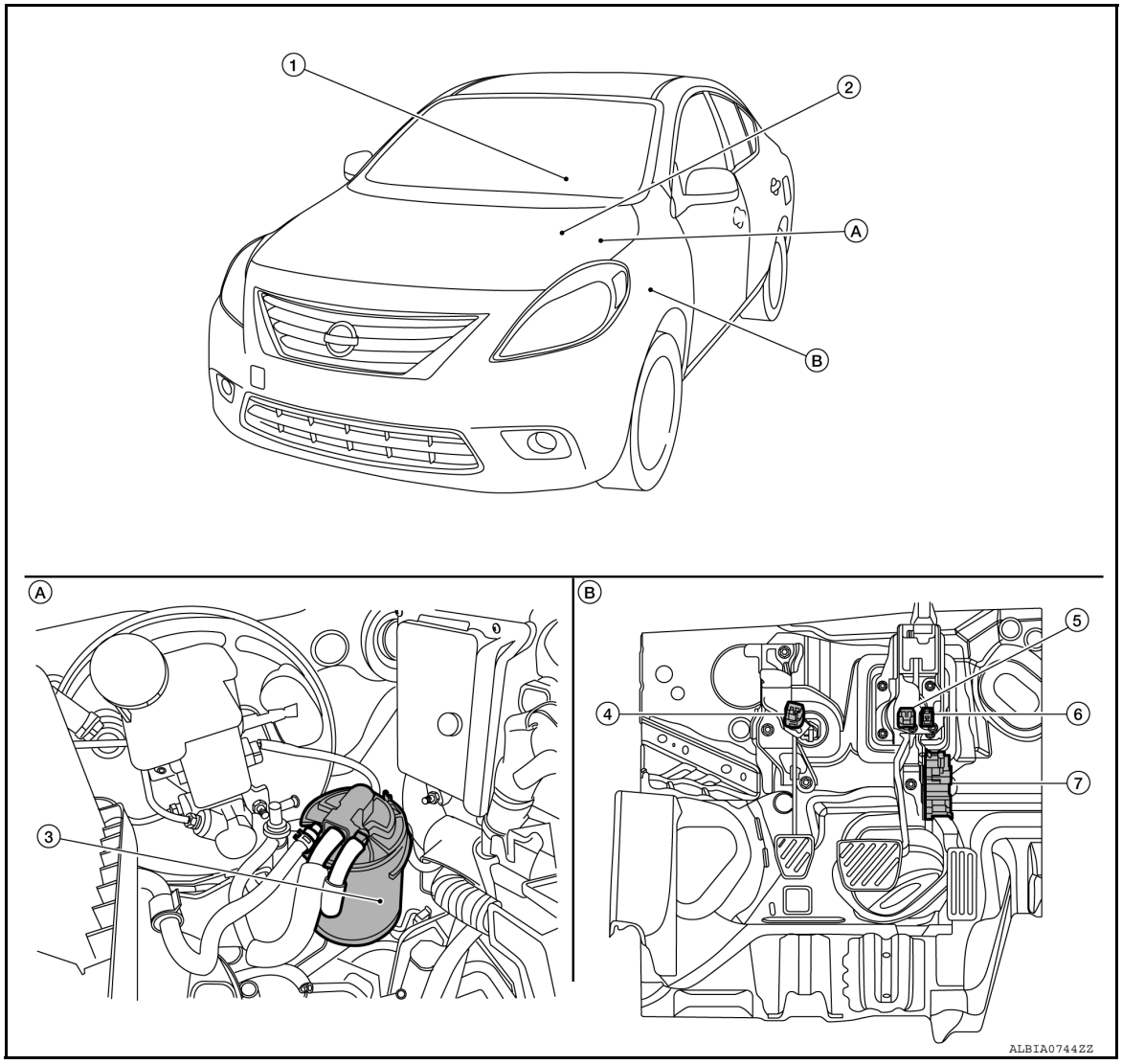


1. Ignition coil No.4 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.2 (with power transistor)
4. Ignition coil No.1 (with power transistor)
5. PCV valve
6. Intake valve timing control solenoid valve
7. Engine oil pressure sensor
8. Engine oil temperature sensor
9. Knock sensor
10. Engine coolant temperature sensor
11. Intake camshaft position sensor
12. Exhaust camshaft position sensor
13. Exhaust valve timing control solenoid valve
14. Fuel injector No.1 (Front)
15. Fuel injector No.1 (Rear)
16. Fuel injector No.2 (Front)
17. Fuel injector No.2 (Rear)
18. Fuel injector No.3 (Front)
19. Fuel injector No.3 (Rear)
20. Fuel injector No.4 (Front)
21. Fuel injector No.4 (Rear)
22. Crankshaft position sensor

A. Engine front right side
B. Left view of the engine
C. Engine rear right side



1. A/F sensor 1
2. Heated oxygen sensor 2



1. ASCD steering switch
2. Fuel pump (with fuel level sensor unit and fuel pressure regulator) Refer to FL-5, "Exploded View".
3. EVAP canister
4. Clutch pedal position switch
5. Stop lamp switch
6. Brake pedal position switch
7. Accelerator pedal position sensor
A. Left side of engine room
B. Periphery of pedals

ENGINE CONTROL SYSTEM : Component Description

INFOID:0000000007224282

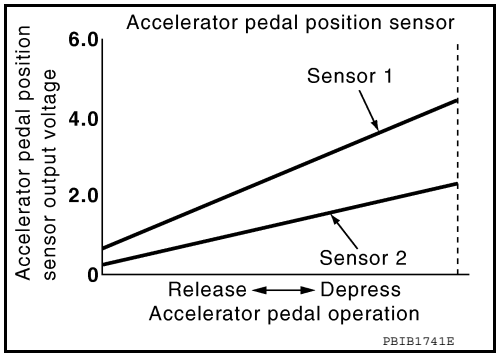
Component	Reference
ECM	EC-17, "ECM"
A/F sensor 1	EC-15, "Air Fuel Ratio Sensor 1"
A/F sensor 1 heater	EC-16, "Air Fuel Ratio Sensor 1 Heater"
Accelerator pedal position sensor	EC-15, "Accelerator Pedal Position Sensor"
Battery current sensor	EC-16, "Battery Current Sensor"
Cooling fan motor	EC-17, "Cooling Fan"
Crankshaft position sensor	EC-17, "Crankshaft Position Sensor"
Electric throttle control actuator	EC-17, "Electric Throttle Control Actuator"
Engine coolant temperature sensor	EC-18, "Engine Coolant Temperature Sensor"

Component	Reference
Engine oil pressure sensor	EC-18, "Engine Oil Pressure Sensor"
Engine oil temperature sensor	EC-18, "Engine Oil Temperature Sensor"
EVAP canister purge volume control solenoid valve	EC-19, "EVAP Canister Purge Volume Control Solenoid Valve"
Exhaust camshaft position sensor	EC-16, "Camshaft Position Sensor"
Exhaust valve timing control solenoid valve	EC-19, "Exhaust Valve Timing Control Solenoid Valve"
Fuel injector	EC-19, "Fuel Injector"
Fuel pump	EC-20, "Fuel Pump"
Heated oxygen sensor 2	EC-20, "Heated Oxygen Sensor 2"
Heated oxygen sensor 2 heater	EC-20, "Heated Oxygen Sensor 2 Heater"
Ignition coil (with power transistor)	EC-21, "Ignition Coil With Power Transistor"
Intake air temperature sensor	EC-21, "Intake Air Temperature Sensor"
Intake camshaft position sensor	EC-16, "Camshaft Position Sensor"
Intake valve timing control solenoid valve	EC-21, "Intake Valve Timing Control Solenoid Valve"
Knock sensor	EC-21, "Knock Sensor"
Mass air flow sensor	EC-22, "Mass Air Flow Sensor"
PCV valve	EC-24, "Positive Crankcase Ventilation"
Refrigerant pressure sensor	EC-22, "Refrigerant Pressure Sensor"
Stop lamp switch	EC-23, "Stop Lamp Switch"
Throttle control motor	EC-23, "Throttle Control Motor"
Throttle control motor relay	EC-23, "Throttle Control Motor Relay"
Throttle position sensor	EC-23, "Throttle Position Sensor"

Accelerator Pedal Position Sensor

INFOID:0000000007224283

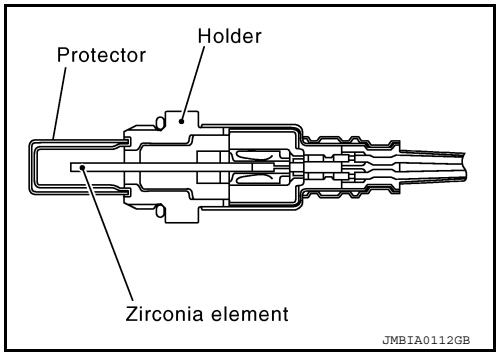
The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator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



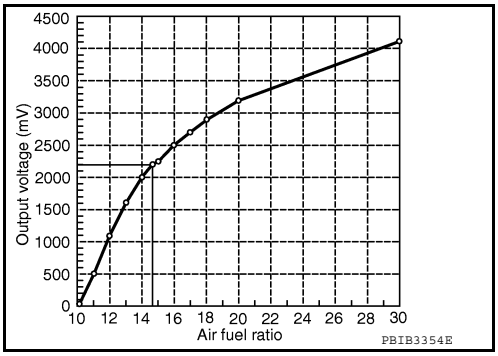
Air Fuel Ratio Sensor 1

INFOID:0000000007224284

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



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



Air Fuel Ratio Sensor 1 Heater

INFOID:0000000007224285

SYSTEM DESCRIPTION

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

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

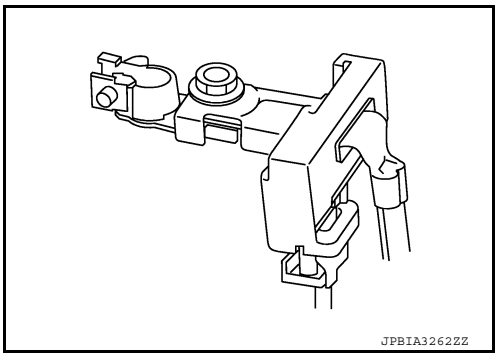
Battery Current Sensor

INFOID:0000000007224286

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

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 XX-XX, "*****".



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.

Camshaft Position Sensor

INFOID:0000000007224287

The camshaft position sensor senses the protrusion of camshaft to identify a particular cylinder. The camshaft position sensor senses the piston position.

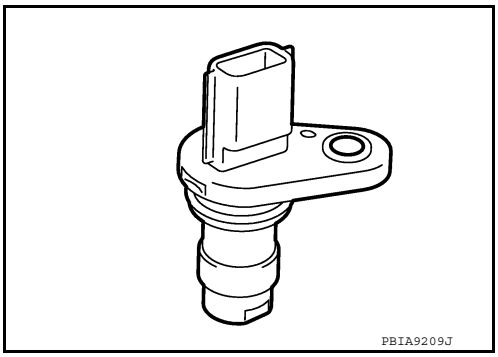
When the crankshaft position sensor system becomes inoperative, the camshaft position sensor provides various controls of engine parts instead, utilizing timing of cylinder identification signals.

The sensor consists of a permanent magnet and Hall IC.

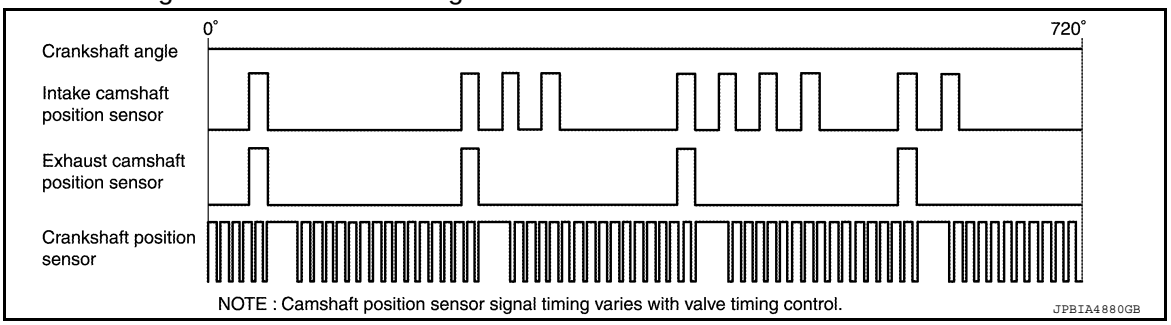
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.

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

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



ECM receives the signals as shown in the figure.



Cooling Fan

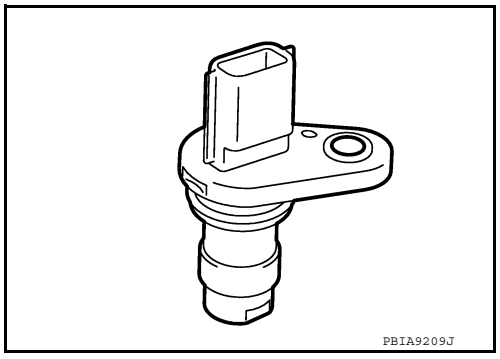
INFOID:0000000007224288

Cooling fan operates at low and high speed when the current flows in the cooling fan motor.
Refer to EC-32, "COOLING FAN CONTROL : System Description" for cooling fan operation.

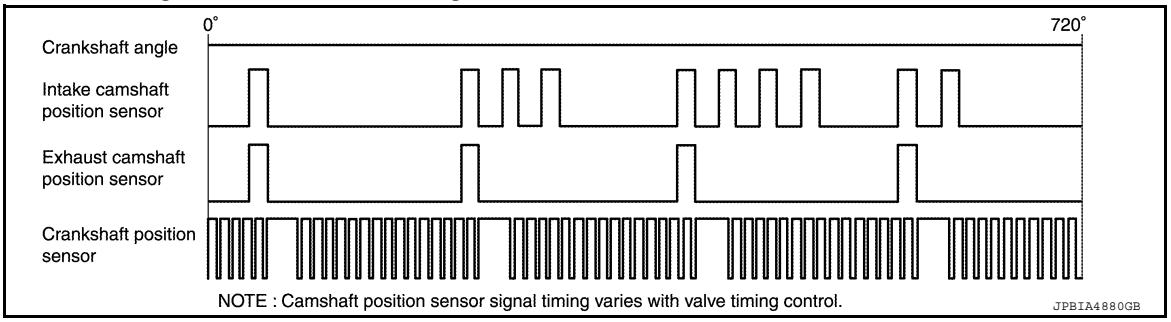
Crankshaft Position Sensor

INFOID:0000000007224289

The crankshaft position sensor is located on the cylinder block rear housing facing the gear teeth (cogs) of the signal plate at end of the crankshaft. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.



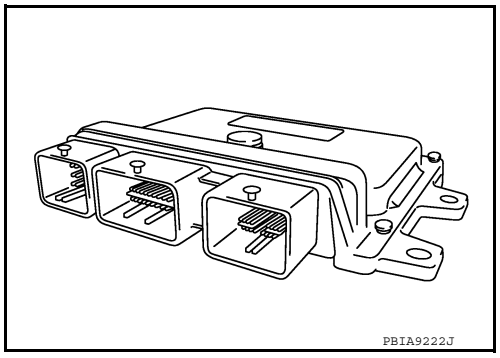
ECM receives the signals as shown in the figure.



ECM

INFOID:0000000007224290

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



Electric Throttle Control Actuator

INFOID:0000000007224291

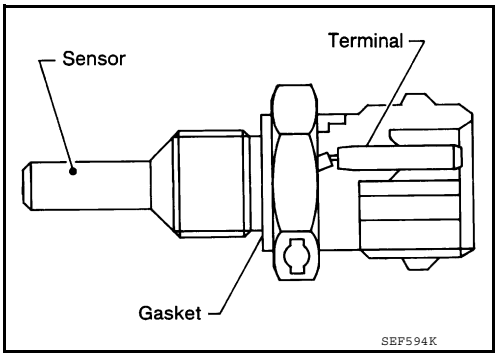
Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.

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

Engine Coolant Temperature Sensor

INFOID:0000000007224292

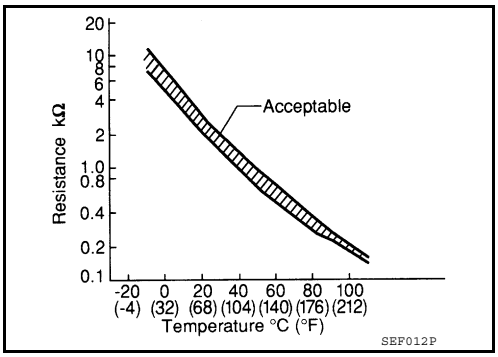
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



<Reference data>

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

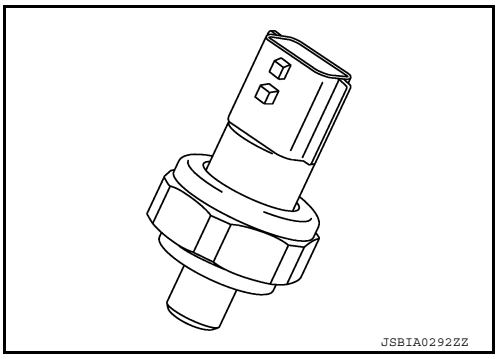
*: These data are reference values and are measured between ECM terminals.



Engine Oil Pressure Sensor

INFOID:0000000007224293

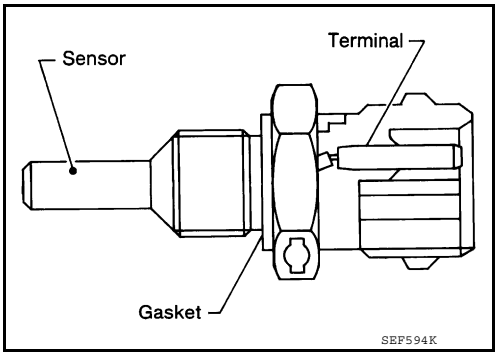
The engine oil pressure (EOP) sensor is detects engine oil pressure and transmits a voltage signal to the ECM.



Engine Oil Temperature Sensor

INFOID:0000000007224294

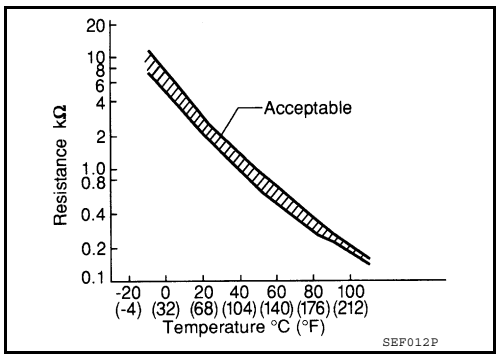
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance 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	2.10 - 2.90
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153

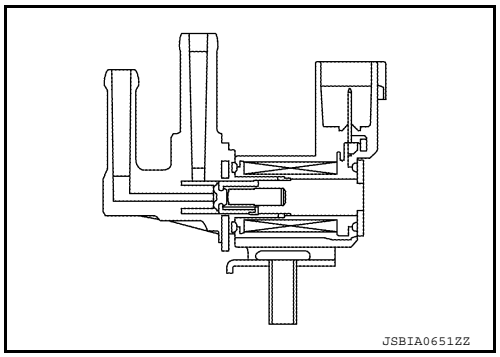
*: These data are reference values and are measured between ECM terminals.



EVAP Canister Purge Volume Control Solenoid Valve

INFOID:0000000007224295

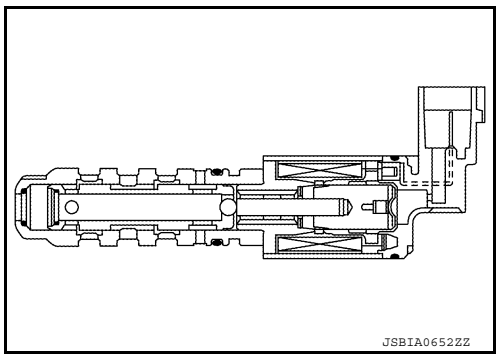
The EVAP canister purge volume control solenoid valve uses a ON/OFF duty to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will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



Exhaust Valve Timing Control Solenoid Valve

INFOID:0000000007224296

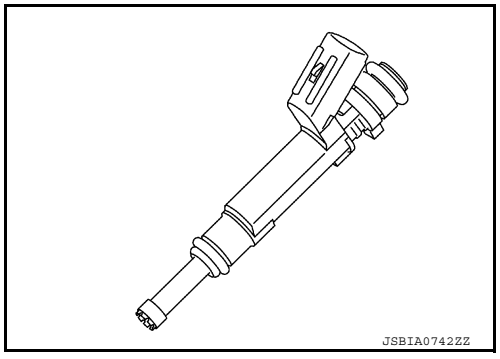
Exhaust valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The exhaust valve timing control solenoid valve changes the oil amount and direction of flow through exhaust valve timing control unit or stops oil flow.
The longer pulse width retards valve angle.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



Fuel Injector

INFOID:0000000007224297

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



Fuel Pump

INFOID:0000000007224298

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

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

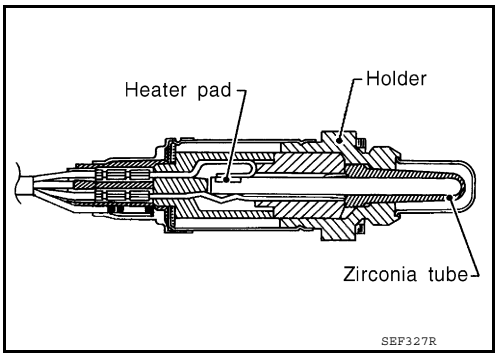
The ECM activates the fuel pump for a few seconds after the ignition switch is turned ON to improve engine start ability. If the ECM receives a engine speed signal from the crankshaft position sensor (POS) and camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump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

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

Heated Oxygen Sensor 2

INFOID:0000000007224299

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



Heated Oxygen Sensor 2 Heater

INFOID:0000000007224300

SYSTEM DESCRIPTION

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

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

OPERATION

Engine speed	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

Ignition Coil With Power Transistor

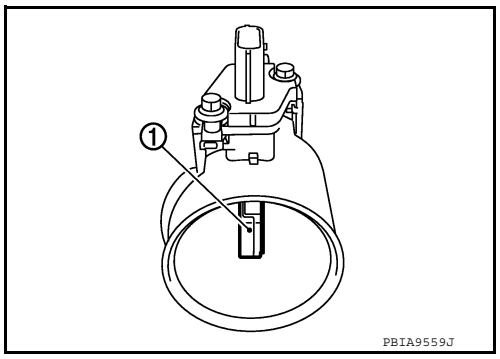
INFOID:0000000007224301

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

Intake Air Temperature Sensor

INFOID:0000000007224302

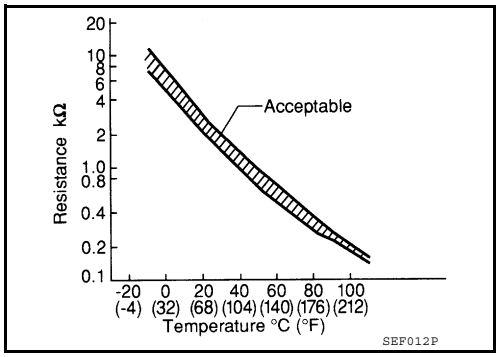
The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the temperature rise.



<Reference data>

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

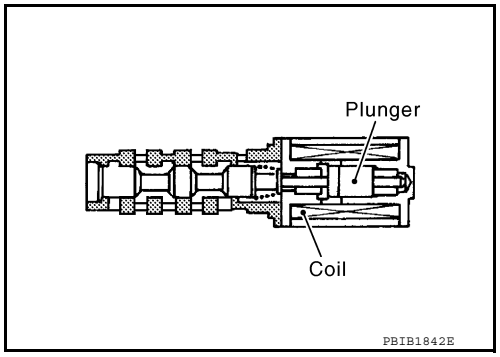
*: These data are reference values and are measured between ECM terminals.



Intake Valve Timing Control Solenoid Valve

INFOID:0000000007224303

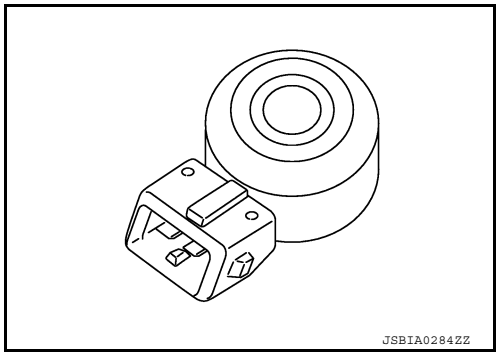
Intake valve timing control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.
The intake valve timing control solenoid valve changes the oil amount and direction of flow through intake valve timing control unit or stops oil flow.
The longer pulse width advances valve angle.
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:0000000007224304

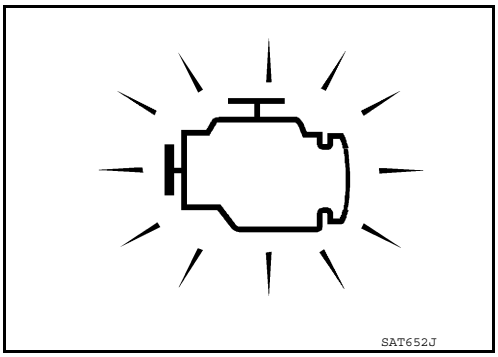
The knock sensor is attached to the cylinder block. It senses engine knocking using a piezoelectric element. A knocking vibration from the cylinder block is sensed as vibrational pressure. This pressure is converted into a voltage signal and sent to the ECM.



Malfunction Indicator

INFOID:0000000007224305

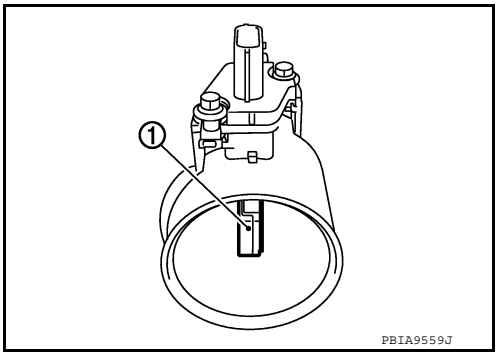
The MI is located on the combination meter.
The MI will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MI should turn OFF. If MI remains ON or continues blinking, the on board diagnostic system detects a DTC(s) that affects exhaust gas.
For details, refer to EC-46, "DIAGNOSIS DESCRIPTION : Malfunction Indicator (MI)".



Mass Air Flow Sensor

INFOID:0000000007224306

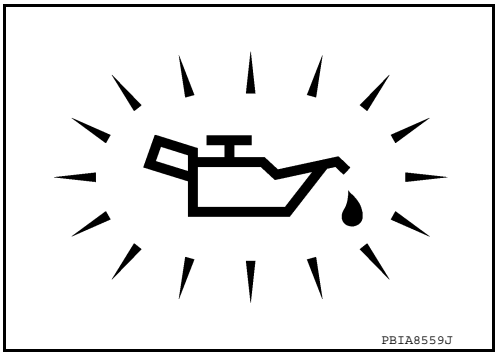
The mass air flow sensor (1) is placed in the stream of intake air. It measures the intake flow rate by measuring a part of the entire intake flow. The mass air flow sensor controls the temperature of the hot wire to a certain amount. The heat generated by the hot wire is reduced as the intake air flows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



Oil Pressure Warning Lamp

INFOID:0000000007224307

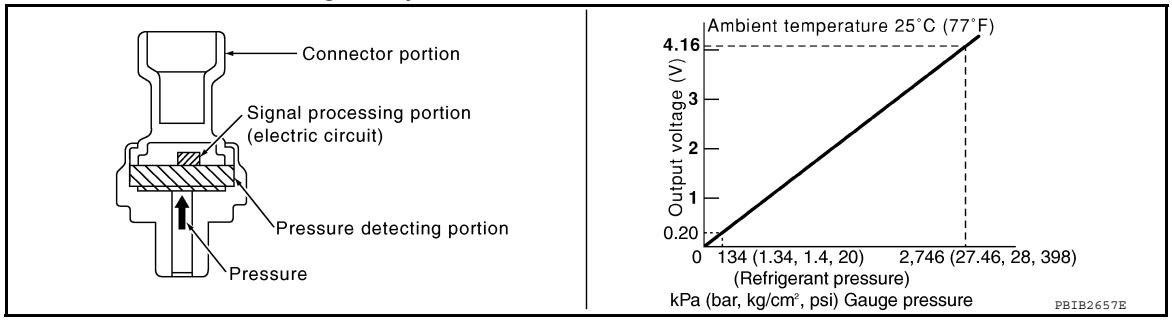
Oil pressure warning lamp is located on the combination meter.
It indicates the low pressure of the engine oil and the malfunction of the engine oil pressure system.
Combination meter turns the oil pressure warning lamp ON/OFF according to the oil pressure warning lamp signal received from ECM via CAN communication.
For details, refer to EC-38, "ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE : System Description".



Refrigerant Pressure Sensor

INFOID:0000000007224308

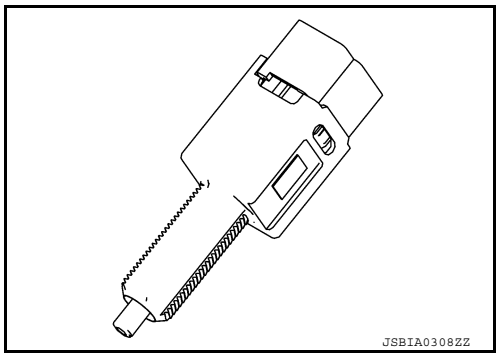
The refrigerant pressure sensor is installed at the condenser of the air conditioner system. The sensor uses an electrostatic volume pressure transducer to convert refrigerant pressure to voltage. The voltage signal is sent to ECM, and ECM controls cooling fan system.



Stop Lamp Switch

INFOID:0000000007224309

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



Throttle Control Motor

INFOID:0000000007224310

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

Throttle Control Motor Relay

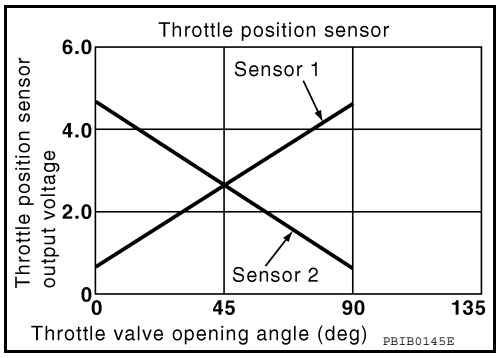
INFOID:0000000007224311

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

Throttle Position Sensor

INFOID:0000000007224312

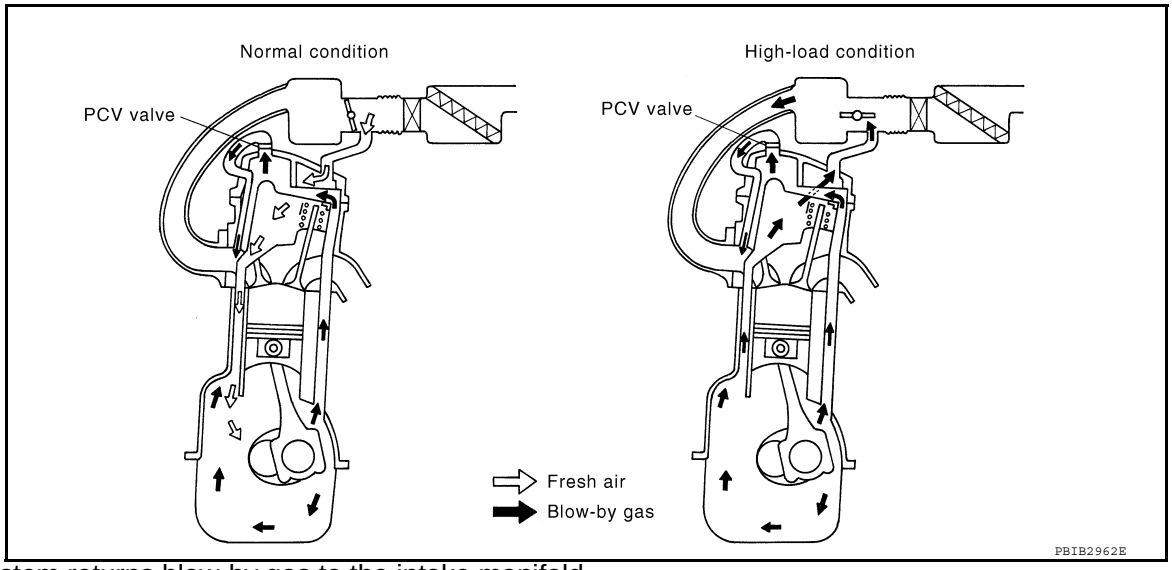
Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position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



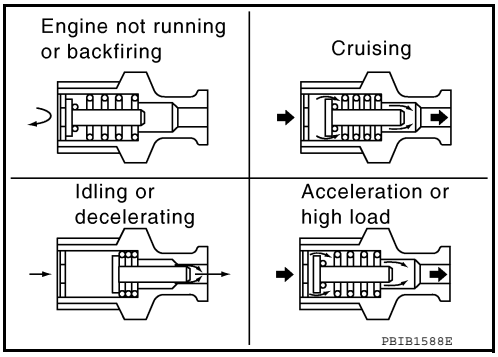
STRUCTURE AND OPERATION

Positive Crankcase Ventilation

INFOID:0000000007224313

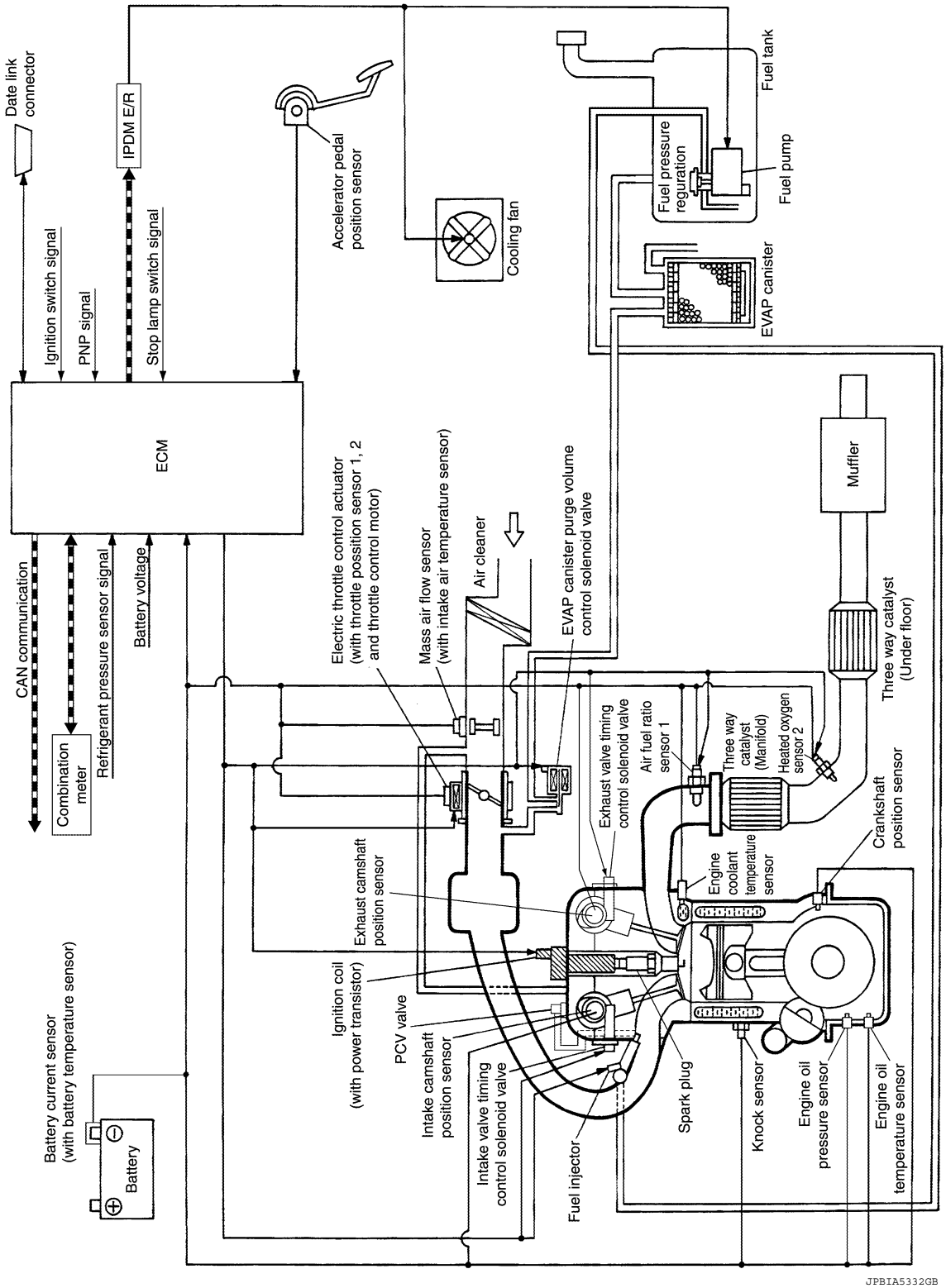


This system returns blow-by gas to the intake manifold.
The positive crankcase ventilation (PCV) valve is provided to conduct crankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-by and a small amount of ventilating air.
The ventilating air is then 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.



SYSTEM
ENGINE CONTROL SYSTEM
ENGINE CONTROL SYSTEM : System Diagram

INFOID:0000000007224314



ENGINE CONTROL SYSTEM : System Description

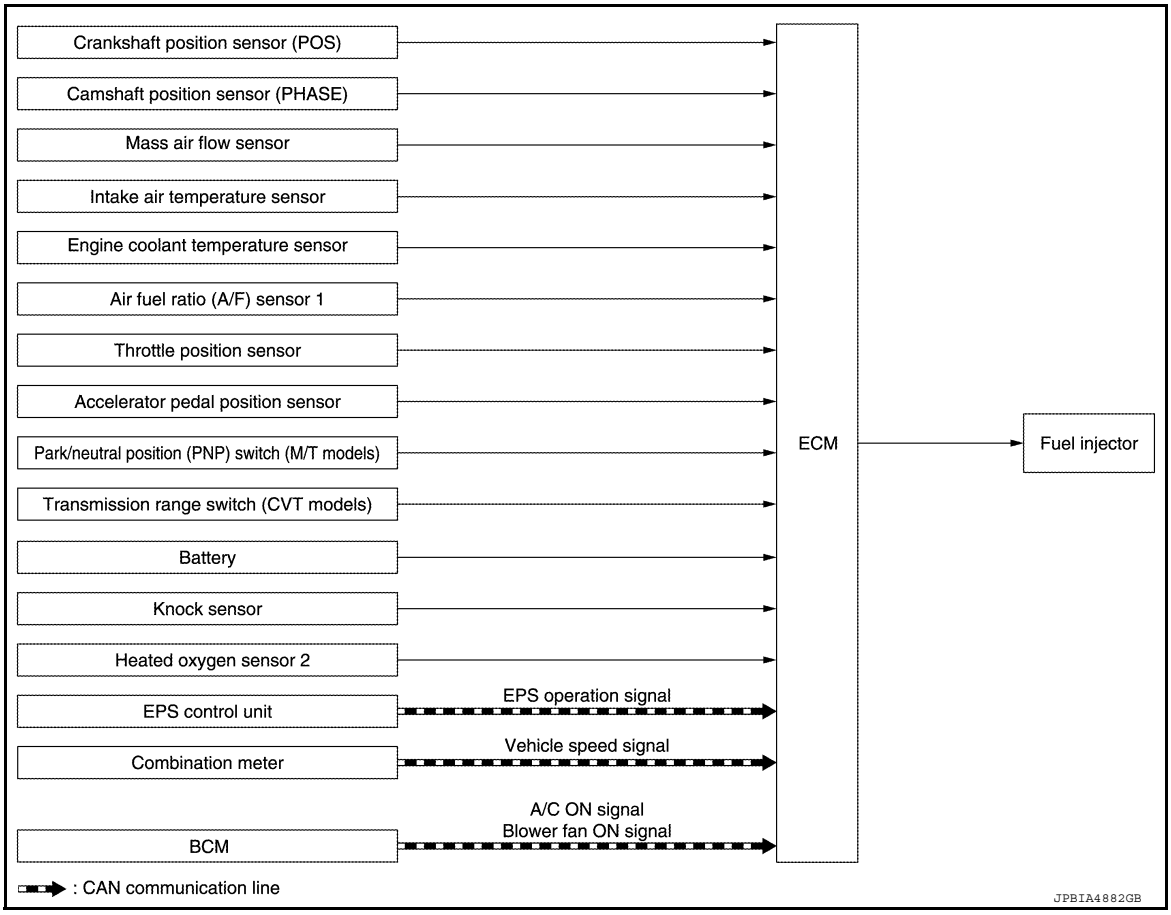
INFOID:0000000007224315

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

MULTIPORT FUEL INJECTION SYSTEM

MULTIPORT FUEL INJECTION SYSTEM : System Diagram

INFOID:0000000007224316



MULTIPORT FUEL INJECTION SYSTEM : System Description

INFOID:0000000007224317

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*4 Piston position	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor (PHASE)			
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch*1	PNP signal		
Transmission range switch*2			
Battery	Battery voltage*4		
Knock sensor	Engine knocking condition		
Heated oxygen sensor 2*3	Density of oxygen in exhaust gas		
EPS control unit	EPS operation signal*5		
Combination meter	Vehicle speed*5		
BCM	A/C ON signal*5 Blower fan signal*5		

*1: M/T models
*2: CVT models
*3: This sensor is not used to control the engine system under normal conditions.
*4: ECM determines the start signal status by the signals of engine speed and battery voltage.
*5: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

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

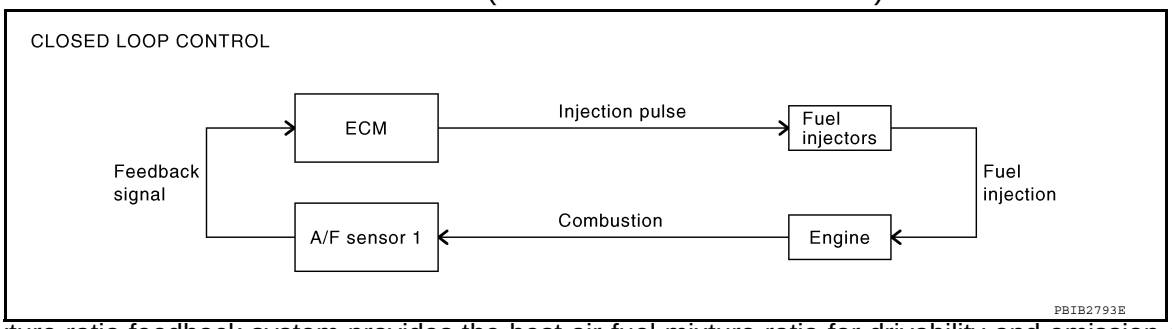
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

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

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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for drivability 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-15, "Air Fuel Ratio Sensor 1". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst (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.

