SECTION ECH

ENGINE CONTROL SYSTEM (HR16DE)

CONTENTS

HR16DE (WITH EURO-OBD)

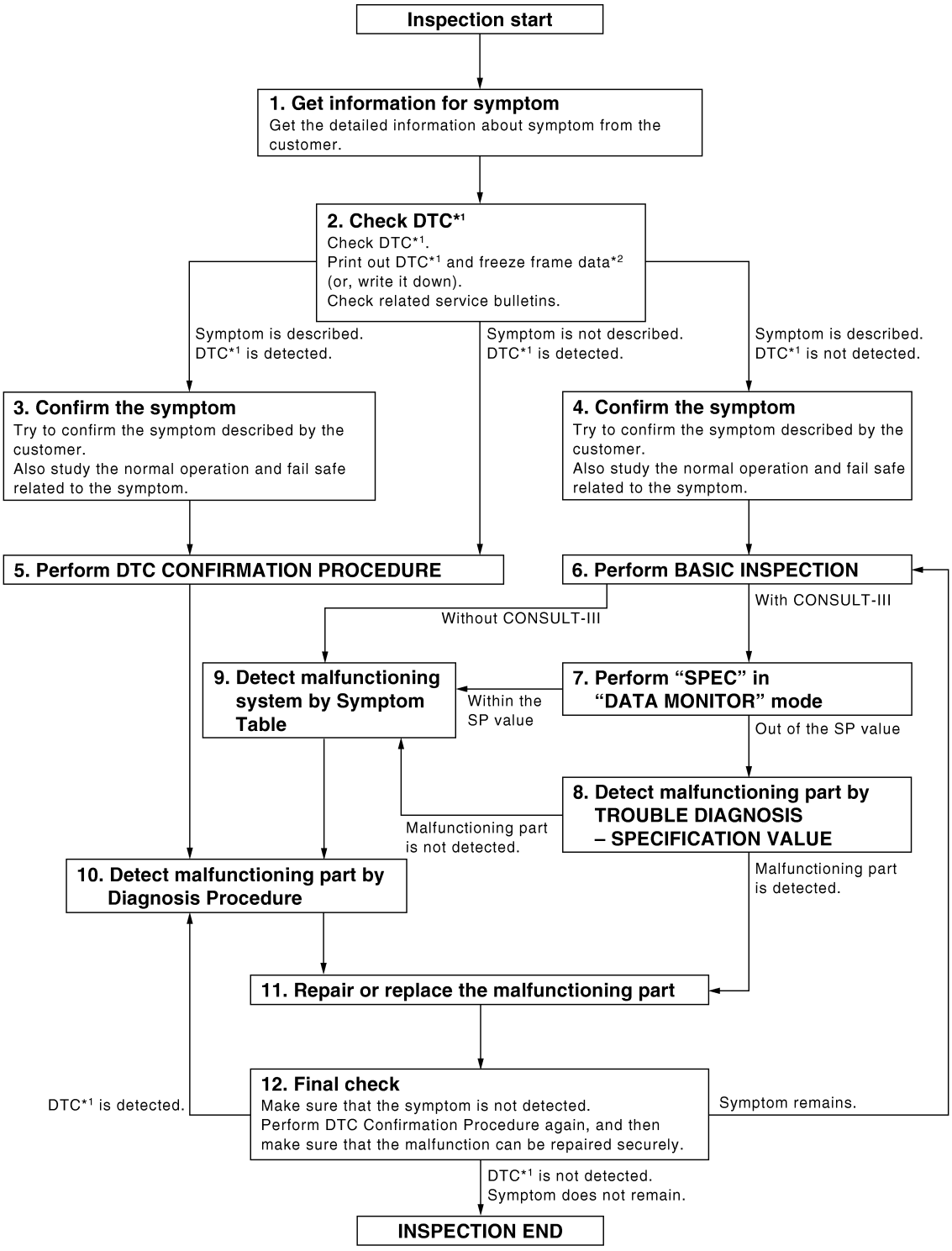
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000001179355

OVERALL SEQUENCE



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

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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 ECH-12, "Diagnostic Work Sheet".)

>> GO TO 2.

2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.

- Record DTC and freeze frame data. (Print them out with CONSULT-III or GST.)
- Erase DTC. (Refer to ECH-76, "Diagnosis Description".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to ECH-334, "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 ECH-338, "Description" and ECH-327, "Fail Safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail safe related to the symptom. Refer to ECH-338, "Description" and ECH-327, "Fail Safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.
If two or more DTCs are detected, refer to ECH-329, "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 ECH-330, "DTC Index".

6.PERFORM BASIC INSPECTION

Perform ECH-14, "BASIC INSPECTION : Special Repair Requirement".

Do you have CONSULT-III?

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

7. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT-III

Make sure that “MAS A/F SE-B1”, “B/FUEL SCHDL” and “A/F ALPHA-B1” are within the SP value using CONSULT-III in “SPEC” of “DATA MONITOR” mode. Refer to ECH-98, "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 ECH-99, "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 ECH-334, "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 Circuit Inspection in GI-41, "Circuit Inspection".

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-III. Refer to ECH-306, "Reference Value".

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it. Refer to ECH-76, "Diagnosis Description".

>> 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. (Refer to ECH-76, "Diagnosis Description".) If the completion of SRT is needed, drive vehicle under the specific DRIVING PATTERN in ECH-331, "How to Set SRT Code".

Diagnostic Work Sheet

INFOID:0000000001179356

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 a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page 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	

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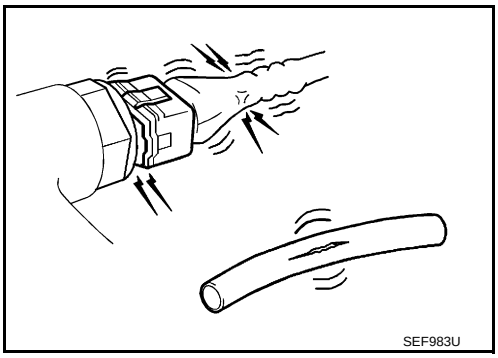
INSPECTION AND ADJUSTMENT
BASIC INSPECTION

BASIC INSPECTION : Special Repair Requirement

INFOID:0000000001179357

1.INSPECTION START

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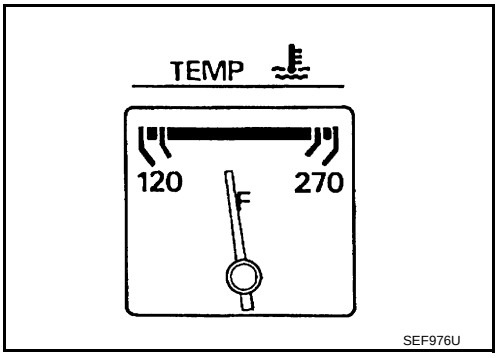

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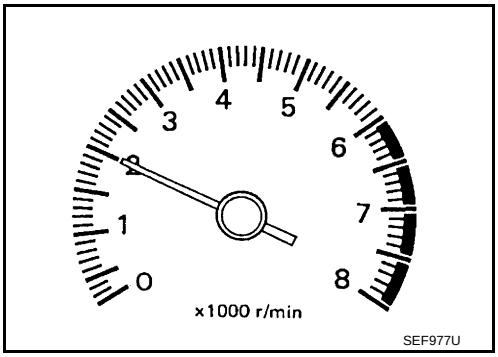
5. Run engine at about 2,000 rpm for about 2 minutes under no load.
6. Make sure that no DTC is displayed with CONSULT-III or GST.

Is any DTC detected?

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



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2.REPAIR OR REPLACE

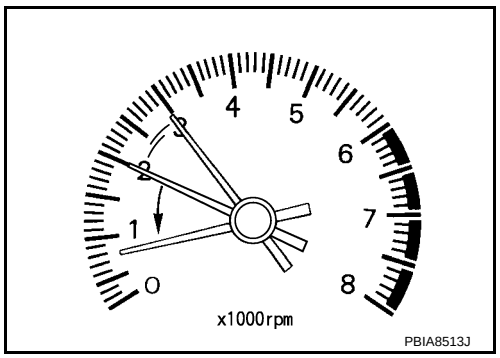
Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> GO TO 3

3.CHECK TARGET IDLE SPEED

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

2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
3. Check idle speed.
   For procedure, refer to ECH-18, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to ECH-348, "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 ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

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 ECH-18, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to ECH-348, "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 ECH-186, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to ECH-182, "DTC Logic".

Is the inspection result normal?

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

9. CHECK ECM FUNCTION

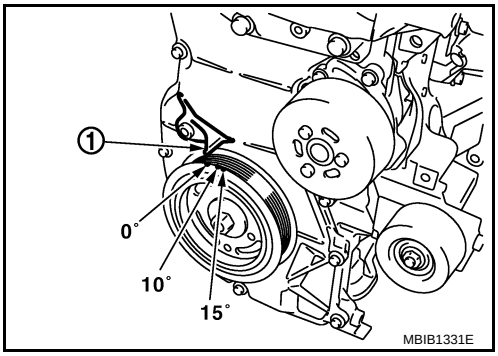
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to SEC-9, "ECM RE-COMMUNICATING FUNCTION : Description".

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.

2. Check ignition timing with a timing light.
   For procedure, refer to ECH-18, "IGNITION TIMING : Special Repair Requirement".
   For specification, refer to ECH-348, "Ignition Timing".



1 : Timing indicator

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 ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

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

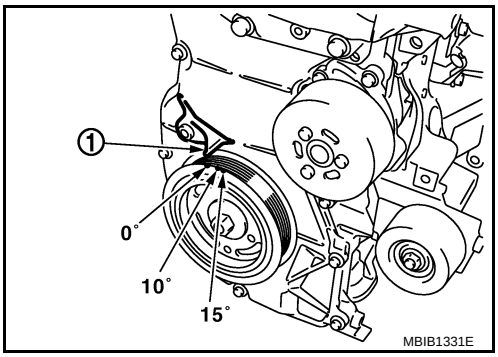
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to ECH-18, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to ECH-348, "Idle Speed".

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 ECH-18, "IGNITION TIMING : Special Repair Requirement".
   For specification, refer to ECH-348, "Ignition Timing".



1 : Timing indicator

Is the inspection result normal?

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

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-47, "Removal and Installation".

Is the inspection result normal?

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

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to ECH-186, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to ECH-182, "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 and registration of all NATS ignition key IDs. Refer to SEC-9, "ECM RE-COMMUNICATING FUNCTION : Description".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:0000000001179358

When replacing ECM, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement

INFOID:0000000001179359

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

Refer to SEC-9, "ECM RE-COMMUNICATING FUNCTION : Description".

>> GO TO 2.

2. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 4.

4. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

IDLE SPEED

IDLE SPEED : Description

INFOID:0000000001179360

This describes how to check the idle speed. For the actual procedure, follow the instructions in “BASIC INSPECTION”.

IDLE SPEED : Special Repair Requirement

INFOID:0000000001179361

1.CHECK IDLE SPEED

With CONSULT-III
Check idle speed in “DATA MONITOR” mode with CONSULT-III.
With GST
Check idle speed with Service $01 of GST.

>> INSPECTION END

IGNITION TIMING

IGNITION TIMING : Description

INFOID:0000000001179362

This describes how to check the ignition timing. For the actual procedure, follow the instructions in “BASIC INSPECTION”.

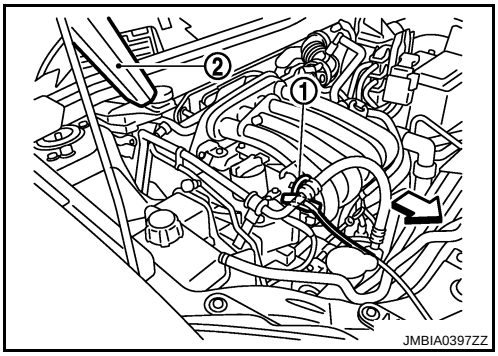
IGNITION TIMING : Special Repair Requirement

INFOID:0000000001179363

1.CHECK IGNITION TIMING

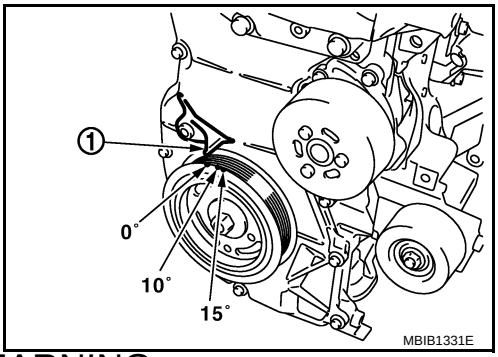
1. Attach timing light to No.1 ignition coil wire harness (1) as shown.

   2 : Timing light
   ⇦ : Vehicle front



2. Check ignition timing.

   1 : Timing indicator



>> INSPECTION END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description

INFOID:0000000001179364

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.

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Re-

quirement

INFOID:0000000001179365

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

THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:0000000001179366

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.

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:0000000001179367

1.START

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

>> END

IDLE AIR VOLUME LEARNING

IDLE AIR VOLUME LEARNING : Description

INFOID:0000000001179368

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.

IDLE AIR VOLUME LEARNING : Special Repair Requirement

INFOID:0000000001179369

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 12.9V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- Park/neutral position switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- Drive vehicle for 10 minutes

Do you have CONSULT-III?

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

2.IDLE AIR VOLUME LEARNING

With CONSULT-III

1. Perform Accelerator Pedal Released Position Learning. Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
3. Start engine and warm it up to normal operating temperature.
4. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
5. Touch “START” and wait 20 seconds.

Is “CMPLT” displayed on CONSULT-III screen?

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

3. IDLE AIR VOLUME LEARNING

Without CONSULT-III

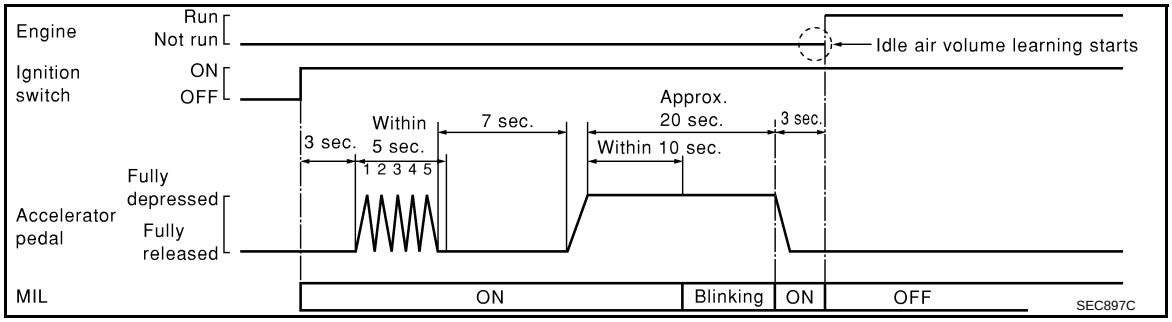
NOTE:

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

1. Perform Accelerator Pedal Released Position Learning. Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
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 ECH-348, "Idle Speed" and ECH-348, "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 ECH-98, "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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:0000000001179370

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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:0000000001179371

1. START

With CONSULT-III

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

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
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.

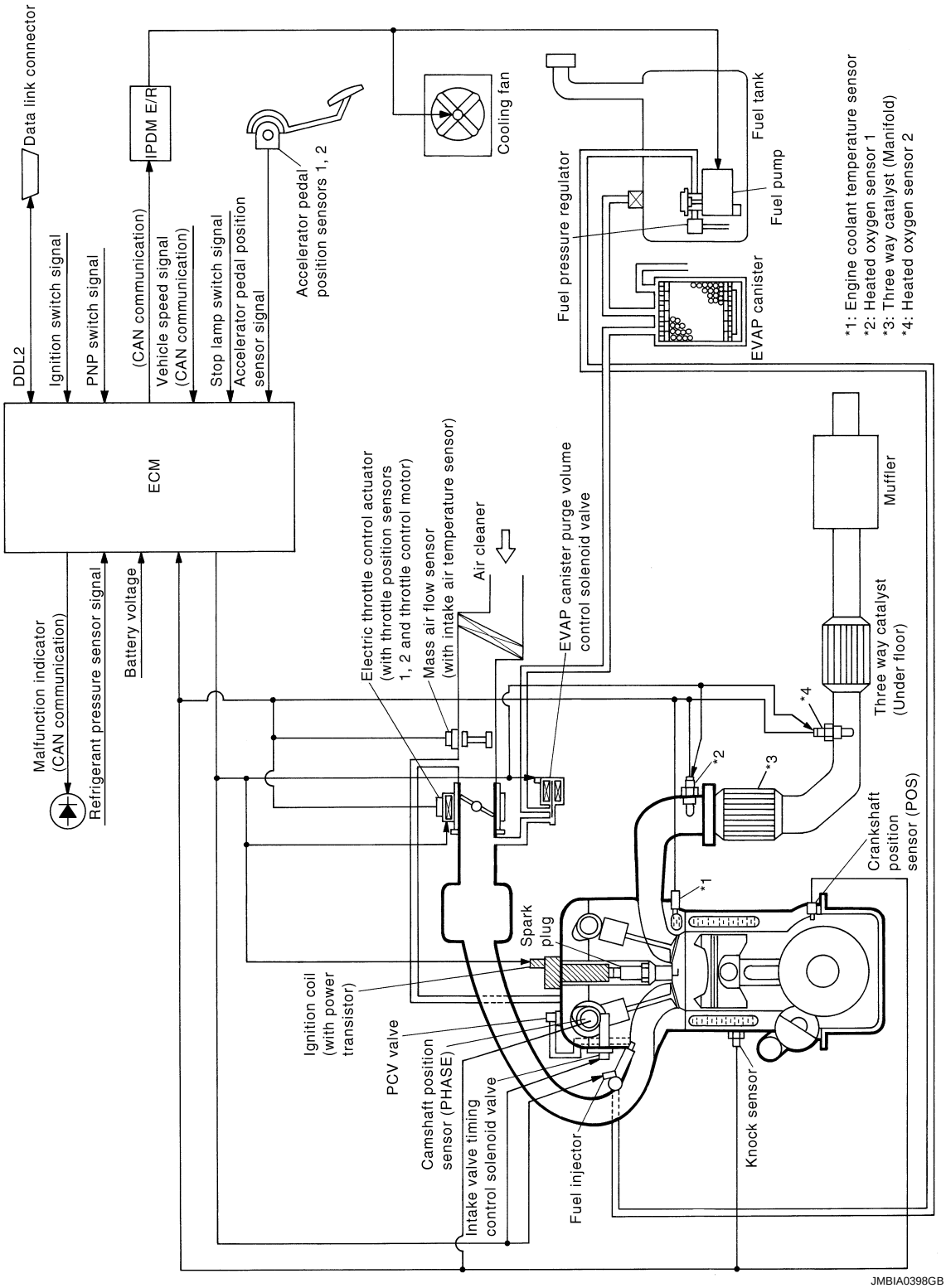
>> END

FUNCTION DIAGNOSIS

ENGINE CONTROL SYSTEM

System Diagram

INFOID:0000000001179372



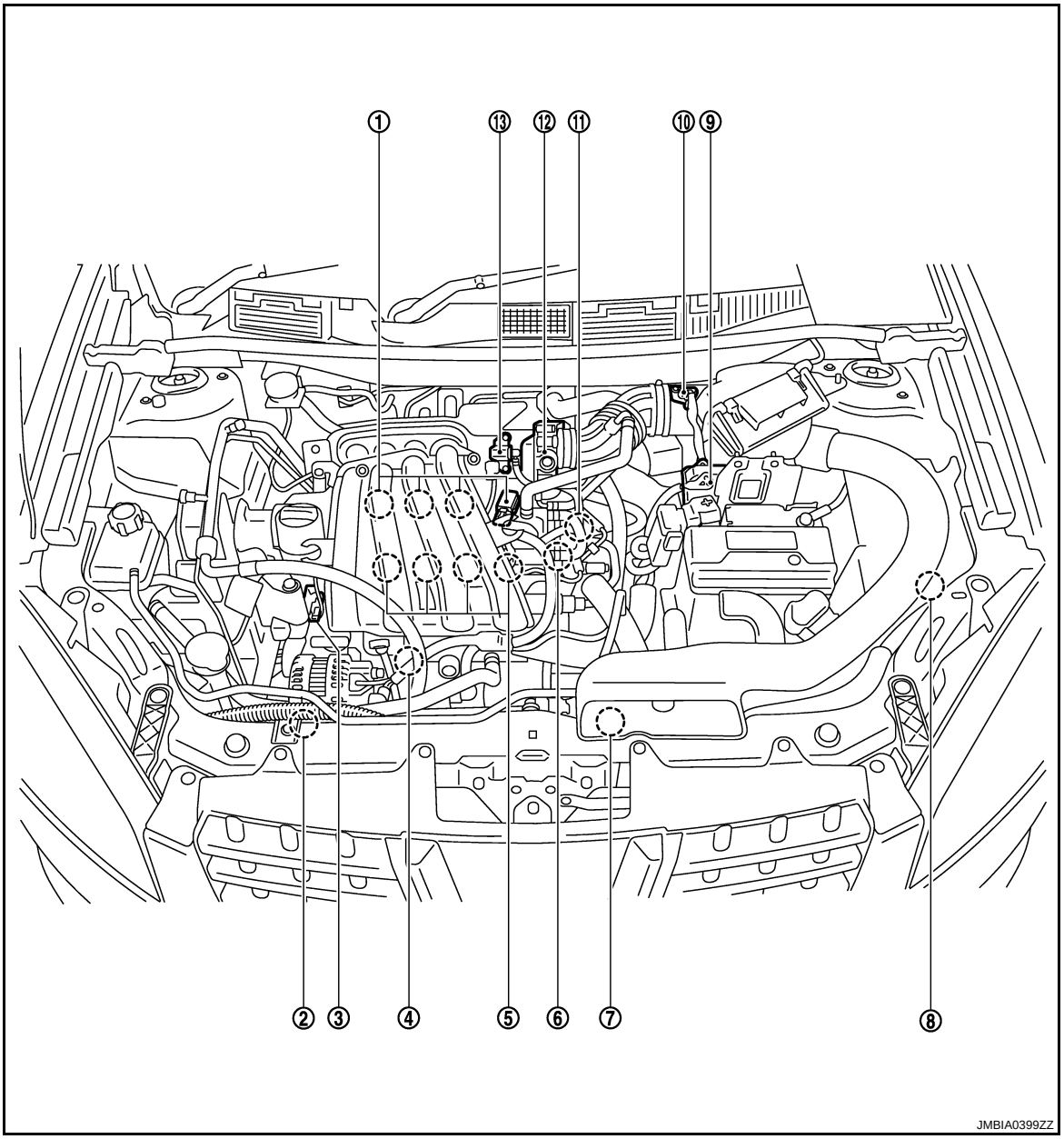
System Description

INFOID:0000000001179373

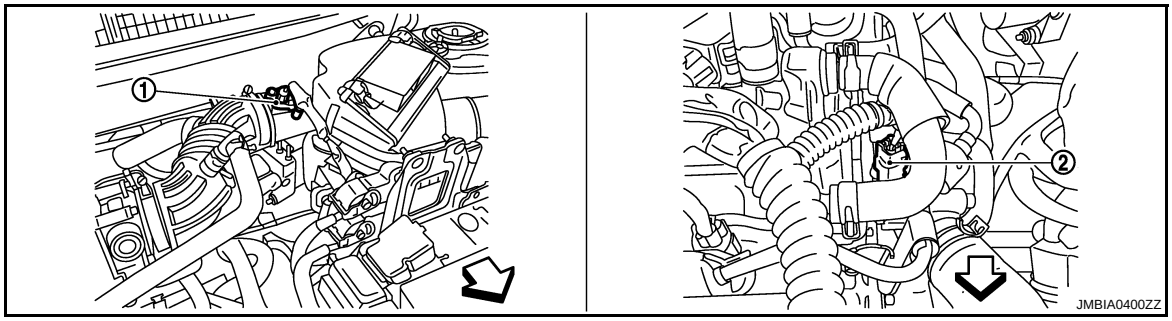
ECM performs various controls such as fuel injection control and ignition timing control.