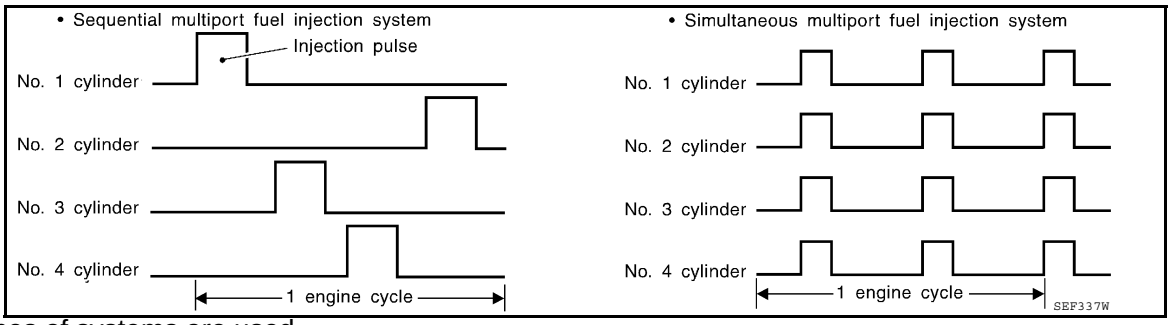
- Open Loop Control
  The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.

- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of heated sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D (CVT models)
- 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 long-term to compensate for continual deviation of the “short-term fuel trim” from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

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

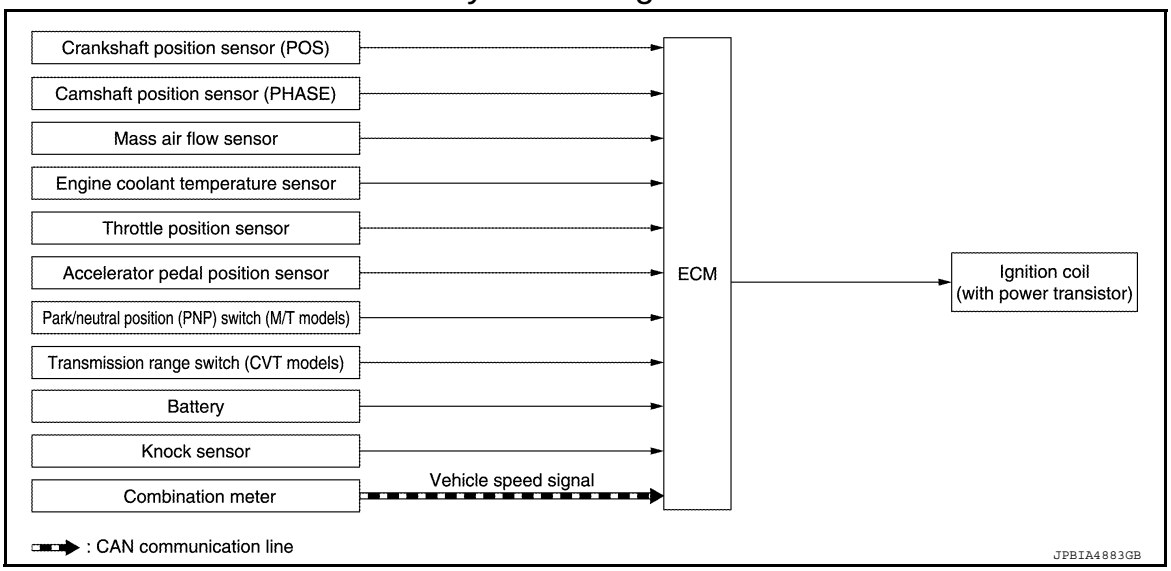
FUEL SHUT-OFF

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

ELECTRIC IGNITION SYSTEM

ELECTRIC IGNITION SYSTEM : System Diagram

INFOID:0000000007224318



ELECTRIC IGNITION SYSTEM : System Description

INFOID:0000000007224319

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3 Piston position	Ignition timing control	Ignition coil (with power transistor)
Camshaft position sensor (PHASE)			
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Park/neutral position (PNP) switch*1	PNP signal		
Transmission range switch*2			
Battery	Battery voltage*3		
Knock sensor	Engine knocking		
Combination meter	Vehicle speed*4		

*1: M/T models
*2: CVT models
*3: ECM determines the start signal status by the signals of engine speed and battery voltage.
*4: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

Firing order: 1 - 3 - 4 - 2
The ignition timing is controlled by the ECM to maintain the best air-fuel ratio for every running condition of the engine. The ignition timing data is stored in the ECM.
The ECM receives information such as the injection pulse width and camshaft position sensor signal. Computing this information, ignition signals are transmitted to the power transistor.
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

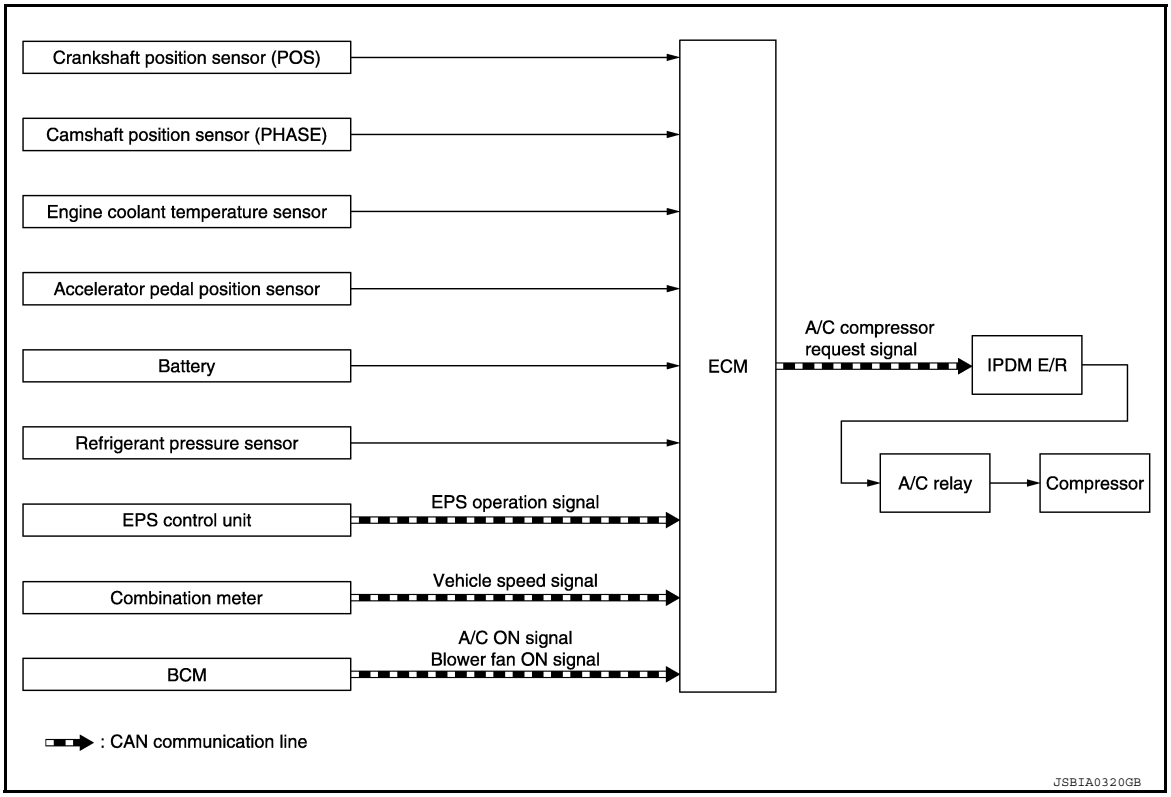
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

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

AIR CONDITIONING CUT CONTROL

AIR CONDITIONING CUT CONTROL : System Diagram

INFOID:0000000007224320



AIR CONDITIONING CUT CONTROL : System Description

INFOID:0000000007224321

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1 Piston position	A/C compressor request signal	IPDM E/R ↓ Air conditioner relay ↓ Compressor
Engine coolant temperature sensor	Engine coolant temperature		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage*1		
Refrigerant pressure sensor	Refrigerant pressure		
EPS control unit	EPS operation signal*2		
Combination meter	Vehicle speed signal*2		
BCM	A/C ON signal*2 Blower fan signal*2		

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

SYSTEM DESCRIPTION

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

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

CAN COMMUNICATION

CAN COMMUNICATION : System Description

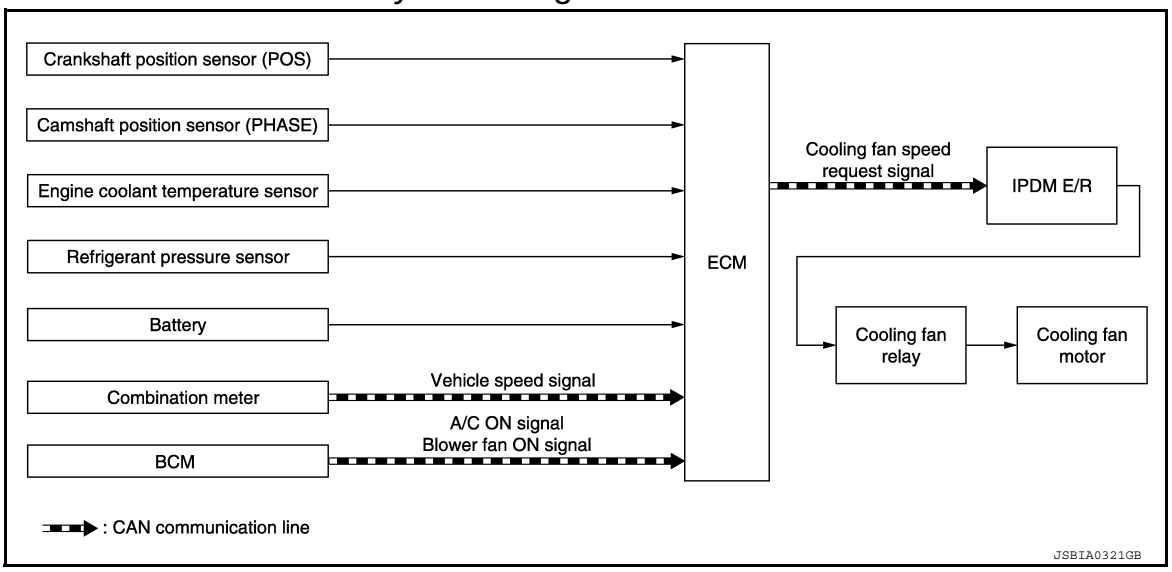
INFOID:0000000007224322

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 XX-XX, "*****", about CAN communication for detail.

COOLING FAN CONTROL

COOLING FAN CONTROL : System Diagram

INFOID:0000000007224323



COOLING FAN CONTROL : System Description

INFOID:0000000007224324

INPUT/OUTPUT SIGNAL CHART

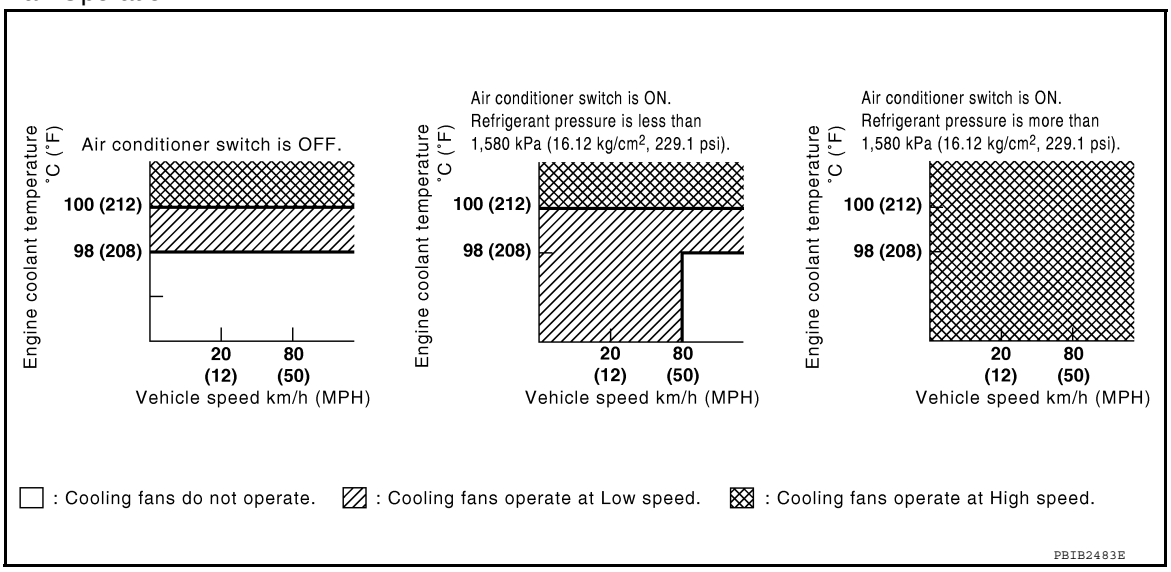
Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1 Piston position	Cooling fan speed request signal	IPDM E/R ↓ Cooling fan relay ↓ Cooling fan motor
Engine coolant temperature sensor	Engine coolant temperature		
Refrigerant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

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

SYSTEM DESCRIPTION

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

Cooling Fan Operation



Cooling Fan Relay Operation

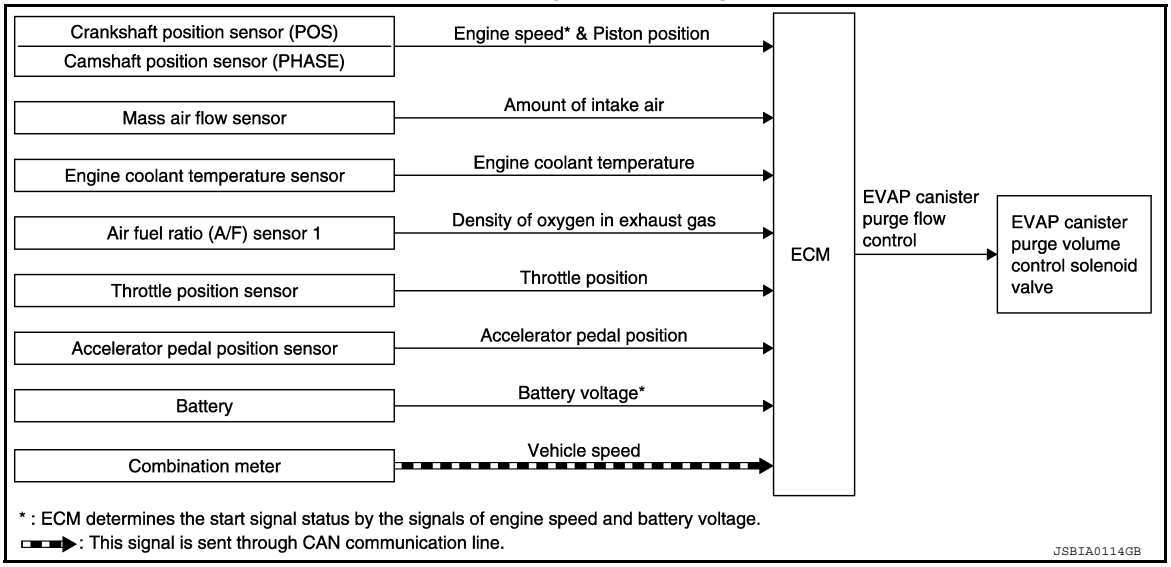
The ECM controls cooling fan relays through CAN communication line.

Cooling fan speed	Cooling fan relay		
	1	2	3
Stop (OFF)	OFF	OFF	OFF
Low (LOW)	ON	OFF	OFF
High (HI)	ON	ON	ON

EVAPORATIVE EMISSION SYSTEM

EVAPORATIVE EMISSION SYSTEM : System Diagram

INFOID:0000000007224325



EVAPORATIVE EMISSION SYSTEM : System Description

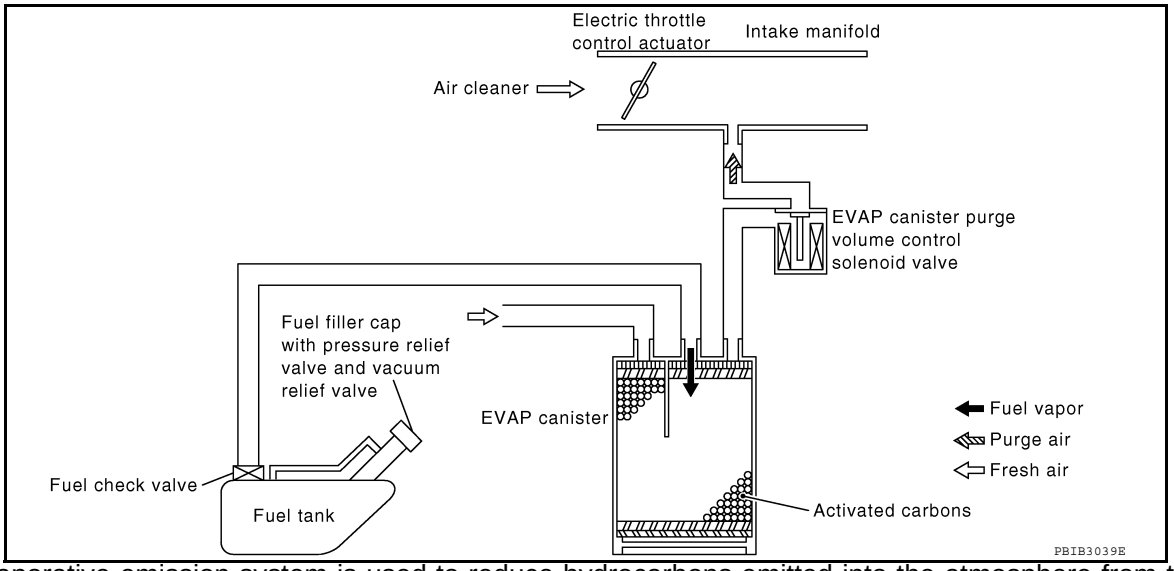
INFOID:0000000007224326

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1 Piston position	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		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage*1		
Combination meter	Vehicle speed*2		

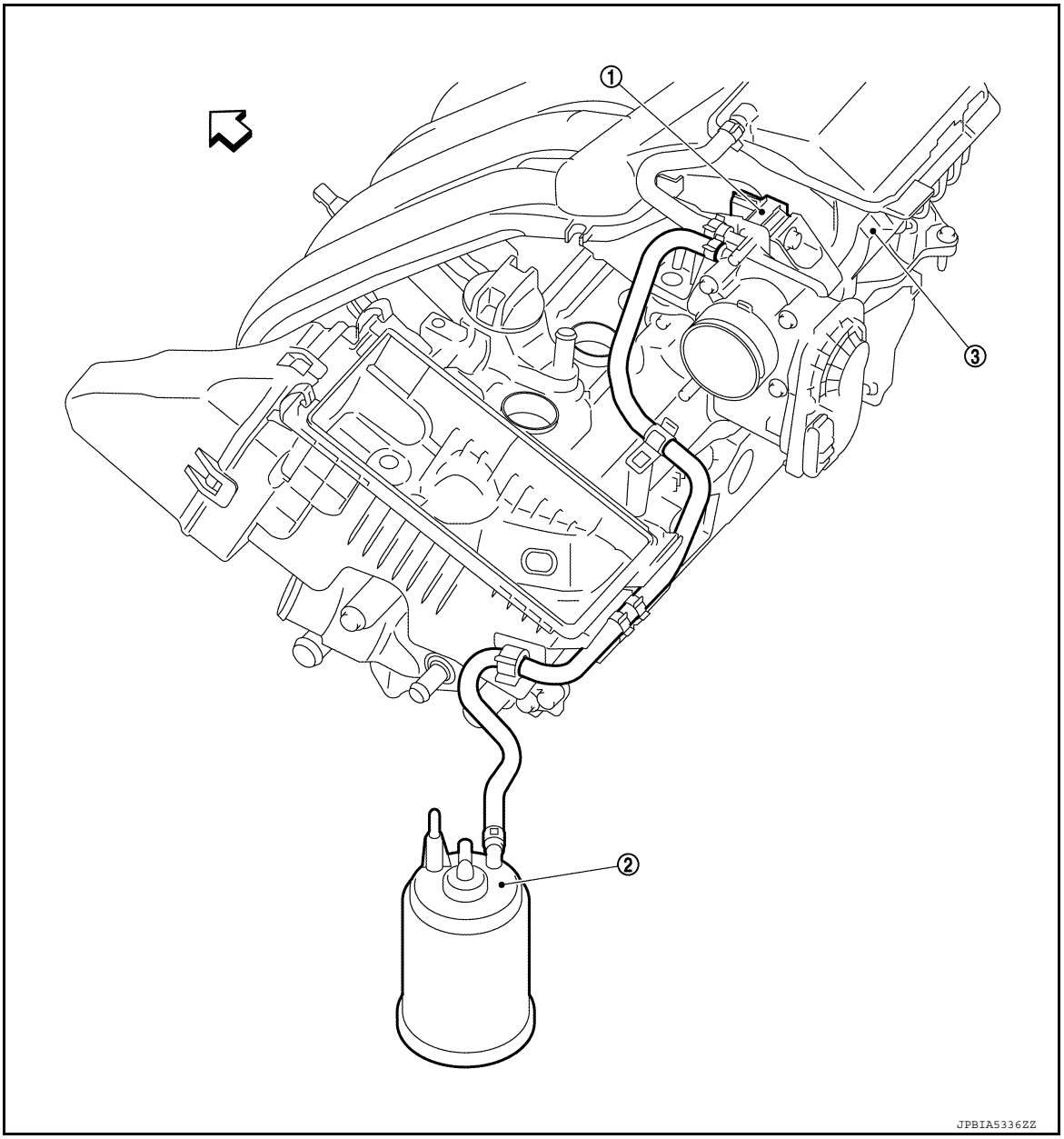
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.
*2: This signal is sent to the ECM through CAN communication line.

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.

EVAPORATIVE EMISSION LINE DRAWING



1. EVAP canister purge volume control solenoid valve
2. EVAP canister
3. Intake manifold

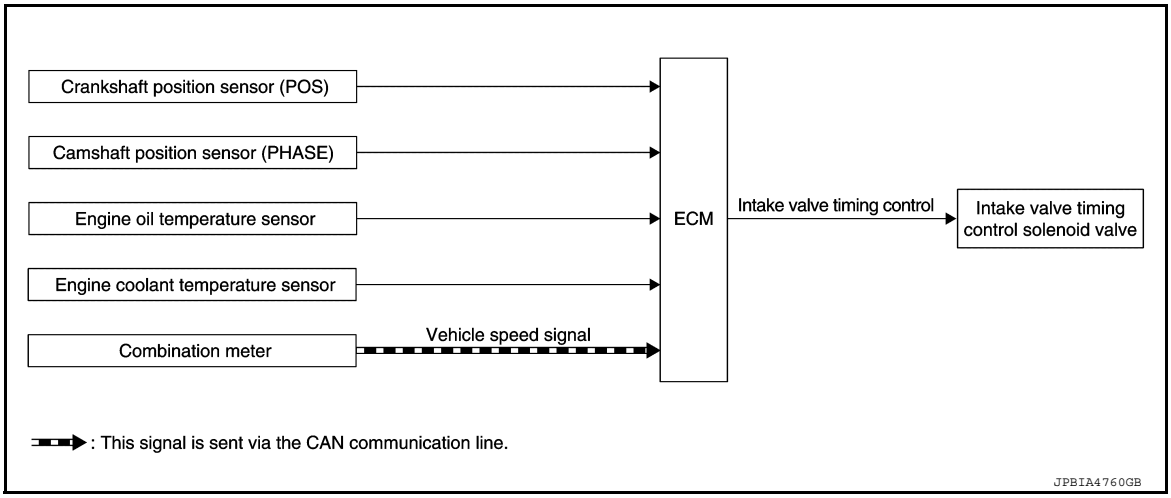
⇦ : Vehicle front

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

INTAKE VALVE TIMING CONTROL

INTAKE VALVE TIMING CONTROL : System Diagram

INFOID:0000000007224327



INTAKE VALVE TIMING CONTROL : System Description

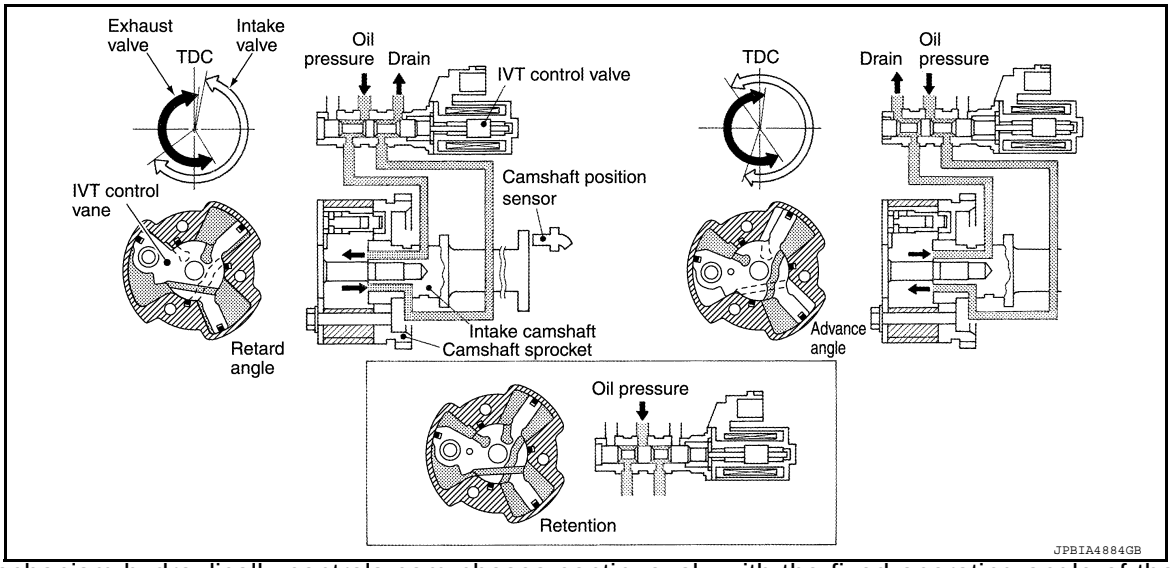
INFOID:0000000007224328

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*1 Piston position	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine oil temperature sensor	Engine oil temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Combination meter	Vehicle speed*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 through CAN communication line.

SYSTEM DESCRIPTION

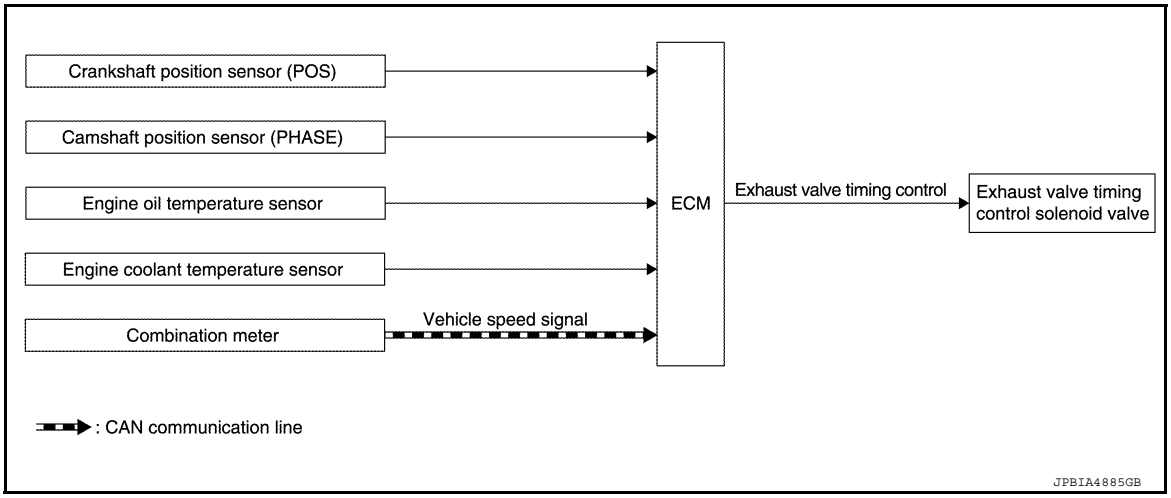


This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.
The ECM receives signals such as crankshaft position, camshaft position, engine speed, engine oil temperature and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals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

EXHAUST VALVE TIMING CONTROL

EXHAUST VALVE TIMING CONTROL : System Diagram

INFOID:0000000007224329



EXHAUST VALVE TIMING CONTROL : System Description

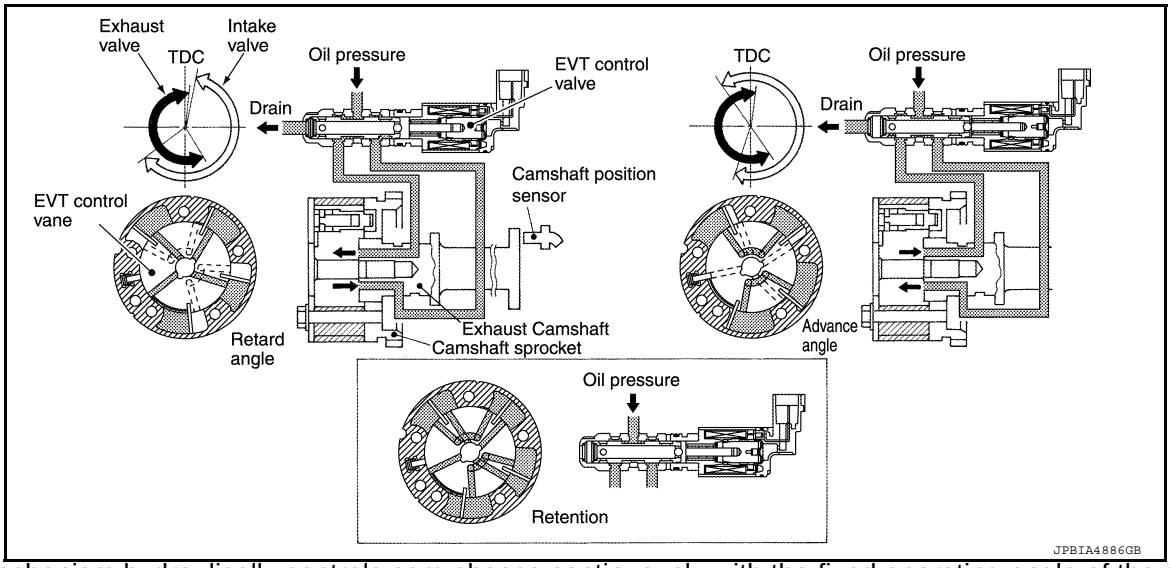
INFOID:0000000007224330

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*1 Piston position	Exhaust valve timing control	Exhaust valve timing control solenoid valve
Camshaft position sensor (PHASE)			
Engine oil temperature sensor	Engine oil temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Combination meter	Vehicle speed*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 through CAN communication line.

SYSTEM DESCRIPTION

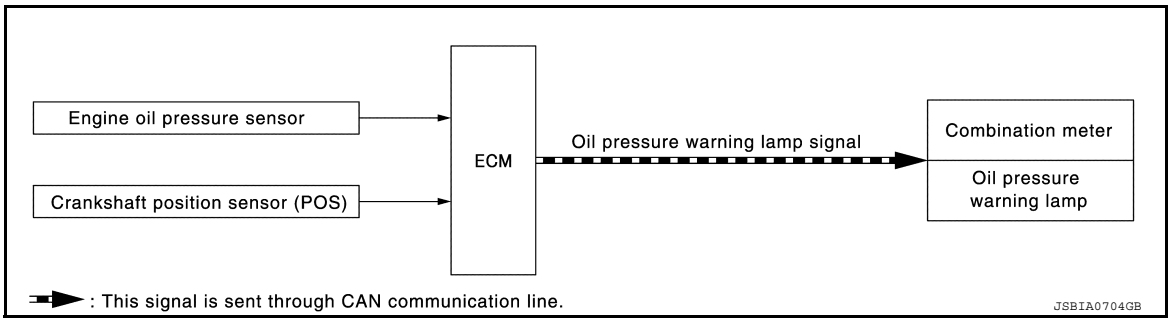


This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the exhaust valve.
The ECM receives signals such as crankshaft position, camshaft position, engine speed, engine oil temperature and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the exhaust valve timing (EVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing of the exhaust valve to increase engine torque and output in a range of high engine speed.

ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE

ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE : System Diagram

INFOID:0000000007224331



ENGINE PROTECTION CONTROL AT LOW ENGINE OIL PRESSURE : System Description

INFOID:0000000007224332

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Engine oil pressure sensor	Engine pressure	Engine protection control • Oil pressure warning lamp signal	Combination meter • Oil pressure warning lamp
Crankshaft position sensor (POS)	Engine speed		

SYSTEM DESCRIPTION

- The engine protection control at low engine oil pressure warns the driver of a decrease in engine oil pressure by the oil pressure warning lamp a before the engine becomes damaged.
- When detecting a decrease in engine oil pressure at an engine speed less than 1,000 rpm, ECM transmits an oil pressure warning lamp signal to the combination meter. The combination meter turns ON the oil pressure warning lamp, according to the signal.

Decrease in engine oil pressure	Engine speed	Combination meter
		Oil pressure warning lamp
Detection	Less than 1,000 rpm	ON*
	1,000 rpm or more	ON

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

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000007224333

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:0000000007224334

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to EC-39, "Diagnosis 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:0000000007224335

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 MI 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 MI illuminates. The MI 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 MI, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MI				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminated	Blinking	Illuminated				
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-68, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:0000000007224336

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 MI 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 MI lights up. In other words, the DTC is stored in the ECM memory and the MI 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 MI 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-68, "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 MI 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-83, "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/MI 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:0000000007224337

RELATIONSHIP BETWEEN MI, 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 MI will come on.
- The MI 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.

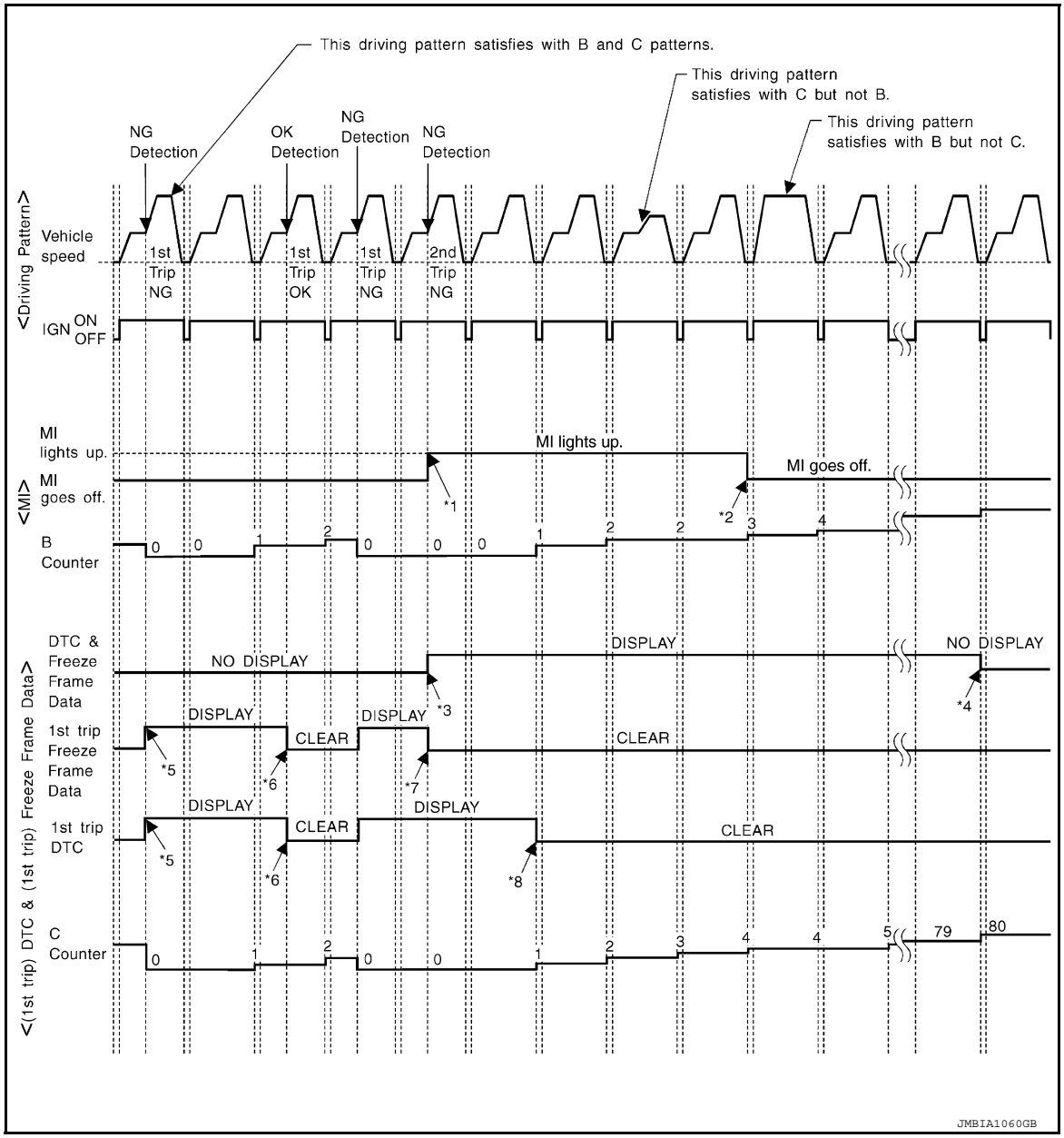
COUNTER SYSTEM CHART

Items	Fuel Injection System	Misfire	Other
MI (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 MI, 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, MI will light up.