Component Parts Location

INFOID:0000000001179374

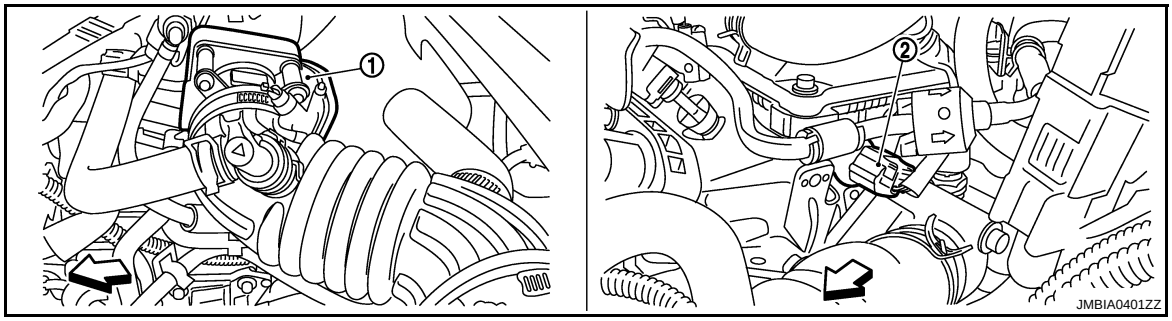


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



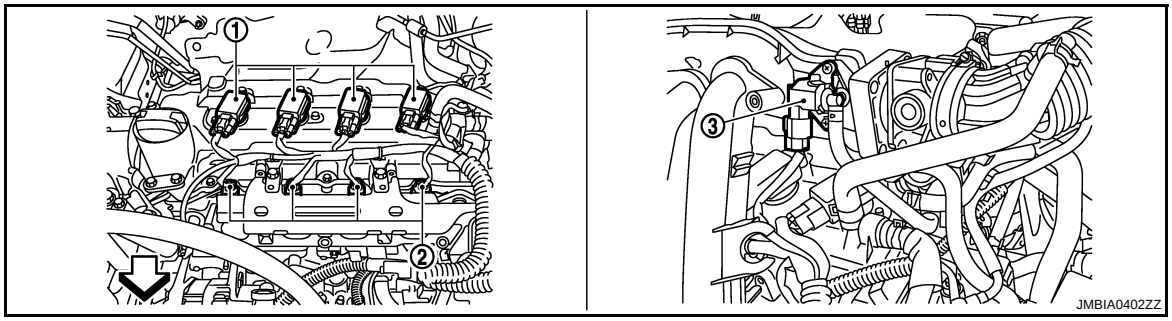
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



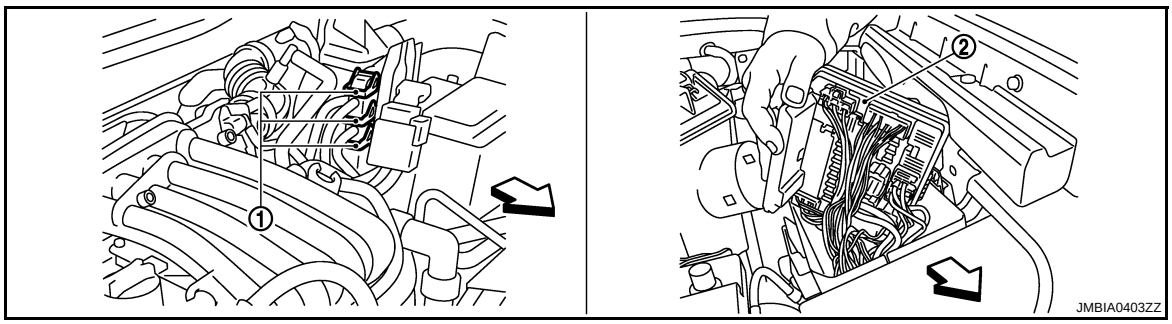
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



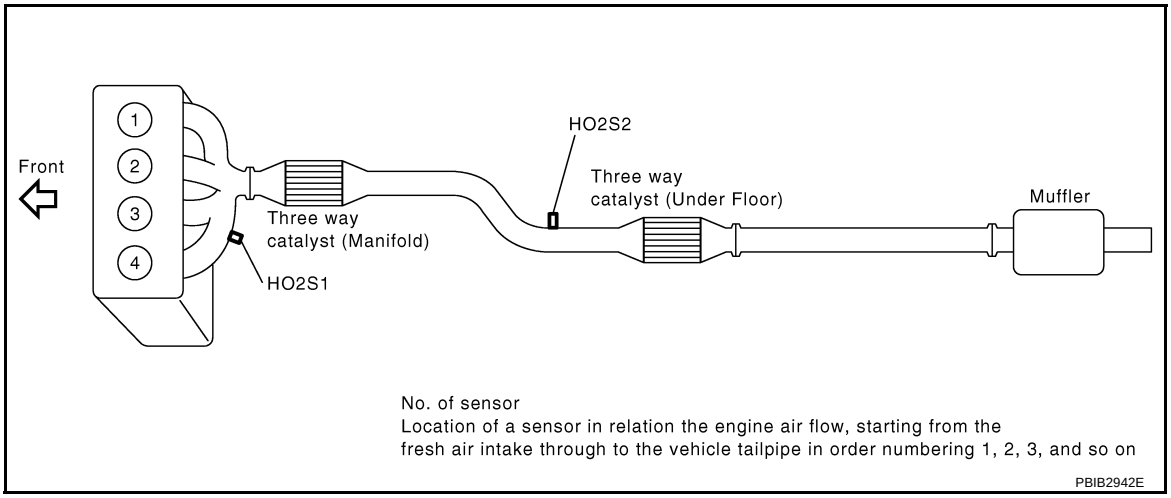
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

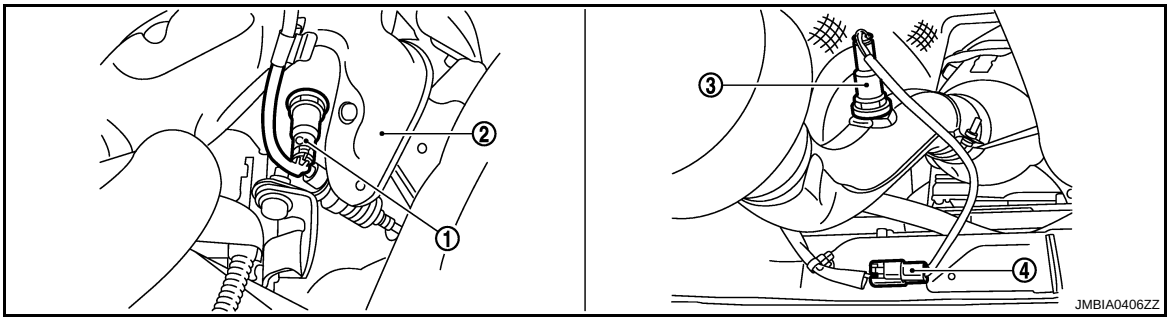
⇦ Vehicle front



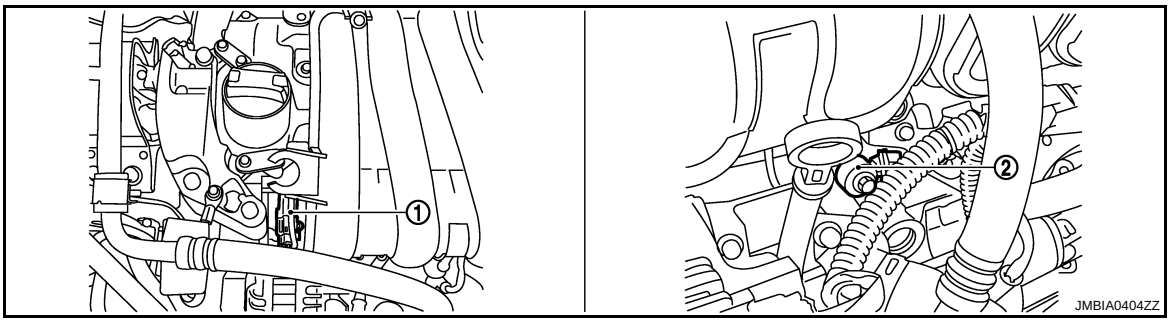
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

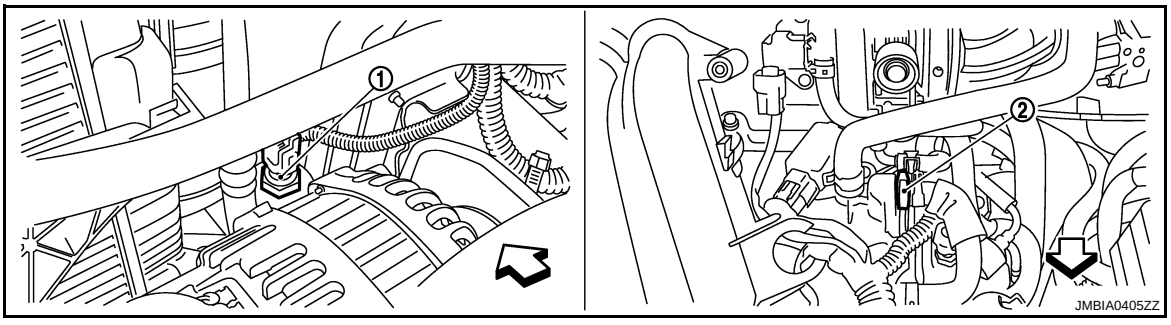




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

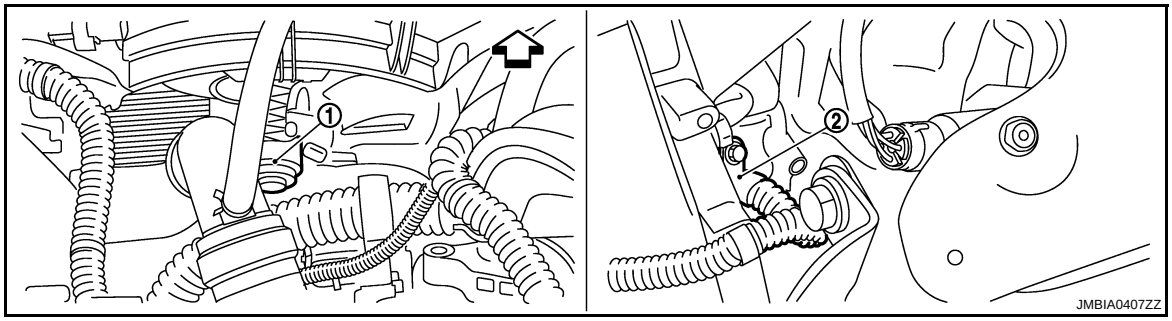


1. Intake valve timing control solenoid valve
2. Knock sensor



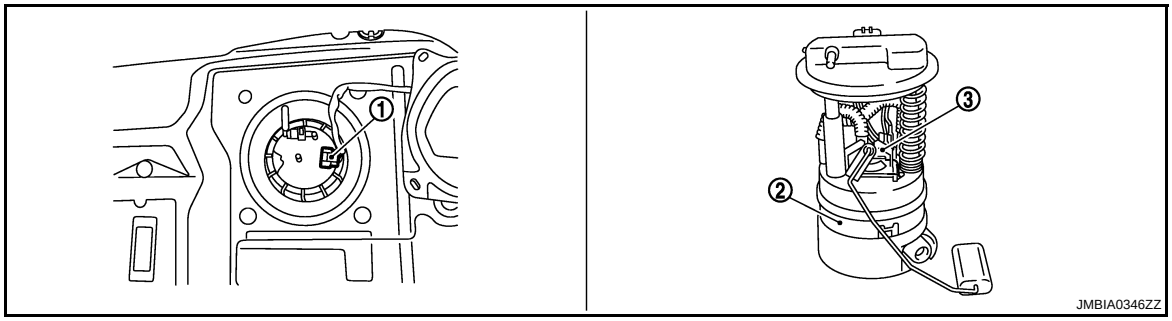
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

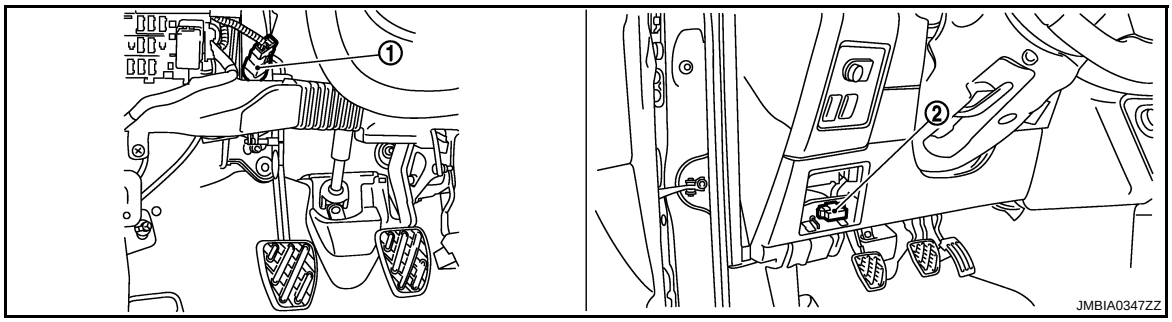


1. Cooling fan motor
2. Crankshaft position sensor (POS)

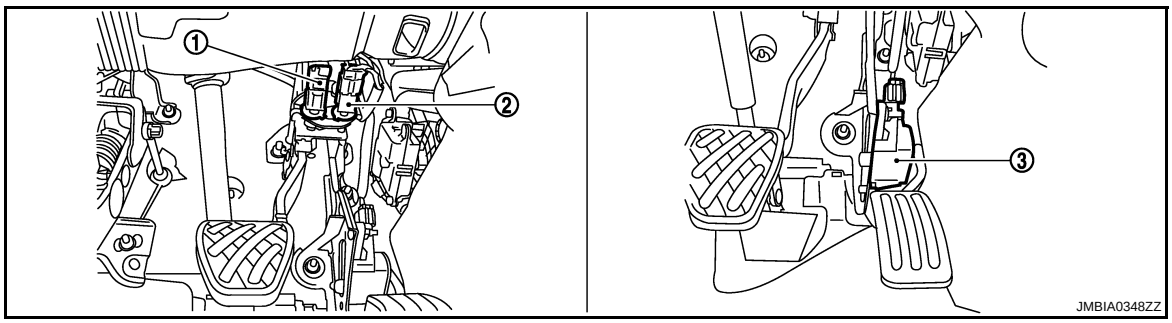
⇦ Vehicle front



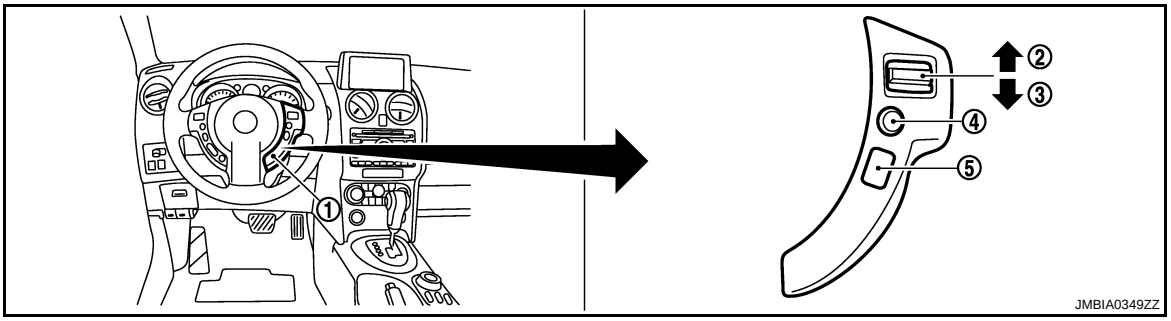
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

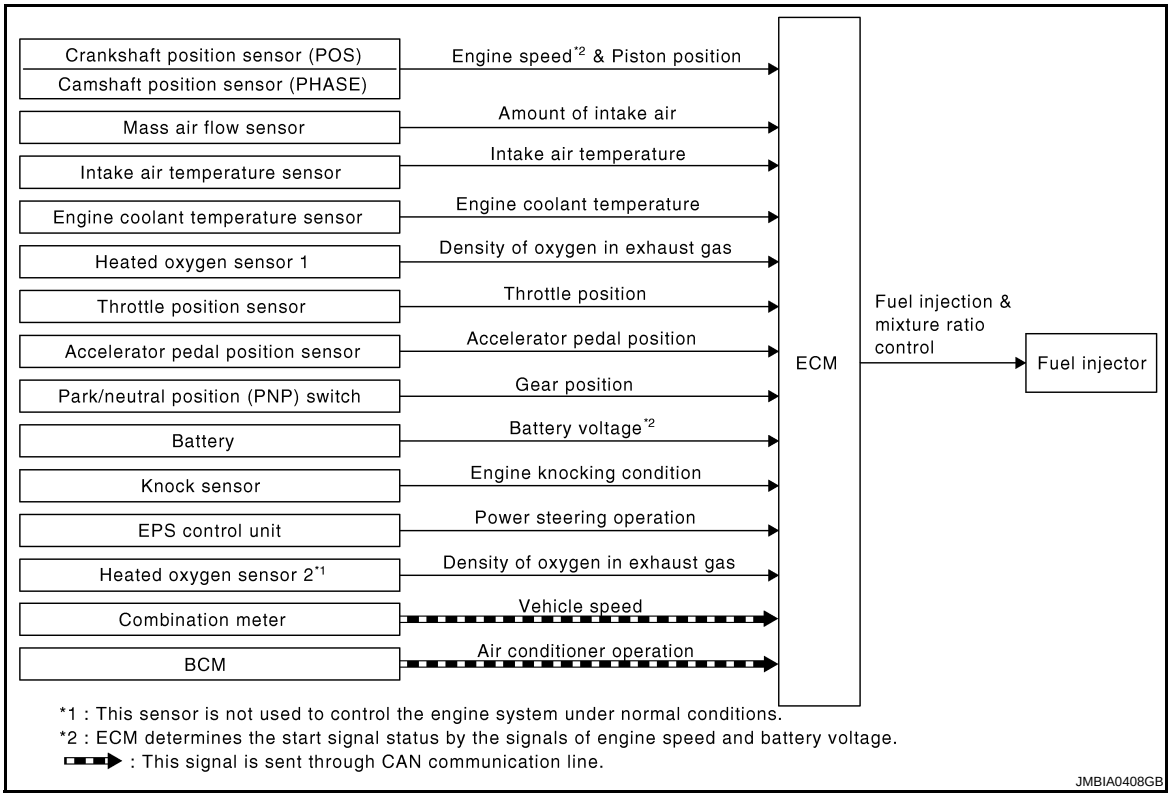
INFOID:0000000001179375

Component	Reference
Accelerator pedal position sensor	ECH-268, "Description"
ASCD brake switch	ECH-282, "Description"
ASCD steering switch	ECH-252, "Description"
ASCD vehicle speed sensor	ECH-261, "Description"
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Cooling fan motor	ECH-287, "Description"
Electric throttle control actuator	ECH-206, "Description"
Engine coolant temperature sensor	ECH-124, "Description"
Fuel injector	ECH-291, "Description"
Fuel pump	ECH-294, "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Heated oxygen sensor 1 heater	ECH-145, "Description"
Heated oxygen sensor 2	ECH-148, "Description"
Heated oxygen sensor 2 heater	ECH-160, "Description"
Ignition signal	ECH-297, "Description"
Intake air temperature sensor	ECH-121, "Description"
Intake valve timing control solenoid valve	ECH-204, "Description"
Knock sensor	ECH-180, "Description"
Mass air flow sensor	ECH-116, "Description"
Park/neutral position switch	ECH-263, "Description"
PCV valve	ECH-303, "Description"
Refrigerant pressure sensor	ECH-304, "Description"
Stop lamp switch	ECH-266, "Description"
Throttle control motor	ECH-215, "Description"
Throttle control motor relay	ECH-212, "Description"
Throttle position sensor	ECH-127, "Description"
Vehicle speed sensor	ECH-198, "Description"

MULTIPORT FUEL INJECTION SYSTEM

System Diagram

INFOID:0000000001179376



System Description

INFOID:0000000001179377

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3 Piston position	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor (PHASE)			
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen 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	Gear position		
Battery	Battery voltage*3		
Knock sensor	Engine knocking condition		
EPS control unit	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
BCM*2	Air conditioner operation		
Combination meter*2	Vehicle speed		

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

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

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

SYSTEM DESCRIPTION

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

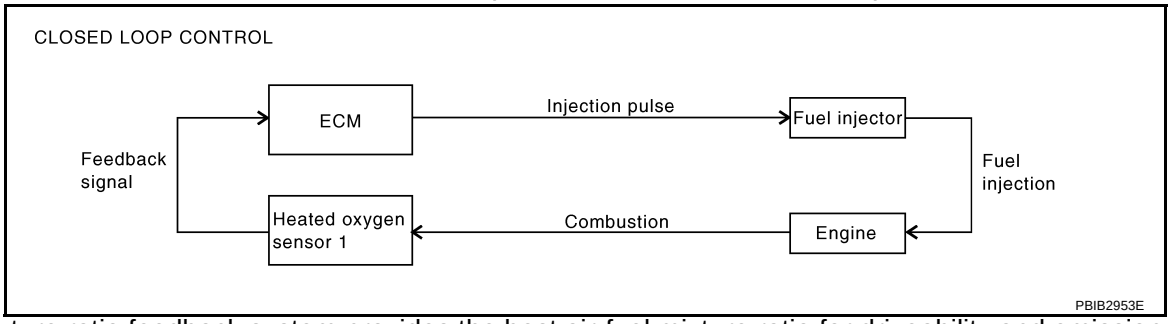
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

<Fuel increase>
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen 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 heated oxygen sensor 1, refer to ECH-130, "DTC Logic". 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 heated oxygen 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.

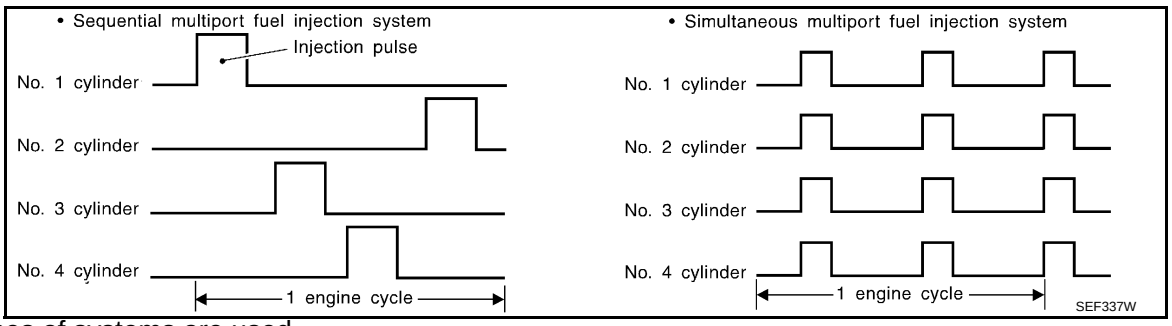
- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of heated oxygen sensor 1 or its circuit
- Insufficient activation of heated sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.

"Fuel trim" refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short term fuel trim and long term fuel trim.
"Short term fuel trim" is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from heated oxygen sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.
"Long term fuel trim" is overall fuel compensation carried out long-term to compensate for continual deviation of the short term fuel trim from the central value. Such deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

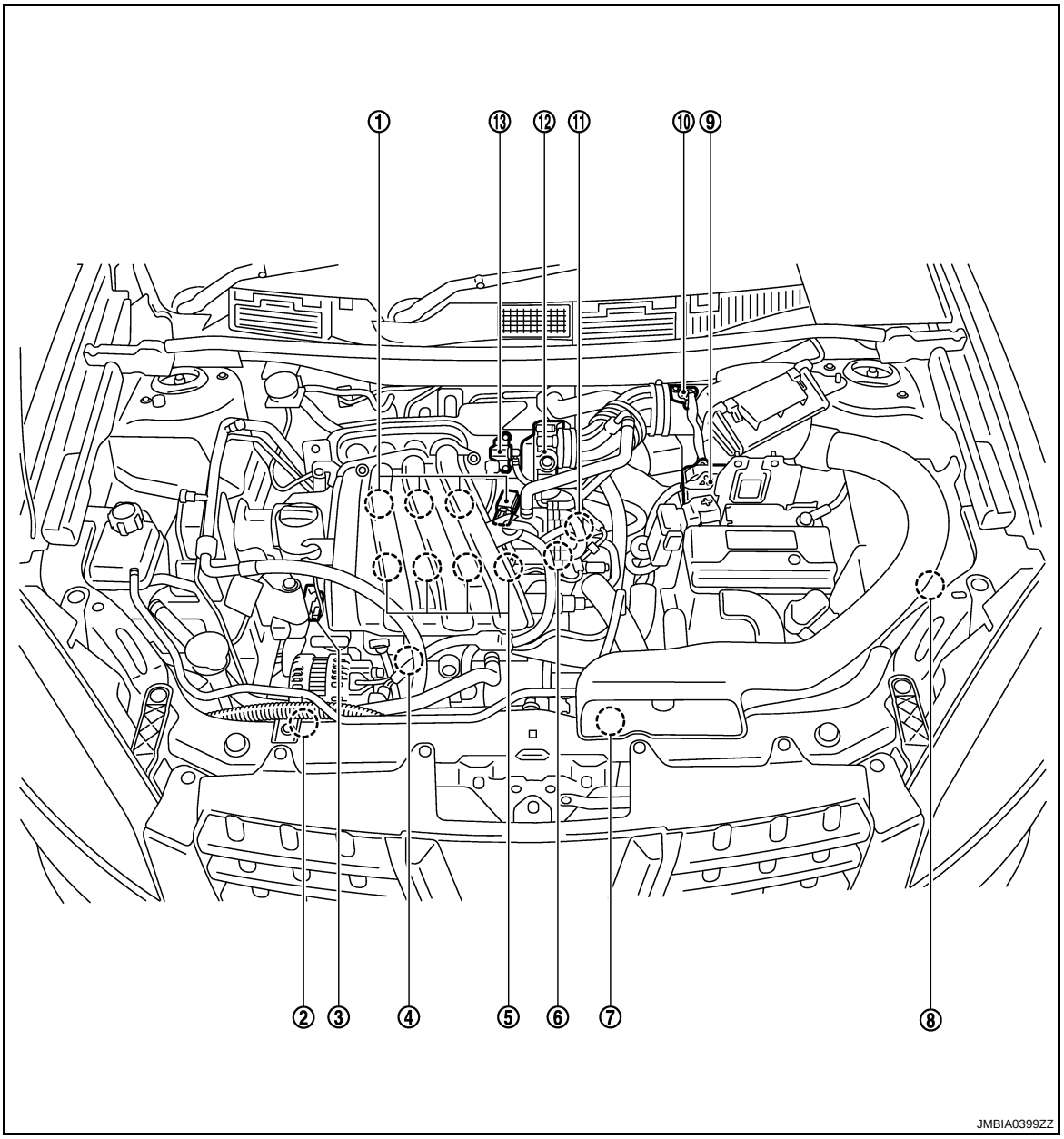
- Sequential Multiport Fuel Injection System
  Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
  Fuel is injected simultaneously into all four cylinders twice each 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