*2: MI 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”

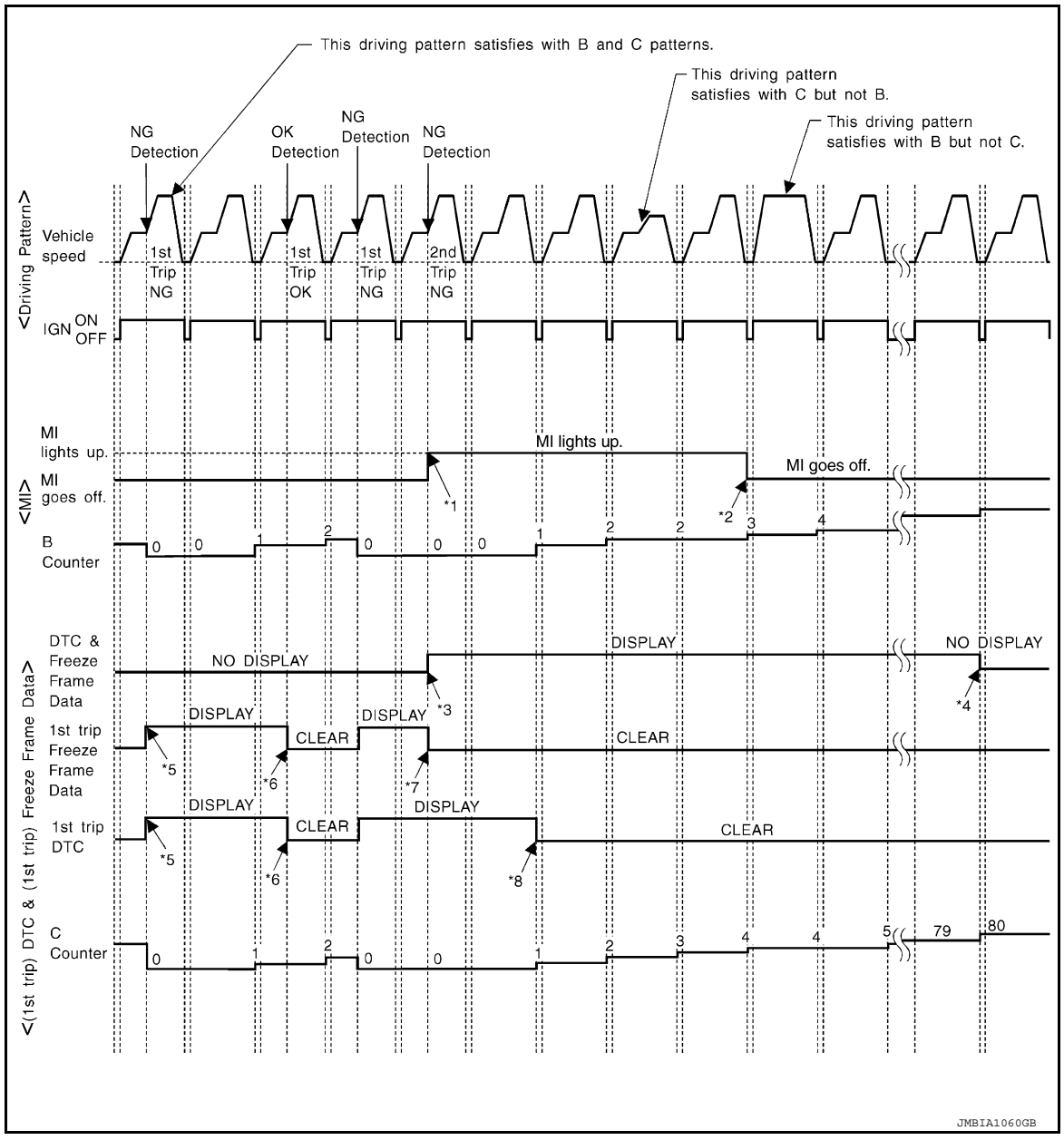
Driving Pattern B

Refer to EC-44, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern C

Refer to EC-44, "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 MI, 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, MI will light up.

*2: MI 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-44, "DIAGNOSIS DESCRIPTION : Driving Pattern".
Driving Pattern B
Refer to EC-44, "DIAGNOSIS DESCRIPTION : Driving Pattern".

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:0000000007224338

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.

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:0000000007224339

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 MI 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”

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON → OFF ← ON → OFF ← ON → OFF ← ON →			
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= MI 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”.

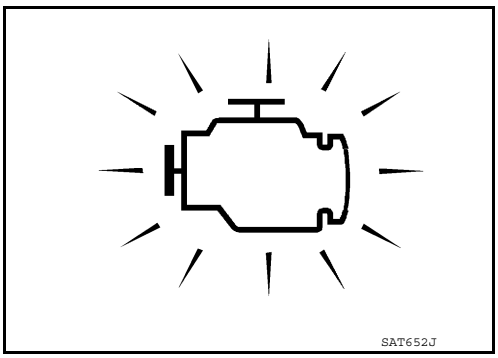
DIAGNOSIS DESCRIPTION : Malfunction Indicator (MI)

INFOID:0000000007224340

- When detecting a DTC that affects exhaust gas, the exhaust emission-related control module transmits a malfunction indicator signal to ECM via CAN communication line.

  ECM prioritizes (MI: ON/blink) the signal received from the exhaust emission-related control module and the ECM-stored DTC that affects exhaust gas and transmits a malfunction indicator lamp signal to the combination meter via CAN communication line.

  The combination meter turns ON or blinks the MI, according to the signal transmitted from ECM, and alerts the driver of malfunction detection.
- Control modules that a DTC of MI ON/Blink is stored (Control module varies among DTCs.):



- ECM
- TCM

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

   NOTE:

   Check the MI circuit if MI does not illuminate. Refer to EC-298, "Component Function Check".
2. When the engine is started, the MI should go off.

   NOTE:

   If MI remains ON or continues blinking, a DTC(s) that affects exhaust gas is detected. In this case, Selfdiagnosis is required for performing inspection and repair.

On Board Diagnosis Function

INFOID:0000000007224341

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MI can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MI 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-88, "Description".
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-89, "Description".
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-90, "Description".
Mixture ratio self-learning value clear	Mixture ratio self-learning value can be erased. Refer to EC-92, "Description".

BULB CHECK MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. The MI on the instrument panel should stay ON.
   If it remains OFF, check MI circuit. Refer to EC-298, "Component Function Check".

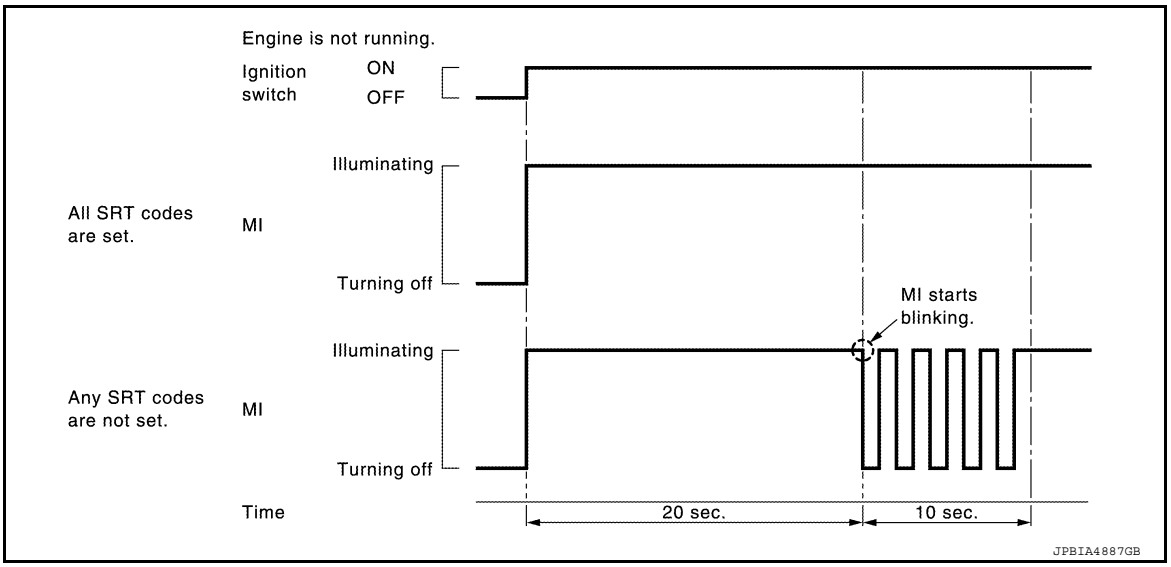
SRT STATUS MODE

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-45, "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 MI if all SRT codes are set.
   - ECM blinks MI for about 10 seconds if all SRT codes are not set.



MALFUNCTION WARNING MODE

Description

In this function ECM turns on or blinks MI 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 MI illuminates.
   If it remains OFF, check MI circuit. Refer to EC-298, "Component Function Check".
3. Start engine and let it idle.
   - For two trip detection logic diagnoses, ECM turns on MI when it detects the same malfunction twice in the two consecutive driving cycles.
   - For 1st trip detection logic diagnoses, ECM turns on MI when it detects a malfunction in one driving cycle.
   - ECM blinks MI when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

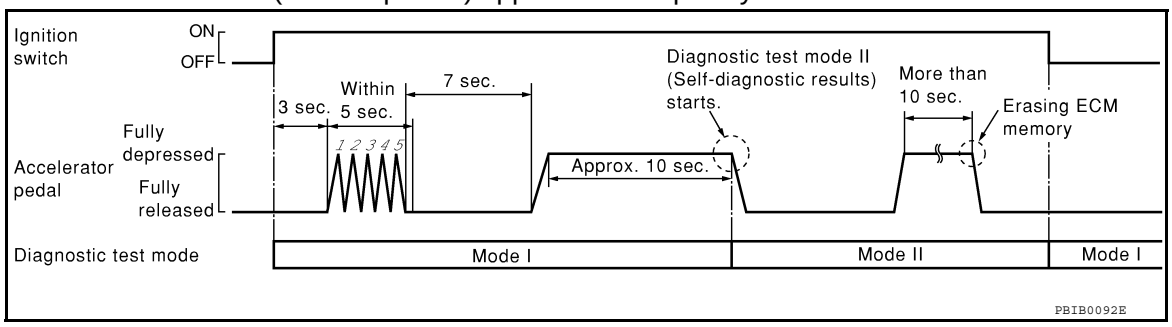
This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MI is blinking.

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 MI starts blinking.
   NOTE:
   Do not release the accelerator pedal for 10 seconds if MI 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.

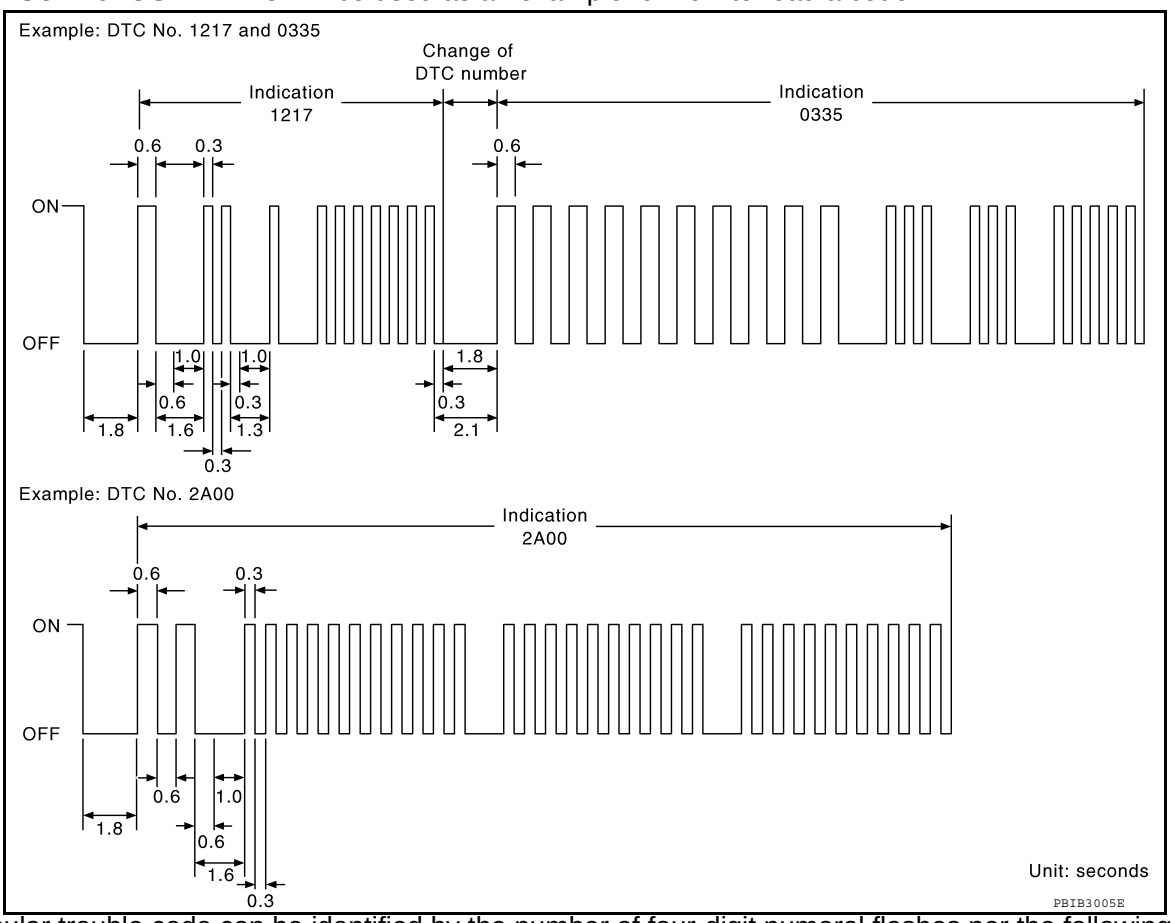


How to Read Self-diagnostic Results

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

The DTC and 1st trip DTC are displayed at the same time. If the MI 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 MI 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-68, "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” mode.
6. The diagnostic information has been erased from the backup memory in the ECM.
   Fully depress the accelerator pedal and keep it depressed for more than 10 seconds.
7. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

CONSULT Function

INFOID:0000000007224342

FUNCTION

Diagnostic test mode	Function
Ecu Identification	ECM part number can be read.
Self Diagnostic Result	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*
Data Monitor	Input/Output data in the ECM can be read.
Active Test	Diagnostic Test Mode in which CONSULT drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function Test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
Work Support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT unit.
DTC & SRT Confirmation	The status of system monitoring tests and the self-diagnosis status/result 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

WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
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
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
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
TARGET IGN TIM ADJ*	• Idle condition	When adjusting target ignition timing
CLSD THL POS LEARN	• Ignition on and engine stopped.	When learning throttle valve closed position

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

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item
Regarding items of DTC and 1st trip DTC, refer to EC-68, "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.

1. Select “ENGINE” with CONSULT.
2. Select “SELF-DIAG RESULTS”.
3. Touch “ERASE”. (DTC in ECM will be erased.)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DTC RESULTS	• The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to EC-68, "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.
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.
ENGINE SPEED [rpm]	• The engine speed at the moment a malfunction is detected is displayed.
VEHICL SPEED [km/h] or [mph]	• The vehicle speed at the moment a malfunction is detected is displayed.
ABSOL TH·P/S [%]	• The throttle valve opening angle at the moment a malfunction is detected is displayed.
B/FUEL SCHDL [msec]	• The base fuel schedule at the moment a malfunction is detected is displayed.
INT/A TEMP SE [°C] or [°F]	• The intake air temperature at the moment a malfunction is detected is displayed.
FUEL SYS-B1	• “Fuel injection system status” at the moment a malfunction is detected is displayed. • One mode in the following 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

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

DATA MONITOR MODE

Monitored Item

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	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”.

Monitored item	Unit	Description	Remarks
A/F ALPHA-B1	%	• The mean value of the air-fuel ratio feedback correction factor per cycle is indicated.	• When the engine is stopped, a certain value is indicated. • When engine is running, specification range is indicated in “SPEC”. • This data also includes the data for the air-fuel ratio learning control.
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)	V	• The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed.	
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 MNTR(B1)	RICH/LEAN	• Display of heated oxygen sensor 2 signal: RICH: means the amount of oxygen after three way catalyst is relatively small. LEAN: means the amount of oxygen after three way catalyst is relatively large.	• When the engine is stopped, a certain value is indicated.
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	V	• The accelerator pedal position sensor signal voltage is displayed.	• ACCEL SEN 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
ACCEL SEN 2			
TP SEN 1-B1	V	• The throttle position sensor signal voltage is displayed.	• TP SEN 2-B1 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 2-B1			
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 sent from EPS control unit) is indicated.	
LOAD SIGNAL	ON/OFF	• Indicates [ON/OFF] condition of the electrical lode signal. ON: Rear window defogger switch is ON and/or lighting switch is 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	• Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW	ON/OFF	• Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1	msec	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.

Monitored item	Unit	Description	Remarks
IGN TIMING	BTDC	• Indicates the ignition timing computed by ECM according to the input signals.	• When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	• "Calculated load value" indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g/s	• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
INT/V TIM(B1)	°CA	• Indicates [°CA] of intake camshaft advance angle.	
EXH/V TIM B1	°CA	• Indicates [°CA] of exhaust camshaft retard angle.	
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.	
AIR COND RLY	ON/OFF	• The air conditioner relay control condition (determined by ECM according to the input signals) is indicated.	
FUEL PUMP RLY	ON/OFF	• Indicates the fuel pump relay control condition determined by ECM according to the input signals.	
THRTL RELAY	ON/OFF	• Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
COOLING FAN	HI/LOW/OFF	• Indicates the condition of the cooling fan (determined by ECM according to the input signals). HI: High speed operation LOW: Low speed operation OFF: Stop	
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
ALT DUTY SIG	ON/OFF	• The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive.	
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 MI is activated.	
ENG OIL TEMP	°C or °F	• The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is indicated.	

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.	
ALT DUTY	%	• Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	
BAT CUR SEN	mV	• The signal voltage of battery current sensor is displayed.	
A/F ADJ-B1	—	• Indicates the correction of a factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal.	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
CLUTCH P/P SW	ON/OFF	• Indicates [ON/OFF] condition clutch pedal position switch signals.	• Models other than M/T models always display OFF.
BAT TEMP SEN	V	• The signal voltage from the battery temperature sensor is displayed.	
THRTL STK CNT B1	—	Not used.	
EOP SENSOR	mV	• The signal voltage of EOP sensor is displayed.	
HO2 S2 DIAG2(B1)	INCMP/CMPLT	**NOTE:** The item is indicated, but not used.	
A/F SEN1 DIAG2(B1)	INCMP/CMPLT	**NOTE:** The item is indicated, but not used.	

NOTE:

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Air fuel ratio (A/F) sensor 1
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch OFF • Shift lever: Neutral • Cut off each fuel injector signal one at a time using CONSULT.	Engine runs rough or dies.	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil
COOLING FAN*	• Ignition switch: ON • Turn the cooling fan “LOW”, “HI” and “OFF” CONSULT.	Cooling fan moves and stops.	• Harness and connectors • IPDM E/R (Cooling fan relay) • Cooling fan motor

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
ENG COOLANT TEMP	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector
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
ALTERNATOR DUTY	• Engine: Idle • Change duty ratio using CONSULT.	Battery voltage changes.	• Harness and connectors • IPDM E/R • Alternator
EXH V/T ASSIGN ANGLE	• Engine: Return to the original non-standard condition • Change exhaust valve timing using CONSULT.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Exhaust valve timing control solenoid valve
INT 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

*: 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
A/F SEN1	A/F SEN1 (B1) P1278/P1279	P0133	EC-156, "DTC Logic"
	A/F SEN1 (B1) P1276	P0130	EC-146, "DTC Logic"
HO2S2	HO2S2 (B1) P1146	P0138	EC-167, "DTC Logic"
	HO2S2 (B1) P1147	P0137	EC-161, "DTC Logic"
	HO2S2 (B1) P0139	P0139	EC-175, "DTC Logic"

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

INFOID:0000000007224343

VALUES ON THE DIAGNOSIS TOOL

Remarks:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.

*Specification data may not be directly related to their components signals/values/operations.

i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

Monitor Item	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-104, "Description".		
B/FUEL SCHDL	See EC-104, "Description".		
A/F ALPHA-B1	See EC-104, "Description".		
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158F)
A/F SEN1 (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
HO2S2 (B1)	• Revving engine from idle up to 3,000 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)			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	0.6 - 0.9 V
		Accelerator pedal: Fully depressed	4.0 - 4.8 V
ACCEL SEN 2	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9 V
		Accelerator pedal: Fully depressed	3.9 - 4.8 V
TP SEN 1-B1	• Ignition switch: ON (Engine stopped) • Shift lever: 1st	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
TP SEN 2-B1	• Ignition switch: ON (Engine stopped) • Shift lever:1st	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
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

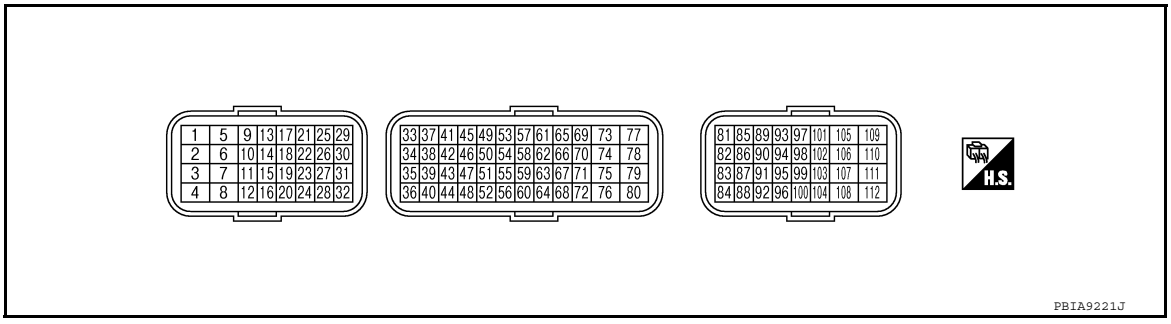
Monitor Item	Condition		Values/Status
LOAD SIGNAL	• Ignition switch: ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
		Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	• Engine: After warming 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
INJ PULSE-B1	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	4°BTDC (CVT) 10°BTDC (M/T)
		2,000 rpm	25° - 45°BTDC
CAL/LD VALUE	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	0.8 - 4.0 g/s
		2,500 rpm	2.0 - 10.0 g/s
PURG VOL C/V	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	0%
		2,000 rpm	0% - 50%
INT/V TIM(B1)	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	–5° - 5°CA
		When revving engine up to 2,000rpm Quickly	Approx. 0° - 40°CA
EXH/V TIM B1	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	–5° - 5°CA
		When revving engine up to 2,000rpm Quickly	Approx. 0° - 40°CA
INT/V SOL(B1)	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	0% - 2%
		When revving engine up to 2,000rpm Quickly	Approx. 0% - 90%
AIR COND RLY	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
FUEL PUMP RLY	• For 1 seconds after turning ignition switch: ON • Engine running or cranking		ON
	• Except above		OFF

Monitor Item	Condition		Values/Status
THRTL RELAY	• Ignition switch: ON		ON
COOLING FAN	• Engine: After warming up, idle the engine • Air conditioner switch: OFF	Engine coolant temperature is 98°C (208°F) or less	OFF
		Engine coolant temperature is between 98°C (208°F) and 99°C (210°F)	LOW
		Engine coolant temperature is 100°C (212°F) or more	HIGH
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
ALT DUTY SIG	• Power generation voltage variable control: Operating		ON
	• Power generation voltage variable control: Not operating		OFF
VEHICLE SPEED	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as 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 MI has turned ON.	0 - 65,535 km (0 - 40,723 miles)
ENG OIL TEMP	• Engine: After warming up		More than 70°C (158F)
A/F S1 HTR (B1)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
ALT DUTY	• Engine: Idle		0 - 80%
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged* • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load		Approx 2,500 - 3,500 mV
A/F ADJ-B1	• Engine running		–0.330 - 0.330
INT/A TEMP SE	• Ignition switch: ON		Indicates intake air temperature
P/N POSI SW	• Ignition switch: ON	Selector lever position: P or N (CVT) or Neutral (M/T)	ON
		Shift lever: Except above	OFF
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates.)		1.0 - 4.0 V
CLUTCH P/P SW	• Ignition switch: ON	Clutch pedal: Fully released	OFF
		Clutch pedal: Fully depressed	ON
BAT TEMP SEN	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	Indicates the temperature around the battery.
THRTL STK CNT B1	Not used.		—
EOP SENSOR	• Engine: After warming up • Selector lever position: P or N (CVT) or Neutral (M/T) • Air conditioner switch: OFF • No load	Idle	Approx 1,000 - 2,000 mV
		2,000 rpm	Approx 1,500 - 3,500 mV

Monitor Item	Condition	Values/Status
HO2 S2 DIAG2(B1)	**NOTE:** The item is indicated, but not used.	—
A/F SEN1 DIAG2(B1)	**NOTE:** The item is indicated, but not used.	—

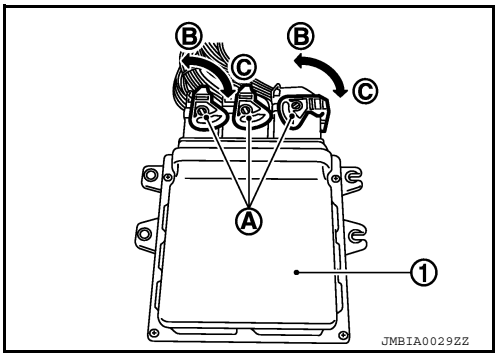
*: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

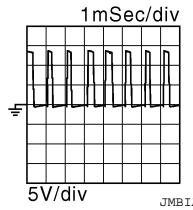
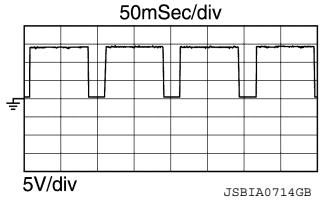
TERMINAL LAYOUT

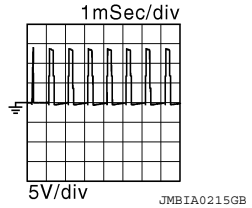
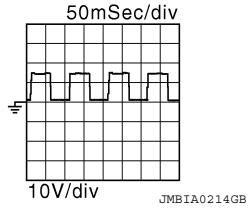
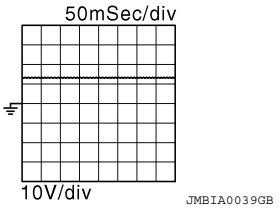
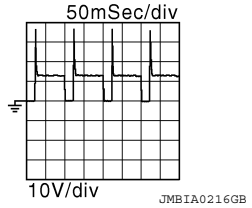


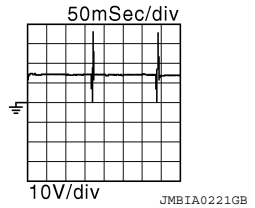
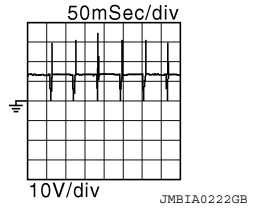
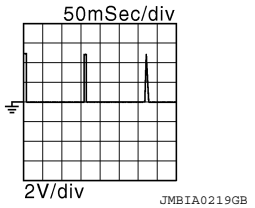
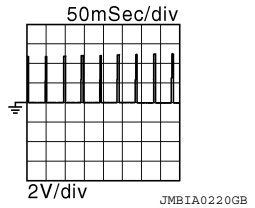
PHYSICAL VALUES

NOTE:
- ECM is located in the engine room left side near battery.
- When disconnecting ECM harness connector (A), loosen (C) it with levers as far as they will go as shown in the figure.
  - ECM (1)
  - Fasten (B)
- Connect a break-out box and harness adapter between the ECM and ECM harness connector.
  - Use extreme care not to touch 2 pins at one time.
  - Data is for comparison and may not be exact.
- Specification data are reference values and are measured between each terminals.
- Pulse signal is measured by CONSULT.

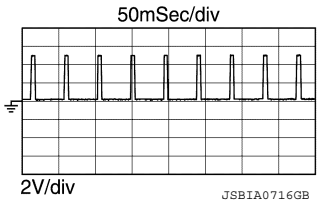
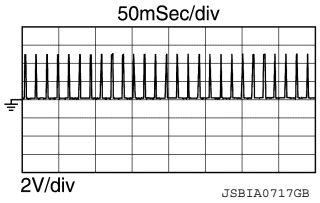


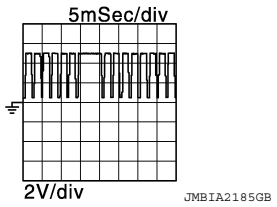
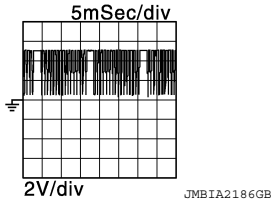
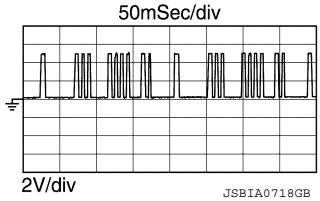
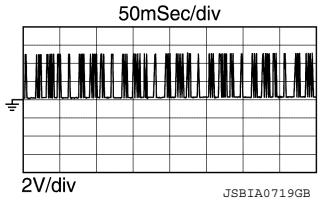
Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (SB)	108 (B)	Throttle control motor (Open)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: D (CVT), 1st (M/T) • Accelerator pedal: Fully depressed	2.6 V★ 
2 (L/W)	108 (B)	Throttle control motor power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
3 (G)	108 (B)	A/F sensor 1 heater	Output	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★ 

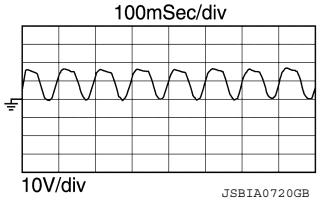
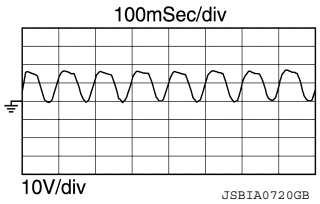
Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
4 (P)	108 (B)	Throttle control motor (Close)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: D (CVT), 1st (M/T) • Accelerator pedal: Fully released	1.8 V★ 
5 (BR)	59 (R)	Heated oxygen sensor 2 heater	Output	[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)
9 (V)	108 (B)	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Idle speed	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.)	BATTERY VOLTAGE (11 - 14 V)★ 
10 (B)	—	ECM ground	—	—	—
11 (B)	—	ECM ground	—	—	—

Terminal No. +	Terminal No. –	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
12 (L) 16 (G) 20 (O) 24 (R)	108 (B)	Fuel injector No. 1 (Rear) Fuel injector No. 3 (Rear) Fuel injector No. 2 (Rear) Fuel injector No. 4 (Rear)	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
25 (L) 29 (G) 30 (O) 31 (L)		Fuel injector No. 4 (Front) Fuel injector No. 3 (Front) Fuel injector No. 2 (Front) Fuel injector No. 1 (Front)		[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
15 (G/W)	108 (B)	Throttle control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON]	0 - 1.0 V
17 (R) 18 (Y/B)	108 (B)	Ignition signal No. 1 Ignition signal No. 2	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.3 V★ 
21 (BR) 22 (W)		Ignition signal No. 4 Ignition signal No. 3		[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	0.2 - 0.5 V★ 
23 (GR)	108 (B)	Fuel pump relay	Output	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0 V
				[Ignition switch: ON] • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14 V)
32 (P)	108 (B)	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: OFF] • A few seconds after turning ignition switch OFF	0 - 1.0 V
				[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
33 (G)	36 (R)	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Shift lever: D (CVT), 1st (M/T) • Accelerator pedal: Fully released	More than 0.36 V
				[Ignition switch: ON] • Engine stopped • Shift lever: D (CVT), 1st (M/T) • Accelerator pedal: Fully depressed	Less than 4.75 V
34 (B)	36 (R)	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Shift lever: D (CVT), 1st (M/T) • Accelerator pedal: Fully released	Less than 4.75 V
				[Ignition switch: ON] • Engine stopped • Shift lever: D (CVT), 1st (M/T) • Accelerator pedal: Fully depressed	More than 0.36 V
36 (R)	—	Sensor ground (Throttle position sensor)	—	—	—
37 (W)	40 (L)	Knock sensor	Input	[Engine is running] • Idle speed	2.5 V
38 (LG)	44 (P)	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine coolant temperature.
39 (L)	68 (R)	Battery temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with battery temperature.
40 (L)	—	Sensor ground (Knock sensor shield circuit)	—	—	—
44 (P)	—	Sensor ground (Engine coolant temperature sensor)	—	—	—
45 (G/B)	52 (LG)	Mass air flow sensor	Input	[Ignition switch ON] • Engine stopped	0.4 V
				[Engine is running] • Warm-up condition • Idle speed	0.7 - 1.3 V
				[Engine is running] • Warm-up condition • Engine is revving from idle to about 4,000 rpm	0.7 - 1.3 to 4.3 V (Check for linear voltage rise in response to engine being increased to about 4,000 rpm.)
46 (V)	52 (LG)	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.
47 (Y)	60 (L)	Engine oil pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.0 - 2.0 V
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.5 - 3.5 V

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
48 (W/R)	63 (GR)	Exhaust camshaft position sensor	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.3 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	4.3 V★ 
49 (P)	108 (B)	A/F sensor 1	Input	[Ignition switch: ON]	2.2 V
50 (L)	59 (R)	Heated oxygen sensor 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
52 (LG)	—	Sensor ground (Mass air flow sensor/Intake air temperature sensor)	—	—	—
53 (L)	108 (B)	A/F sensor 1	Input	[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.8 V Output voltage varies with air fuel ratio.
54 (BR)	—	Sensor ground (Engine oil temperature sensor)	—	—	—
57 (P)	54 (BR)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine oil temperature.
58 (O)	68 (R)	Battery current sensor	Input	[Engine is running] • Battery: Fully charged* • Idle speed	2.5 - 3.5 V
59 (R)	—	Sensor ground (Heated oxygen sensor 2)	—	—	—
60 (L)	—	Sensor ground (Engine oil pressure sensor)	—	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
61 (R)	62 (G)	Crankshaft position sensor	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	4.0 V★ 
62 (G)	—	Sensor ground (Crankshaft position sensor)	—	—	—
63 (GR)	—	Sensor ground (Camshaft position sensor)	—	—	—
65 (WR)	63 (GR)	Intake camshaft position sensor	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.3 V★ 
				[Engine is running] • Engine speed is 2,000 rpm	4.3 V★ 
68 (R)	—	Sensor ground (Battery current sensor)	—	—	—
69 (BR)	108 (B)	Park/Neutral position signal	Input	[Ignition switch: ON] • Shift lever: P or N (CVT), Neutral (M/T)	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON] • Shift lever: Except above position	0 V
71 (Y)	68 (R)	Sensor power supply (Battery current sensor)	—	[Ignition switch: ON]	5 V
72 (W)	36 (R)	Sensor power supply (Throttle position sensor)	—	[Ignition switch: ON]	5 V

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
73 (P)	108 (B)	Intake valve timing control solenoid valve	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • When revving engine up to 2,000rpm quickly	7 - 10 V★ 
74 (O)	60 (L)	Sensor power supply (Engine oil pressure sensor)	—	[Ignition switch: ON]	5 V
75 (BR)	62 (G)	Sensor power supply (Crankshaft position sensor)	—	[Ignition switch: ON]	5 V
77 (P)	108 (B)	Exhaust valve timing control solenoid valve	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • When revving engine up to 2,000rpm quickly	7 - 10 V★ 
78 (L/W)	63 (GR)	Sensor power supply (Camshaft position sensor)	—	[Ignition switch: ON]	5 V
81 (BR)	108 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
83 (P)	—	CAN-L	Input/ Output	—	—
84 (L)	—	CAN-H	Input/ Output	—	—
85 (GR)	98 (LG)	Refrigerant pressure sensor	Input	[Engine is running] • Warm-up condition • Both A/C switch and blower fan switch: ON (Compressor operates)	1.0 - 4.0 V
88 (GR)	—	Data link connector	Input/ Output	—	—
93 (L)	108 (B)	Ignition switch	Input	[Ignition switch: OFF]	0 V
				[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
98 (LG)	—	Sensor ground (Refrigerant pressure sensor)	—	—	—
99 (P)	108 (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)
101 (W)	98 (LG)	Sensor power supply (Refrigerant pressure sensor)	—	[Ignition switch: ON]	5 V

Terminal No.		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
102 (BR)	104 (Y)	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5 V
103 (GR)	104 (Y)	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6 V
				[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4 V
104 (Y)	—	Sensor ground (Accelerator pedal position sensor 2)	—	—	—
105 (G)	108 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
106 (V)	111 (R)	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5 V
108 (B)	—	ECM ground	—	—	—
110 (SB)	111 (R)	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9 V
				[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7 V
111 (R)	—	Sensor ground (Accelerator pedal position sensor 1)	—	—	—

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)
*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to XX-XX, "*****".

Fail Safe

INFOID:0000000007224344

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 MI circuit, the ECM cannot warn the driver by lighting up MI 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 MI circuit is open by means of operating fail safe function. The fail safe function also operates when above diagnoses except MI circuit are detected and demands the driver to repair the malfunction.	EC-298, "Component Function Check"

DTC RELATED ITEM

DTC No.	Detected items	Engine operating condition in fail safe mode
P0011	Intake valve timing control	The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.
P0014	Exhaust valve timing control	The signal is not energized to the exhaust valve timing control solenoid valve and the valve control does not function.