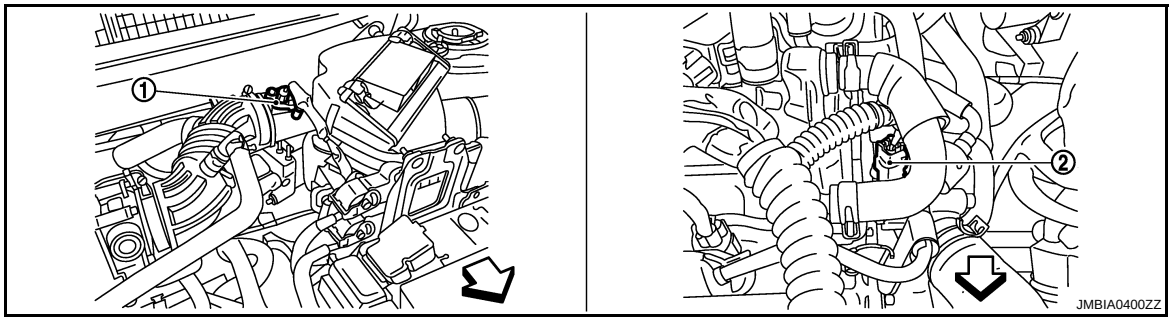
Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

Component Parts Location

INFOID:0000000001179378

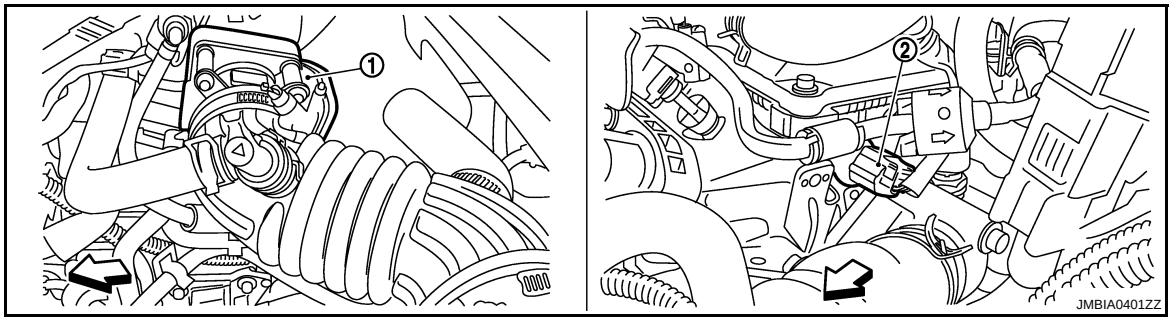


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



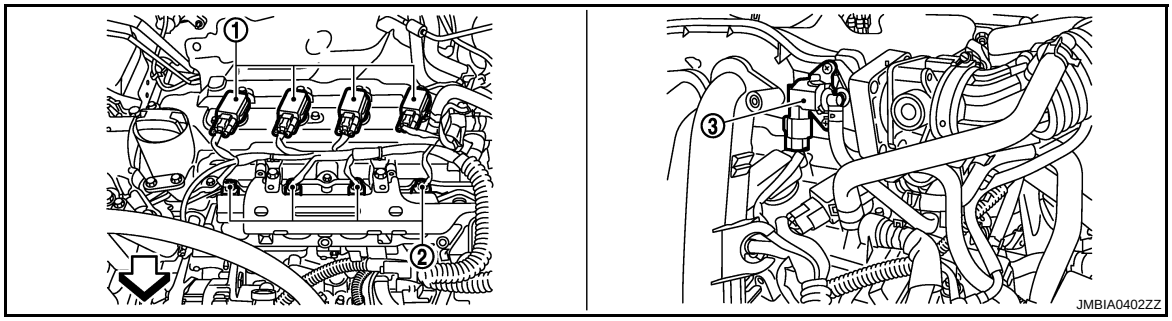
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



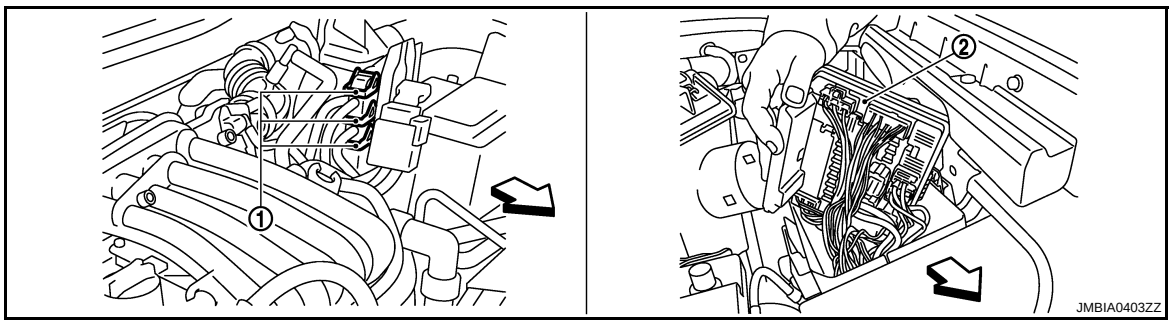
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



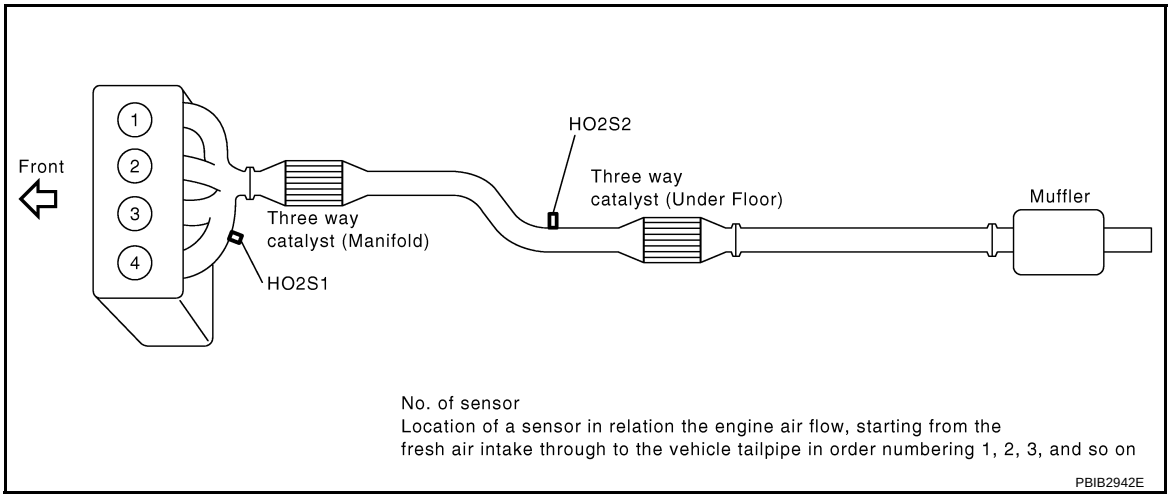
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

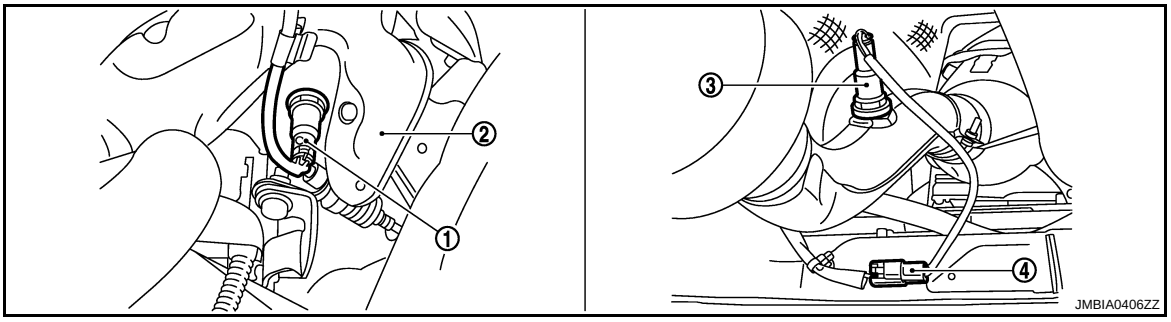
⇦ Vehicle front



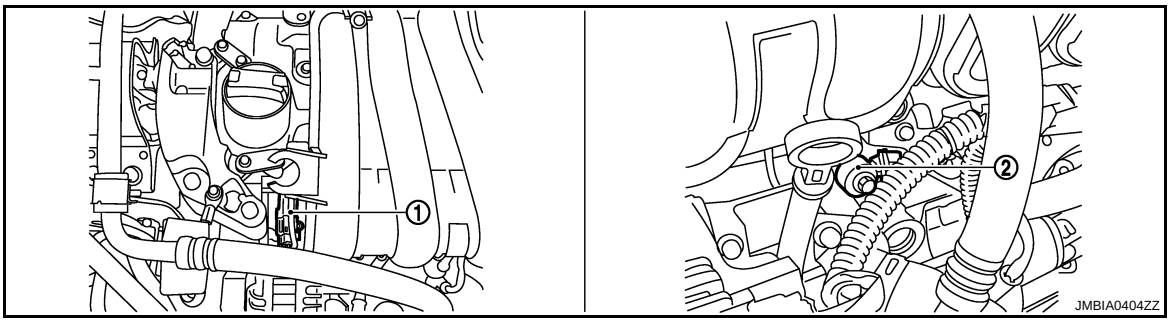
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

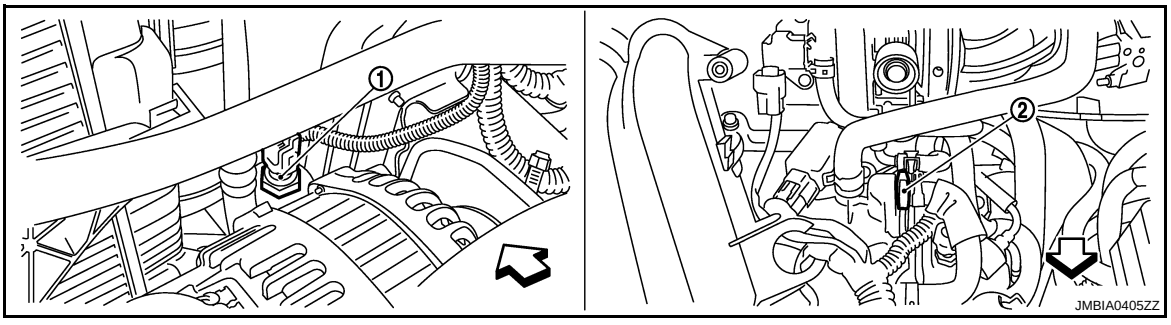




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

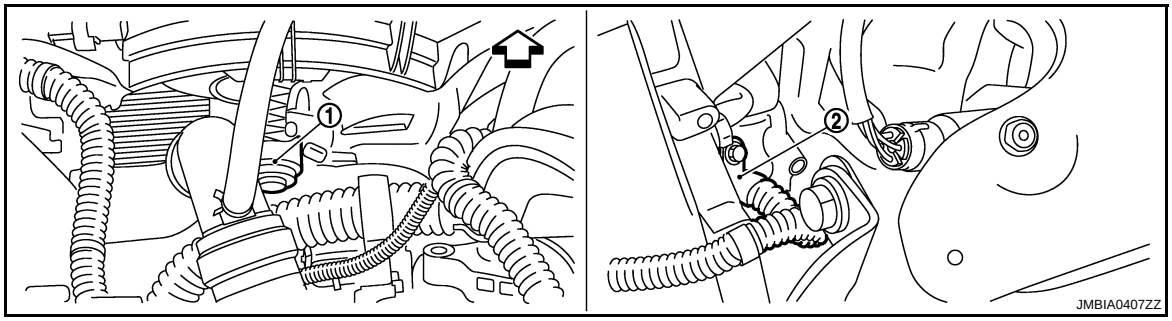


1. Intake valve timing control solenoid valve
2. Knock sensor



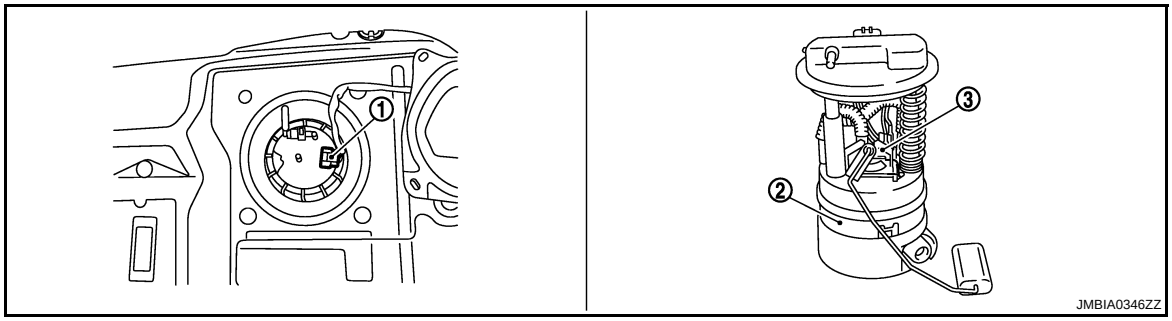
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