DTC No.	Detected items	Engine operating condition in fail safe mode
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 conditions. 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. So, the acceleration will be poor.
P0197 P0198	Engine oil temperature sensor	Exhaust valve timing control does not function.
P0500	Vehicle speed sensor	The cooling fan operates (Highest) while engine is running.
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.
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.
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: When engine is idling — Driving condition: Normal
		Vehicle condition: When accelerating — Driving condition: Poor acceleration
P2100 P2103	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2101	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2118	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
		(When throttle valve opening angle in fail safe mode is not in specified range:) ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
		(When ECM detects the throttle valve is stuck open:) While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in the Neutral position, and engine speed will not exceed 1,000 rpm or more.
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Inspection Priority Chart

INFOID:0000000007224345

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	• U1000 U1001 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 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 Camshaft position sensor (PHASE) • P0500 Vehicle speed sensor • P0520 Engine oil pressure sensor • P0605 P0607 ECM • P0643 Sensor power supply • P0850 Park/neutral position (PNP) switch • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	• P0031 P0032 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 Heated oxygen sensor 2 heater • P0075 Intake valve timing control solenoid valve • P0078 Exhaust valve timing control solenoid valve • P0130 P0131 P0132 P0133 P2A00 Air fuel ratio (A/F) sensor 1 • P0137 P0138 P0139 Heated oxygen sensor 2 • P0444 EVAP canister purge volume control solenoid valve • P0603 ECM • P1217 Engine over temperature (OVERHEAT) • P1805 Brake switch • P2100 P2103 Throttle control motor relay • P2101 Electric throttle control function • P2118 Throttle control motor
3	• P0011 Intake valve timing control • P0014 Exhaust valve timing control • P0171 P0172 Fuel injection system function • P0300 - P0304 Misfire • P0420 Three way catalyst function • P0524 Engine oil pressure • P1715 Input speed sensor • P1720 Vehicle speed sensor • P2119 Electric throttle control actuator

DTC Index

INFOID:0000000007224346

×:Applicable —: Not applicable

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MI	Reference page
CONSULT GST*2	ECM*3					
U1000	1000	CAN COMM CIRCUIT	—	1	×	EC-115
U1001	1001*4	CAN COMM CIRCUIT	—	2	—	EC-115
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	—	**—**
P0011	0011	INT/V TIM CONT-B1	—	2	×	EC-116
P0014	0014	EXT/V TIM CONT-B1	—	2	×	EC-120
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	EC-123
P0032	0032	A/F SEN1 HTR (B1)	—	2	×	EC-123

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MI	Reference page
CONSULT GST*2	ECM*3					
P0037	0037	HO2S2 HTR (B1)	—	2	×	EC-126
P0038	0038	HO2S2 HTR (B1)	—	2	×	EC-126
P0075	0075	INT/V TIM V/CIR-B1	—	2	×	EC-129
P0078	0078	EX V/T ACT/CIRC-B1	—	2	×	EC-131
P0102	0102	MAF SEN/CIRCUIT-B1	—	1	×	EC-134
P0103	0103	MAF SEN/CIRCUIT-B1	—	1	×	EC-134
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	EC-139
P0113	0113	IAT SEN/CIRCUIT-B1	—	2	×	EC-139
P0117	0117	ECT SEN/CIRC	—	1	×	EC-141
P0118	0118	ECT SEN/CIRC	—	1	×	EC-141
P0122	0122	TP SEN 2/CIRC-B1	—	1	×	EC-143
P0123	0123	TP SEN 2/CIRC-B1	—	1	×	EC-143
P0130	0130	A/F SENSOR1 (B1)	×	2	×	EC-146
P0131	0131	A/F SENSOR1 (B1)	—	2	×	EC-150
P0132	0132	A/F SENSOR1 (B1)	—	2	×	EC-153
P0133	0133	A/F SENSOR1 (B1)	×	2	×	EC-156
P0137	0137	HO2S2 (B1)	×	2	×	EC-161
P0138	0138	HO2S2 (B1)	×	2	×	EC-167
P0139	0139	HO2S2 (B1)	×	2	×	EC-175
P0171	0171	FUEL SYS-LEAN-B1	—	2	×	EC-181
P0172	0172	FUEL SYS-RICH-B1	—	2	×	EC-185
P0197	0197	EOP SEN/CIRC	—	2	×	EC-189
P0198	0198	EOP SEN/CIRC	—	2	×	EC-189
P0222	0222	TP SEN 1/CIRC-B1	—	1	×	EC-191
P0223	0223	TP SEN 1/CIRC-B1	—	1	×	EC-191
P0300	0300	MULTI CYL MISFIRE	—	1 or 2	× or —	EC-194
P0301	0301	CYL 1 MISFIRE	—	1 or 2	× or —	EC-194
P0302	0302	CYL 2 MISFIRE	—	1 or 2	× or —	EC-194
P0303	0303	CYL 3 MISFIRE	—	1 or 2	× or —	EC-194
P0304	0304	CYL 4 MISFIRE	—	1 or 2	× or —	EC-194
P0327	0327	KNOCK SEN/CIRC-B1	—	2	—	EC-200
P0328	0328	KNOCK SEN/CIRC-B1	—	2	—	EC-200
P0335	0335	CKP SEN/CIRCUIT	—	2	×	EC-202
P0340	0340	CMP SEN/CIRC-B1	—	2	×	EC-206
P0420	0420	TW CATALYST SYS-B1	×	2	×	EC-210
P0444	0444	PURG VOLUME CONT/V	—	2	×	EC-215
P0500	0500	VEH SPEED SEN/CIRC*5	—	2	×	EC-218
P0520	0520	EOP SENSOR/SWITCH	—	2	—	EC-220
P0524	0524	ENGINE OIL PRESSURE	—	1	—	EC-222
P0603	0603	ECM BACK UP/CIRCUIT*6	—	2	×	EC-225
P0605	0605	ECM	—	1 or 2	× or —	EC-227

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MI	Reference page
CONSULT GST*2	ECM*3					
P0607	0607	ECM	—	1*7 2*8	×*7 —*8	EC-229
P0643	0643	SENSOR POWER/CIRC	—	1	×	EC-230
P0850	0850	P-N POS SW/CIRCUIT	—	2	×	EC-232
P1217	1217	ENG OVER TEMP	—	1	×	EC-235
P1225	1225	CTP LEARNING-B1	—	2	—	EC-238
P1226	1226	CTP LEARNING-B1	—	2	—	EC-239
P1550	1550	BAT CURRENT SENSOR	—	2	—	EC-240
P1551	1551	BAT CURRENT SENSOR	—	2	—	EC-243
P1552	1552	BAT CURRENT SENSOR	—	2	—	EC-243
P1553	1553	BAT CURRENT SENSOR	—	2	—	EC-246
P1554	1554	BAT CURRENT SENSOR	—	2	—	EC-249
P1610	1610	LOCK MODE	—	2	—	XX-XX, "*****"
P1611	1611	ID DISCORD, IMMU-ECM	—	2	—	XX-XX, "*****"
P1612	1612	CHAIN OF ECM-IMMU	—	2	—	XX-XX, "*****"
P1715	1715	IN PULY SPEED	—	2	—	EC-252
P1720	1720	V/SP SEN (A/T OUT)	—	2	—	EC-253
P1805	1805	BRAKE SW/CIRCUIT	—	2	—	EC-255
P2100	2100	ETC MOT PWR-B1	—	1	×	EC-257
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	EC-260
P2103	2103	ETC MOT PWR	—	1	×	EC-257
P2118	2118	ETC MOT-B1	—	1	×	EC-264
P2119	2119	ETC ACTR-B1	—	1	×	EC-266
P2122	2122	APP SEN 1/CIRC	—	1	×	EC-268
P2123	2123	APP SEN 1/CIRC	—	1	×	EC-268
P2127	2127	APP SEN 2/CIRC	—	1	×	EC-271
P2128	2128	APP SEN 2/CIRC	—	1	×	EC-271
P2135	2135	TP SENSOR-B1	—	1	×	EC-274
P2138	2138	APP SENSOR	—	1	×	EC-277
P2A00	2A00	A/F SENSOR1 (B1)	—	2	×	EC-281

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

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

*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 MI illuminates.

*6: This self-diagnosis is not for ECM power supply circuit, even though “ECM BACK UP/CIRCUIT” is displayed on CONSULT screen.

*7: CVT models.

*8: M/T models.

Test Value and Test Limit

INFOID:0000000007224347

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	89H	84H	The amount of shift in air fuel ratio
			P2A00	8AH	84H	The amount of shift in air fuel ratio
			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited 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
	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
	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

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)	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	89H	84H	The amount of shift in air fuel ratio
			P2A03	8AH	84H	The amount of shift in air fuel ratio
			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
			P015D	94H	01H	O2 Sensor Delayed Response - Lean to Rich Bank 2 Sensor 1
	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
	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

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
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
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)
	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)

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
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
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
	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

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

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

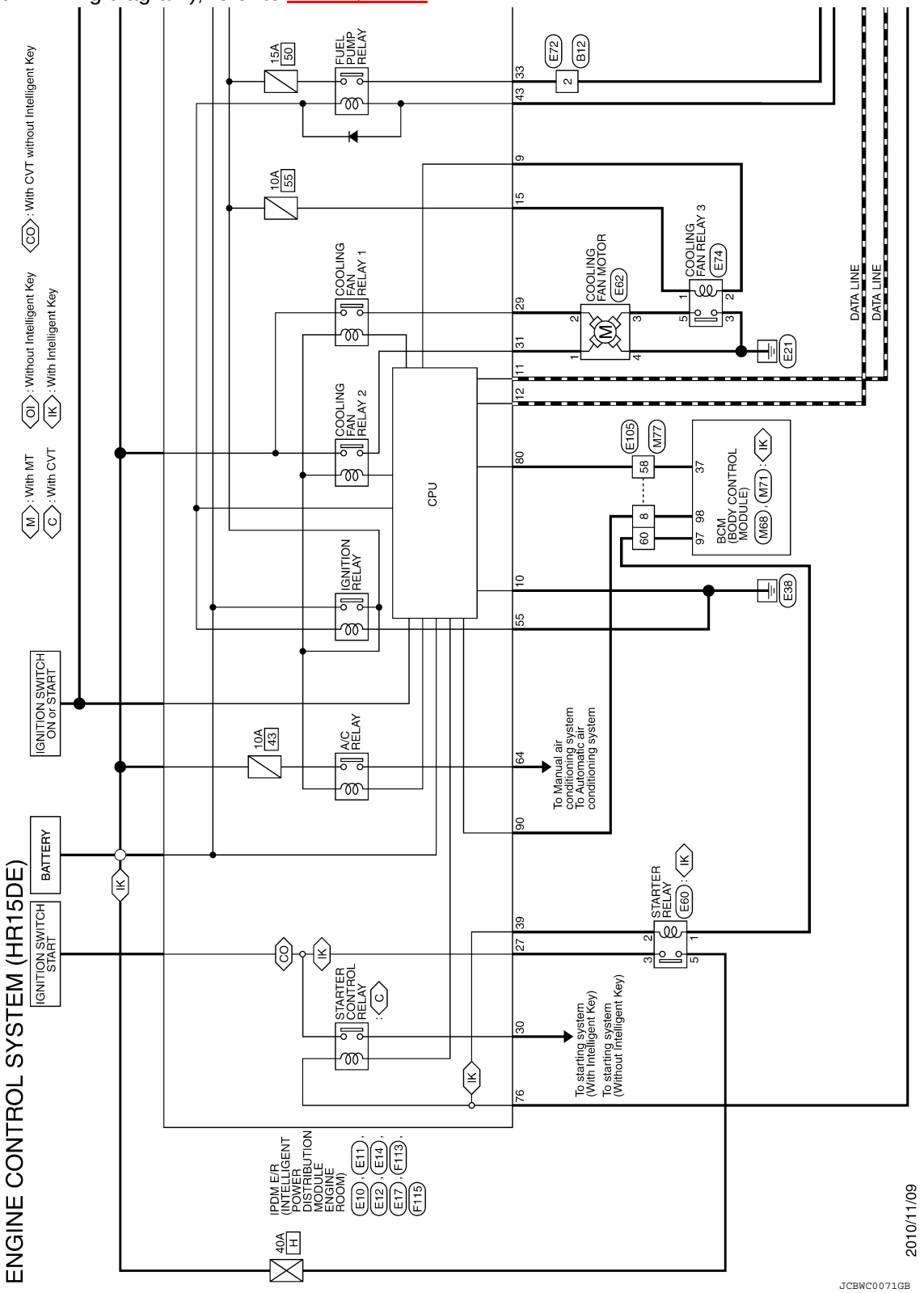
WIRING DIAGRAM

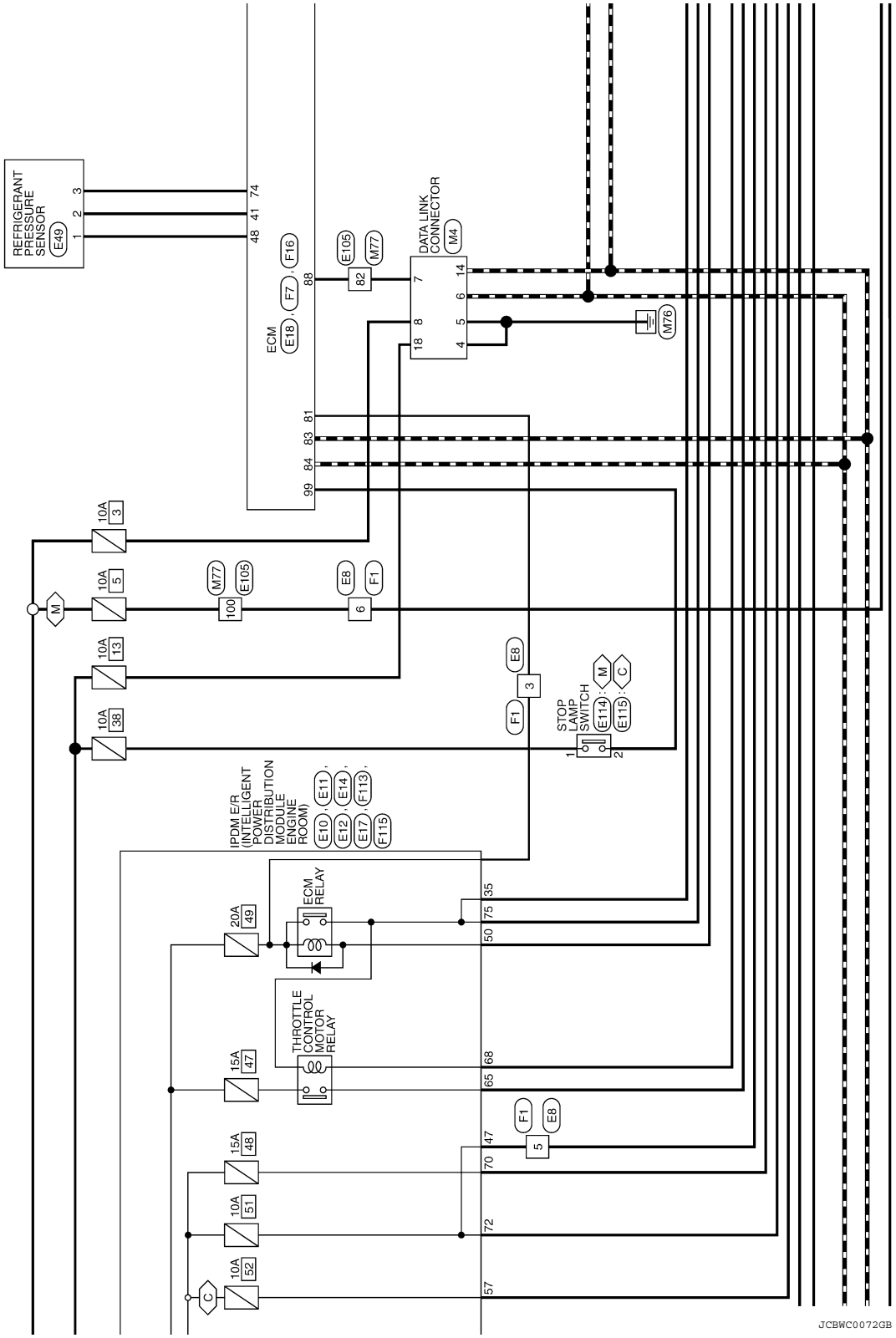
ENGINE CONTROL SYSTEM

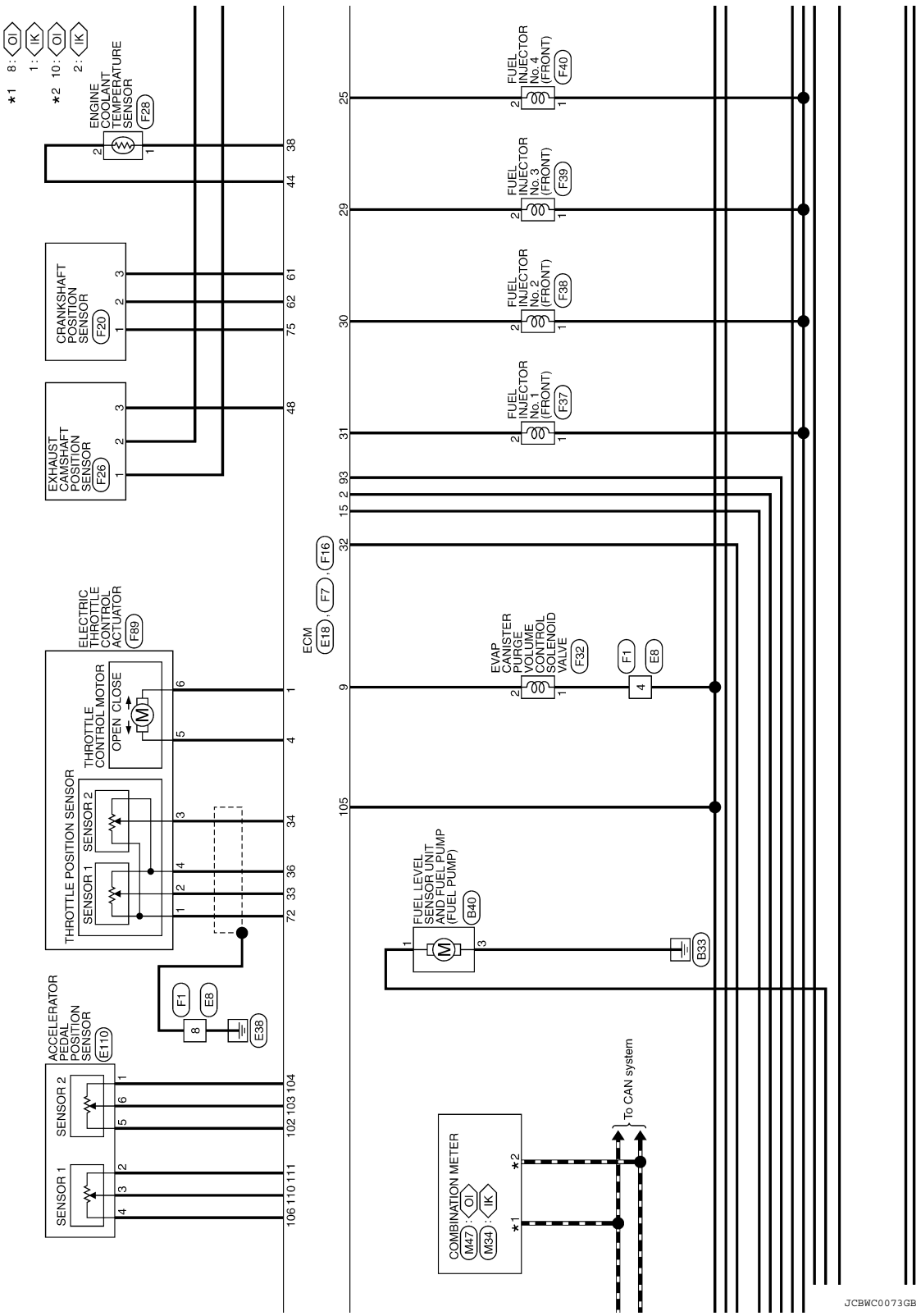
Wiring Diagram

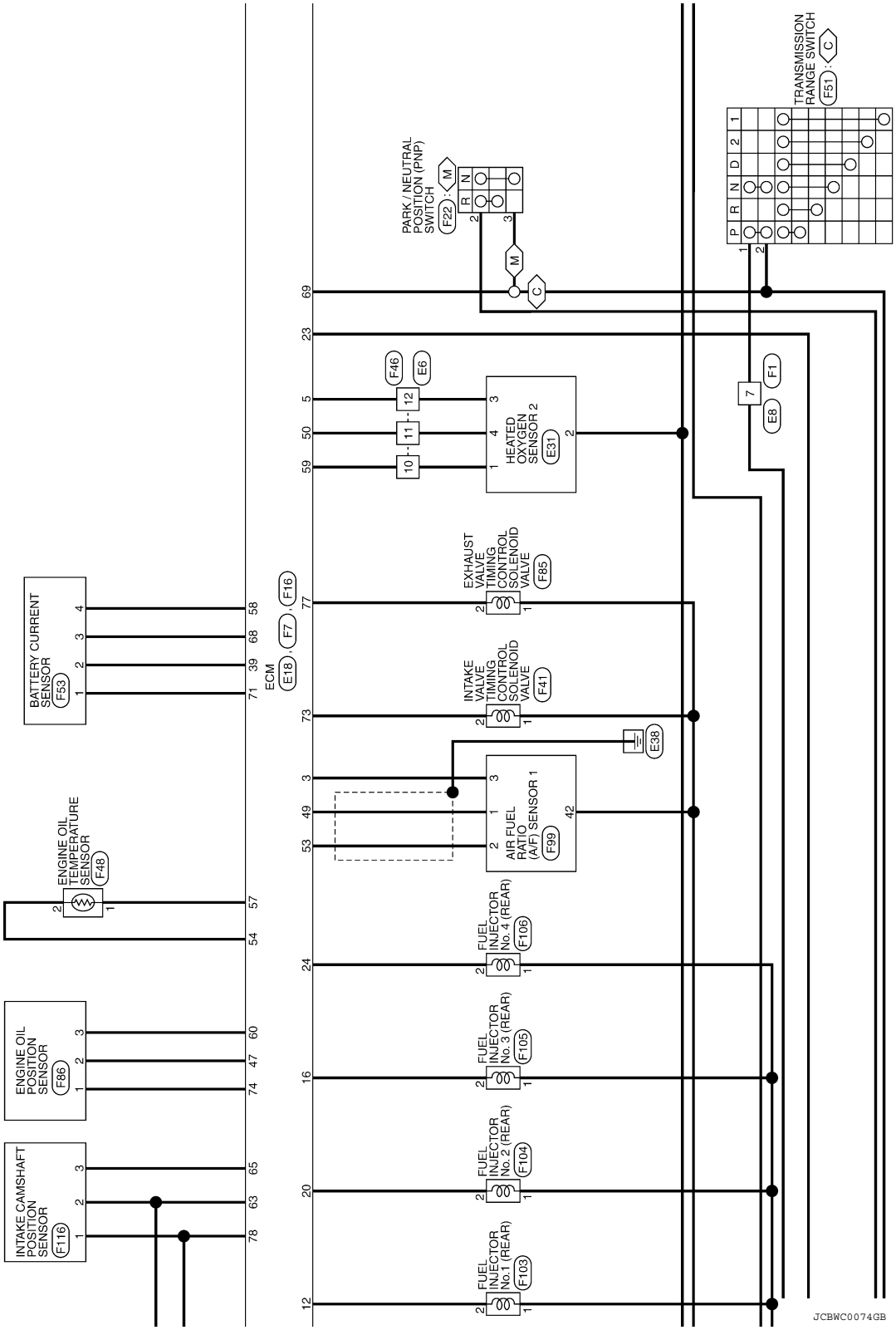
INFOID:0000000007224348

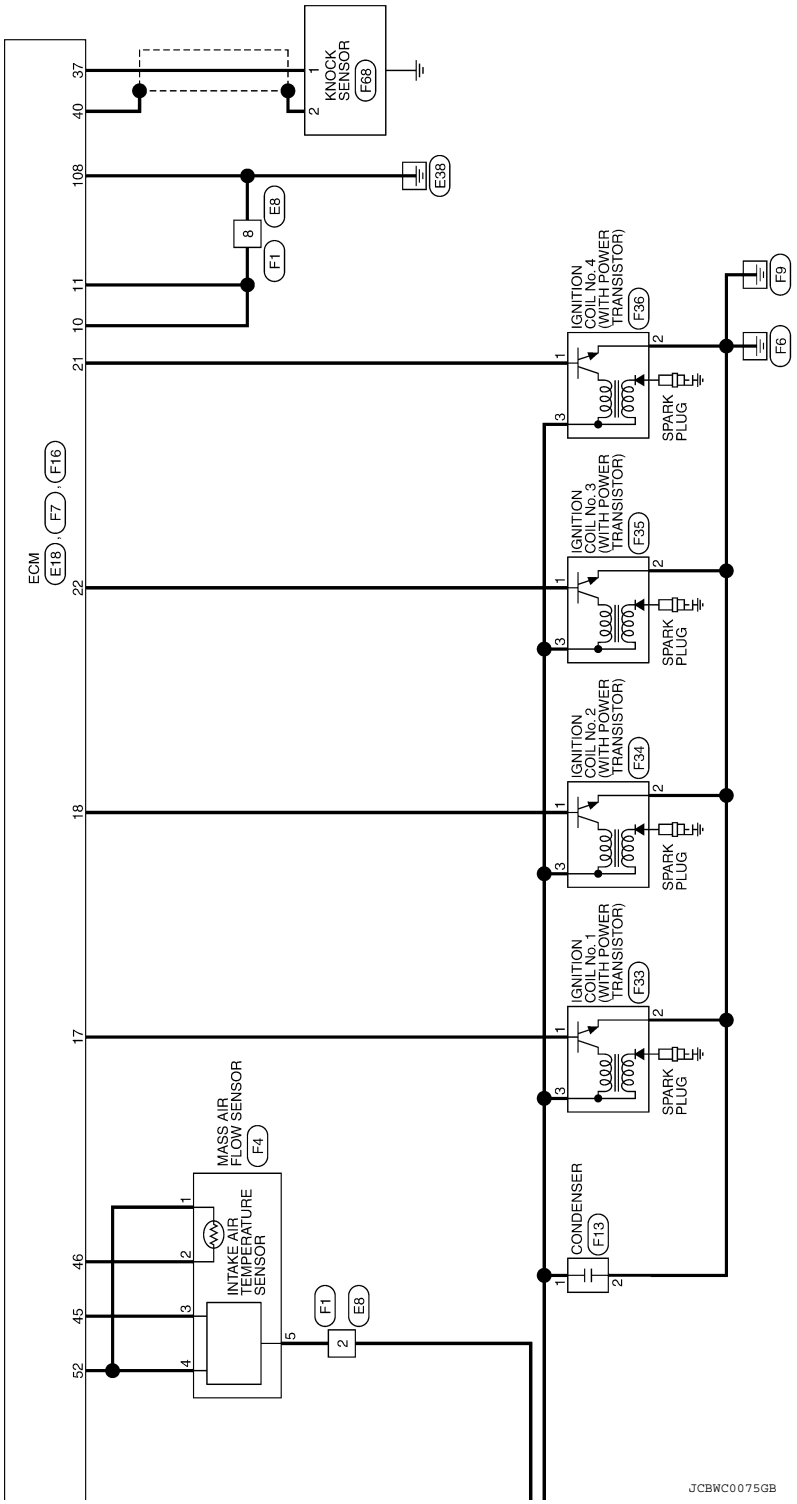
For connector terminal arrangements, harness layouts, and alphabets in a ⬡ (option abbreviation; if not described in wiring diagram), refer to XX-XX, "*****".




REFRIGERANT PRESSURE SENSOR
E49
ECM
E18
F7
F16
E105
82
M77
DATA LINK CONNECTOR
M4
M76
IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
E10
E11
E12
E14
E17
F113
F115
ECM RELAY
THROTTLE CONTROL MOTOR RELAY
STOP LAMP SWITCH
E114
E115
10A 3
10A 5
10A 13
10A 38
20A 49
15A 47
15A 48
10A 51
10A 52
100
6
3
5
JCBWC0072GB


ENGINE COOLANT TEMPERATURE SENSOR F28
CRANKSHAFT POSITION SENSOR F20
EXHAUST CAMSHAFT POSITION SENSOR F26
ELECTRIC THROTTLE CONTROL ACTUATOR F89
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
THROTTLE CONTROL MOTOR
OPEN CLOSE
ACCELERATOR PEDAL POSITION SENSOR E110
SENSOR 1
SENSOR 2
ECM E18, E7, F16
FUEL INJECTOR No. 1 (FRONT) F37
FUEL INJECTOR No. 2 (FRONT) F38
FUEL INJECTOR No. 3 (FRONT) F39
FUEL INJECTOR No. 4 (FRONT) F40
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE F32
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (FUEL PUMP) B40
COMBINATION METER M47, M34
To CAN system
JCBWC0073GB


TRANSMISSION RANGE SWITCH
F51 : C
P R N D 1 2
PARK / NEUTRAL POSITION (PNP) SWITCH
F22 : M
R N
HEATED OXYGEN SENSOR 2
E31
F46
E6
F1
E8
EXHAUST VALVE TIMING CONTROL SOLENOID VALVE
F85
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
F41
E38
AIR FUEL RATIO (A/F) SENSOR 1
F99
FUEL INJECTOR No.4 (REAR)
F106
FUEL INJECTOR No.3 (REAR)
F105
FUEL INJECTOR No.2 (REAR)
F104
FUEL INJECTOR No.1 (REAR)
F103
BATTERY CURRENT SENSOR
F53
ENGINE OIL TEMPERATURE SENSOR
F48
ENGINE OIL POSITION SENSOR
F86
INTAKE CAMSHAFT POSITION SENSOR
F116
ECM
E18 , F7 , F16
JCBWC0074GB


ECM
E18, F7, F16
37
40
108
11
10
21
22
18
17
46
45
52
KNOCK SENSOR
F68
E38
E8
8
F1
IGNITION COIL No.4 (WITH POWER TRANSISTOR)
F36
IGNITION COIL No.3 (WITH POWER TRANSISTOR)
F35
IGNITION COIL No.2 (WITH POWER TRANSISTOR)
F34
IGNITION COIL No.1 (WITH POWER TRANSISTOR)
F33
SPARK PLUG
F9
F6
MASS AIR FLOW SENSOR
F4
INTAKE AIR TEMPERATURE SENSOR
CONDENSER
F13
JCBWC0075GB

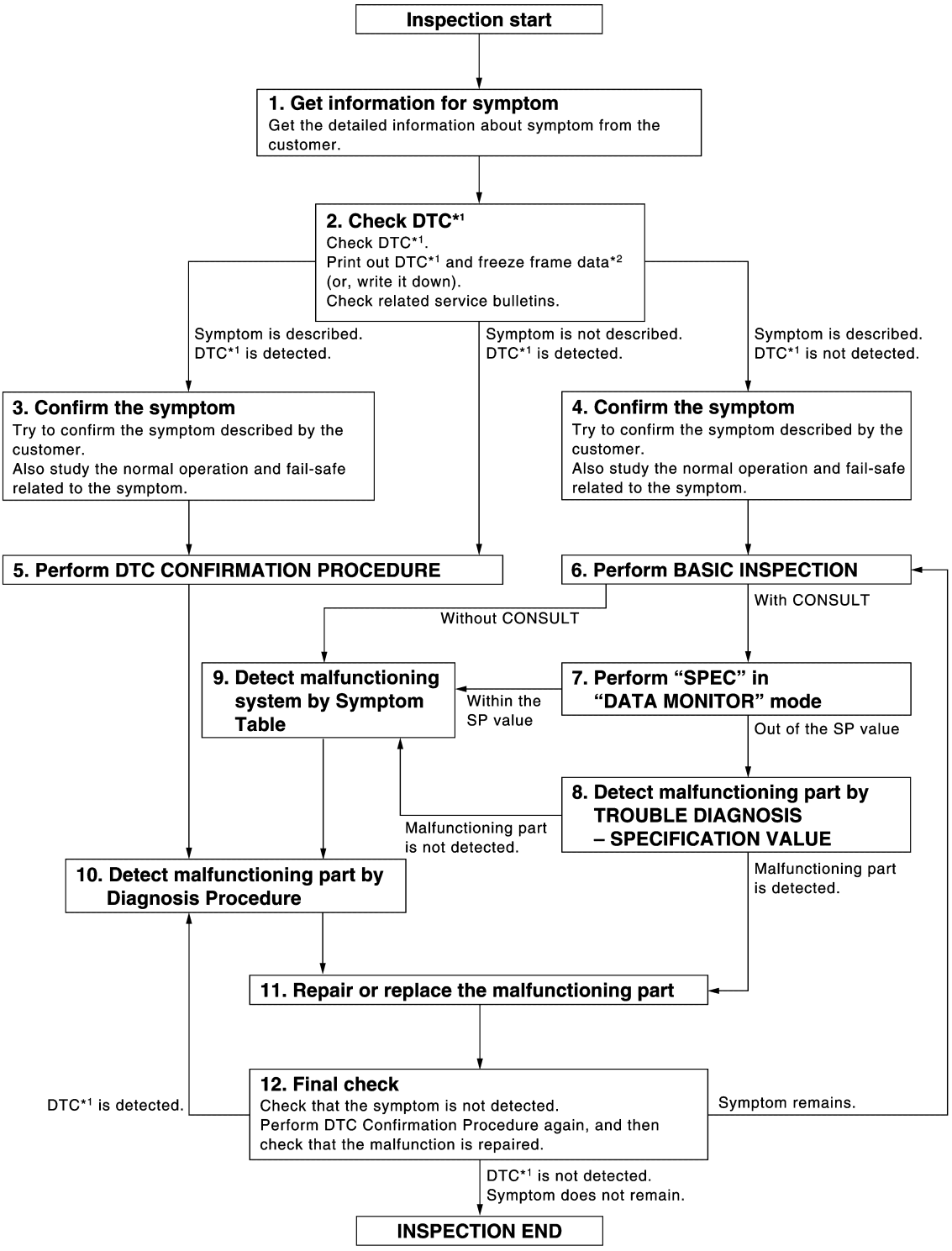
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000007224349

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-85, "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.
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-301, "Symptom Table".)

3. Check related service bulletins for information.

Is any symptom described and is any DTC detected?

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

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MI ON).
Also study the normal operation and fail safe related to the symptom. Refer to EC-306, "Description" and EC-66, "Fail Safe".
Diagnostic 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-306, "Description" and EC-66, "Fail Safe".
Diagnostic 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-68, "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 XX-XX, "*****".

6.PERFORM BASIC INSPECTION

Perform EC-93, "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” and “A/F ALPHA-B1” are within the SP value in “SPEC” of “DATA MONITOR” mode with CONSULT. Refer to EC-104, "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-105, "Diagnosis Procedure".

Is malfunctioning part detected?

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

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to EC-301, "Symptom Table" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptom.

>> 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 XX-XX, "*****".

Is malfunctioning part detected?

YES >> GO TO 11.
NO >> Monitor input data from related sensors or check the voltage of related ECM terminals using CONSULT. Refer to EC-56, "Reference Value".

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

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

>> GO TO 12.

12. FINAL CHECK

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

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.
YES-2 >> Symptom remains: GO TO 6.
NO >> Before returning the vehicle to the customer, make sure to erase unnecessary DTC in ECM. If the completion of SRT is needed, drive vehicle under the specific “DRIVING PATTERN” in EC-100, "SRT Set Driving Pattern".

Diagnostic Work Sheet

INFOID:0000000007224350

DESCRIPTION

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about an incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the WORKSHEET SAMPLE below in order to organize all the information for troubleshooting.
Some conditions may cause the MI to come on steady or blink and DTC to be detected. Examples:
Vehicle ran out of fuel, which caused the engine to misfire.

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

ADDITIONAL SERVICE WHEN REPLACING ECM

Description

INFOID:0000000007224351

When replacing ECM, this procedure must be performed.

Work Procedure

INFOID:0000000007224352

1. PERFORM INITIALIZATION OF NATS SYSTEM AND REGISTRATION OF ALL NATS IGNITION KEY IDS

Refer to XX-XX, "*****".

>> GO TO 2.

2. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-88, "Work Procedure".

>> GO TO 3.

3. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-89, "Work Procedure".

>> GO TO 4.

4. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-90, "Work Procedure".

>> END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

Description

INFOID:0000000007224353

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 harness connector of accelerator pedal position sensor or ECM is disconnected.

Work Procedure

INFOID:0000000007224354

1.START

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

>> END

THROTTLE VALVE CLOSED POSITION LEARNING

Description

INFOID:0000000007224355

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

Work Procedure

INFOID:0000000007224356

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:0000000007224357

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

Work Procedure

INFOID:0000000007224358

1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.
- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- Selector lever: P or N (CVT), Neutral (M/T)
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
- **For vehicles equipped with daytime light systems, perform one of the following procedures before starting engine not to illuminate headlamps.**
- Apply parking brake
- Set lighting switch to the 1st position
- Steering wheel: Neutral (Straight-ahead position) position
- Vehicle speed: Stopped
- Transmission: Warmed-up
- CVT models
- With CONSULT: Drive vehicle until “FLUID TEMP SE” in “DATA MONITOR” mode of “TRANSMISSION” system indicates less than 0.9 V.
- Without CONSULT: Drive vehicle for 10 minutes.
- M/T models
- Drive vehicle for 10 minutes.

Do you have CONSULT?

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

2.IDLE AIR VOLUME LEARNING

With CONSULT
1. Perform ACCELERATOR PEDAL RELEASED POSITION LEARNING. Refer to EC-88, "Work Procedure".
2. Perform THROTTLE VALVE CLOSED POSITION LEARNING. Refer to EC-89, "Work Procedure".
3. Start engine and warm it up to normal operating temperature.
4. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode with CONSULT.
5. Touch “START” and wait 20 seconds.

Is “CMPLT” displayed on CONSULT screen?

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

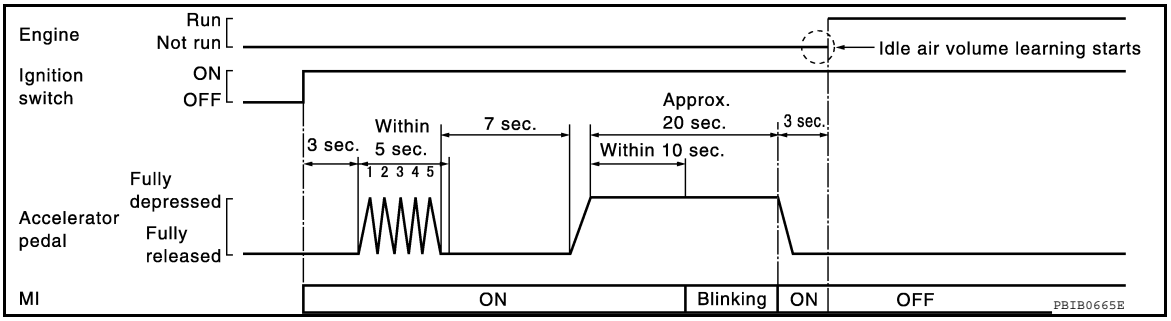
3.IDLE AIR VOLUME LEARNING

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-88, "Work Procedure".
2. Perform THROTTLE VALVE CLOSED POSITION LEARNING. Refer to EC-89, "Work Procedure".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly five times within 5 seconds.

- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.

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



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications.
For specification, refer to EC-312, "Idle Speed" and EC-312, "Ignition Timing".

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

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

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-104, "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 all over again:
- Engine stalls.
- Erroneous idle.

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

Description

INFOID:0000000007224359

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

Work Procedure

INFOID:0000000007224360

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. Make sure DTC P0102 is detected.
7. Select Service $04 with GST to erase the DTC P0102.

>> END

BASIC INSPECTION

Work Procedure

INFOID:0000000007224361

1.INSPECTION START

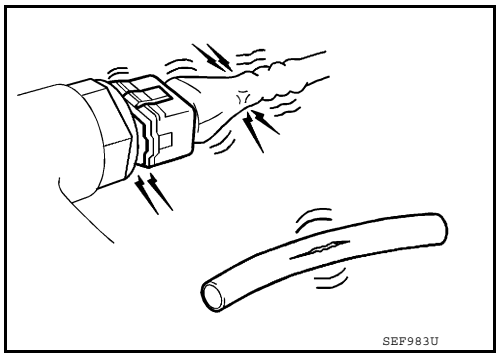
1. Check service records for any recent repairs that may indicate a related malfunction, or a current need for scheduled maintenance.
2. Open engine hood and check the following:

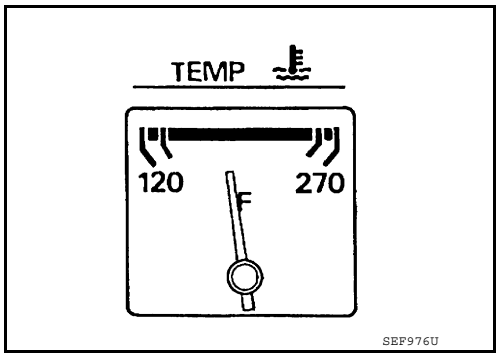
- Harness connectors for improper connections
- Wiring harness for improper connections, pinches and cut
- Vacuum hoses for splits, kinks and improper connections
- Hoses and ducts for leaks
- Air cleaner clogging
- Gasket

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

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

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

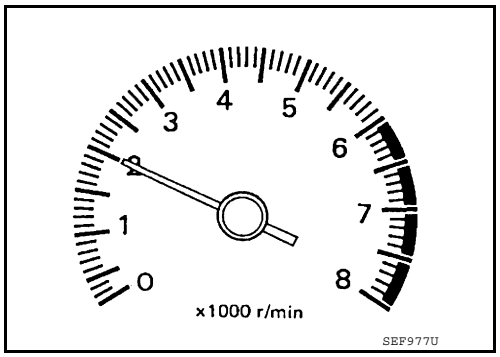




5. Run engine at about 2,000 rpm for about 2 minutes under no load.
6. Make sure that no DTC is displayed with CONSULT or GST.

Is any DTC detected?

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



2.REPAIR OR REPLACE

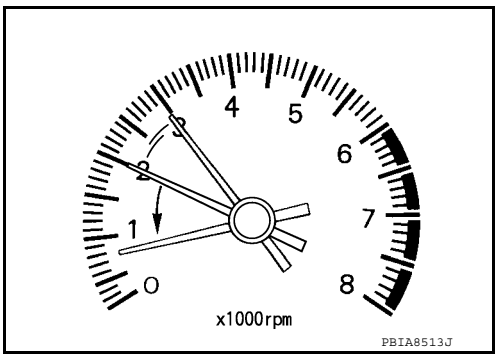
Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3

3.CHECK TARGET IDLE SPEED

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

2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
3. Check idle speed.
   For procedure, refer to EC-307, "Inspection".
   For specification, refer to EC-312, "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-88, "Work Procedure".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-89, "Work Procedure".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-90, "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 TARGET IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-307, "Inspection".
   For specification, refer to EC-312, "Idle Speed".

Is the inspection result normal?

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

8. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-206, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-202, "DTC Logic".

Is the inspection result normal?

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

9. CHECK ECM FUNCTION

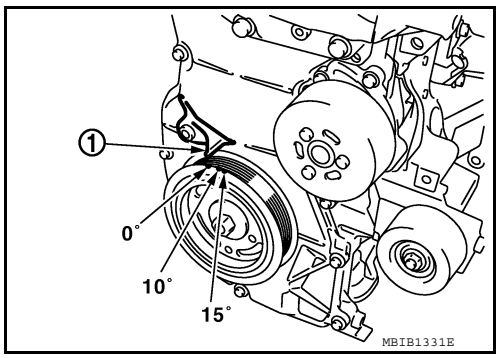
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
2. Perform initialization and registration of all NATS ignition key IDs. Refer to XX-XX, "*****".