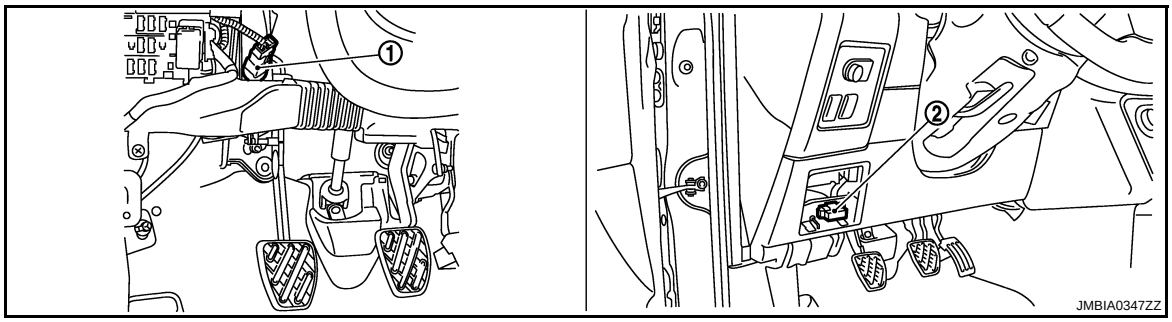


1. Cooling fan motor
2. Crankshaft position sensor (POS)

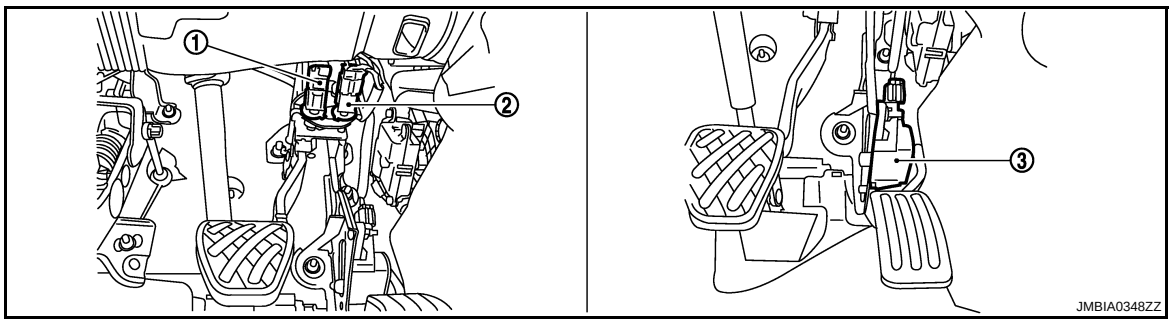
⇦ Vehicle front



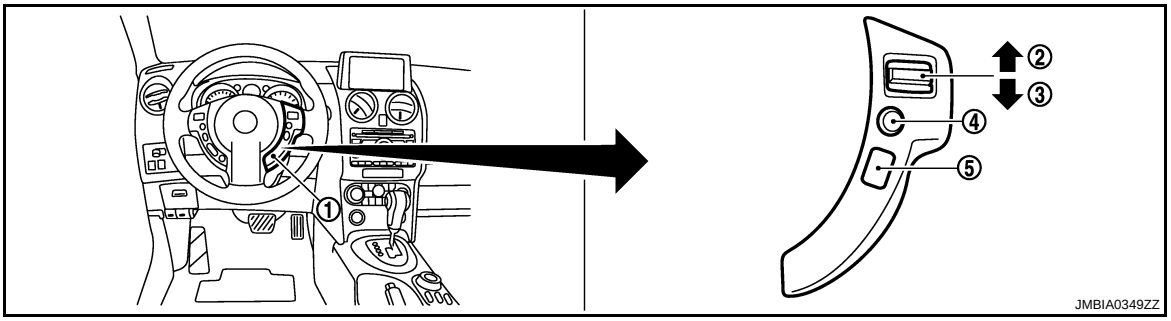
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

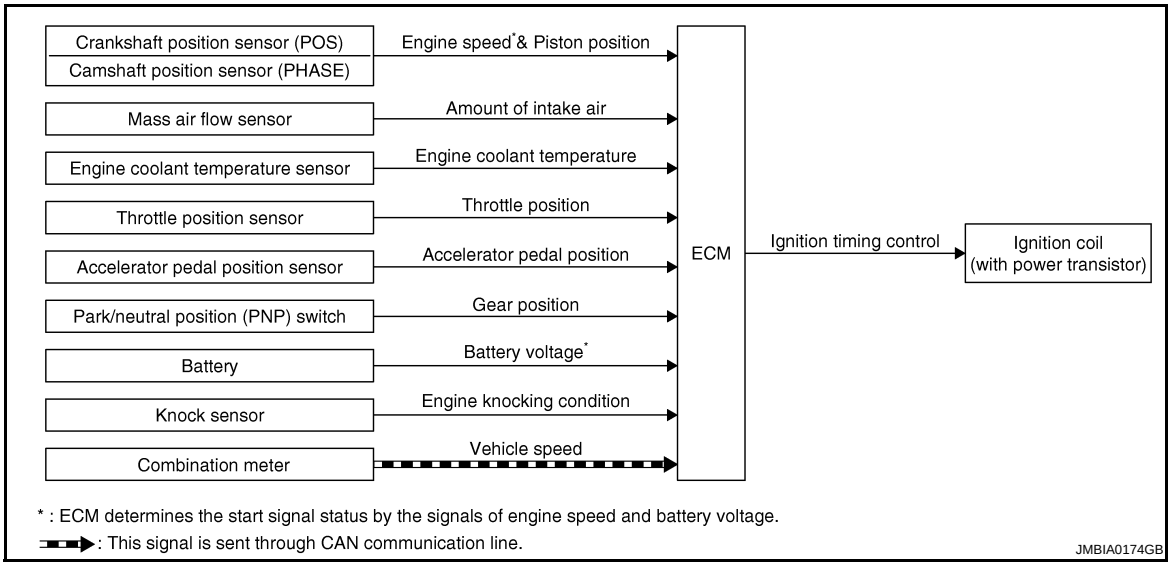
INFOID:0000000001179379

Component	Reference
Accelerator pedal position sensor	ECH-268, "Description"
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Engine coolant temperature sensor	ECH-124, "Description"
Fuel injector	ECH-291, "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Heated oxygen sensor 2	ECH-160, "Description"
Intake air temperature sensor	ECH-121, "Description"
Knock sensor	ECH-180, "Description"
Mass air flow sensor	ECH-116, "Description"
Park/neutral position (PNP) switch	ECH-263, "Description"
Throttle position sensor	ECH-127, "Description"
Vehicle speed sensor	ECH-198, "Description"

ELECTRIC IGNITION SYSTEM

System Diagram

INFOID:0000000001179380



System Description

INFOID:0000000001179381

INPUT/OUTPUT SIGNAL CHART

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

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

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

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 (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.

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

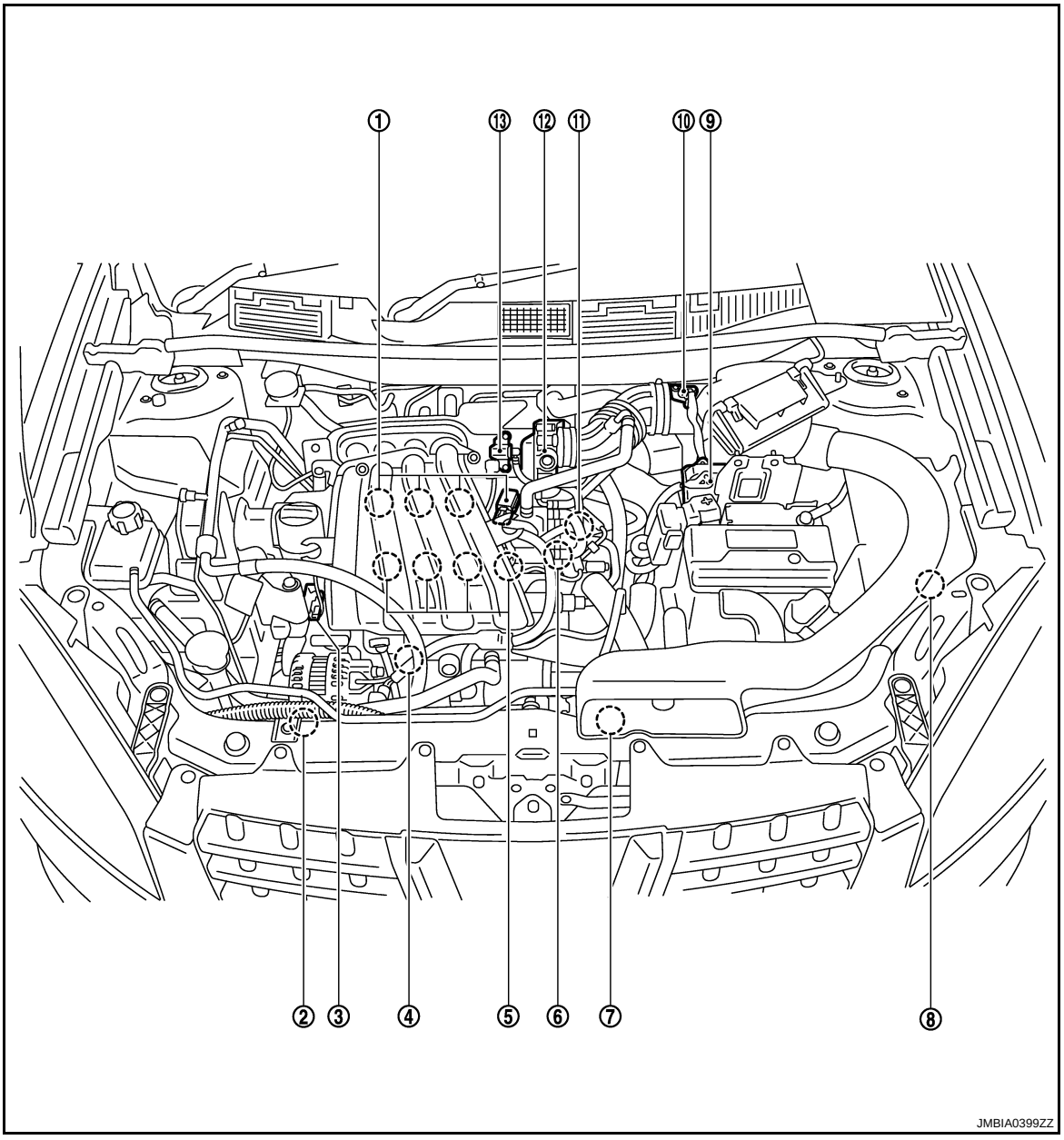
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not

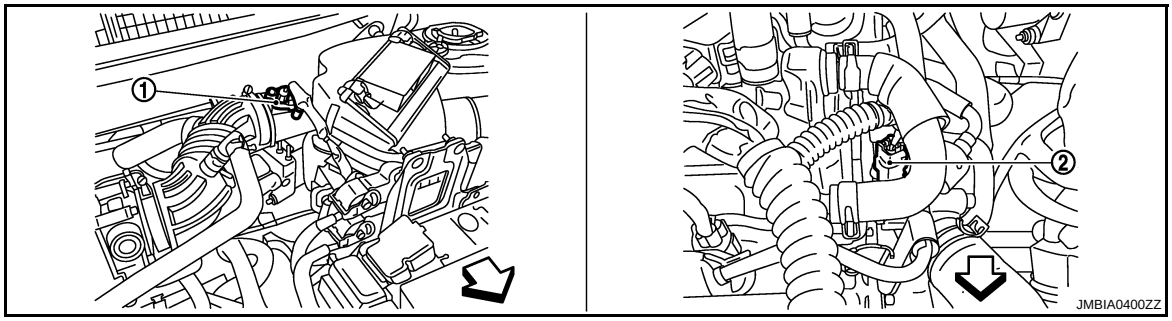
operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Component Parts Location