>> 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-308, "Inspection".
   For specification, refer to EC-312, "Ignition Timing".
- Timing indicator (1)



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-88, "Work Procedure".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-89, "Work Procedure".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-90, "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 TARGET IDLE SPEED AGAIN

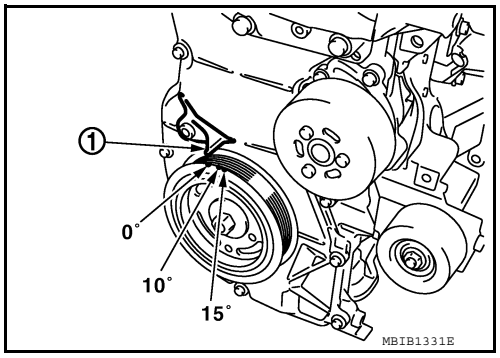
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-307, "Inspection".
   For specification, refer to EC-312, "Idle Speed".

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-308, "Inspection".
   For specification, refer to EC-312, "Ignition Timing".
- Timing indicator (1)



Is the inspection result normal?

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

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to XX-XX, "*****".

Is the inspection result normal?

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

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-206, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-202, "DTC Logic".

Is the inspection result normal?

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

18. CHECK ECM FUNCTION

1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to XX-XX, "*****".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, perform EC-87, "Work Procedure".

>> INSPECTION END

FUEL PRESSURE CHECK

Work Procedure

INFOID:0000000007224362

FUEL PRESSURE RELEASE

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

>> INSPECTION END

FUEL PRESSURE CHECK

1.FUEL PRESSURE CHECK

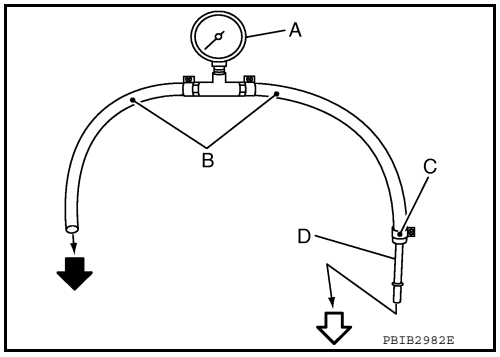
CAUTION:

- **Before disconnecting fuel line, release fuel pressure from fuel line to eliminate danger.**
- **The fuel hose connection method used when taking fuel pressure check must not be used for other purposes.**
- **Be careful not to scratch or put debris around connection area when servicing, so that the quick connector maintains seal ability with O-rings inside.**
- **Do not perform fuel pressure check with electrical systems operating (i.e. lights, rear defogger, A/C, etc.) Fuel pressure gauge may indicate false readings due to varying engine load and changes in manifold vacuum.**

NOTE:

Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because N17 models do not have fuel return system.

1. Release fuel pressure to zero.
2. Prepare fuel hose for fuel pressure check (B) and fuel tube adapter [SST: KV10118400 or KV10120000] (D), then connect fuel pressure gauge (A).



⇦ **To quick connector**

⬅ **To fuel tube (engine side)**

C : Hose clamp

CAUTION:

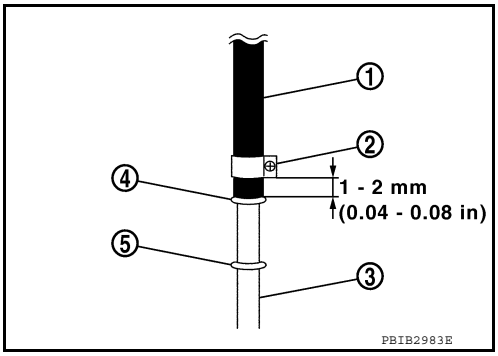
- **Use suitable fuel hose for fuel pressure check (genuine NISSAN fuel hose without quick connector).**
- **To avoid unnecessary force or tension to hose, use moderately long fuel hose for fuel pressure check.**
- **Do not use the fuel hose for checking fuel pressure with damage or cracks on it.**
-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

3. Remove fuel hose.

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

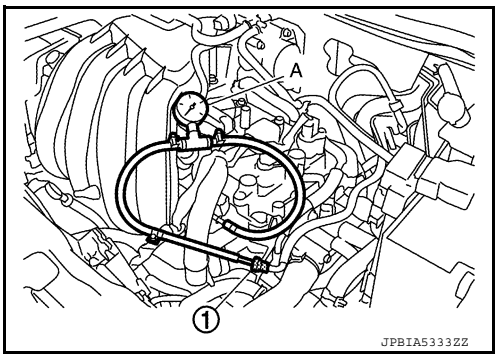
CAUTION:

- **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 - 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 to quick connector (1).



A : Fuel pressure gauge

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. Turn ignition switch ON and check for fuel leakage.
8. Start engine and check for fuel leakage.
9. 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 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

Is the inspection result normal?

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

2. CHECK FUEL HOSE AND FUEL TUBE

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

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”. Refer to FL-5, "Exploded View".
NO >> Repair or replace.

HOW TO SET SRT CODE

Description

INFOID:0000000007224363

OUTLINE

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

SRT ITEM

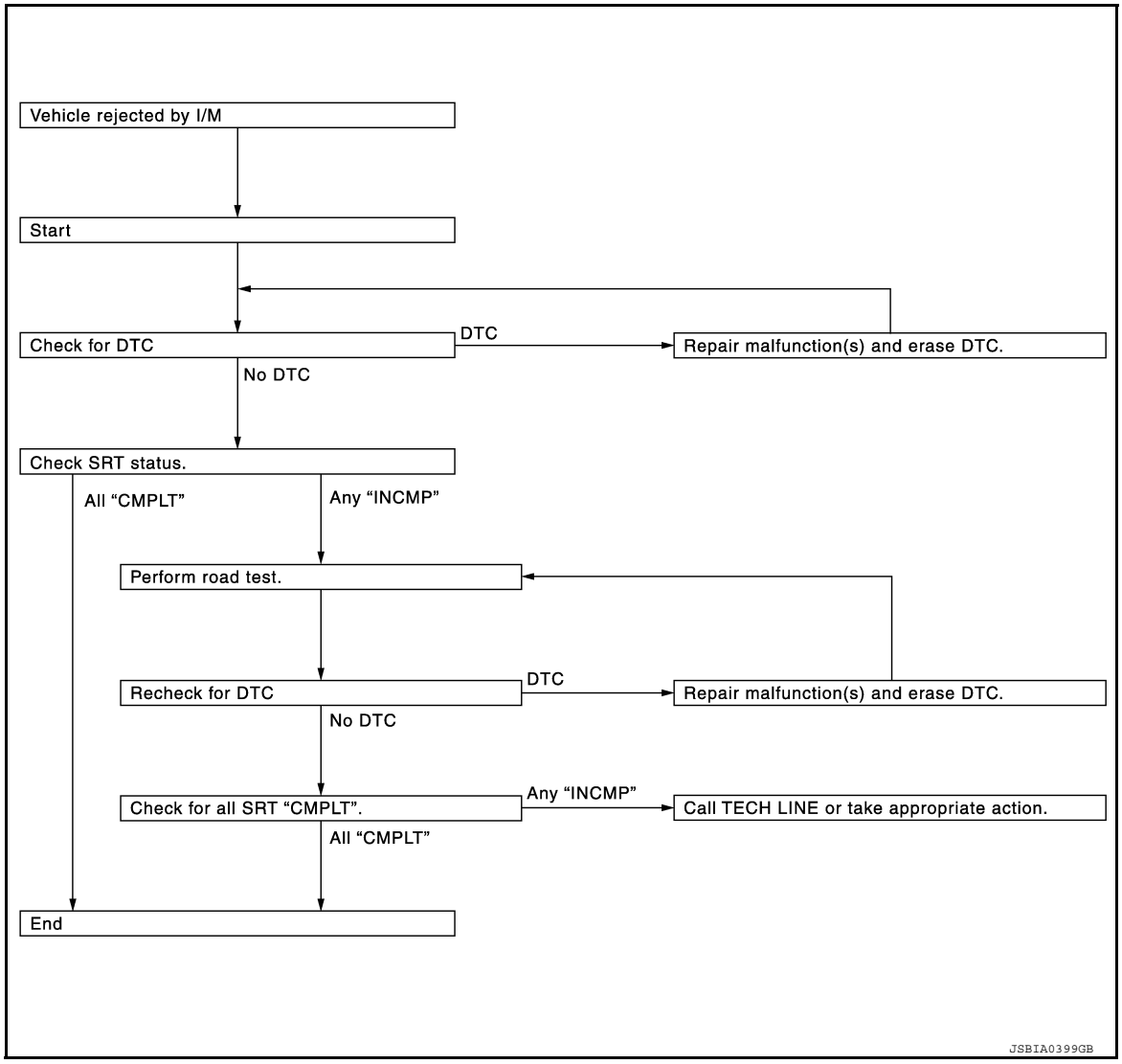
The table below shows required self-diagnostic items to set the SRT to “CMPLT”.

SRT item* (CONSULT indication)	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	Three way catalyst function	P0420
HO2S	Air fuel ratio (A/F) sensor 1	P0130, P0133
	Heated oxygen sensor 2	P0137
	Heated oxygen sensor 2	P0138
	Heated oxygen sensor 2	P0139

*: 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.

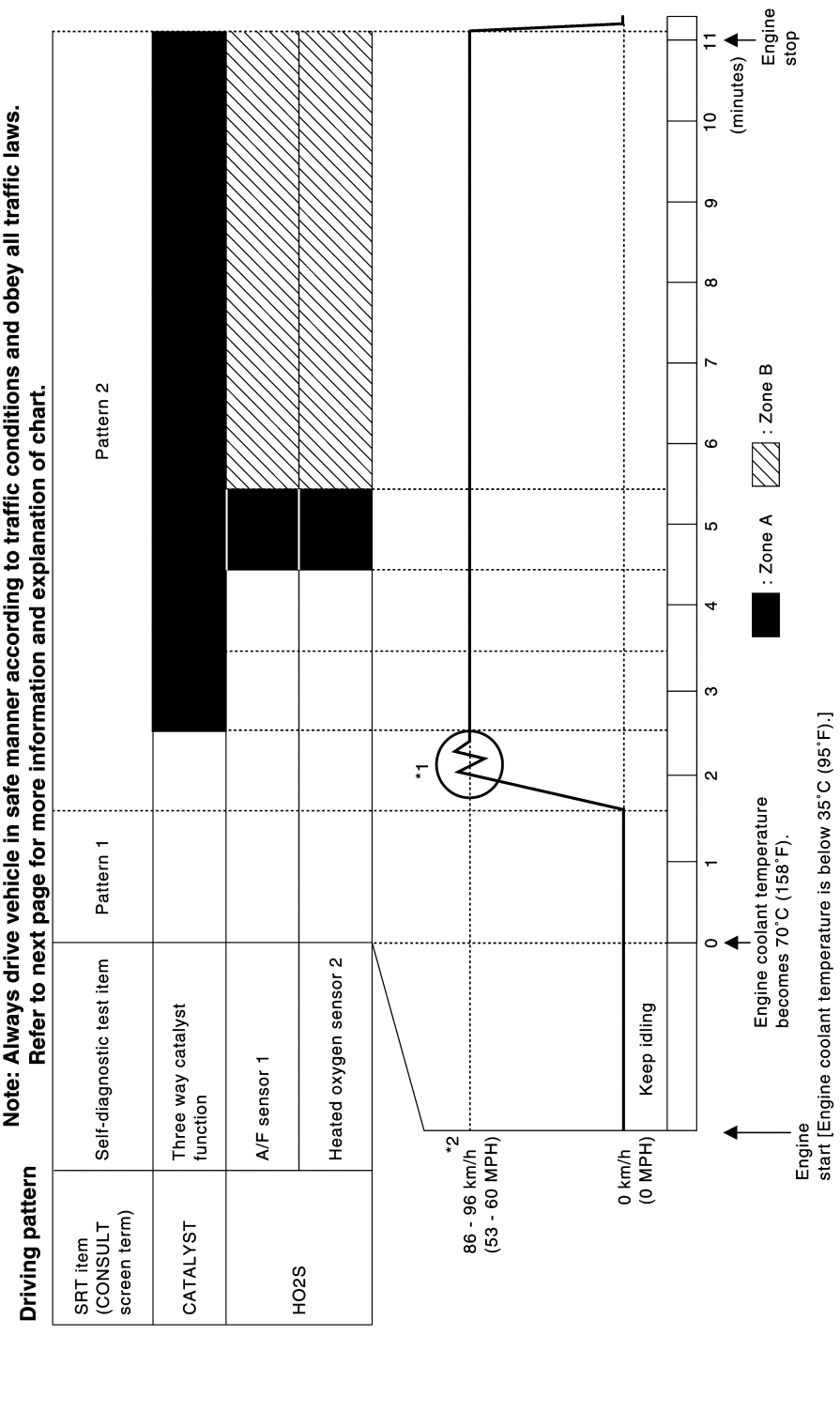


SRT Set Driving Pattern

INFOID:0000000007224364

CAUTION:

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



JSBIA1318GB

NOTE:

*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:0000000007224365

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-68, "DTC Index".
NO >> GO TO 2.

2.CHECK SRT STATUS

WITH CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode of “ENGINE” using CONSULT.
WITHOUT CONSULT
Perform “SRT status” mode with EC-46, "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 of “ENGINE” using CONSULT.
2. For SRT(s) that is not set, perform the corresponding “DTC CONFIRMATION PROCEDURE” according to the “Performance Priority” in the “SRT ITEM” table. Refer to EC-45, "DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code".
3. Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-68, "DTC Index".
NO >> GO TO 7.

4.PERFORM ROAD TEST

- Check the “Performance Priority” in the “SRT ITEM” table. Refer to EC-45, "DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to EC-100, "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-56, "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. CHECK SRT STATUS

WITH CONSULT
Select “SRT STATUS” in “DTC & SRT CONFIRMATION” mode of “ENGINE” using CONSULT.

WITHOUT CONSULT
Perform “SRT status” mode with EC-46, "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:0000000007224366

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

Component Function Check

INFOID:0000000007224367

1. START

Make sure that all of the following conditions are satisfied.
- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (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
  - CVT models: After the engine is warmed up to normal operating temperature, drive vehicle until “FLUID TEMP SE” (CVT fluid temperature sensor signal) indicates more than 60°C (140°F).
  - M/T models: After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied
  - Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle

>> GO TO 2.

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

With CONSULT
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform EC-93, "Work Procedure".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode with CONSULT.
3. Make sure that monitor items are within the SP value.

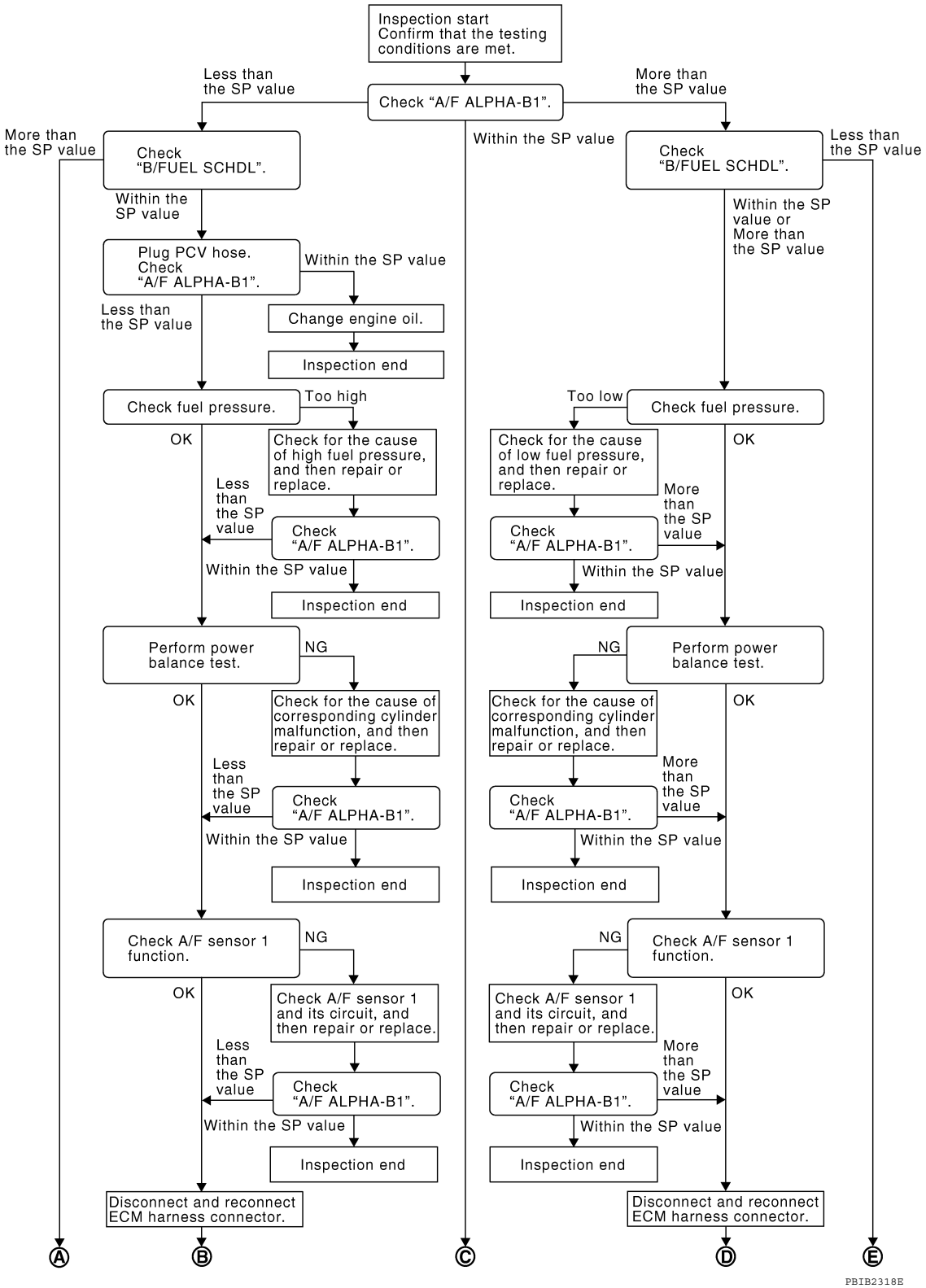
Is the inspection result normal?

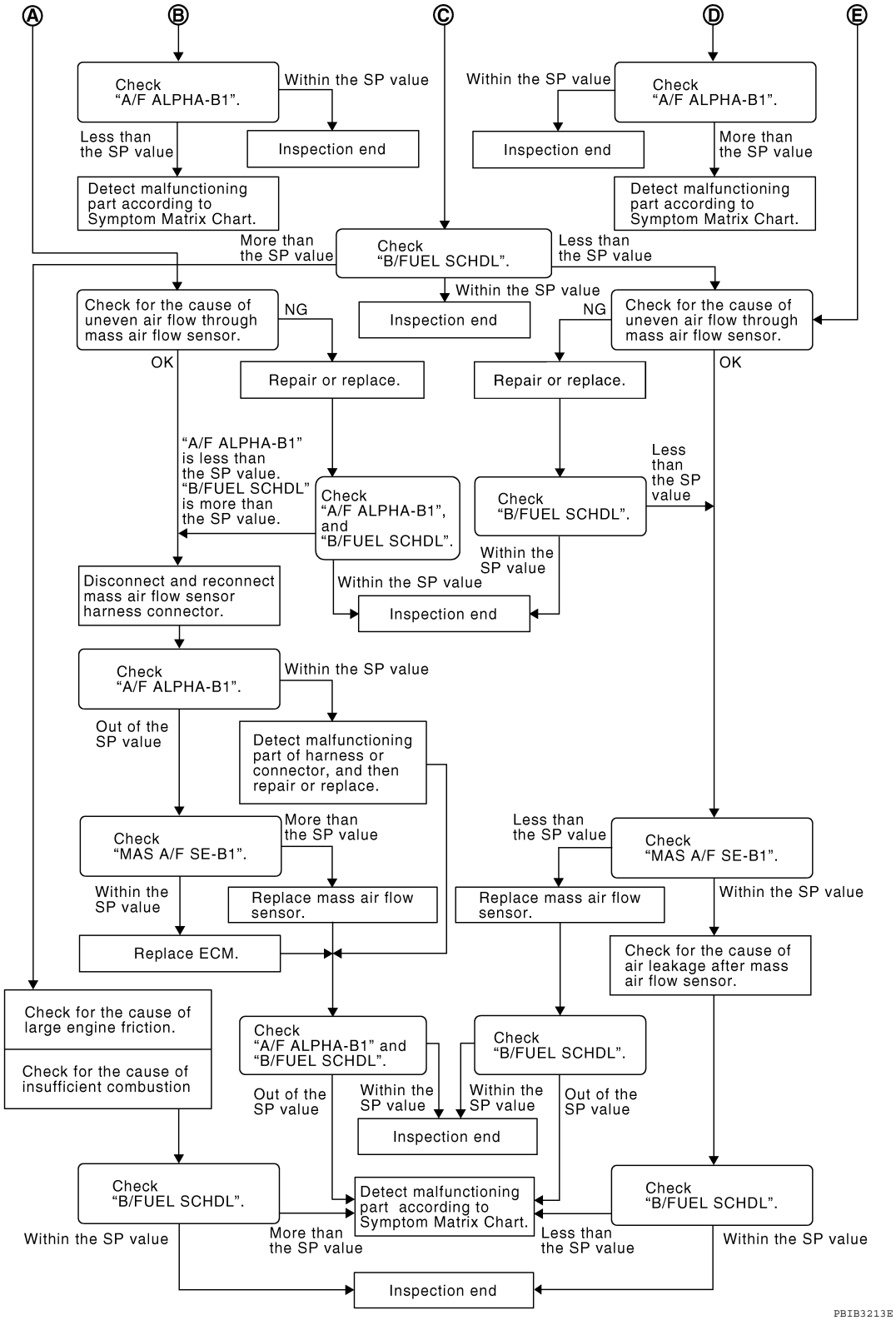
YES >> END
NO >> Go to EC-105, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224368

OVERALL SEQUENCE





DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1"

With CONSULT

1. Start engine.
2. Confirm that the testing conditions are met. Refer to EC-104, "Component Function Check".
3. Select "A/F ALPHA-B1" in "SPEC" of "DATA MONITOR" mode, and make sure that the indication is within the SP value.

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

Is the measurement value within the SP value?

YES >> GO TO 17.
NO-1 >> Less than the SP value: GO TO 2.
NO-2 >> More than the SP value: GO TO 3.

2. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> GO TO 4.
NO >> More than the SP value: GO TO 19.

3. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> GO TO 6.
NO-1 >> More than the SP value: GO TO 6.
NO-2 >> Less than the SP value: GO TO 25.

4. CHECK “A/F ALPHA-B1”

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

Is the measurement value within the SP value?

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

5. CHANGE ENGINE OIL

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

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

>> **INSPECTION END**

6. CHECK FUEL PRESSURE

Check fuel pressure. (Refer to EC-97, "Work Procedure".)

Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> Fuel pressure is too high: Replace fuel filter and fuel pump assembly (Refer to FL-5, "Exploded View"), and then GO TO 8.
NO-2 >> Fuel pressure is too low: GO TO 7.

7. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging

Is the inspection result normal?

YES >> Replace fuel filter and fuel pump assembly (Refer to FL-5, "Exploded View"), and then GO TO 8.
NO >> Repair or replace and then GO TO 8.

8. CHECK “A/F ALPHA-B1”

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

Is the measurement value within the SP value?

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

9. PERFORM POWER BALANCE TEST

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

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.
1. Ignition coil and its circuit (Refer to EC-296, "Component Inspection (Ignition Coil with Power Transistor)".)
2. Fuel injector and its circuit (Refer to EC-289, "Component Inspection".)
3. Intake air leakage
4. Low compression pressure (Refer to XX-XX, "*****".)

Is the inspection result normal?

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

11. CHECK “A/F ALPHA-B1”

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

Is the measurement value within the SP value?

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

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.
- For DTC P0130, refer to EC-146, "DTC Logic".
- For DTC P0131, refer to EC-150, "DTC Logic".
- For DTC P0132, refer to EC-153, "DTC Logic".
- For DTC P0133, refer to EC-156, "DTC Logic".
- For DTC P2A00, refer to EC-281, "DTC Logic".

Is any DTC detected?

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

13. CHECK A/F SENSOR 1 CIRCUIT

Perform DIAGNOSTIC PROCEDURE according to corresponding DTC.

>> GO TO 14.

14. CHECK “A/F ALPHA-B1”

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

Is the measurement value within the SP value?

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

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

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

>> GO TO 16.

16. CHECK “A/F ALPHA-B1”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-301, "Symptom Table".

17. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO-1 >> More than the SP value: GO TO 18.
NO-2 >> Less than the SP value: GO TO 25.

18. DETECT MALFUNCTIONING PART

1. Check for the cause of large engine friction. Refer to the following.
- Engine oil level is too high
- Engine oil viscosity
- Belt tension of power steering, alternator, A/C compressor, etc. is excessive
- Noise from engine
- Noise from transmission, etc.
2. Check for the cause of insufficient combustion. Refer to the following.
- Valve clearance malfunction
- Intake valve timing control function malfunction
- Camshaft sprocket installation malfunction, etc.

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

19. CHECK INTAKE SYSTEM

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

Is the inspection result normal?

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

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

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

Is the measurement value within the SP value?

YES >> **INSPECTION END**
NO >> “B/FUEL SCHDL” is more, “A/F ALPHA-B1” is less than the SP value: GO TO 21.

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect mass air flow sensor harness connector.

3. Check pin terminal and connector for damage and then reconnect it again.

>> GO TO 22.

22. CHECK “A/F ALPHA-B1”

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

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-134, "DTC Logic". Then GO TO 29.
NO >> GO TO 23.

23. CHECK “MAS A/F SE-B1”

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

Is the measurement value within the SP value?

YES >> GO TO 24.
NO >> More than the SP value: Replace mass air flow sensor (Refer to XX-XX, "*****"), and then GO TO 29.

24. REPLACE ECM

1. Replace ECM. Refer to EC-311, "Removal and Installation".
2. Perform EC-87, "Work Procedure".

>> GO TO 29.

25. CHECK INTAKE SYSTEM

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

Is the inspection result normal?

YES >> GO TO 27.
NO >> Repair or replace malfunctioning part, and then GO TO 26.

26. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Less than the SP value: GO TO 27.

27. CHECK “MAS A/F SE-B1”

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

Is the measurement value within the SP value?

YES >> GO TO 28.
NO >> Less than the SP value: Replace mass air flow sensor (Refer to XX-XX, "*****"), and then GO TO 30.

28. CHECK INTAKE SYSTEM

Check for the cause of air leak after the mass air flow sensor. Refer to the following.
- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks of PCV valve

- Disconnection or cracks of EVAP purge hose, open stuck of EVAP canister purge volume control solenoid valve
- Malfunctioning seal of rocker cover gasket
- Disconnection, looseness, or cracks of hoses, such as vacuum hose, connecting to intake air system parts
- Malfunctioning seal of intake air system, etc.

>> GO TO 30.

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-301, "Symptom Table".

30. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-301, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000007224369

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

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

ECM		Ground	Continuity
Connector	Terminal		
F7	10	Ground	Existed
	11		
E18	108		

3. Also check harness for short to power.

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E8, F1
- Harness for open or short between ECM and ground

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

4.CHECK ECM POWER SUPPLY CIRCUIT-I

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

ECM		Ground	Voltage
Connector	Terminal		
E18	93	Ground	Battery voltage

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse (No. 51)
- Harness for open or short between ECM and fuse

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

6.CHECK ECM POWER SUPPLY CIRCUIT-II

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

Check the voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal		
E18	105	Ground	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.

Is the inspection result normal?

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

7. CHECK ECM POWER SUPPLY CIRCUIT-III

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

IPDM E/R		Ground	Voltage
Connector	Terminal		
F113	50	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) or XX-XX, "*****" (Without I–KEY).

8. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

9. CHECK ECM POWER SUPPLY CIRCUIT-IV

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

ECM		Ground	Voltage
Connector	Terminal		
F7	32	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 10.

10. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector F113.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	32	F113	50	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and IPDM E/R

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

12. CHECK 20 A FUSE

1. Disconnect 20 A fuse (No. 49) from IPDM E/R.
2. Check 20 A fuse.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace 20 A fuse.

13. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E12.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E18	105	E12	35	Existed

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

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair open circuit or short to ground or short power in harness or connectors.

14. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) XX-XX, "*****" (Without I–KEY).
NO >> Repair or replace harness or connectors.

U1000, U1001 CAN COMM CIRCUIT

Description

INFOID:0000000007224370

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

DTC Logic

INFOID:0000000007224371

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1000	CAN communication line	When ECM is not transmitting or receiving CAN communication signal of OBD (emission related diagnosis) for 2 seconds or more.	Harness or connectors (CAN communication line is open or shorted)
U1001		When ECM is not transmitting or receiving CAN communication signal other than OBD (emission related diagnosis) for 2 seconds or more.	

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-115, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224372

Go to XX-XX, "*****".

P0011 IVT CONTROL

DTC Logic

INFOID:0000000007224373

DTC DETECTION LOGIC

NOTE:
If DTC P0011 is displayed with DTC P0075, first perform the trouble diagnosis for DTC P0075. Refer to EC-129, "DTC Logic".

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011	Intake valve timing control performance	There is a gap between angle of target and phase-control angle degree.	• Crankshaft position sensor • Intake 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

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

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	1,200 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
Shift lever	P or N position (CVT) Neutral position (M/T)

4. Let engine idle for 10 seconds.
5. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-117, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 60°C (140°F)
Shift 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.

2. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-117, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

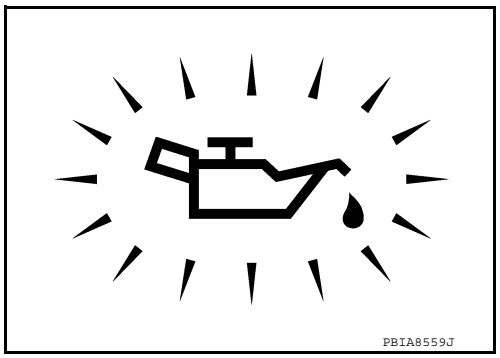
INFOID:0000000007224374

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 >> Go to XX-XX, "*****".
NO >> GO TO 2.



2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-118, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace intake valve timing control solenoid valve.Refer to XX-XX, "*****".

3.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor.Refer to XX-XX, "*****".

4.CHECK INTAKE CAMSHAFT POSITION SENSOR

Refer to EC-208, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace intake camshaft position sensor. Refer to XX-XX, "*****".

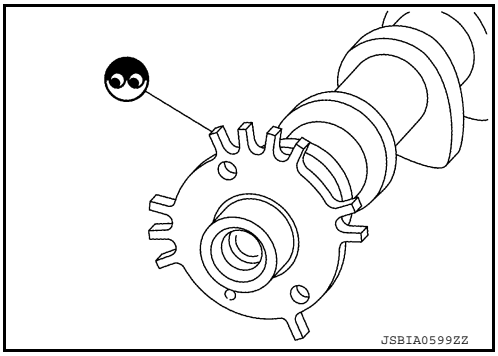
5.CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to XX-XX, "*****".



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 XX-XX, "*****".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

8. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224375

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

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

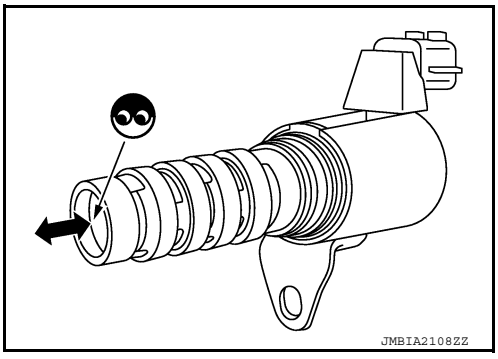
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve. Refer to XX-XX, "*****".

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve. Refer to XX-XX, "*****".
2. Apply 12 V between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

CAUTION:
Do not apply 12 V 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 intake valve timing control solenoid valve. Refer to XX-XX, "*****".

P0014 EVT CONTROL

DTC Logic

INFOID:0000000007224376

DTC DETECTION LOGIC

NOTE:
If DTC P0014 is displayed with DTC P0078, first perform trouble diagnosis for DTC P0078. Refer to EC-131, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0014	EXH/V TIM CONT-B1 (Exhaust valve timing control performance)	There is a gap between angle of target and phase-control angle degree.	• Crankshaft position sensor • Exhaust camshaft position sensor • Exhaust valve timing control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for exhaust valve timing control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Maintain the following conditions for at least 6 consecutive seconds. Hold the accelerator pedal as steady as possible.

ENG SPEED	1,200 - 2,000 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 60°C (140°F)
Selector lever	P or N position (CVT) Neutral position (M/T)

4. Let engine idle for 10 seconds.
5. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-121, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 2,950 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?

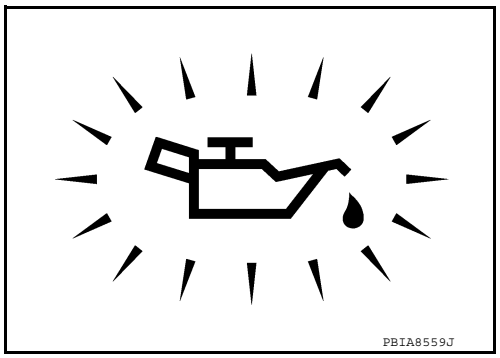
YES >> Proceed to EC-121, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224377

1.CHECK OIL PRESSURE WARNING LAMP

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



Is oil pressure warning lamp illuminated?

YES >> Check the engine oil level. Refer to XX-XX, "*****".
NO >> GO TO 2.

2.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE

Check the exhaust valve timing control solenoid valve. Refer to EC-122, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".

3.CHECK CRANKSHAFT POSITION SENSOR

Check the crankshaft position sensor. Refer to EC-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor. Refer to XX-XX, "*****".

4.CHECK EXHAUST CAMSHAFT POSITION SENSOR

Check the exhaust camshaft position sensor. Refer to EC-208, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace exhaust valve timing control position sensor. Refer to XX-XX, "*****".

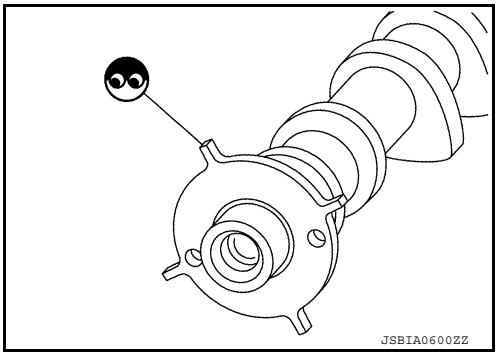
5.CHECK CAMSHAFT (EXHAUST)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to XX-XX, "*****".



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 XX-XX, "*****".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Refer to XX-XX, "*****", “INSPECTION AFTER INSTALLATION”.

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Clean lubrication line.

Component Inspection

INFOID:0000000007224378

1. CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect exhaust valve timing control solenoid valve harness connector.
3. Check resistance between exhaust valve timing control solenoid valve terminals as per the following.

Exhaust valve timing control solenoid valve		Resistance
+	–	
Terminal		
1	2	7.0 - 7.7 Ω [at 20°C (68°F)]
1	Ground	∞ Ω (Continuity should not exist)
2		

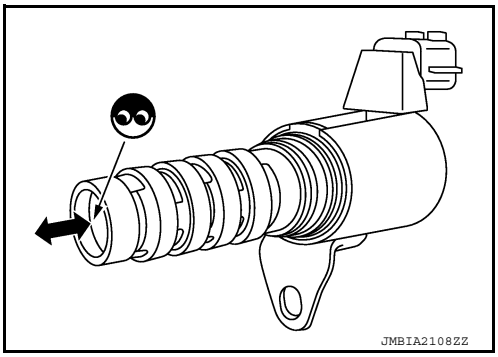
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".

2. CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".
2. Provide 12 V DC between exhaust valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in exhaust valve timing control solenoid valve.
NOTE:
Always replace O-ring when exhaust valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".

P0031, P0032 A/F SENSOR 1 HEATER

DTC Logic

INFOID:0000000007224379

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0032	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. 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-123, "Diagnosis Procedure".
NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224380

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

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

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

A/F sensor 1		Ground	Voltage
Connector	Terminal		
F49	4	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R harness connector F115
- 20A fuse (No. 49)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

4.CHECK A/F SENSOR 1 HEATER OUTPUT SIGNAL CIRCUIT

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	3	F7	3	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK A/F SENSOR 1 HEATER

Refer to XX-XX, "*****".

Is the inspection result normal?

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

6.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

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) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

>> Repair or replace.

Component Inspection

INFOID:0000000007224381

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

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

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

Is the inspection result normal?

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

2. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

CAUTION:

- **Discard any air fuel ratio (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 air fuel ratio (A/F) sensor, clean exhaust system threads using Heated Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0037, P0038 HO2S2 HEATER

DTC Logic

INFOID:0000000007224382

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0037	HO2 HTR (B1) (Heated oxygen sensor 2 heater 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 (Heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0038	HO2 HTR (B1) (Heated oxygen sensor 2 heater 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 (Heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT
1. Turn ignition switch ON and select “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Check 1st trip DTC.

With GST
Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Proceed to EC-126, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224383

1.CHECK HO2S2 POWER SUPPLY CIRCUIT

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

HO2S2		Ground	Voltage
Connector	Terminal		
F31	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace error-detected parts.

2.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	3	F7	5	Existed

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

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK HEATED OXYGEN SENSOR 2 HEATER

Check the heated oxygen sensor 2 heater. Refer to EC-127, "Component Inspection".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> GO TO 4.

4.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

>> INSPECTION END

Component Inspection

INFOID:0000000007224384

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 per the following.

Heated oxygen sensor 2		Resistance
+	–	
Terminal		
2	3	3.3 - 4.4 Ω [at 25°C (77°F)]
1	2	∞ Ω (Continuity should not exist)
	3	
	4	
4	1	
	2	
	3	

Is the inspection result normal?

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

2.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

>> INSPECTION END

P0075 IVT CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000007224385

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075	Intake valve timing control solenoid valve 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

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 TO2.

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-129, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224386

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing (IVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between intake valve timing control solenoid valve harness connector and ground.

IVT control solenoid valve		Ground	Voltage
Connector	Terminal		
F41	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 intake valve timing control solenoid valve and IPDM E/R

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

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

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

3. Check the continuity between intake valve timing control solenoid valve harness connector and ECM harness connector.

IVT control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F41	2	F16	73	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 or short to ground or short to power in harness or connectors.

4.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-130, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace intake valve timing control solenoid valve. Refer to XX-XX, "*****".

5.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224387

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

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

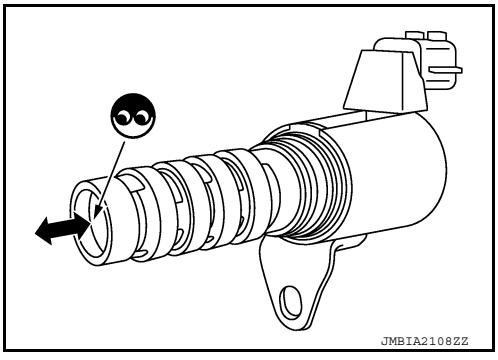
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve. Refer to XX-XX, "*****"

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve. Refer to XX-XX, "*****".
2. Apply 12 V between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

CAUTION:
Do not apply 12 V 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 intake valve timing control solenoid valve. Refer to XX-XX, "*****".

P0078 EVT CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000007224388

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0078	EX V/T ACT/CIRC-B1 (Exhaust valve timing control solenoid valve circuit)	An improper voltage is sent to the ECM through exhaust valve timing control solenoid valve.	• Harness or connectors (Exhaust valve timing control solenoid valve circuit is open or shorted.) • Exhaust valve timing control solenoid valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition 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 TO2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-131, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224389

1.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect exhaust valve timing (EVT) control solenoid valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between exhaust valve timing control solenoid valve harness connector and ground.

EVT control solenoid valve		Ground	Voltage
Connector	Terminal		
F85	1	Ground	Battery voltage

Is the inspection result normal?

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

2.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between EVT control solenoid valve harness connector and IPDM E/R harness connector.

EVT control solenoid valve		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F85	1	F115	75	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

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

3.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVT control solenoid valve harness connector and ECM harness connector.

EVT control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F85	2	F16	77	Existed

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 EXHAUST VALVE TIMING CONTROL SOLENOID VALVE

Check the exhaust valve timing control solenoid valve. Refer to EC-132, "Component Inspection".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224390

1.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect exhaust valve timing control solenoid valve harness connector.
3. Check resistance between exhaust valve timing control solenoid valve terminals as per the following.

Exhaust valve timing control solenoid valve		Resistance
+	–	
Terminal		
1	2	7.0 - 7.7 Ω [at 20°C (68°F)]
1	Ground	∞ Ω (Continuity should not exist)
2		

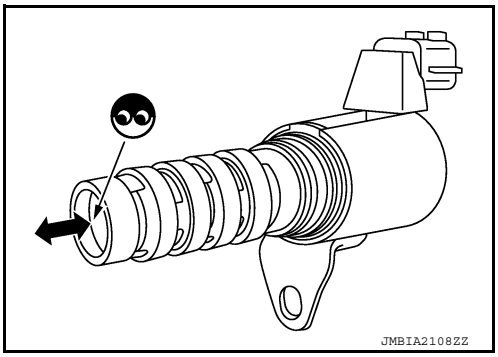
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".

2.CHECK EXHAUST VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".
2. Provide 12 V DC between exhaust valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in exhaust valve timing control solenoid valve.
NOTE:
Always replace O-ring when exhaust valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace exhaust valve timing control solenoid valve. Refer to XX-XX, "*****".

P0102, P0103 MAF SENSOR

DTC Logic

INFOID:0000000007224391

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air leakage • Mass air flow sensor
P0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

Which DTC is detected?

P0102 >> 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-134, "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-134, "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-134, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224392

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 GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

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

4. 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		
F4	5	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK MAF SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F4	4	F16	52	Existed

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

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F4	3	F16	45	Existed

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Refer to EC-136, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace mass air flow sensor. Refer to XX-XX, "*****".

8.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224393

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 indication.

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.3 V
	Idle to about 4,000 rpm	0.7 - 1.3 V to Approx. 4.3 V*

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

Without CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector and ground.

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F16	45 (MAF sensor signal)	52	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.3 V
			Idle to about 4,000 rpm	0.7 - 1.3 V to Approx. 4.3 V*

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

Is the inspection result normal?

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

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH MASS AIR FLOW SENSOR

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 indication.

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.3 V
	Idle to about 4,000 rpm	0.7 - 1.3 V to Approx. 4.3 V*

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

Without CONSULT
1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector and ground.

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F16	45 (MAF sensor signal)	52	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.3 V
			Idle to about 4,000 rpm	0.7 - 1.3 V to Approx. 4.3 V*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK MASS AIR FLOW SENSOR-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 indication.

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
	Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.3 V
	Idle to about 4,000 rpm	0.7 - 1.3 V to Approx. 4.3 V*

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

Without CONSULT
1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector and ground.

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F16	45 (MAF sensor signal)	52	Ignition switch ON (Engine stopped.)	Approx. 0.4 V
			Idle (Engine is warmed-up to normal operating temperature.)	0.7 - 1.3 V
			Idle to about 4,000 rpm	0.7 - 1.3 V to Approx. 4.3 V*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace mass air flow sensor. Refer to XX-XX, "*****".

P0112, P0113 IAT SENSOR

DTC Logic

INFOID:0000000007224394

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112	Intake air temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air temperature sensor
P0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-139, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224395

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor (with intake air temperature sensor) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between mass air flow sensor harness connector and ground.

MAF sensor		Ground	Voltage
Connector	Terminal		
F4	2	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK 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 mass air flow sensor harness connector and ECM harness connector.

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F4	1	F16	52	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 or short to ground or short to power in harness or connectors.

4.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-140, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to XX-XX, "*****".

5.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224396

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 follows.

Terminals	Condition		Resistance
1 and 2	Temperature [°C (°F)]	25 (77)	1.800 - 2.200 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor). Refer to XX-XX, "*****".

P0117, P0118 ECT SENSOR

DTC Logic

INFOID:0000000007224397

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0117	Engine coolant temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Engine coolant temperature sensor
P0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to EC-141, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224398

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK ECT 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
Connector	Terminal		
F28	1	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK 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	
F28	2	F16	44	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 or short to ground or short to power in harness or connectors.

4.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace engine coolant temperature sensor. Refer to XX-XX, "*****".

5.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

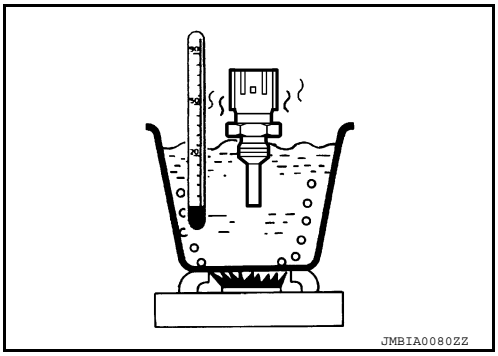
>> INSPECTION END

Component Inspection

INFOID:0000000007224399

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



Terminals	Condition		Resistance
1 and 2	Temperature [°C (°F)]	20 (68)	2.10 - 2.90 kΩ
		50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor. Refer to XX-XX, "*****".

P0122, P0123 TP SENSOR

DTC Logic

INFOID:0000000007224400

DTC DETECTION LOGIC

NOTE:
If DTC P0122 or P0123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122	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	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-143, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224401

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.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		
F89	2	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK 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	
F89	4	F16	36	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 or short to ground or short to power in harness or connectors.

4.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	
F89	3	F16	34	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-144, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224402

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-89, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever to D (CVT) or 1st (M/T) position.
6. Check the voltage between ECM harness connector and ground.

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
F16	33 (TP sensor 1 signal)	36	Accelerator pedal	Fully released	More than 0.36 V
				Fully depressed	Less than 4.75 V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75 V
				Fully depressed	More than 0.36 V

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 XX-XX, "*****".

>> INSPECTION END

P0130 A/F SENSOR 1

DTC Logic

INFOID:0000000007224403

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal fluctuates according to fuel feedback control.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0130	Air fuel ratio (A/F) sensor 1 circuit	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 6.

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

1. Start engine and warm it up to normal operating temperature.
2. Select “ENGINE” using CONSULT.
3. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode.
4. Check “A/F SEN1 (B1)” indication.

Does the indication fluctuate around 2.2 V?

YES >> GO TO 3.
NO >> Go to EC-147, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION -I

1. Select “ENGINE” using CONSULT.
2. Select “A/F SEN1 (B1) P1276” (for DTC P0130) of “A/F SEN1” in “DTC WORK SUPPORT” mode.
3. Touch “START”.
4. When the following conditions are met, “TESTING” will be displayed on the CONSULT screen.

ENG SPEED	1,600 - 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 (CVT models) 5th position (M/T models)

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 4.
NO >> Check A/F sensor 1 function again. GO TO 2.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION -II

Release accelerator pedal fully.

NOTE:

Never apply brake when releasing the accelerator pedal.

Which does “TESTING” change to?

COMPLETED>>GO TO 5.
OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 3.

5. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION -III

Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-147, "Diagnosis Procedure".

6. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION

Perform component function check. Refer to EC-147, "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-147, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224404

1. PERFORM COMPONENT FUNCTION CHECK

With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever to D position (CVT) or 5th position (M/T), then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 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 five times.
5. Stop the vehicle and turn ignition switch OFF.
6. Turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for five times.
10. Stop the vehicle and connect GST to the vehicle.
11. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-147, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224405

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

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

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

A/F sensor 1		Ground	Voltage
Connector	Terminal		
F49	4	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R harness connector F115
- 20A fuse (No. 49)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

4. Check the continuity between A/F sensor 1 harness connector and ground or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

Is the inspection result normal?

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

6. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

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) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0131 A/F SENSOR 1

DTC Logic

INFOID:0000000007224406

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	DTC detecting condition	Possible Cause
P0131	Air fuel ratio (A/F) sensor 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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Select “ENGINE” using CONSULT.
3. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode.
4. Check “A/F SEN1 (B1)” indication.

Is the indication constantly approx. 0 V?

YES >> Go to EC-151, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds and then restart engine.
2. 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.
3. Maintain the following conditions for about 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:
- **Keep the accelerator pedal as steady as possible during cruising.**
- **If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.**

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-151, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224407

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

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

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

A/F sensor 1		Ground	Voltage
Connector	Terminal		
F49	4	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R harness connector F115
- 20A fuse (No. 49)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

4. Check the continuity between A/F sensor 1 harness connector and ground or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

Is the inspection result normal?

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

6. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

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) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0132 A/F SENSOR 1

DTC Logic

INFOID:0000000007224408

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately high.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Air fuel ratio (A/F) sensor 1 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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Select “ENGINE” using CONSULT.
3. Select “A/F SEN1 (B1)” in “DATA MONITOR” mode.
4. Check “A/F SEN1 (B1)” indication.

Is the indication constantly approx. 5 V?

YES >> Go to EC-154, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds and then restart engine.
2. 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.
3. Maintain the following conditions for about 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 mph)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever	Suitable position

NOTE:
- **Keep the accelerator pedal as steady as possible during the cruising.**
- **If this procedure is not completed within 1 minute after restarting engine at step 1, return to step 1.**

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-154, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224409

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

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

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

A/F sensor 1		Ground	Voltage
Connector	Terminal		
F49	4	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R harness connector F115
- 20A fuse (No. 49)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

4. Check the continuity between A/F sensor 1 harness connector and ground or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

Is the inspection result normal?

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

6. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

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) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0133 A/F SENSOR 1

DTC Logic

INFOID:0000000007224410

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	DTC detecting condition	Possible Cause
P0133	Air fuel ratio (A/F) sensor 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

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.

Do you have CONSULT?

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. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
4. Let engine idle for 1 minute.
5. Select “ENGINE” using CONSULT.
6. Select “A/F SEN1(B1) P1278/P1279” (for DTC P0133) of “A/F SEN1” in “DTC WORK SUPPORT” mode.
7. 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-157, "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 about 10 seconds.

If "TESTING" is not displayed after 10 seconds, refer to EC-104, "Component Function Check".

2. Wait for about 20 seconds at idle under the condition that "TESTING" is displayed on the CONSULT screen.
3. Make sure that "TESTING" changes to "COMPLETED".

If "TESTING" changed to "OUT OF CONDITION", refer to EC-104, "Component Function Check".

4. Touch "SELF-DIAG RESULT".

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-157, "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. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute 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 about 1 minute.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-157, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224411

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

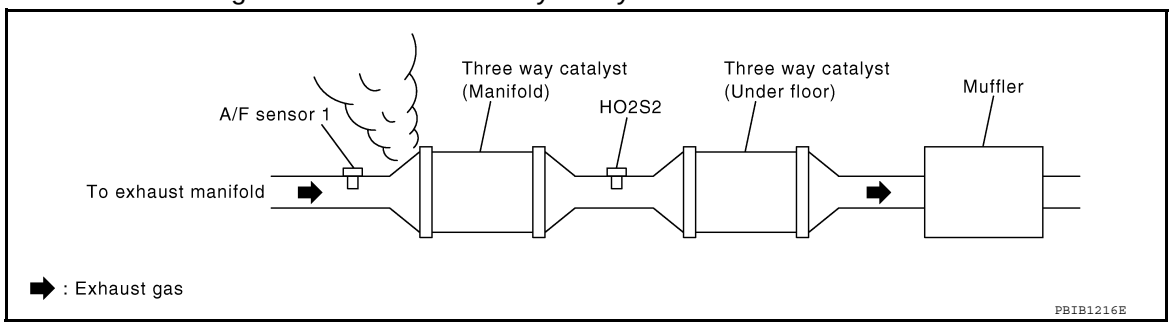
2. RETIGHTEN A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to XX-XX, "*****".

>> GO TO 3.

3.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst 1.



Is exhaust gas leak detected?

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

4.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 5.

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-181, "DTC Logic" or EC-185, "DTC Logic".
NO >> GO TO 6.

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

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

A/F sensor 1		Ground	Voltage
Connector	Terminal		
F49	4	Ground	Battery voltage

Is the inspection result normal?

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

7.DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R harness connector F115
- 20A fuse (No. 49)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

4. Check the continuity between A/F sensor 1 harness connector and ground or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

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

Refer to EC-124, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 13.

10. CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor.
Refer to EC-136, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning mass air flow sensor. Refer to XX-XX, "*****".

11. CHECK PCV VALVE

Refer to EC-310, "Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace PCV valve. Refer to XX-XX, "*****".

12. CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or replace.

13. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

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) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

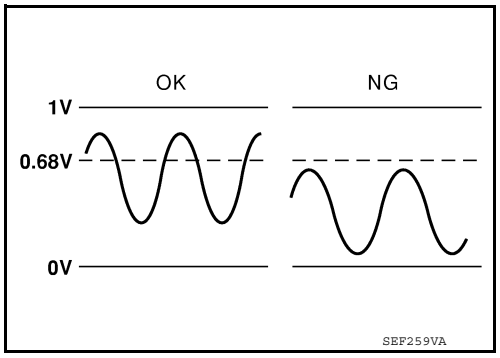
P0137 HO2S2

DTC Logic

INFOID:0000000007224412

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 maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor does not reach the specified voltage.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
7. Open engine hood.
8. Select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
9. Follow the instruction of CONSULT.
   NOTE:

It will take at most 10 minutes until “COMPLETED” is displayed.
10. Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Proceed to EC-163, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-162, "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-163, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224413

1.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure.

Is the inspection result normal?

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

2.PERFORM COMPONENT FUNCTION CHECK-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure.

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-163, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224414

1.HECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171. Refer to EC-181, "DTC Logic".
NO >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	1	F16	59	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	4	F16	50	Existed

2. Check the continuity between HO2S2 harness connector ground or ECM harness connector and ground.

HO2S2		Ground	Continuity
Connector	Terminal		
F31	4	Ground	Not existed

ECM		Ground	Continuity
Connector	Terminal		
F16	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-164, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View"

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224415

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

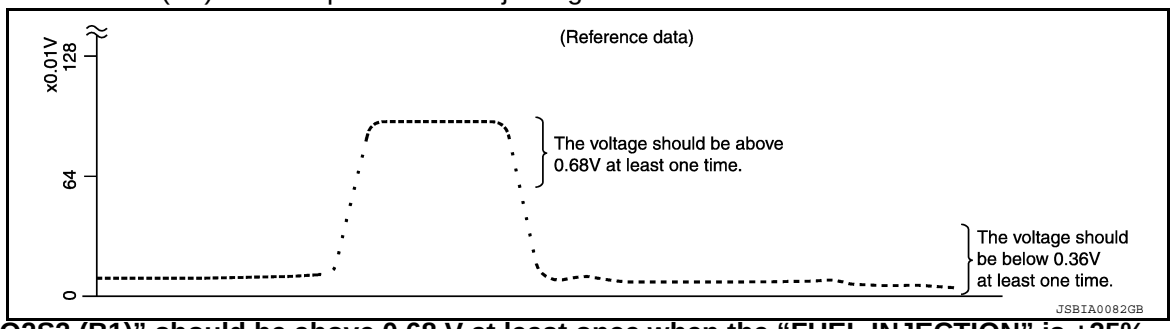
YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select “ENGINE” using CONSULT.
2. Select “DATA MONITOR” mode.
3. Start engine and warm it up to the normal operating temperature.
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 “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT.

8. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.36 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 condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0138 HO2S2

DTC Logic

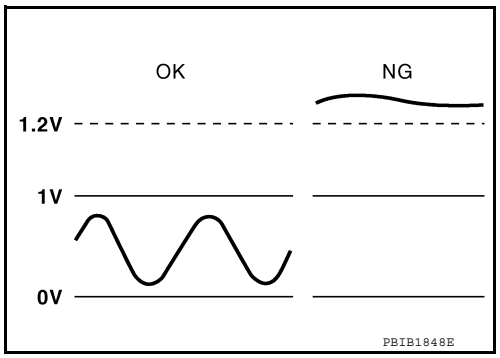
INFOID:0000000007224416

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time.

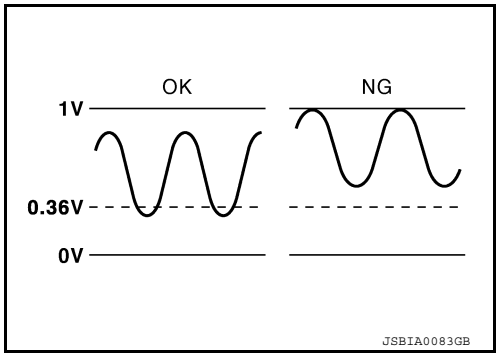
MALFUNCTION A

To judge 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	DTC detecting condition		Possible cause
P0138	Heated oxygen sensor 2 circuit high voltage	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING OF DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to 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 2 minutes.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-169, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> Without CONSULT: GO TO 5.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

NOTE:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Turn ignition switch ON and select “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Make sure that “COOLAN TEMP/S” indication is 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).
7. Open engine hood.
8. Select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.
9. Follow the instruction of CONSULT.
   NOTE:
   It will take at most 10 minutes until “COMPLETED” is displayed.
10. Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT

OK >> INSPECTION END
NG >> Proceed to EC-169, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to EC-168, "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-169, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224417

1. PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Check the voltage between ECM harness connector terminals under the following condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2 signal)	59	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

2.PERFORM COMPONENT FUNCTION CHECK-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2 signal)	59	Keeping engine at idle for 10 minutes	The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2 signal)	59	Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T)	The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-169, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224418

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-167, "DTC Logic".

Which malfunction is detected?

A >> GO TO 2.
B >> GO TO 9.

2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace ground connection.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	1	F16	59	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	4	F16	50	Existed

2. Check the continuity between HO2S2 harness connector and ground or ECM harness connector and ground.

HO2S2		Ground	Continuity
Connector	Terminal		
F31	4	Ground	Not existed

ECM		Ground	Continuity
Connector	Terminal		
F16	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace harness or connectors.

6.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-172, "Component Inspection".

Is the inspection result normal?

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

7.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

9. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace ground connection.

10. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172. Refer to EC-185, "DTC Logic".
NO >> GO TO 11.

11. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	1	F16	59	Existed

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

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	4	F16	50	Existed

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

HO2S2		Ground	Continuity
Connector	Terminal		
F31	4	Ground	Not existed

ECM		Ground	Continuity
Connector	Terminal		
F16	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-172, "Component Inspection".

Is the inspection result normal?

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

14. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

15. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224419

1. INSPECTION START

Do you have CONSULT?

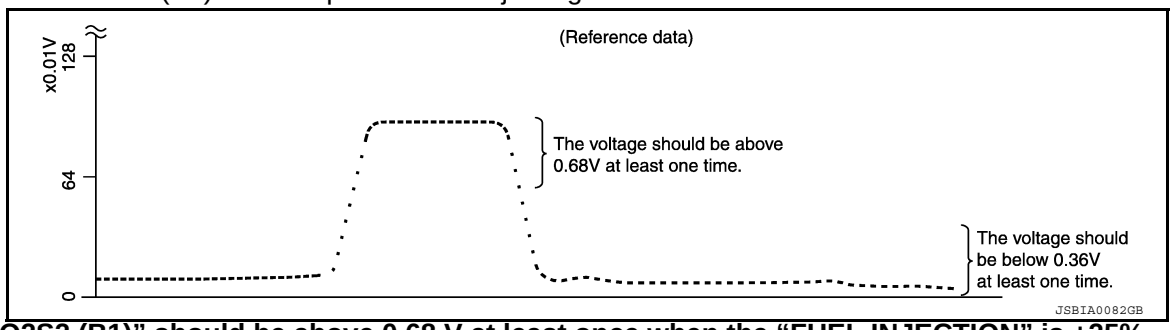
Do you have CONSULT?

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

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select “ENGINE” using CONSULT.
2. Select “DATA MONITOR” mode.
3. Start engine and warm it up to the normal operating temperature.
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 “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT.
8. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.36 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 condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4. CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

5. CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

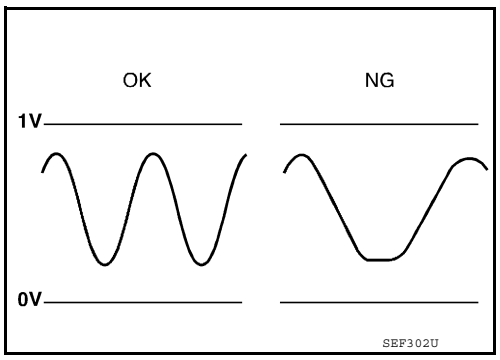
P0139 HO2S2

DTC Logic

INFOID:0000000007224420

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 the various driving condition such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 6.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition 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. 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 of “ENGINE” using CONSULT.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P0139” in “DTC WORK SUPPORT” mode of “ENGINE” using CONSULT.

11. Start engine and follow the instruction of CONSULT display.
NOTE:
It will take at most 10 minutes until “COMPLETED” is displayed.

Is “COMPLETED” displayed on CONSULT screen?

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

4. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Perform DTC confirmation procedure again.

>> GO TO 3.

5. PERFORM SELF-DIAGNOSIS

With CONSULT
Perform ECM self-diagnosis.

Is DTC “P0139” detected?

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

6. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-176, "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-177, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224421

1. PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and 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 and ground under the following condition.

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F16	50 (HO2S2 signal)	59	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.12 V for 1 second during this procedure.

Is the inspection result normal?

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

2. PERFORM COMPONENT FUNCTION CHECK-II

Check the voltage between ECM harness connector and ground under the following condition.

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F16	50 (HO2S2 signal)	59	Keeping engine speed at idle for 10 minutes	A change of voltage should be more than 0.12 V for 1 second during this procedure.

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

Check the voltage between ECM harness connector and ground under the following condition.

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F16	50 (HO2S2 signal)	59	Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T)	A change of voltage should be more than 0.12 V for 1 second during this procedure.

Is the inspection result normal?

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

Diagnosis Procedure

INFOID:0000000007224422

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-181, "DTC Logic" or EC-185, "DTC Logic".
NO >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S2 harness connector and ECM harness connector.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	1	F16	59	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or 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.

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	4	F16	50	Existed

2. Check the continuity between HO2S2 harness connector or ECM harness connector and ground.

HO2S2		Ground	Continuity
Connector	Terminal		
F31	4	Ground	Not existed

ECM		Ground	Continuity
Connector	Terminal		
F16	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-178, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace heated oxygen sensor 2. Refer to EX-5, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224423

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

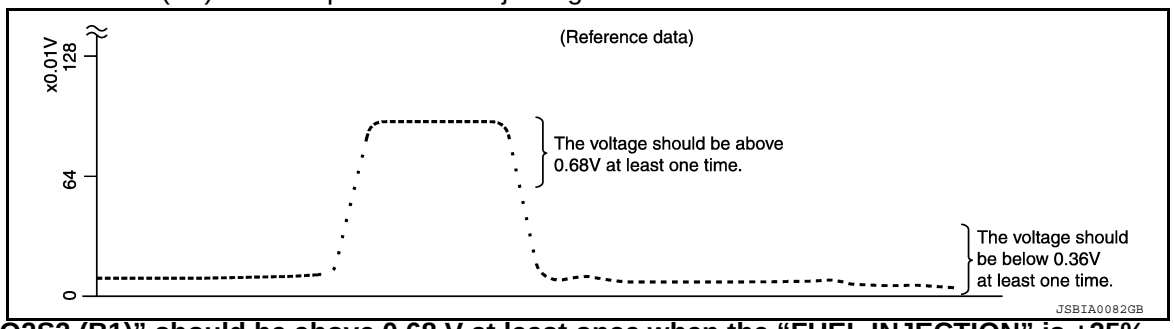
YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select “ENGINE” using CONSULT.
2. Select “DATA MONITOR” mode.
3. Start engine and warm it up to the normal operating temperature.
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 “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT.

8. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.36 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 condition.

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Keeping engine at idle for 10 minutes	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Coasting from 80 km/h (50 MPH) in D position (CVT), 4th gear position (M/T)	The voltage should be above 0.68 V at least once during this procedure. The voltage should be below 0.36 V at least once during this procedure.

Is the inspection result normal?

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

6. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EX-5, "Exploded View".

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner (commercial service tool) and approved anti-seize lubricant (commercial service tool).**

>> INSPECTION END

P0171 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000007224424

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 the 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 lights up the MI (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171	Fuel injection system too lean	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leaks • A/F sensor 1 • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-92, "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 may not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-182, "Diagnosis Procedure".
NO >> Check exhaust and intake air leak visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Start engine and let it idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-182, "Diagnosis Procedure".

NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.
   Hold the accelerator pedal as steady as possible.
   The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data ± 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
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).

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

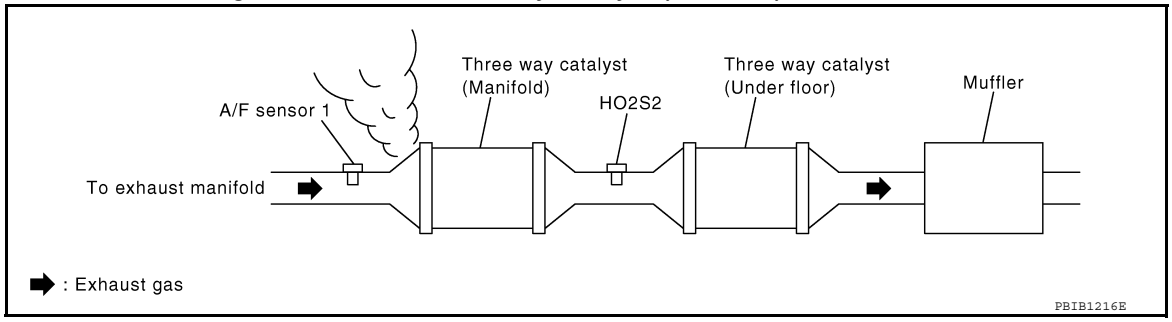
YES >> Go to EC-182, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224425

1.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

Intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

5. Check the continuity between A/F sensor 1 harness connector or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

6. Also check harness for short to 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. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-97, "Work Procedure".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-97, "Work Procedure".

At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

Is the inspection result normal?

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

5. CHECK FUEL HOSES AND FUEL TUBES

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, "Exploded View".
NO >> Repair or replace

6. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Check “MASS AIRFLOW” in “DATA MONITOR” mode with CONSULT.

0.8 - 4.0 g/s : at idling
2.0 - 10.0 g/s : at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in Service $01 with GST.

0.8 - 4.0 g/s : at idling
2.0 - 10.0 g/s : at 2,500 rpm

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-134, "DTC Logic".

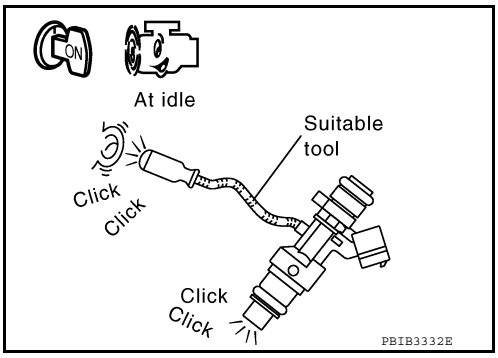
7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Let engine idle.
2. Listen to each fuel injector operating sound.



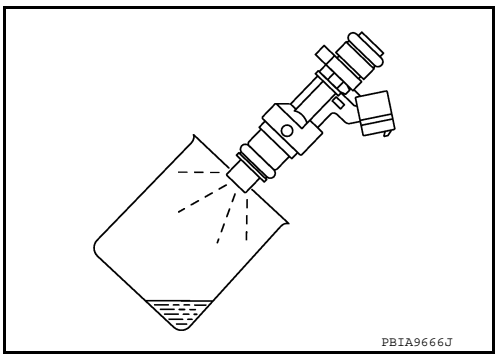
Clicking noise should be heard.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR. Refer to EC-288, "Component Function Check".

8. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Remove fuel tube assembly. Refer to XX-XX, "*****".
   Keep fuel hose and all fuel injectors connected to fuel tube.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each fuel injector.
7. Crank engine for about 3 seconds.



Fuel should be sprayed evenly for each fuel injector.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones. Refer to XX-XX, "*****".

9. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

P0172 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000007224426

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 the 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 lights up the MI (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172	Fuel injection system too rich	• 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 leaks • Incorrect fuel pressure • Mass air flow sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-92, "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 may not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-186, "Diagnosis Procedure".
NO >> Remove spark plugs and check for fouling, etc.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Start engine and let it idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-186, "Diagnosis Procedure".
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and drive the vehicle under the similar conditions to (1st trip) Freeze Frame Data for 10 minutes. Refer to the table below.
   Hold the accelerator pedal as steady as possible.
   The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data ± 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
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).

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

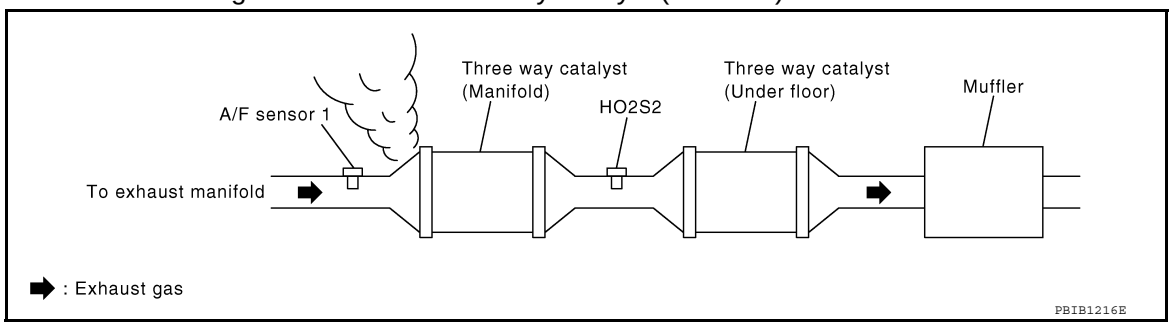
YES >> Go to EC-186, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224427

1.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

5. Check the continuity between A/F sensor 1 harness connector or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

6. Also check harness for short to 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. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-97, "Work Procedure".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-97, "Work Procedure".

At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

Is the inspection result normal?

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

5. CHECK FUEL HOSES AND FUEL TUBES

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, "Exploded View".
NO >> Repair or replace

6. CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Check “MASS AIRFLOW” in “DATA MONITOR” mode with CONSULT.

0.8 - 4.0 g/s : at idling
2.0 - 10.0 g/s : at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in “Service $01” with GST.

0.8 - 4.0 g/s : at idling
2.0 - 10.0 g/s : at 2,500 rpm

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-134, "DTC Logic".

7. CHECK FUNCTION OF FUEL INJECTOR

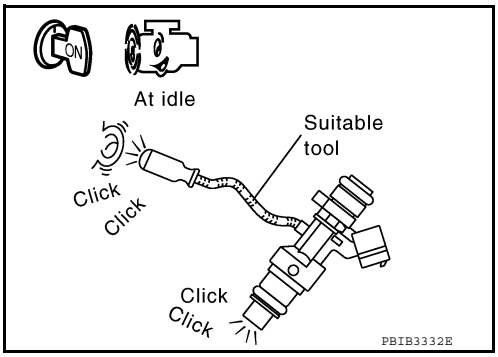
With CONSULT

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Let engine idle.
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.



Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR. Refer to EC-288, "Component Function Check".

8. CHECK FUEL INJECTOR

1. Remove fuel injector assembly. Refer to XX-XX, "*****".
   Keep fuel hose and all fuel injectors connected to fuel tube.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Disconnect all ignition coil harness connectors.
5. Prepare pans or saucers under each fuel injectors.
6. Crank engine for about 3 seconds.
   Make sure fuel does not drip from fuel injector.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one. Refer to XX-XX, "*****".

9. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

P0197, P0198 EOT SENSOR

DTC Logic

INFOID:0000000007224428

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 engine oil temperature sensor is sent to ECM.	• Harness or connectors (EOT 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 engine oil temperature sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Proceed to EC-189, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224429

1.CHECK ENGINE OIL TEMPERATURE SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect engine oil temperature (EOT) sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EOT sensor harness connector and ground.

EOT sensor		Ground	Voltage (Approx.)
Connector	Terminal		
F48	1	Ground	5 V

Is the inspection result normal?

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

2.CHECK ENGINE OIL TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

EOT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F48	1	F16	57	Existed

4. Also check harness for short to ground.

Is the inspection result normal?

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

3.CHECK EOT SENSOR GROUND CIRCUIT

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

EOT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F48	2	F16	54	Existed

4. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK ENGINE OIL TEMPERATURE SENSOR

Check the engine oil temperature sensor. Refer to EC-190, "Component Inspection".

Is the inspection result normal?

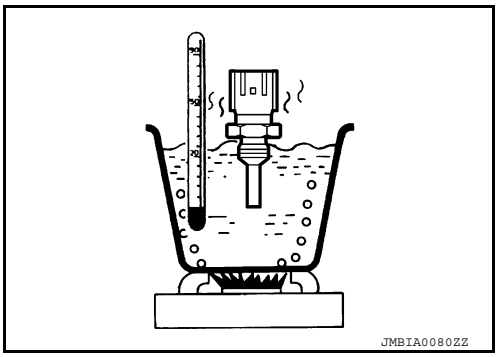
YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace engine oil temperature sensor. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224430

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. Refer to XX-XX, "*****".
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.



Engine oil temperature sensor		Condition		Resistance (kΩ)
+	–			
Terminal				
1	2	Temperature [°C (°F)]	20 (68)	2.1 - 2.9
			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 XX-XX, "*****".

P0222, P0223 TP SENSOR

DTC Logic

INFOID:0000000007224431

DTC DETECTION LOGIC

NOTE:
If DTC P0222 or P0223 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222	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	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 more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-191, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224432

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR 1 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		
F89	2	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK 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 harness connector and ECM harness connector.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F89	4	F16	36	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 or short to ground or short to power in harness or connectors.

4. CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F89	1	F16	33	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE POSITION SENSOR

Refer to EC-192, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224433

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-89, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever to D (CVT) or 1st (M/T) position.
6. Check the voltage between ECM harness connector and ground.

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
F16	33 (TP sensor 1 signal)	36	Accelerator pedal	Fully released	More than 0.36 V
				Fully depressed	Less than 4.75 V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75 V
				Fully depressed	More than 0.36 V

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 XX-XX, "*****".

>> INSPECTION END

P0300, P0301, P0302, P0303, P0304 MISFIRE

DTC Logic

INFOID:0000000007224434

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MI 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 MI will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MI will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MI will remain on.
   If another misfire condition occurs that can damage the TWC, the MI 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 MI 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 on any one cylinder or on multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300	Multiple cylinder misfire detected	Multiple cylinder misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector circuit is open or shorted • Fuel injector* • Intake air leak • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • A/F sensor 1 • Incorrect PCV hose connection
P0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	

*: DTC is detected even where a malfunction occurs one side of the dual injector.

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart engine and let it idle for about 35 minutes.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-195, "Diagnosis Procedure".

NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and drive the vehicle under the 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.
   The similar conditions to (1st trip) Freeze Frame Data means the vehicle operation 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)
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 time to driving varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 20 minutes
Around 2,000 rpm	Approximately 10 minutes
More than 3,000 rpm	Approximately 7 minutes

3. Check 1st trip DTC.

Is 1st trip DTC detected?

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

Diagnosis Procedure

INFOID:0000000007224435

1. CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

Is intake air leak detected?

YES >> Discover air leak location and repair.
NO >> GO TO 2.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 3.
YES-2 >> Without CONSULT: GO TO 4.
NO >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

With CONSULT

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

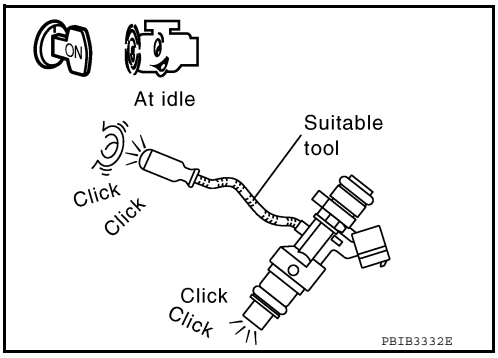
Is the inspection result normal?

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

4. CHECK FUNCTION OF FUEL INJECTOR

1. Start engine and let engine idle.
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.



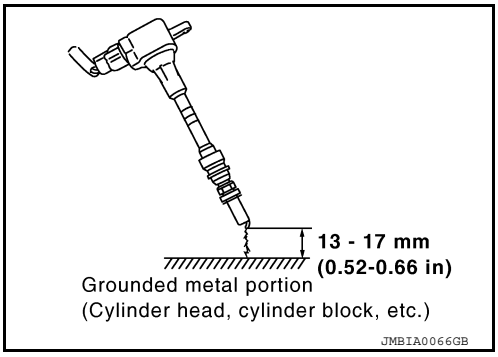
Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble diagnosis for FUEL INJECTOR. Refer to EC-288, "Component Function Check".

5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Do the following procedure in the place where ventilation is good without the combustible.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse 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 two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

NOTE:
When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

6. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

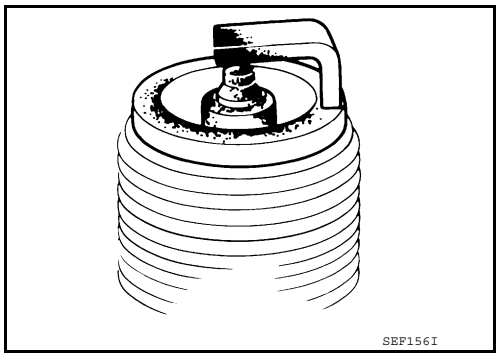
YES >> GO TO 7.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-293, "Component Function Check".

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 XX-XX, "*****".
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 about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to XX-XX, "*****".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to XX-XX, "*****".

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. Release fuel pressure to zero. Refer to EC-97, "Work Procedure".
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-97, "Work Procedure".

At idling: Approximately 350 kPa (3.5 bar, 3.57 kg/cm^2, 51 psi)

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”. Refer to XX-XX, "*****".
NO >> Repair or replace.

12. CHECK IGNITION TIMING

Check the following items.
For procedure, refer to EC-308, "Inspection".
For specification, refer to EC-312, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Follow the EC-93, "Work Procedure".

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

5. Check the continuity between A/F sensor 1 harness connector or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK A/F SENSOR 1 HEATER

Refer to EC-124, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace A/F sensor 1. Refer to XX-XX, "*****".

15. CHECK MASS AIR FLOW SENSOR

With CONSULT

Check “MASS AIRFLOW” in “DATA MONITOR” mode with CONSULT.

0.8 - 4.0 g/s : at idling
2.0 - 10.0 g/s : at 2,500 rpm

With GST

Check mass air flow sensor signal in Service $01 with GST.

0.8 - 4.0 g/s : at idling
2.0 - 10.0 g/s : at 2,500 rpm

Is the measurement value within the specification?

YES >> GO TO 16.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-134, "DTC Logic".

16. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in EC-301, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Repair or replace.

17. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests.

>> GO TO 18.

18. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

P0327, P0328 KS

DTC Logic

INFOID:0000000007224436

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detected condition	Possible cause
P0327	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor
P0328	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> 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-200, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224437

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between knock sensor harness connector and ECM harness connector.

Knock sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F68	2	F16	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 or short to ground 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.

Knock sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F68	1	F16	37	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 or short to ground or short to power in harness or connectors.

4. CHECK KNOCK SENSOR

Refer to EC-201, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace knock sensor. Refer to XX-XX, "*****".

5. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224438

1. CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as follows.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Terminals	Resistance [at 20°C (68°F)]
1 and 2	Approx. 532 - 588 kΩ

CAUTION:
Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace knock sensor. Refer to XX-XX, "*****".

P0335 CKP SENSOR (POS)

DTC Logic

INFOID:0000000007224439

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sensor (POS) circuit	• The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. • The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. • The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	• Harness or connectors [Crankshaft position sensor (POS) circuit is open or shorted.] (Battery current sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Accelerator pedal position sensor 2 circuit is shorted.) • Crankshaft position sensor (POS) • Battery current sensor • Refrigerant pressure sensor • Accelerator pedal position sensor • Signal plate

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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-202, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224440

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

1. Disconnect crankshaft position (CKP) sensor (POS) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CKP sensor (POS) harness connector and ground.

CKP sensor (POS)		Ground	Voltage
Connector	Terminal		
F20	1	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 3.

3. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F20	1	F16	75	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
F16	71	Battery current sensor	F53	1
	75	CKP sensor (POS)	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	Accelerator pedal position sensor 2	E101	5

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-242, "Component Inspection").
- Refrigerant pressure sensor (Refer to EC-299, "Component Function Check").
- Accelerator pedal position sensor (Refer to EC-269, "Component Inspection").