INFOID:0000000001179382

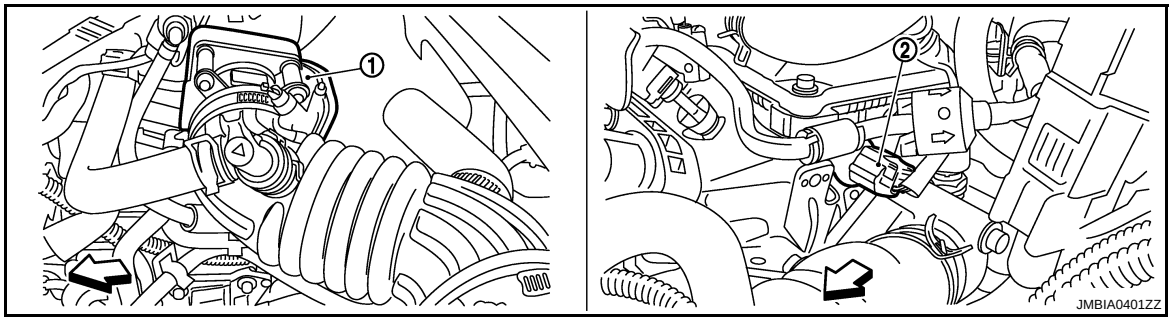


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



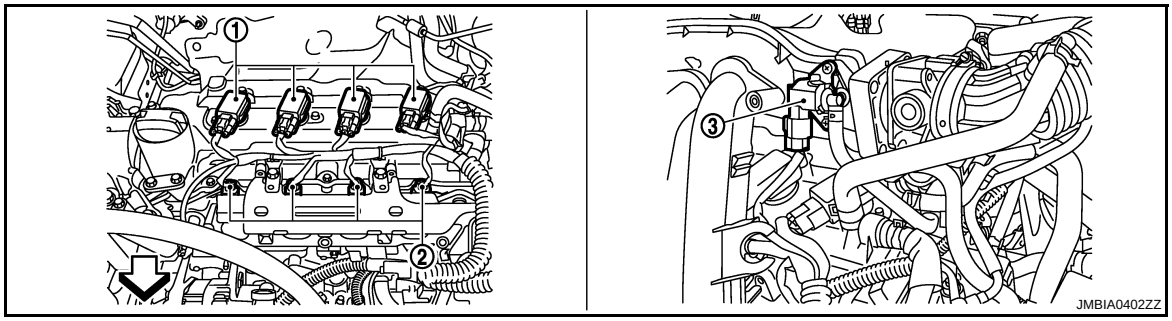
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



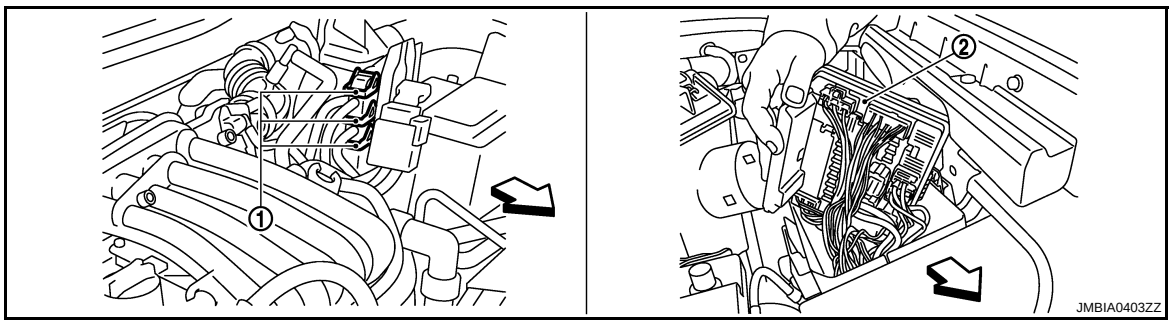
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



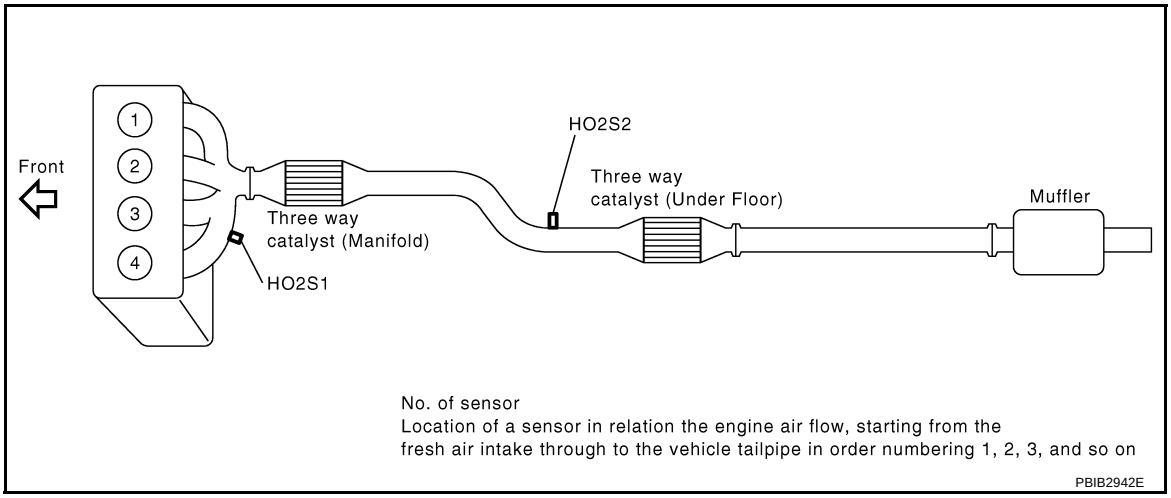
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

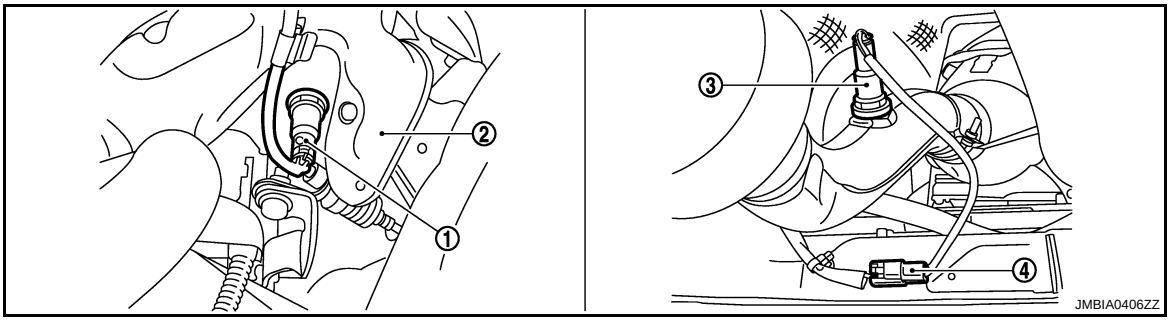
⇦ Vehicle front



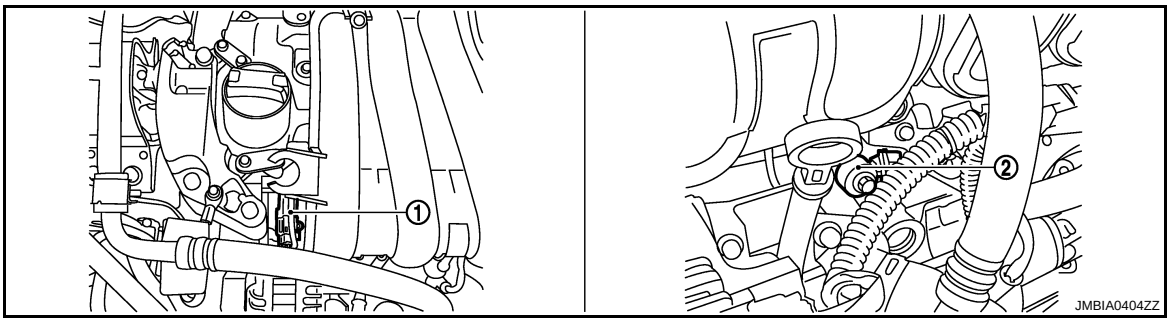
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

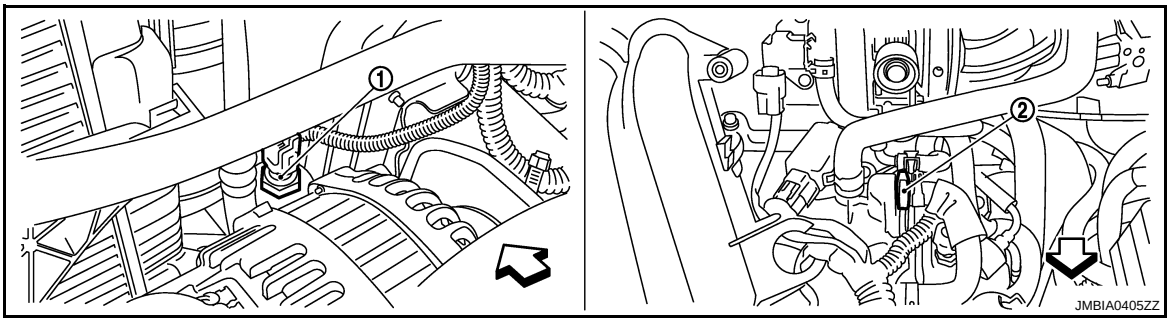




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

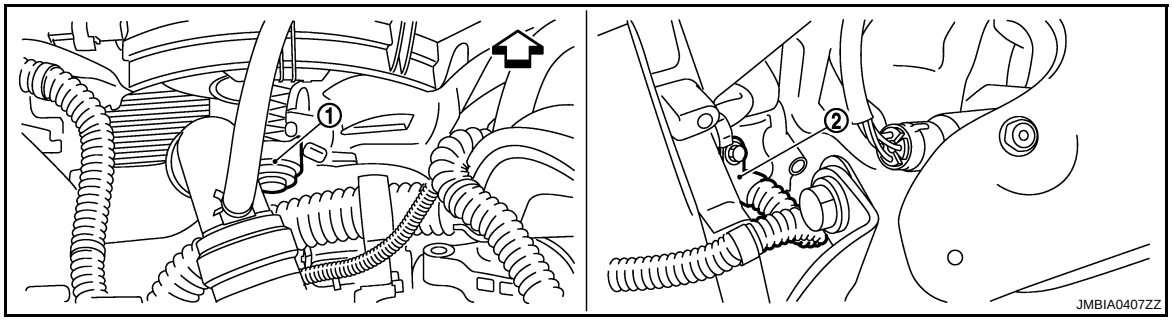


1. Intake valve timing control solenoid valve
2. Knock sensor



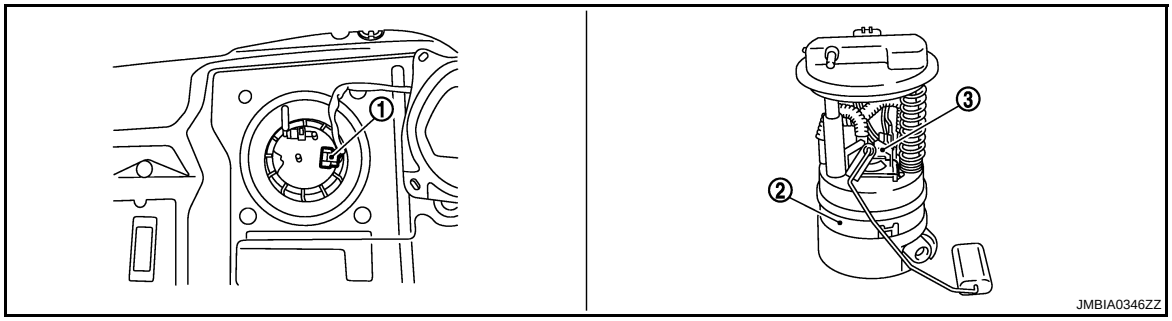
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