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace refrigerant pressure sensor. Refer to XX-XX, "*****".

6. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F20	2	F16	62	Existed

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

7.CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F20	3	F16	61	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

8.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace crankshaft position sensor (POS). Refer to XX-XX, "*****".

9.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace the signal plate. Refer to XX-XX, "*****".

10.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

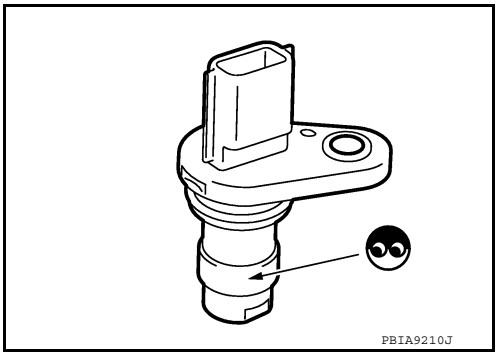
INFOID:0000000007224441

1.CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect crankshaft position sensor (POS) harness connector.
4. Remove the sensor. Refer to XX-XX, "*****".
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor (POS). Refer to XX-XX, "*****".



2.CHECK CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as follows.

Terminals (Polarity)	Resistance [at 25°C (77°F)]

1 (+) - 2 (-)	Except 0 or ∞ Ω
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace crankshaft position sensor (POS). Refer to XX-XX, "*****".

P0340 CMP SENSOR (PHASE)

DTC Logic

INFOID:0000000007224442

DTC DETECTION LOGIC

NOTE:
If DTC P0340 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sensor (PHASE) 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 circuit is open or shorted) • Intake camshaft position sensor • Exhaust camshaft position sensor • Intake camshaft • Exhaust camshaft • Starter motor • Starting system circuit • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. 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-206, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep 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-206, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224443

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.

2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace ground connection.

3.CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between CMP sensor (PHASE) harness connector and ground.

CMP sensor (PHASE)			Ground	Voltage
Camshaft	Connector	Terminal		
Intake	F116	1	Ground	Approx. 5 V
Exhaust	F26	1		

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.CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connectors.
3. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)			ECM		Continuity
Camshaft	Connector	Terminal	Connector	Terminal	
Intake	F116	2	F16	63	Existed
Exhaust	F26	2			

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

5.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)			ECM		Continuity
Camshaft	Connector	Terminal	Connector	Terminal	
Intake	F116	3	F16	65	Existed
Exhaust	F26	3		48	

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

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

6.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-208, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace camshaft position sensor (PHASE). Refer to XX-XX, "*****".

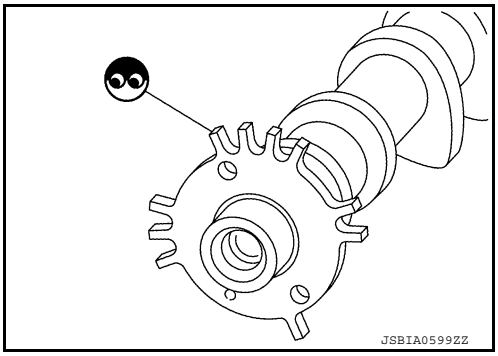
7.CHECK CAMSHAFT (INT)

Check the following.

- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 8.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to XX-XX, "*****".

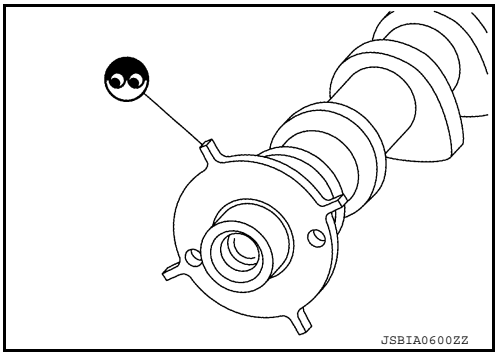


8. CHECK CAMSHAFT (EXH)

Check the following.
- Accumulation of debris to the signal plate of camshaft rear end
- Chipping signal plate of camshaft rear end

Is the inspection result normal?

YES >> GO TO 9.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft. Refer to XX-XX, "*****".



9. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

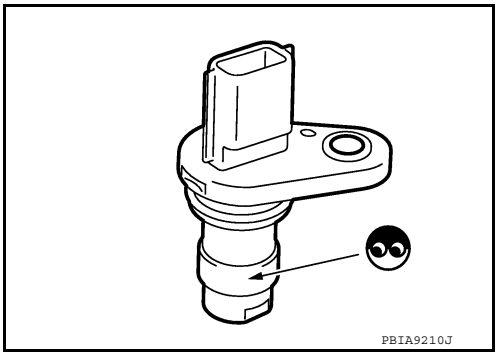
INFOID:0000000007224444

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. Refer to XX-XX, "*****".
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace camshaft position sensor. Refer to XX-XX, "*****".



2. CHECK CAMSHAFT POSITION SENSOR-II

Check resistance camshaft position sensor terminals as follows.

Terminals (Polarity)	Resistance [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞ Ω
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace camshaft position sensor. Refer to XX-XX, "*****".

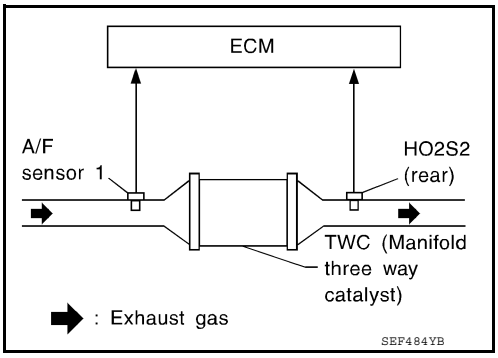
P0420 THREE WAY CATALYST FUNCTION

DTC Logic

INFOID:0000000007224445

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420	Catalyst system efficiency below threshold	• 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 leaks • Fuel injector • Fuel injector leaks • Spark plug • Improper ignition timing

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With 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. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT.
6. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
7. Open engine hood.
8. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT.
9. Rev engine up to 2,000 to 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.

10. Check the indication of “CATALYST”.

Which is displayed on CONSULT screen?

CMPLT >> GO TO 6.
INCMP >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Wait 5 seconds at idle.
2. Rev engine up to 2,000 to 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).

Does the indication change to “CMPLT”?

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

5. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

6. PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-212, "Diagnosis Procedure".
NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-211, "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-212, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224446

1. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart 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 condition.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F16	50 (HO2S2)	59	Keeping engine speed at 2500 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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-212, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224447

1.CHECK EXHAUST SYSTEM

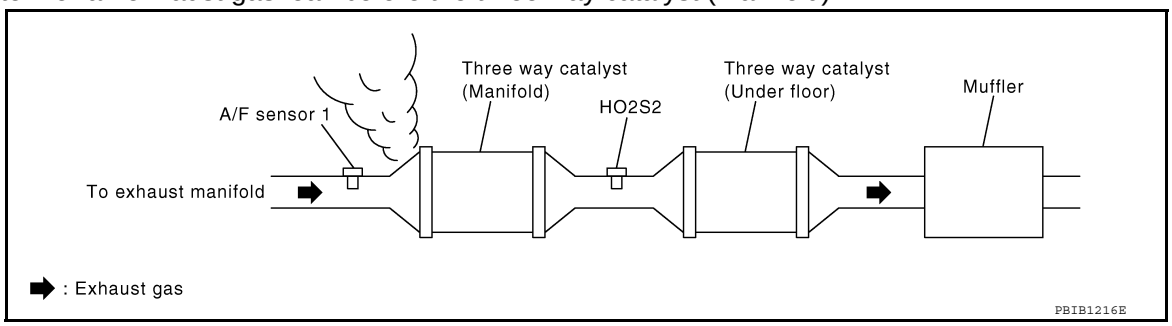
Visually check exhaust tubes and muffler for dent.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace.

2.CHECK EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst (manifold).



Is exhaust gas leak detected?

YES >> Repair or replace.
NO >> GO TO 3.

3.CHECK INTAKE AIR LEAK

Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

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

4.CHECK IGNITION TIMING AND IDLE SPEED

Check the following items. Refer to EC-93, "Work Procedure".
For specification, refer to EC-312, "Ignition Timing"
For specification, refer to EC-312, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-93, "Work Procedure".

5.CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

Cylinder		ECM			Voltage
No.	Front / Rear	Connector	Terminal		
			+	–	
1	Front	F7	31	108	Battery voltage
2			30		
3			29		
4			25		
1	Rear		12		
2			20		
3			16		
4			24		

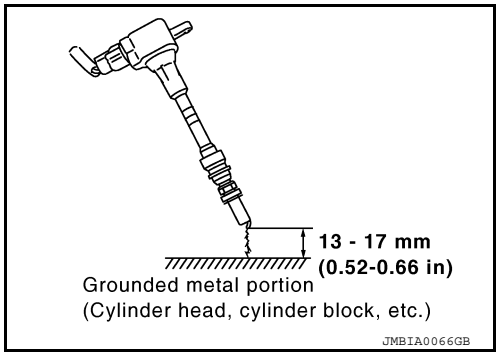
Is the inspection result normal?

YES >> GO TO 6.
NO >> Perform EC-288, "Diagnosis Procedure".

6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Do the following procedure in the place where ventilation is good without the combustible.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse 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 two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

NOTE:
When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a known-good spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

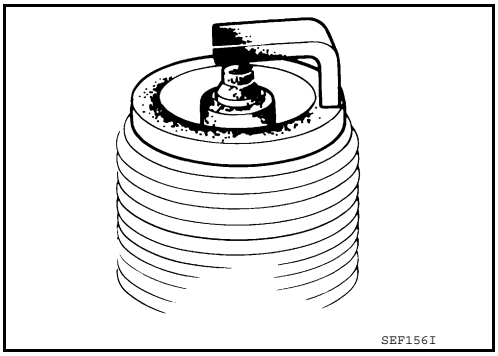
Spark should be generated.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-293, "Diagnosis Procedure".

8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc. Refer to XX-XX, "*****".



Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to XX-XX, "*****".
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 about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to XX-XX, "*****".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to XX-XX, "*****".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.

Does fuel drip from fuel injector?

YES >> GO TO 11.
NO >> Replace the fuel injector(s) from which fuel is dripping. Refer to XX-XX, "*****".

11. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the trouble fixed?

YES >> INSPECTION END
NO >> Replace three way catalyst assembly. Refer to EX-5, "Exploded View".

P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

DTC Logic

INFOID:0000000007224448

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is open or shorted.) • EVAP canister purge volume control solenoid valve

DTC CONFIRMATION PROCEDURE

1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-215, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224449

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		
F32	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 connector E8, F1
- 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 or 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	
F32	2	F7	9	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 or 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-216, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to XX-XX, "*****".

6. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

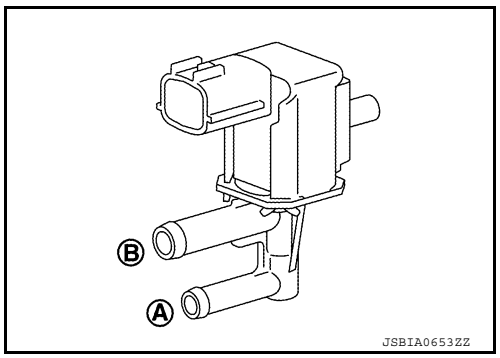
INFOID:0000000007224450

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.

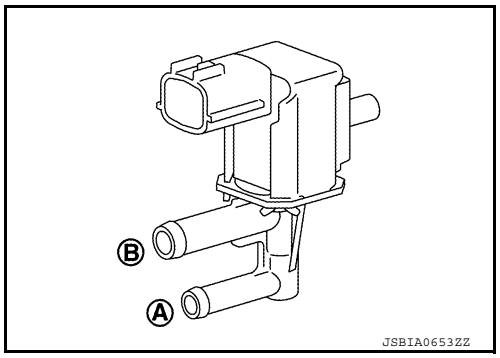
6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



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 XX-XX, "*****".

P0500 VSS

Description

INFOID:0000000007224451

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:0000000007224452

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-229, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) of vehicle speed signal is sent to ECM 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) • Combination meter • ABS actuator and electric unit (control unit)

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 3.

3.CHECK VEHICLE SPEED SENSOR FUNCTION

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.
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 4.
NO >> Go to EC-219, "Diagnosis Procedure".

4.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 60 consecutive seconds.

CAUTION:

Always drive vehicle at a safe speed.

ENG SPEED	1,600 - 6,000 rpm (CVT) 1,900 - 6,000 rpm (M/T)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	6.2 - 31.8 msec (CVT) 4.5 - 31.8 msec (M/T)
Shift lever	Except P or N position (CVT) Except Neutral position (M/T)
PW/ST SIGNAL	OFF

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-219, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-219, "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-219, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224453

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-219, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224454

1.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace.

2.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to XX-XX, "*****" (TYPE A) or XX-XX, "*****" (TYPE B).

>> INSPECTION END

P0520 EOP SENSOR

DTC Logic

INFOID:0000000007224455

DTC DETECTION LOGIC

NOTE:
If DTC P0520 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	Detecting condition	Possible cause
P0520	EOP SENSOR/SWITCH [Engine oil pressure sensor circuit]	ECM detects the following status continuously for 5 seconds or more: • A voltage signal transmitted from the engine oil pressure sensor is lower than 0.3 V. • A voltage signal transmitted from the engine oil pressure sensor is higher than 5.02 V.	• Harness or connectors (Engine oil pressure sensor circuit is open or shorted.) • Engine oil pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.CHECK ENGINE OIL LEVEL

Check engine oil level. Refer to XX-XX, "*****".

Is inspection result normal?

YES >> GO TO 3.
NO >> Check engine oil leak. Refer to XX-XX, "*****".

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-220, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224456

1.CHECK ENGINE OIL PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect engine oil pressure sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between engine oil pressure sensor harness connector terminals.

Engine oil pressure sensor		Ground	Voltage (Approx.)
Connector	Terminal		
F86	1	Ground	5 V

Is inspection result normal?

YES >> GO TO 2
NO >> Repair or replace error-detected parts.

2.CHECK ENGINE OIL PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between engine oil pressure sensor harness connector and ECM harness connector.

Engine oil pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F86	3	F16	60	Existed

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

Is inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK ENGINE OIL PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between engine oil pressure sensor harness connector and ECM harness connector.

Engine oil pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F86	2	F16	47	Existed

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

Is inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK ENGINE OIL PRESSURE SENSOR

Refer to EC-221, "Component Inspection".

Is inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace engine oil pressure sensor. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224457

1.CHECK ENGINE OIL PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine oil pressure sensor harness connector.
3. Check resistance between engine oil pressure sensor connector terminals.

Engine oil pressure sensor		Condition	Resistance (kΩ)
Terminal			
1	2	None	4 – 10
	3		2 – 8
2	1		4 – 10
	3		1 – 3
3	1		2 – 8
	2		1 – 3

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Replace engine oil pressure sensor. Refer to XX-XX, "*****".

P0524 ENGINE OIL PRESSURE

DTC Logic

INFOID:0000000007224458

DTC DETECTION LOGIC

NOTE:
If DTC P0524 is displayed with DTC P0520 or P0075, perform trouble diagnosis for DTC P0520 or P0075 first. Refer to EC-220, "DTC Logic" or EC-129, "DTC Logic".

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	Detecting condition	Possible cause
P0524	ENGINE OIL PRESSURE (Engine oil pressure too low)	An engine oil pressure sensor signal voltage applied to ECM remains lower than the specified value continuously for 10 seconds or more when the engine speed is 1,000 rpm ore more.	• Decrease in engine oil pressure • Decrease in engine oil level • Engine oil condition • Engine oil pressure sensor • Engine body

DTC CONFIRMATION PROCEDURE

CAUTION:
If “Diagnosis Procedure” is unfinished, be sure to perform Step 3 and 4.

1.PRECONDITIONING-I

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 2.

2.PRECONDITIONING-II

Is “Diagnosis Procedure” of DTC P0524 finished?

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

3.CHECK ENGINE OIL LEVEL

Check engine oil level. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Proceed to EC-223, "Diagnosis Procedure"

4.CHECK ENGINE OIL PRESSURE

WITH CONSULT

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Start the engine and check that “EOP SENSOR” changes, according to engine speeds.

Monitor item	Condition		Value (Approx.)
EOP SENSOR	• Engine oil temperature: 80°C (176°F) • Selector lever: P or N position (CVT), Neutral position (M/T) • Air conditioner switch: OFF • No load	Engine speed: 600 rpm	1,053 mV or more
		Engine speed: 2,000 rpm	1,802 mV or more

Without CONSULT

Check engine oil level. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Proceed to EC-223, "Diagnosis Procedure"

5.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Maintain the following conditions for about 10 consecutive seconds.

Selector lever	P or N position (CVT) Neutral position (M/T)
Engine coolant temperature	70°C (158°F) or more
Engine speed	1,000 rpm or more

NOTE:
With engine speed set around 4,000 rpm, the phenomenon can be reproduced more easily.

3. Check DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-223, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224459

1.CHECK ENGINE OIL LEVEL

1. Turn ignition switch OFF.
2. Check engine oil level. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 4.

2.CHECK ENGINE OIL PRESSURE

WITH CONSULT

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Start the engine and check that “EOP SENSOR” changes, according to engine speeds.

Monitor item	Condition		Value (Approx.)
EOP SENSOR	• Engine oil temperature: 80°C (176°F) • Selector lever: P or N position (CVT), Neutral position (M/T) • Air conditioner switch: OFF • No load	Engine speed: 600 rpm	1,053 mV or more
		Engine speed: 2,000 rpm	1,802 mV or more

Without CONSULT

Check engine oil level. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Check oil pressure. Refer to XX-XX, "*****".

3.CHECK ENGINE OIL PRESSURE SENSOR

Check engine oil pressure sensor. Refer to EC-221, "Component Inspection".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace engine oil pressure sensor. Refer to XX-XX, "*****".

4.CHECK ENGINE OIL LEAKAGE

Check engine oil leakage. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

5. CHECK CAUSE OF ENGINE OIL CONSUMPTION

Check the following item.

Step	Inspection item	Equipment	Standard	Reference
1	PCV valve	EC-310, "Inspection"		
2	Exhaust front tube	Visual	• No blocking • No abnormal sounds	—
3	Oil pump	Visual	• No blocking • No damage	—
4	• Piston • Piston pin • Piston ring	• Piston to piston pin oil clearance XX-XX, "*****" • Piston ring side clearance XX-XX, "*****" • Piston ring end gap XX-XX, "*****"		
5	Cylinder block	• Cylinder block top surface distortion XX-XX, "*****" • Piston to cylinder bore clearance XX-XX, "*****"		

>> Repair or replace error-detected parts.

Component Inspection

INFOID:0000000007224460

1. CHECK ENGINE OIL PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine oil pressure sensor harness connector.
3. Check the resistance between engine oil pressure sensor connector terminals.

Engine oil pressure sensor		Resistance (kΩ)
+	–	
Terminal		
1	2	4 – 10
	3	2 – 8
2	1	4 – 10
	3	1 – 3
3	1	2 – 8
	2	1 – 3

Is the inspection result normal?

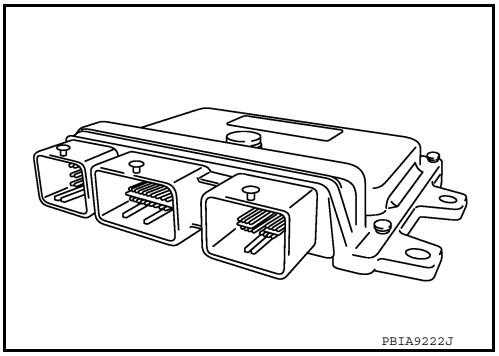
YES >> INSPECTION END
NO >> Replace engine oil pressure sensor. Refer to XX-XX, "*****".

P0603 ECM POWER SUPPLY

Description

INFOID:0000000007224461

ECM has the memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the Idle Air Volume Learning value memory, etc. even when the ignition switch is turned OFF.



DTC Logic

INFOID:0000000007224462

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0603	ECM BACK UP/CIRCUIT (ECM power supply circuit)	ECM back-up RAM system does not function properly.	• Harness or connectors [ECM power supply (back up) circuit is open or shorted.] • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON wait at least 10 seconds.
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-225, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224463

1.INSPECTION START

1. Erase DTC.
2. Perform DTC CONFIRMATION PROCEDURE.
   See EC-225, "DTC Logic".

Is the 1st trip DTC P0603 displayed again?

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

2.REPLACE ECM

1. Replace ECM. Refer to EC-311, "Removal and Installation".

2. Perform EC-87, "Work Procedure".

>> INSPECTION END

P0605 ECM

DTC Logic

INFOID:0000000007224464

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.	

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

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-227, "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 ON.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-227, "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 ON.
3. Repeat step 2 for 32 times.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-227, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224465

1.INSPECTION START

1. Erase DTC.
2. Perform DTC CONFIRMATION PROCEDURE.
   See EC-227, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

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

2.REPLACE ECM

1. Replace ECM. Refer to EC-311, "Removal and Installation".
2. Perform EC-87, "Work Procedure".

>> INSPECTION END

P0607 ECM

DTC Logic

INFOID:0000000007224466

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0607	ECM (CAN communication bus)	When detecting error during the initial diagnosis of CAN controller of ECM.	ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check DTC.

Is DTC detected?

YES >> Proceed to EC-229, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224467

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC confirmation procedure. Refer to EC-229, "DTC Logic".
4. Check DTC.

Is the DTC P0607 displayed again?

YES >> Replace ECM. Refer to EC-311, "Removal and Installation".
NO >> INSPECTION END

P0643 SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000007224468

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0643	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	• Harness or connectors (Accelerator pedal position 1 circuit is shorted.) (Throttle position sensor 1 circuit is shorted.) (Intake camshaft position sensor circuit is shorted.) (Exhaust camshaft position sensor circuit is shorted.) (Engine oil pressure sensor circuit is shorted.) • Accelerator pedal position sensor • Throttle position sensor • Intake camshaft position sensor • Exhaust camshaft position sensor • Engine oil pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-230, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224469

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK SENSOR POWER SUPPLY

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

ECM		Ground	Voltage (Approx.)
Connector	Terminal		
F16	72	Ground	5 V
	74		
	78		
E18	106		

Is the inspection result normal?

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

3.CHECK SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F16	72	Throttle position sensor 1	F89	2
	74	Engine oil pressure sensor	F86	1
	78	Intake camshaft position sensor	F116	1
		Exhaust camshaft position sensor	F26	
E18	106	Accelerator pedal position sensor 1	E101	4

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.
- Throttle position sensor 1 (Refer to EC-192, "Component Inspection".)
- Engine oil pressure sensor (Refer to EC-221, "Component Inspection".)
- Intake camshaft position sensor (Refer to EC-208, "Component Inspection".)
- Exhaust camshaft position sensor (Refer to EC-208, "Component Inspection".)
- Accelerator pedal position sensor 1 (Refer to EC-269, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

P0850 PNP SWITCH

Description

INFOID:0000000007224470

When the selector lever position is P or N (CVT), Neutral position (M/T), park/neutral position (PNP) signal is ON.

DTC Logic

INFOID:0000000007224471

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850	Park/neutral position signal	The park/neutral position (PNP) signal is not changed in the process of engine starting and driving.	• Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] • Transmission range switch (CVT models) • Park/neutral position (PNP) switch (M/T models)

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

>> GO TO 3.

3.CHECK PNP SIGNAL FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT. Then check “P/N POSI SW” signal under the following conditions.

Shift lever position	Known-good signal
N or P position (CVT) Neutral position (M/T)	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-233, "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	1,500 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	4.2 (CVT) or 3.0 (M/T) - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 mph)
Shift lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-233, "Diagnosis Procedure".
NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-233, "Component Function Check".

NOTE:
Use component function check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-233, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224472

1. PERFORM COMPONENT FUNCTION CHECK

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

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
F16	69 (PNP signal)	108	Shift lever	P or N (CVT) Neutral (M/T)	Battery voltage
				Except above	Approx. 0 V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-233, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224473

1. CHECK TRANSMISSION RANGE SWITCH (CVT) OR PARK/NEUTRAL POSITION (PNP) SWITCH (M/T) POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect transmission range switch (CVT) or PNP switch (M/T) harness connector.
3. Turn ignition switch ON.
4. Check the voltage between transmission range switch (CVT) or PNP switch (M/T) harness connector and ground.

Transmission range switch (CVT) / PNP switch (M/T)		Ground	Voltage
Connector	Terminal		
F51 (CVT)	1	Ground	Battery voltage
F22 (M/T)	2		

Is the inspection result normal?

YES >> GO TO 3.

NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E8, F1
- Harness connectors E105, M77 (M/T)
- IPDM E/R harness connector E14 (CVT)
- 10 A fuse (No. 5) (M/T)
- 10 A fuse (No. 52) (CVT)
- Harness for open or short between transmission range switch (CVT) or PNP switch (M/T) and fuse

Is the inspection result normal?

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

3.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between transmission range switch (CVT) or PNP switch (M/T) harness connector and ECM harness connector.

Transmission range switch (CVT) / PNP switch (M/T)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F51 (CVT)	2	F16	69	Existed
F22 (M/T)	3			

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

4.CHECK TRANSMISSION RANGE SWITCH (CVT) OR PNP SWITCH (M/T)

Refer to XX-XX, "*****" (CVT) or XX-XX, "*****" (M/T).

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace transmission range switch (CVT) or PNP switch (M/T). Refer to XX-XX, "*****" (CVT) or XX-XX, "*****" (M/T).

5.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000007224474

DTC DETECTION LOGIC

NOTE:

- **If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-229, "DTC Logic".**

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over temperature (Overheat)	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant was not added to the system using the proper filling method. • Engine coolant is not within the specified range.	• Harness or connectors (The cooling fan circuit is open or shorted.) • IPDM E/R (Cooling fan relay 1, 2) • Cooling fan relay 3 • Cooling fan motor • Radiator hose • Radiator • Radiator cap • Reservoir tank • Water pump • Thermostat

CAUTION:

When a malfunction is indicated, be sure to replace the coolant. Refer to XX-XX, "***". Also, replace the engine oil. Refer to XX-XX, "*****".**

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Be sure to use coolant with the proper mixture ratio. Refer to XX-XX, "*****".**
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-235, "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-236, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224475

1.PERFORM COMPONENT FUNCTION CHECK-I

WARNING:

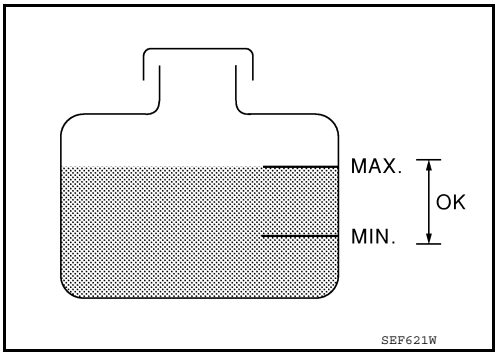
Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

Check the coolant level in the reservoir tank and radiator.
Allow engine to cool before checking coolant level.

Is the coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Go to EC-236, "Diagnosis Procedure".
NO >> GO TO 2



2. PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Go to EC-236, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM COMPONENT FUNCTION CHECK-III

With CONSULT
1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT and touch “LOW” on the CONSULT screen.
3. Make sure that cooling fan operates at low speed.

Without CONSULT
1. Start engine and let it idle.
2. Turn air conditioner switch and blower fan switch ON.
3. Make sure that cooling fan operates at low speed.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-236, "Diagnosis Procedure".

4. PERFORM COMPONENT FUNCTION CHECK-IV

With CONSULT
1. Touch “HI” on the CONSULT screen.
2. Make sure that cooling fan operates at higher speed than low speed.

Without CONSULT
1. Turn ignition switch OFF.
2. Turn air conditioner switch and blower fan switch OFF.
3. Disconnect engine coolant temperature sensor harness connector.
4. Connect 150Ω resistor to engine coolant temperature sensor harness connector.
5. Restart engine and make sure that cooling fan operates at higher speed than low speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-236, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224476

1. CHECK COOLING FAN OPERATION

With CONSULT
1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that cooling fan motor operate at each speed (LOW/HI).

Without CONSULT
1. Perform IPDM E/R auto active test and check cooling fan motor operation. Refer to XX-XX, "*****" (WITH I-KEY) or XX-XX, "*****" (WITHOUT I-KEY).
2. Make sure that cooling fan motor operate at each speed (Low/High).

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-284, "Diagnosis Procedure".

2. CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to XX-XX, "*****".

Is leakage detected?

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

3. CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak.
- Hose (Refer to XX-XX, "*****".)
- Radiator (Refer to XX-XX, "*****".)
- Water pump (Refer to XX-XX, "*****".)

>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace radiator cap. Refer to XX-XX, "*****".

5. CHECK THERMOSTAT

Check thermostat. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat. Refer to XX-XX, "*****".

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-142, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor. Refer to XX-XX, "*****".

7. OVERHEATING CAUSE ANALYSIS

If the cause cannot be isolated, check XX-XX, "*****".

>> INSPECTION END

P1225 TP SENSOR

DTC Logic

INFOID:0000000007224477

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-238, "Diagnosis Procedure".
NO >> INSPECTION END

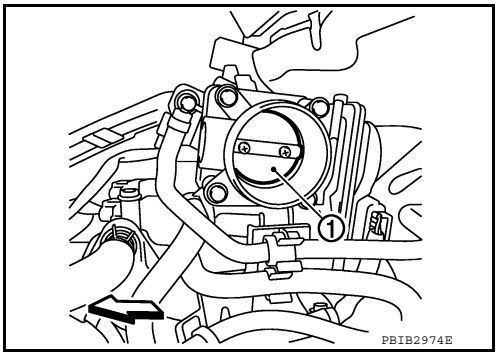
Diagnosis Procedure

INFOID:0000000007224478

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to XX-XX, "*****".
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

- ⇦: Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-89, "Work Procedure".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

P1226 TP SENSOR

DTC Logic

INFOID:0000000007224479

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226	Closed throttle position learning performance	Closed throttle position learning is not performed successfully, repeatedly.	Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-239, "Diagnosis Procedure".
NO >> INSPECTION END

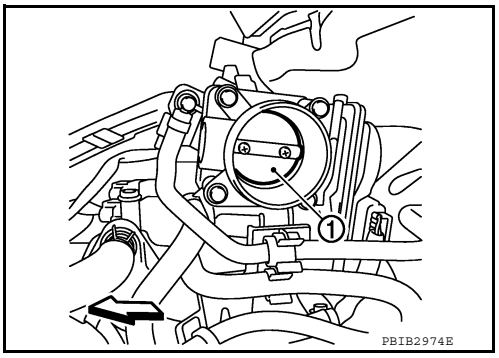
Diagnosis Procedure

INFOID:0000000007224480

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer toXX-XX, "*****".
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

- ⇦: Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-89, "Work Procedure".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

P1550 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000007224481

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.) (Crankshaft position sensor circuit is open or shorted) (Refrigerant pressure sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is open or shorted.) • Battery current sensor • Crankshaft position sensor • Crankshaft • Starter motor • Starting system circuit • Dead (Weak) battery • Refrigerant pressure sensor • Accelerator pedal position sensor 2

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-240, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224482

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect battery current sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (Approx.)
Connector	Terminal		
F53	1	Ground	5 V

Is the inspection result normal?

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

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

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	
F53	1	F16	71	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F16	71	Battery current sensor	F53	1
	75	Crankshaft position sensor	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	Accelerator pedal position sensor 2	E101	5

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-204, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-299, "Diagnosis Procedure".)
- Accelerator pedal position sensor 2 (Refer to EC-279, "Component Inspection".)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace malfunctioning component.

5.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT

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	
F53	3	F16	68	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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F53	4	F16	58	Existed

2. 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 BATTERY CURRENT SENSOR

Check the battery current sensor. Refer to EC-242, "Component Inspection".

Is the inspection result normal?

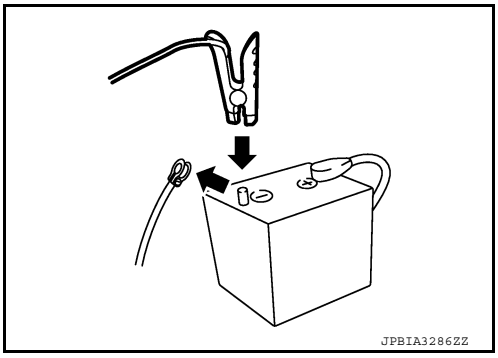
YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224483

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.
4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector and ground.



ECM			Voltage (Approx.)
Connector	+	-	
	Terminal		
F16	58 (Battery current sensor signal)	68	2.5 V

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

P1551, P1552 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000007224484

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.) (Crankshaft position sensor circuit is open or shorted) (Refrigerant pressure sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is open or shorted.) • Battery current sensor • Crankshaft position sensor • Crankshaft • Starter motor • Starting system circuit • Dead (Weak) battery • Refrigerant pressure sensor • Accelerator pedal position sensor 2
P1552	BAT CURRENT SENSOR (Battery current sensor circuit high input)	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V with ignition switch ON

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-243, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224485

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect battery current sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (Approx.)
Connector	Terminal		
F53	1	Ground	5 V

Is the inspection result normal?

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

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

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	
F53	1	F16	71	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F16	71	Battery current sensor	F53	1
	75	Crankshaft position sensor	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	Accelerator pedal position sensor 2	E101	5

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-204, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-299, "Diagnosis Procedure".)
- Accelerator pedal position sensor 2 (Refer to EC-279, "Component Inspection".)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace malfunctioning component.

5.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT

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	
F53	3	F16	68	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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F53	4	F16	58	Existed

2. 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 BATTERY CURRENT SENSOR

Check the battery current sensor. Refer to EC-242, "Component Inspection".

Is the inspection result normal?

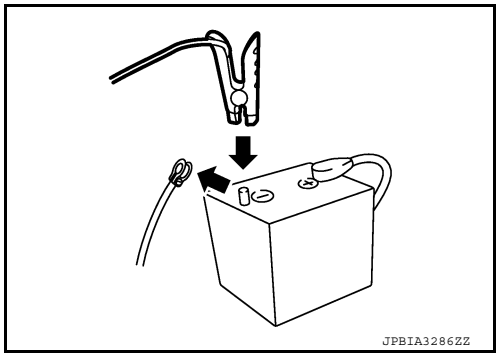
YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224486

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.
4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector and ground.



ECM			Voltage (Approx.)
Connector	+	-	
	Terminal		
F16	58 (Battery current sensor signal)	68	2.5 V

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

P1553 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000007224487

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.) (Crankshaft position sensor circuit is open or shorted) (Refrigerant pressure sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is open or shorted.) • Battery current sensor • Crankshaft position sensor • Crankshaft • Starter motor • Starting system circuit • Dead (Weak) battery • Refrigerant pressure sensor • Accelerator pedal position sensor 2

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-246, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224488

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect battery current sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (Approx.)
Connector	Terminal		
F53	1	Ground	5 V

Is the inspection result normal?

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

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

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	
F53	1	F16	71	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F16	71	Battery current sensor	F53	1
	75	Crankshaft position sensor	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	Accelerator pedal position sensor 2	E101	5

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-204, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-299, "Diagnosis Procedure".)
- Accelerator pedal position sensor 2 (Refer to EC-279, "Component Inspection".)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace malfunctioning component.

5.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT

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	
F53	3	F16	68	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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F53	4	F16	58	Existed

2. 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 BATTERY CURRENT SENSOR

Check the battery current sensor. Refer to EC-242, "Component Inspection".

Is the inspection result normal?

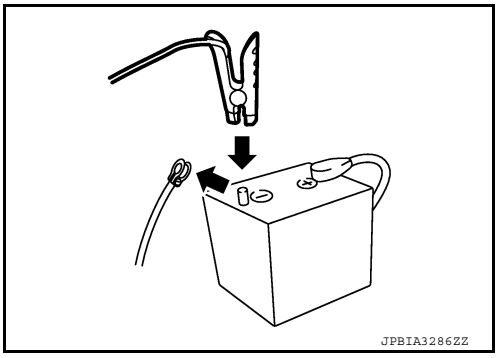
YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224489

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.
4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector and ground.



ECM			Voltage (Approx.)
Connector	+	-	
	Terminal		
F16	58 (Battery current sensor signal)	68	2.5 V

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

P1554 BATTERY CURRENT SENSOR

DTC Logic

INFOID:0000000007224490

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1554	Battery current sensor performance	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	• Harness or connectors (Battery current sensor circuit is open or shorted.) (Crankshaft position sensor circuit is open or shorted) (Refrigerant pressure sensor circuit is open or shorted.) (Accelerator pedal position sensor 2 circuit is open or shorted.) • Battery current sensor • Crankshaft position sensor • Crankshaft • Starter motor • Starting system circuit • Dead (Weak) battery • Refrigerant pressure sensor • Accelerator pedal position sensor 2

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-249, "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-250, "Diagnosis Procedure".

Component Function Check

INFOID:0000000007224491

1.PRECONDITIONING

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 12.8 V at idle.**
- **Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.**

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

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 and ground.

ECM			Voltage
Connector	+	-	
	Terminal	Terminal	
F16	58 (Battery current sensor signal)	68	Above 2.3 V at least once

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-250, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224492

1.CHECK BATTERY CURRENT SENSOR POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect battery current sensor harness connector.
3. Turn ignition switch ON.
4. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (Approx.)
Connector	Terminal		
F53	1	Ground	5 V

Is the inspection result normal?

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

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

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	
F53	1	F16	71	Existed

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit.

3.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness connector for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F16	71	Battery current sensor	F53	1
	75	Crankshaft position sensor	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	Accelerator pedal position sensor 2	E101	5

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK COMPONENTS

Check the following.
- Crankshaft position sensor (Refer to EC-204, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-299, "Diagnosis Procedure".)
- Accelerator pedal position sensor 2 (Refer to EC-279, "Component Inspection".)

Is the inspection result normal?

YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace malfunctioning component.

5.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT

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	
F53	3	F16	68	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 BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F53	4	F16	58	Existed

2. 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 BATTERY CURRENT SENSOR

Check the battery current sensor. Refer to EC-242, "Component Inspection".

Is the inspection result normal?

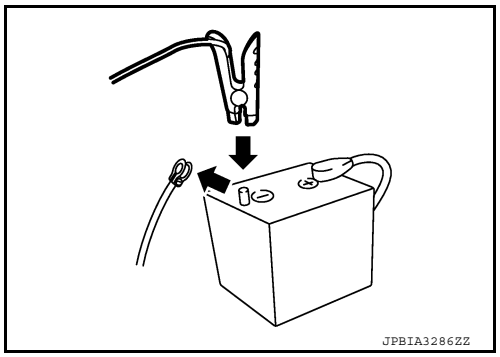
YES >> Check intermittent incident. Refer to XX-XX, "*****".
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

Component Inspection

INFOID:0000000007224493

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable.
4. Install jumper cable between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector and ground.



ECM			Voltage (Approx.)
Connector	+	-	
	Terminal		
F16	58 (Battery current sensor signal)	68	2.5 V

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery current sensor. Refer to XX-XX, "*****".

P1715 INPUT SPEED SENSOR

Description

INFOID:0000000007224494

ECM receives input speed sensor signal from TCM via the CAN communication line. ECM uses this signal for engine control.

DTC Logic

INFOID:0000000007224495

DTC DETECTION LOGIC

NOTE:

- **If DTC P1715 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-202, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to EC-206, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-227, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715	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) • Harness or connectors (Input speed sensor circuit is open or shorted) • TCM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and drive the vehicle at more than 50 km/h (31 MPH) for at least 5 seconds.
   CAUTION:
   Always drive vehicle at a safe speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-252, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224496

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble shooting relevant to DTC indicated.

2.REPLACE TCM

Replace TCM. Refer to XX-XX, "*****".

>> INSPECTION END

P1720 VSS

Description

INFOID:0000000007224497

ECM receives two vehicle speed signals via the CAN communication line. One is sent from “ABS actuator and electric unit (control unit)” via combination meter, and the other is from TCM (Transmission control module). ECM uses these signals for engine control.

DTC Logic

INFOID:0000000007224498

DTC DETECTION LOGIC

NOTE:

- **If DTC P1720 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1720 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-227, "DTC Logic".**
- **If DTC P1720 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-229, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1720	Vehicle speed sensor (TCM output)	The difference between two vehicle speed signals is out of the specified range.	• Harness or connectors (Secondary speed sensor circuit is open or shorted.) (Wheel sensor circuit is open or shorted.) • TCM • Secondary speed sensor • ABS actuator and electric unit (control unit) • Wheel sensor • Combination meter

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Drive vehicle at a speed of 20 km/h (12 MPH) or more for at least 5 seconds without depressing the brake pedal.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-253, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224499

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Check DTC with “ABS actuator and electric unit (control unit)”. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble shooting relevant to DTC indicated.

3. CHECK COMBINATION METER FUNCTION

Check combination meter function. Refer to XX-XX, "*****" (TYPE A) or XX-XX, "*****" (TYPE B).

>> INSPECTION END

P1805 BRAKE SWITCH

DTC Logic

INFOID:0000000007224500

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805	Brake switch	A brake switch signal is not sent to ECM for extremely long time while the vehicle is driving.	• 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 DTC.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-255, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224501

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. 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		
E114 (M/T) E115 (CVT)	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. 38)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or 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 ECM harness connector and stop lamp switch harness connector.

ECM		Stop lamp switch		Continuity
Connector	Terminal	Connector	Terminal	
E18	99	E114 (M/T) E115 (CVT)	2	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 or short to ground or short to power in harness or connectors.

5. CHECK STOP LAMP SWITCH

Refer to EC-256, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace brake pedal assembly. Refer to XX-XX, "*****".

6. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224502

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 XX-XX, "*****".
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 brake pedal assembly. Refer to XX-XX, "*****".

P2100, P2103 THROTTLE CONTROL MOTOR RELAY

DTC Logic

INFOID:0000000007224503

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100	Throttle control motor relay circuit open	ECM detects a 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	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	• Harness or connectors (Throttle control motor relay circuit is shorted) • Throttle control motor relay

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V.

Witch 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-257, "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-257, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224504

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Check voltage between ECM harness connector and ground.

ECM			Voltage
Connector	Terminal		
	+	–	
F7	15	108	Battery voltage

Is the inspection result normal?

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

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector F115.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	15	F115	68	Existed

4. 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.
- IPDM E/R connector F115
- Harness for open or short between IPDM E/R and ECM

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

4.CHECK FUSE

1. Disconnect 20 A fuse (No. 49) from IPDM E/R.
2. Check 20 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace 20 A fuse.

5.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check voltage between ECM harness connector and ground under the following conditions.

ECM			Conditions	Voltage
Connector	Terminal			
	+	–		
F7	2	108	Ignition switch: OFF	Approx. 0 V
			Ignition switch: ON	Battery voltage

Is the inspection result normal?

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

6.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector F115.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	F115	65	Existed

5. 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.
- IPDM E/R connector F115
- Harness for open or short between IPDM E/R and ECM

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

8. CHECK FUSE

1. Disconnect 15 A fuse (No. 47) from IPDM E/R.
2. Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace 15 A fuse.

9. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) or XX-XX, "*****" (Without I–KEY).
NO >> Repair or replace harness or connectors.

P2101 ELECTRIC THROTTLE CONTROL FUNCTION

DTC Logic

INFOID:0000000007224505

DTC DETECTION LOGIC

NOTE:

- **If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to EC-257, "DTC Logic".**
- **If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to EC-266, "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

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-260, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224506

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

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

ECM			Condition	Voltage
Connector	Terminal			
	+	–		
F7	2	108	Ignition switch OFF	Approx. 0 V
			Ignition switch ON	Battery voltage

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 3.

3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Check voltage between ECM harness connector and ground.

ECM			Voltage
Connector	Terminal		
	+	–	
F7	15	108	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector F115.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F115	68	F7	15	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.
- IPDM E/R connector F115
- Harness for open or short between IPDM E/R and ECM

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

6. CHECK FUSE

1. Disconnect 20 A fuse (No. 49) from IPDM E/R.
2. Check 20 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace 20 A fuse.

7. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-III

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector F115.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F115	65	F7	2	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 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R connector F115
- Harness for open or short between IPDM E/R and ECM

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

9. CHECK FUSE

1. Disconnect 15 A fuse (No. 47) from IPDM E/R.
2. Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace 15 A fuse.

10. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) or XX-XX, "*****" (Without I–KEY).
NO >> Repair or replace harness or connectors.

11. 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	
F89	5	F7	1	Not existed
			4	Existed
F89	6	F7	1	Existed
			4	Not existed

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

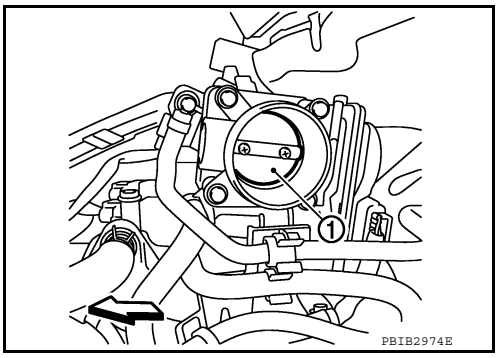
Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace harness or connectors.

12. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct. Refer to XX-XX, "*****"
2. Check if foreign matter is caught between the throttle valve (1) and the housing.

- ⇦: Vehicle front



Is the inspection result normal?

YES >> GO TO 13.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-89, "Work Procedure".

13. CHECK THROTTLE CONTROL MOTOR

Refer to EC-263, "Component Inspection".

Is the inspection result normal?

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

14. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair or replace harness or connectors.

15. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace malfunction electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224507

1. CHECK THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between electric throttle control actuator terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
5 and 6	Approx. 1 - 15 Ω

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 XX-XX, "*****".

>> INSPECTION END

P2118 THROTTLE CONTROL MOTOR

DTC Logic

INFOID:0000000007224508

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2118	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 perform the following before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-264, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224509

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
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	
F89	5	F7	1	Not existed
			4	Existed
F89	6	F7	1	Existed
			4	Not existed

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

Is the inspection result normal?

YES >> GO TO 3.

NO >> Repair or replace harness or connectors.

3.CHECK THROTTLE CONTROL MOTOR

Refer to EC-265, "Component Inspection".

Is the inspection result normal?

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

4.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace harness or connectors.

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224510

1.CHECK THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between electric throttle control actuator terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
5 and 6	Approx. 1 - 15 Ω

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 XX-XX, "*****".

>> INSPECTION END

P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

DTC Logic

INFOID:0000000007224511

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P2119	Electric throttle control actuator	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	Electric throttle control actuator
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Set selector lever to D (CVT) or 1st (M/T) position and wait at least 3 seconds.
3. Set selector lever to P (CVT) or Neutral (M/T) position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Set selector lever to D (CVT) or 1st (M/T) position and wait at least 3 seconds.
7. Set selector lever to P (CVT) or Neutral (M/T) position.
8. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to EC-266, "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. Set selector lever to D (CVT) or 1st (M/T) position and wait at least 3 seconds.
3. Set selector lever to P (CVT) or Neutral (M/T) position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-266, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

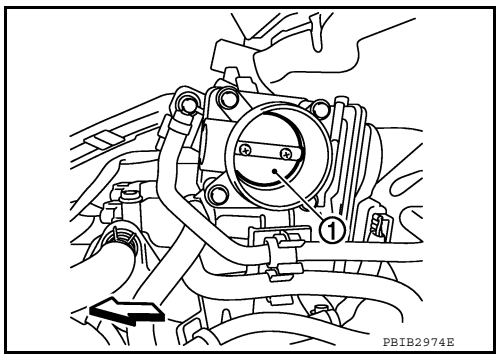
INFOID:0000000007224512

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to XX-XX, "*****".

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

- ⇦: Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-89, "Work Procedure".

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

P2122, P2123 APP SENSOR

DTC Logic

INFOID:0000000007224513

DTC DETECTION LOGIC

NOTE:
If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	• Harness or connectors (APP sensor 1 circuit is open or shorted.) • Accelerator pedal position sensor (APP sensor 1)
P2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-268, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224514

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK APP 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 (Approx.)
Connector	Terminal		
E101	4	Ground	5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK 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	
E101	2	E18	111	Existed

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK APP SENSOR 1 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	
E101	3	E18	110	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK APP SENSOR

Refer to EC-269, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "Exploded View".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224515

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector and ground.

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
E18	110 (APP sensor 1 signal)	111	Accelerator pedal	Fully released	0.6 - 0.9 V
				Fully depressed	3.9 - 4.7 V
	103 (APP sensor 2 signal)	104		Fully released	0.3 - 0.6 V
				Fully depressed	1.95 - 2.4 V

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, "Exploded View".

>> INSPECTION END

P2127, P2128 APP SENSOR

DTC Logic

INFOID:0000000007224516

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127	Accelerator pedal position sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	• Harness or connectors (APP sensor 2 circuit is open or shorted.) (Battery current sensor circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • Battery current sensor • Crankshaft position sensor (POS) • Refrigerant pressure sensor
P2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-271, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224517

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK APP 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
Connector	Terminal		
E101	5	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 3.

3.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	
E101	5	E18	102	Existed

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.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F16	71	Battery current sensor	F53	1
	75	Crankshaft position sensor (POS)	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	APP sensor	E101	5

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-242, "Component Inspection".)
- Crankshaft position sensor (POS) (Refer to EC-204, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-299, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 10.
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	
E101	1	E18	104	Existed

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

7.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	
E101	6	E18	103	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

8.CHECK APP SENSOR

Refer to EC-273, "Component Inspection".

Is the inspection result normal?

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

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "Exploded View".

>> INSPECTION END

10.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224518

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector and ground.

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
E18	110 (APP sensor 1 signal)	111	Accelerator pedal	Fully released	0.6 - 0.9 V
				Fully depressed	3.9 - 4.7 V
	103 (APP sensor 2 signal)	104		Fully released	0.3 - 0.6 V
				Fully depressed	1.95 - 2.4 V

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, "Exploded View".

>> INSPECTION END

P2135 TP SENSOR

DTC Logic

INFOID:0000000007224519

DTC DETECTION LOGIC

NOTE:
If DTC P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135	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 and 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1 and 2)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-274, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224520

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK THROTTLE POSITION SENSOR 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		
F89	2	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK 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 ground.

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F89	4	F16	36	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 or short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Electric throttle control actuator		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F89	1	F16	33	Existed
	3		34	

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-275, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

Replace electric throttle control actuator. Refer to XX-XX, "*****".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224521

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-89, "Work Procedure".
4. Turn ignition switch ON.
5. Set selector lever to D (CVT) or 1st (M/T) position.
6. Check the voltage between ECM harness connector and ground.

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
F16	33 (TP sensor 1 signal)	36	Accelerator pedal	Fully released	More than 0.36 V
				Fully depressed	Less than 4.75 V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75 V
				Fully depressed	More than 0.36 V

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 XX-XX, "*****".

>> INSPECTION END

P2138 APP SENSOR

DTC Logic

INFOID:0000000007224522

DTC DETECTION LOGIC

NOTE:
If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-230, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	• Harness or connector (APP sensor 1 and 2 circuit is open or shorted.) (Battery current sensor circuit is open or shorted.) [Crankshaft position sensor (POS) circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 and 2) • Battery current sensor • Crankshaft position sensor (POS) • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-277, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224523

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK APP 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
Connector	Terminal		
E101	4	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

3.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage
Connector	Terminal		
E101	5	Ground	Approx. 5 V

Is the inspection result normal?

YES >> GO TO 7.
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	
E101	5	E18	102	Existed

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit or short to ground or shot to power in harness or connectors.

5.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F16	71	Battery current sensor	F53	1
	75	Crankshaft position sensor (POS)	F20	1
E18	101	Refrigerant pressure sensor	E49	3
	102	APP sensor	E101	5

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.
- Battery current sensor (Refer to EC-242, "Component Inspection".)
- Crankshaft position sensor (POS) (Refer to EC-204, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-299, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace malfunctioning component.

7.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 as follows.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E101	1	E18	104	Existed
	2		111	

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 or short to ground or shot to power in harness or connectors.

8.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector as follows.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E101	3	E18	110	Existed
	6		103	

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 or short to ground or shot to power in harness or connectors.

9.CHECK APP SENSOR

Refer to EC-279, "Component Inspection".

Is the inspection result normal?

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

10.REPLACE ACCELERATOR PEDAL ASSEMBLY

Replace accelerator pedal assembly. Refer to ACC-3, "Exploded View".

>> INSPECTION END

11.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection

INFOID:0000000007224524

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check the voltage between ECM harness connector and ground.

ECM			Condition		Voltage
Connector	Terminal				
	+	–			
E18	110 (APP sensor 1 signal)	111	Accelerator pedal	Fully released	0.6 - 0.9 V
				Fully depressed	3.9 - 4.7 V
	103 (APP sensor 2 signal)	104		Fully released	0.3 - 0.6 V
				Fully depressed	1.95 - 2.4 V

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, "Exploded View".

>> INSPECTION END

P2A00 A/F SENSOR 1

DTC Logic

INFOID:0000000007224525

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	DTC detecting condition	Possible Cause
P2A00	Air fuel ratio (A/F) sensor 1 (bank 1) circuit range/performance	• The output voltage computed by ECM from the A/F sensor 1 signal shifts to the lean side for a specified period. • The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the rich side for a specified period.	• A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leaks

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Restart engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
4. Let engine idle for 1 minute.
5. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-281, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000007224526

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to XX-XX, "*****".

>> GO TO 3.

3.CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.

NO >> GO TO 4.

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to EC-182, "Diagnosis Procedure" or EC-186, "Diagnosis Procedure".
NO >> GO TO 5.

5. CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Check harness connector for water.

Water should not exit.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace harness connector.

6. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

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

A/F sensor 1		Ground	Voltage
Connector	Terminal		
F49	4	Ground	Battery voltage

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.
- IPDM E/R harness connector F115
- 20A fuse (No. 49)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

A/F sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F49	1	F16	49	Existed
	2		53	

4. Check the continuity between A/F sensor 1 harness connector and ground or ECM harness connector and ground.

A/F sensor 1		Ground	Continuity
Connector	Terminal		
F49	1	Ground	Not existed
	2		

ECM		Ground	Continuity
Connector	Terminal		
F16	49	Ground	Not existed
	53		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to EC-124, "Component Inspection".

Is the inspection result normal?

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

10. CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace.

11. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to XX-XX, "*****".

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) and approved anti-seize lubricant (commercial service tool).**

>> GO TO 12.

12. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-92, "Work Procedure".

>> INSPECTION END

COOLING FAN

Component Function Check

INFOID:0000000007224527

1.CHECK COOLING FAN FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT.
3. Touch “LOW” and “Hi” on the CONSULT screen.
4. Check that cooling fan operates at each speed.

Without CONSULT

1. Perform IPDM E/R auto active test and check cooling fan motor operation. Refer to XX-XX, "*****" (With I-KEY) or XX-XX, "*****" (Without I-KEY).
2. Check that cooling fan operates at each speed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Refer to EC-284, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224528

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK COOLING FAN MOTOR CIRCUIT

1. Disconnect cooling fan motor harness connector.
2. Check the continuity between IPDM E/R harness connector and cooling fan motor harness connector.

IPDM E/R		Cooling fan motor		Continuity
Connector	Terminal	Connector	Terminal	
E11	31	E62	1	Existed
	29		2	

3. Check the continuity between cooling fan motor harness connector and ground.

Cooling fan motor		Ground	Continuity
Connector	Terminal		
E62	4	Ground	Existed

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

YES or NO

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness for open or short between cooling fan motor and IPDM E/R
- Harness for open or short between cooling fan motor and ground

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

4.CHECK COOLING FAN MOTOR RELAY 3

Refer to EC-285, "Component Inspection (Cooling Fan Relay 3)".

YES or NO

YES >> GO TO 5.
NO >> Replace cooling fan motor relay 3.

5.CHECK COOLING FAN MOTOR

Refer to EC-285, "Component Inspection (Cooling Fan Motor)".

YES or NO

YES >> GO TO 6.
NO >> Replace cooling fan motor. Refer to XX-XX, "*****".

6.CHECK INTERMITTENT INCIDENT

Perform XX-XX, "*****".

YES or NO

YES >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) or XX-XX, "*****" (Without I–KEY).
NO >> Repair or replace harness or connector.

Component Inspection (Cooling Fan Motor)

INFOID:0000000007224529

1.CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connector.
3. Supply cooling fan motor terminals with battery voltage and check operation.

Cooling fan motor			Operation
Connector	+	–	
	terminals		
E62	1	4	Cooling fan motor operates
	2	3	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan motor. Refer to XX-XX, "*****".

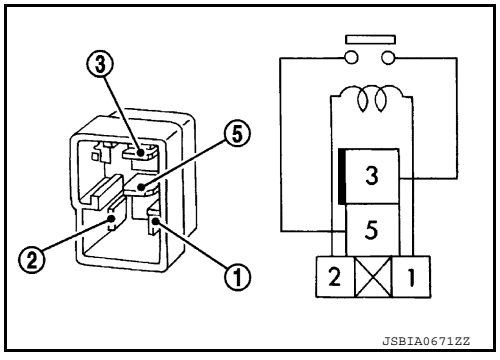
Component Inspection (Cooling Fan Relay 3)

INFOID:0000000007224530

1.CHECK COOLING FAN MOTOR RELAY 3

1. Turn ignition switch OFF.
2. Remove cooling fan motor relay 3.
3. Check continuity between cooling fan motor relay 3 terminals under the following conditions.

Cooling fan motor relay 3 terminals		Conditions	Continuity
3	5	12 V direct current supply between terminals 1 and 2	Existed
		No current supply	Not existed



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan motor relay 3.

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000007224531

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred to ECM through the CAN communication line.

Component Function Check

INFOID:0000000007224532

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-286, "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-286, "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-286, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224533

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to EC-286, "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

Perform trouble diagnosis of rear window defogger system. Refer to XX-XX, "*****".

>> INSPECTION END

3. CHECK HEADLAMP SYSTEM

Perform trouble diagnosis of headlamp system. Refer to XX-XX, "*****".

>> INSPECTION END

4. CHECK AIR CONDITIONING SYSTEM

Perform trouble diagnosis of air conditioning system. Refer to XX-XX, "*****" (AUTOMATIC AIR CONDITIONING), XX-XX, "*****" (MANUAL AIR CONDITIONING).

>> INSPECTION END

FUEL INJECTOR

Component Function Check

INFOID:0000000007224534

1.INSPECTION START

Turn ignition switch to START.

Is any cylinder ignited?

YES >> GO TO 2.
NO >> Go to EC-288, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

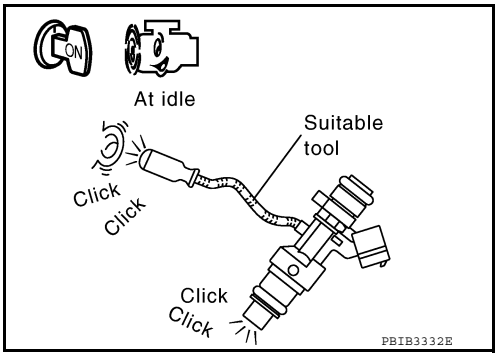
With CONSULT

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Let engine idle.
2. Listen to each fuel injector operating sound.

Clicking noise should be heard.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-288, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224535

1.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel injector harness connector and ground.

Fuel injector				Ground	Voltage
Cylinder	Connector	Front / Rear	Terminal		
1	F37	Front	1	Ground	Battery voltage
	F103	Rear			
2	F38	Front	1		
	F104	Rear			
3	F39	Front	1		
	F105	Rear			
4	F40	Front	1		
	F106	Rear			

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- IPDM E/R connector F115

- 10 A fuse (No. 51)
- Harness for open or short between fuel injector and fuse

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

3. CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between fuel injector harness connector and ECM harness connector.

Fuel injector				ECM		Continuity
Cylinder	Connector	Front / Rear	Terminal	Connector	Terminal	
1	F37	Front	2	F7	31	Existed
	F103	Rear			12	
2	F38	Front	2		30	
	F104	Rear			20	
3	F39	Front	2		29	
	F105	Rear			16	
4	F40	Front	2		25	
	F106	Rear			24	

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

4. CHECK FUEL INJECTOR

Refer to EC-289, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning fuel injector. Refer to XX-XX, "*****"

5. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) or XX-XX, "*****" (Without I–KEY).
NO >> Repair or replace harness or connectors.

Component Inspection

INFOID:0000000007224536

1. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check resistance between fuel injector terminals as follows.

Terminals	Resistance
1 and 2	11.1 - 14.5 Ω [at 10 - 60°C (50 - 140°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector. Refer to XX-XX, "*****".

FUEL PUMP

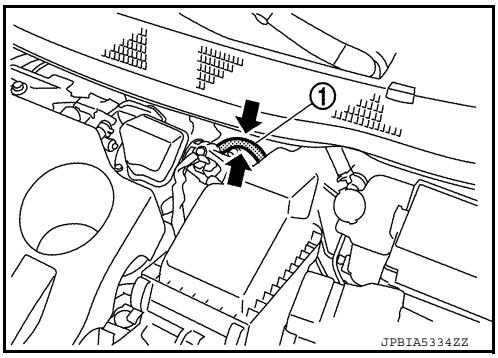
Component Function Check

INFOID:0000000007224537

1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose (1) with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.



Is the inspection result normal?

YES >> INSPECTION END
NO >> EC-290, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224538

1.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ECM harness connector and ground.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F7	23	E18	108	Battery voltage

Is the inspection result normal?

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

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

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

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F113	43	F7	23	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect “fuel level sensor unit and fuel pump” harness connector.
4. Turn ignition switch ON.
5. Check the voltage between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage
Connector	Terminal		
B40	1	Ground	Battery voltage should for exist 1 second after ignition switch is turn ON.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 4.

4. CHECK FUSE

1. Turn ignition switch OFF.
2. Disconnect 15 A fuse (No. 50) from IPDM E/R.
3. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace 15 A fuse.

5. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector.
3. Check the continuity between IPDM E/R harness connector and “fuel level sensor unit and fuel pump” harness connector.

IPDM E/R		Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
E12	33	B40	1	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 FUEL PUMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Continuity
Connector	Terminal		
B40	3	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit or short to power in harness or connectors.

7. CHECK FUEL PUMP

Refer to EC-292, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace “fuel level sensor unit and fuel pump”.Refer to FL-5, "Exploded View".

8. CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to XX-XX, "*****" (With I–KEY) or XX-XX, "*****" (Without I–KEY).
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

Component Inspection

INFOID:0000000007224539

1. CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Check resistance between “fuel level sensor unit and fuel pump” terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
1 and 3	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, "Exploded View".

IGNITION SIGNAL

Component Function Check

INFOID:0000000007224540

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-293, "Diagnosis Procedure".

2.IGNITION SIGNAL FUNCTION

With CONSULT

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

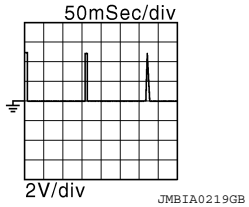
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-293, "Diagnosis Procedure".

3.IGNITION SIGNAL FUNCTION

Without CONSULT

1. Let engine idle.
2. Check the voltage signal between ECM harness connector and ground with an oscilloscope.

ECM			Voltage signal
Connector	Terminal		
	+	–	
F7	17	108	
	18		
	21		
	22		

NOTE:
The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-293, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224541

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
2. Check the voltage between ECM harness connector and ground.

ECM			Voltage
Connector	Terminal		
	+	–	
E18	105	108	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-112, "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		
F13	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 F115.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
F115	70	F13	1	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 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit or 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		
F13	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 ground or short to power in harness or connectors.

6.CHECK CONDENSER

Refer to EC-297, "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	F33	3	Ground	Battery voltage
2	F34	3		
3	F35	3		
4	F36	3		

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK 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	F33	2	Ground	Existed
2	F34	2		
3	F35	2		
4	F36	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit or short to power in harness or connectors.

9. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Ignition coil			ECM		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F33	1	F7	17	Existed
2	F34	1		18	
3	F35	1		22	
4	F36	1		21	

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

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-296, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning ignition coil with power transistor. Refer to XX-XX, "*****".

11. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000007224542

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 follows.

Terminals	Resistance
1 and 2	Except 0 or ∞ Ω [at 25°C (77°F)]
1 and 3	Except 0 Ω [at 25°C (77°F)]
2 and 3	

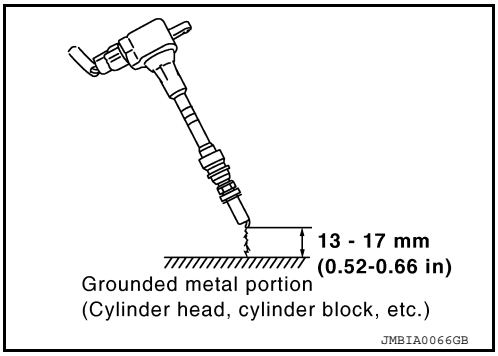
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor. Refer to XX-XX, "*****".

2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:
Do the following procedure in the place where ventilation is good without the combustible.

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:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked.
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **Do not approach to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might cause to damage the ignition coil if the gap of more than 17 mm (0.66 in) is taken.**

NOTE:
When the gap is less than 13 mm (0.52 in), the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor. Refer to XX-XX, "*****".

Component Inspection (Condenser)

INFOID:0000000007224543

1. CHECK CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as follows.

Terminals	Resistance [at 25°C (77°F)]
1 and 2	Above 1 MΩ

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace condenser.

MALFUNCTION INDICATOR

Component Function Check

INFOID:0000000007224544

1.CHECK MI FUNCTION

1. Turn ignition switch ON.
2. Make sure that MI lights up.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-298, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224545

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is DTC detected?

YES >> Perform trouble diagnosis for DTC UXXXX.
NO >> GO TO 2.

2.CHECK COMBINATION METER

Check DTC with combination meter. Refer to XX-XX, "*****" (TYPE A) or XX-XX, "*****" (TYPE B).

Is DTC detected?

YES >> Perform troubleshooting relevant to DTC indicated.
NO >> GO TO 3.

3.CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace combination meter. Refer to XX-XX, "*****" (TYPE A) or XX-XX, "*****" (TYPE B).
NO >> Repair or replace harness or connectors.

REFRIGERANT PRESSURE SENSOR

Component Function Check

INFOID:0000000007224546

1.CHECK REFRIGERANT PRESSURE SENSOR OVERALL 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 and ground.

ECM			Voltage
Connector	Terminal		
	+	–	
E18	101 (Refrigerant pressure sensor signal)	98	1.0 - 4.0V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-299, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000007224547

1.CHECK GROUND CONNECTION

1. Turn A/C switch and blower fan switch OFF.
2. Stop engine.
3. Turn ignition switch OFF.
4. Check ground connection E38. Refer to Ground Inspection in XX-XX, "*****".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pressure sensor		Ground	Voltage
Connector	Terminal		
E49	3	Ground	Approx. 5 V

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 refrigerant pressure sensor

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

4.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	
E49	1	E18	98	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 refrigerant pressure sensor

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

6. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM harness connector and refrigerant pressure sensor harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E49	2	E18	85	Existed

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

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness for open or short between ECM and refrigerant pressure sensor

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

8. CHECK INTERMITTENT INCIDENT

Refer to XX-XX, "*****".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to XX-XX, "*****".
NO >> Repair or replace.

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000007224548

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-290, "Component Function Check"
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-97, "Work Procedure"
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-288, "Component Function Check"
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-33, "EVAPORATIVE EMISSION SYSTEM : System Description"
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-310, "Inspection"
	Incorrect idle speed adjustment						1	1	1	1		1			EC-93, "Work Procedure"
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-260, "DTC Logic" EC-264, "DTC Logic" EC-266, "DTC Logic"
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-308, "Inspection"
	Ignition signal circuit	1	1	2	2	2		2	2			2			EC-293, "Diagnosis Procedure"
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-112, "Diagnosis Procedure"

	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	1		2										EC-134, "DTC Logic"
Engine coolant temperature sensor circuit						3			3					EC-141, "DTC Logic"
Air fuel ratio (A/F) sensor 1 circuit			2	3	2		2	2			2			EC-146, "DTC Logic" EC-150, "DTC Logic" EC-153, "DTC Logic" EC-156, "DTC Logic" EC-281, "DTC Logic"
Throttle position sensor circuit						2			2					EC-143, "DTC Logic" EC-191, "DTC Logic" EC-238, "DTC Logic" EC-239, "DTC Logic" EC-274, "DTC Logic"
Accelerator pedal position sensor circuit			3	2	1									EC-268, "DTC Logic" EC-271, "DTC Logic" EC-277, "DTC Logic"
Knock sensor circuit			2								3			EC-200, "DTC Logic"
Engine oil pressure sensor circuit			4		2						3			EC-220, "DTC Logic"
Crankshaft position sensor circuit	2	2												EC-202, "DTC Logic"
Camshaft position sensor circuit	3	2												EC-206, "DTC Logic"
Vehicle speed signal circuit		2	3		3						3			EC-218, "DTC Logic"

	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	
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-225, "DTC Logic" EC-227, "DTC Logic"
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-116, "DTC Logic"
Exhaust valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-120, "DTC Logic"
PNP signal circuit			3		3		3	3			3			EC-232, "DTC Logic"
Refrigerant pressure sensor circuit		2				3			3		4			EC-299, "Diagnosis Procedure"
Electrical load signal circuit							3							EC-286, "Diagnosis Procedure"
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	XX-XX, "*****" (AUTOMATIC AIR CONDITIONING) XX-XX, "*****" (MANUAL AIR CONDITIONING)
ABS actuator and electric unit (control unit)			4											XX-XX, "*****"

1 - 6: The numbers refer to the order of inspection.

(continued on next table)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FL-12, "Inspection"
	Fuel piping			5	5	5		5	5			5			FL-4, "Inspection"
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—
Air	Air duct	5	5	5	5	5	5	5	5	5		5			XX-XX, "*****"
	Air cleaner														XX-XX, "*****"
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)														XX-XX, "*****"
	Electric throttle control actuator														XX-XX, "*****"
	Air leakage from intake manifold/Collector/Gasket														XX-XX, "*****"
Cranking	Battery	1	1	1		1		1	1			1		1	XX-XX, "*****"
	Generator circuit														XX-XX, "*****"
	Starter circuit	3													XX-XX, "*****"
	Signal plate	6													XX-XX, "*****"
	PNP signal	4													EC-233, "Diagnosis Procedure"
Engine	Cylinder head	5	5	5	5	5		5	5			5			XX-XX, "*****"
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		XX-XX, "*****"
	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			XX-XX, "*****"
	Camshaft														XX-XX, "*****"
	Intake valve timing control														EC-118, "Component Inspection"
	Exhaust valve timing control														EC-122, "Component Inspection"
	Intake valve												3		XX-XX, "*****"
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			XX-XX, "*****" EX-7, "Inspection"
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			XX-XX, "*****" XX-XX, "*****" XX-XX, "*****"
	Oil level (Low)/Filthy oil														XX-XX, "*****"
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			XX-XX, "*****" XX-XX, "*****"
	Thermostat									5					XX-XX, "*****"
	Water pump														XX-XX, "*****"
	Water gallery														XX-XX, "*****"
	Cooling fan									5					XX-XX, "*****"
	Coolant level (Low)/Contaminated coolant														XX-XX, "*****"
NATS (NISSAN Vehicle Immobilizer System)		1	1												XX-XX, "*****"

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

Description

INFOID:0000000007224549

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,400 rpm under no load (for example, the shift lever position is neutral and engine speed is over 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 2,000 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, EC-26, "MULTIPORT FUEL INJECTION SYSTEM : System Description".

PERIODIC MAINTENANCE

IDLE SPEED

Inspection

INFOID:0000000007224550

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.

Without CONSULT
Check idle speed by installing the pulse type tachometer clamp on the loop wire or on suitable high-tension wire which installed between No.1 ignition coil and No.1 spark plug.

>> INSPECTION END

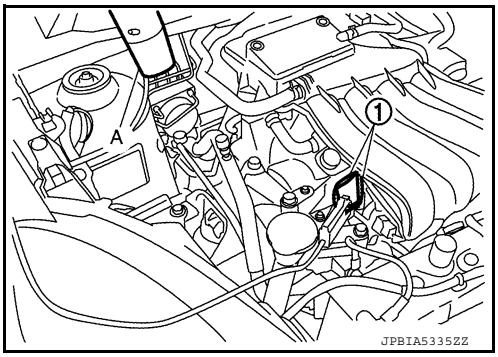
IGNITION TIMING

Inspection

INFOID:0000000007224551

1.CHECK IGNITION TIMING

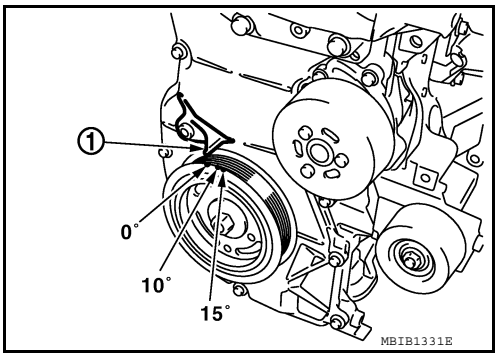
1. Attach timing light (A) to loop wire (1) as shown.



2. Check ignition timing.

1 : Timing indicator

>> INSPECTION END



EVAPORATIVE EMISSION SYSTEM

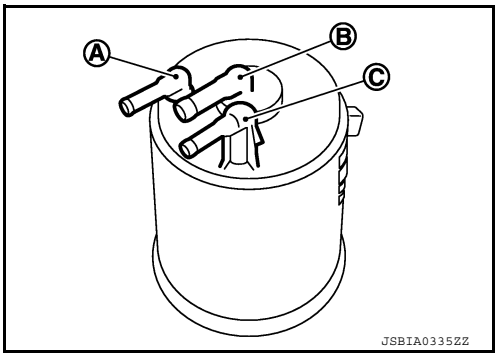
Inspection

INFOID:0000000007224552

1. Visually inspect EVAP vapor lines for improper attachment and for cracks, damage, loose connections, chafing and deterioration.
2. Check EVAP canister as follows:

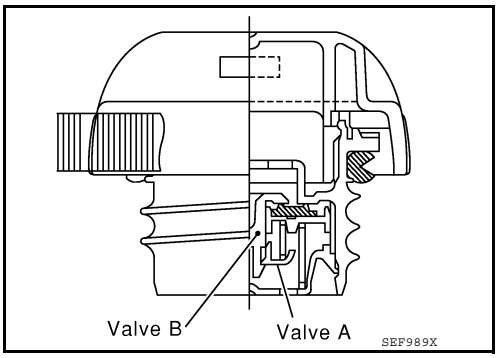
a. Block port (A). Orally blow air through port (B). Check that air flows freely through port (C).

b. Block port (B). Orally blow air through port (A). Check that air flows freely through port (C).



3. Inspect fuel tank filler cap vacuum relief valve for clogging, sticking, etc.

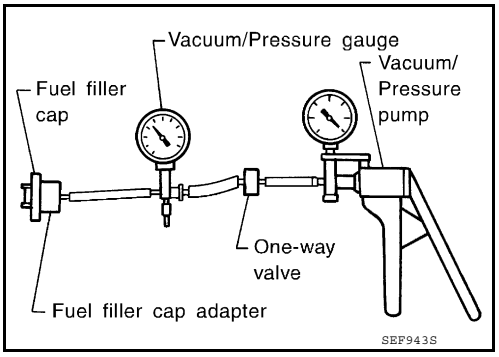
a. Wipe clean valve housing.



b. Check valve opening pressure and vacuum.

Pressure:	15.3 - 20.0 kPa (0.153 - 0.200 bar, 0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)
Vacuum:	–6.0 to –3.4 kPa (–0.06 bar to –-0.034bar, –0.061 to –0.035 kg/cm^2, –0.87 to –0.49 psi)

c. If out of specification, replace fuel filler cap as an assembly.



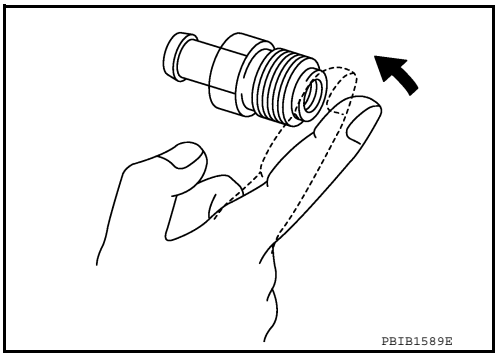
POSITIVE CRANKCASE VENTILATION

Inspection

INFOID:0000000007224553

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?

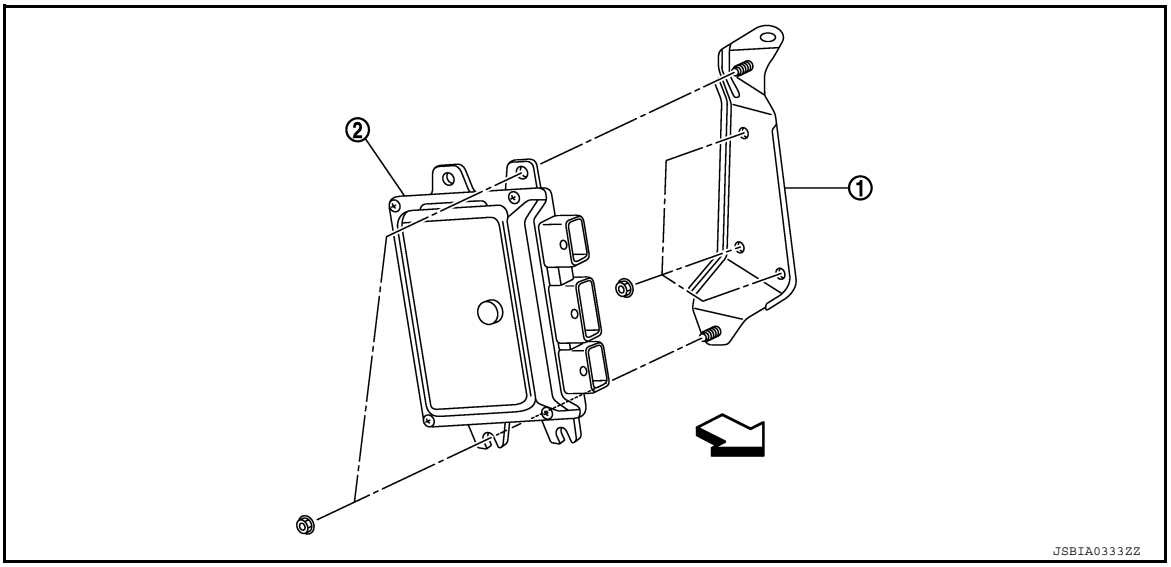
YES >> INSPECTION END
NO >> Replace PCV valve. Refer to XX-XX, "*****".

REMOVAL AND INSTALLATION

ECM

Exploded View

INFOID:0000000007224554



1. ECM bracket
2. ECM

⇦ : Vehicle front

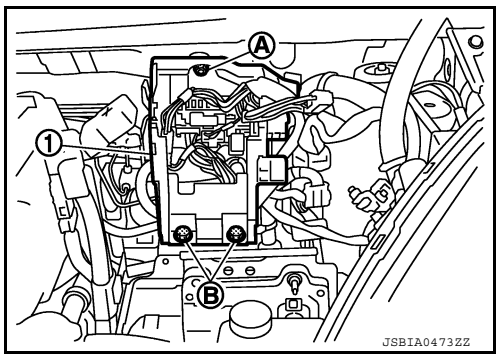
Removal and Installation

INFOID:0000000007224555

REMOVAL

1. Remove battery. Refer to XX-XX, "*****".
2. Remove IPDM E/R. Refer to XX-XX, "*****" (With intelligent key system) or XX-XX, "*****" (Without intelligent key system).
3. Remove IPDM E/R cover (1).

A : mounting nut
B : mounting bolts



4. Disconnect ECM harness connectors.
5. Remove ECM mounting nuts.
6. Remove ECM from ECM bracket.

INSTALLATION

Install in the reverse order of removal.

CAUTION:

Must be perform additional service when replacing ECM. Refer to EC-87, "Work Procedure".

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000007224556

Transmission	Condition	Specification
CVT	No load* (in P or N position)	650 ± 50 rpm
M/T	No load* (in Neutral position)	650 ± 50 rpm

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:0000000007224557

Transmission	Condition	Specification
CVT	No load* (in P or N position)	4 ± 5°BTDC
M/T	No load* (in Neutral position)	10 ± 5°BTDC

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000007224558

Condition	Specification (Using CONSULT or GST)
At idle	10 – 35%
At 2,500 rpm	10 – 35%

Mass Air Flow Sensor

INFOID:0000000007224559

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.7 – 1.3 V*
Mass air flow (Using CONSULT or GST)	0.8 – 4.0 g/s at idle* 2.0 – 10.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.