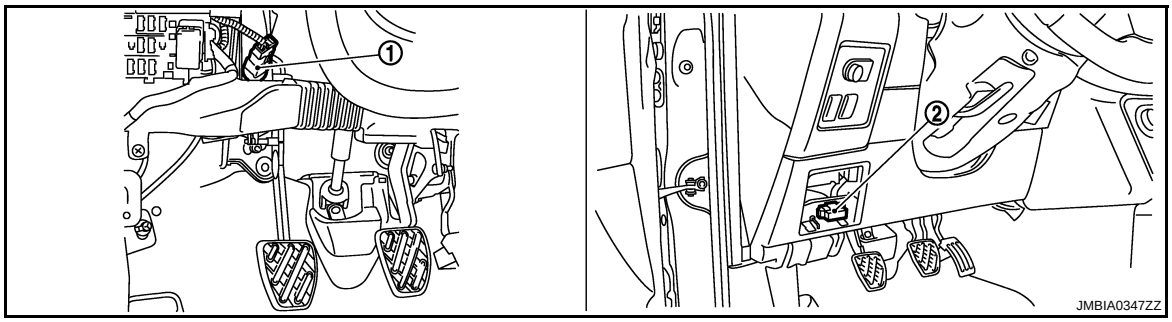


1. Cooling fan motor
2. Crankshaft position sensor (POS)

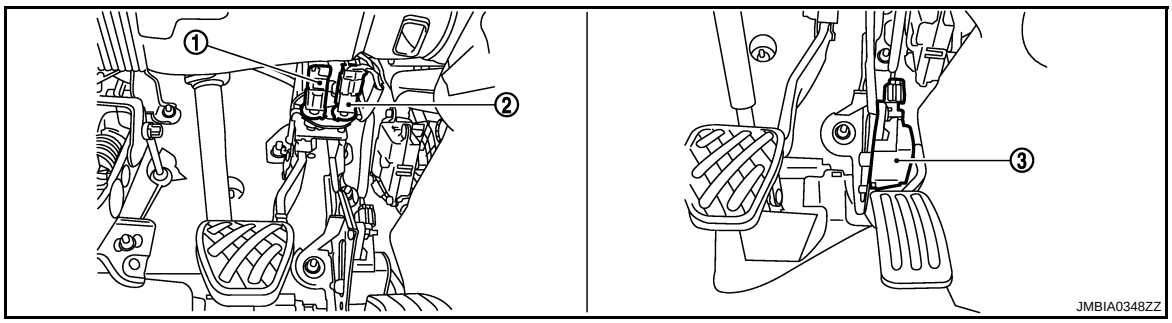
⇦ Vehicle front



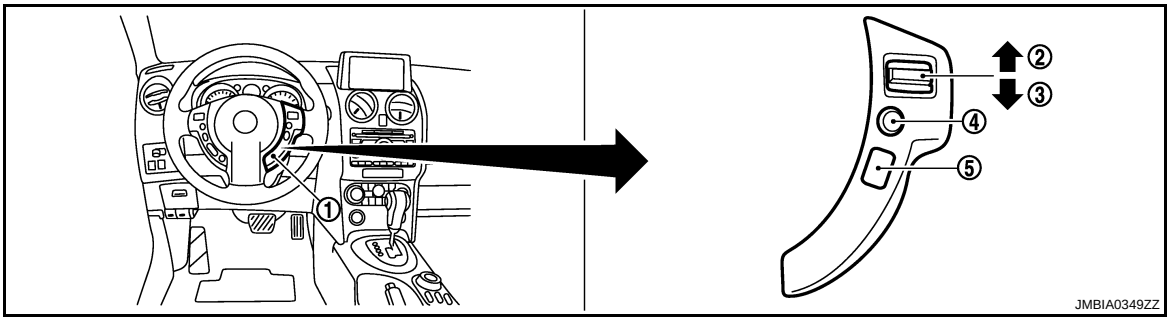
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

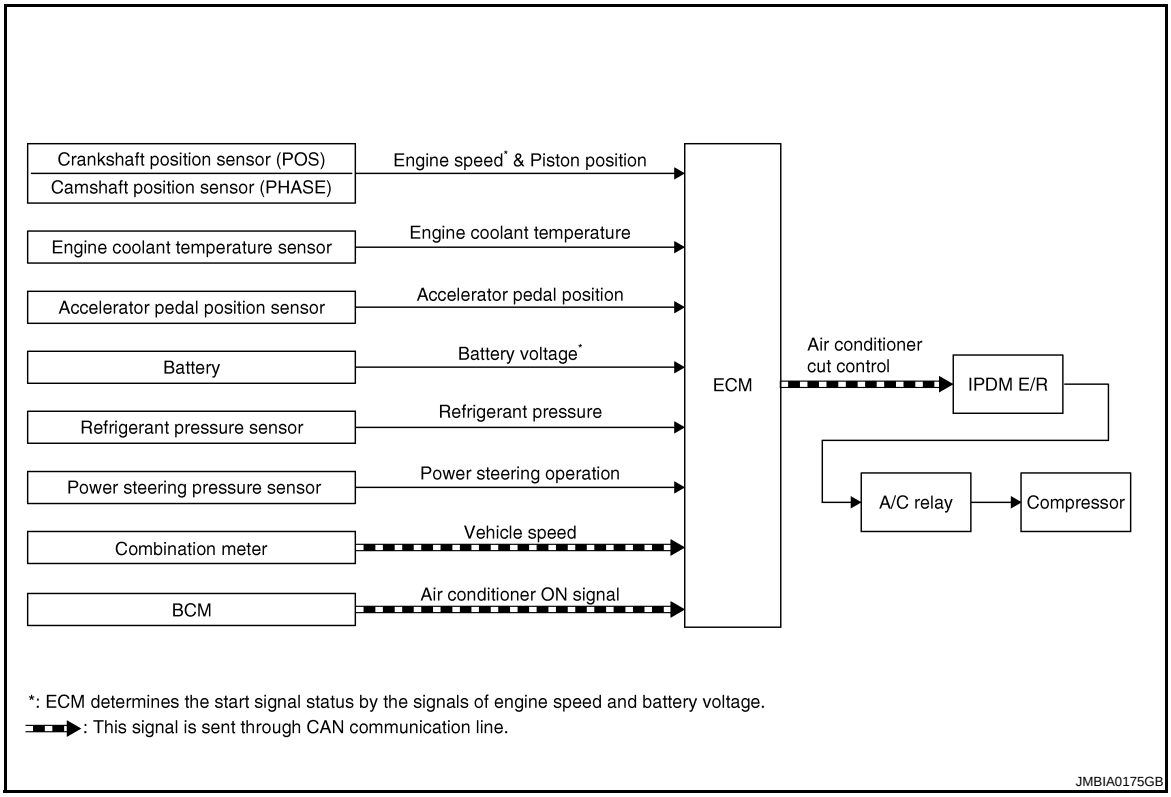
INFOID:0000000001179383

Component	Reference
Accelerator pedal position sensor	ECH-268, "Description"
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Engine coolant temperature sensor	ECH-124, "Description"
Ignition signal	ECH-297, "Description"
Knock sensor	ECH-180, "Description"
Mass air flow sensor	ECH-116, "Description"
Park/neutral position (PNP) switch	ECH-263, "Description"
Throttle position sensor	ECH-127, "Description"
Vehicle speed sensor	ECH-198, "Description"

AIR CONDITIONING CUT CONTROL

System Diagram

INFOID:0000000001179384



System Description

INFOID:0000000001179385

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

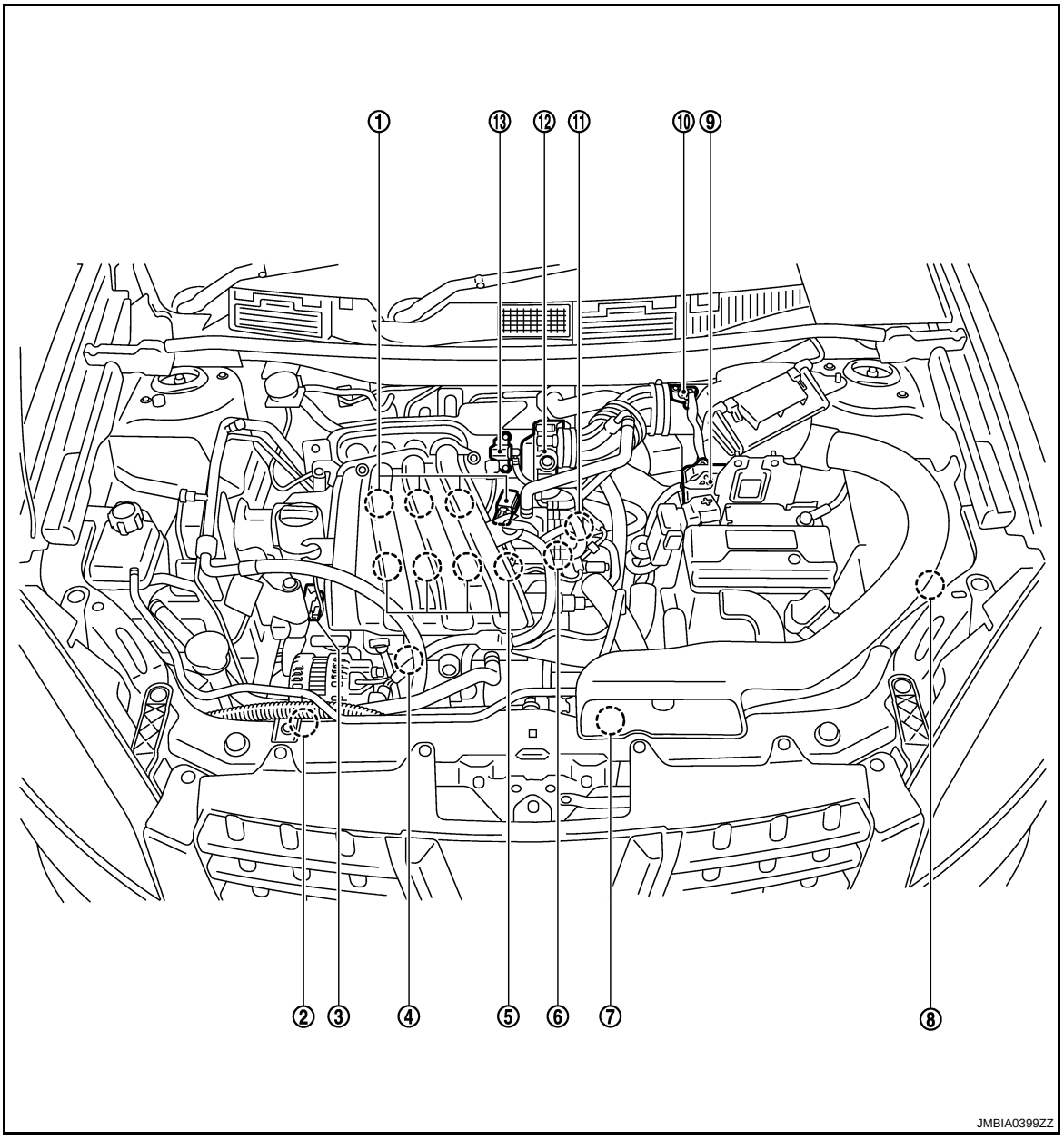
This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

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

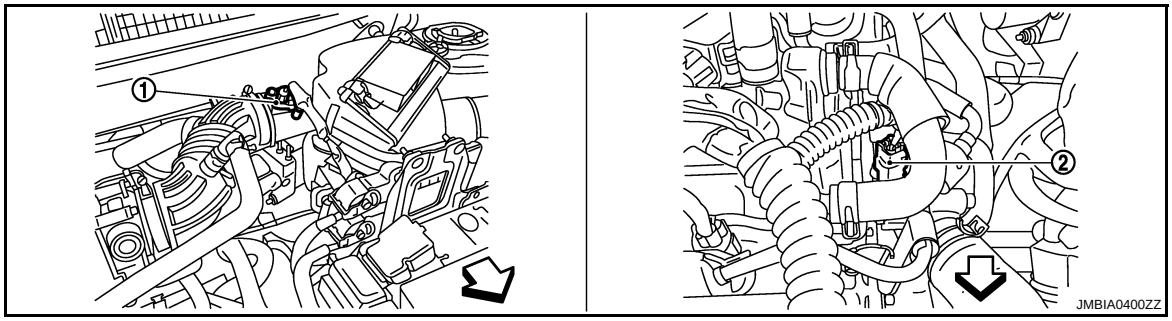
• When refrigerant pressure is excessively low or high.

Component Parts Location

INFOID:0000000001179386

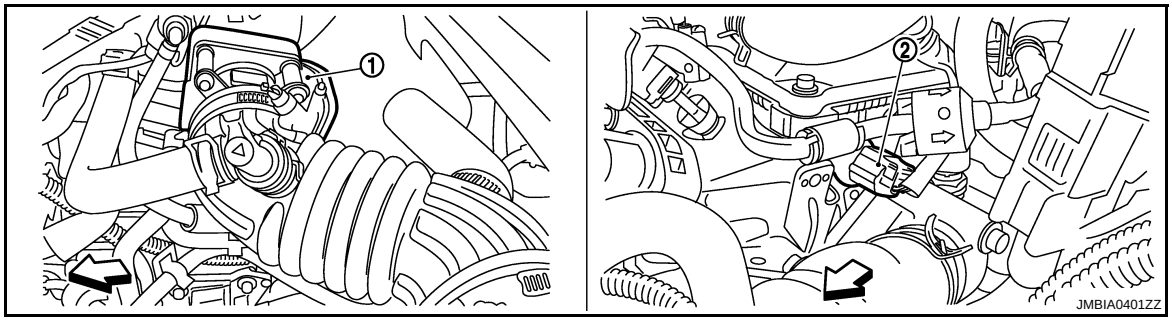


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



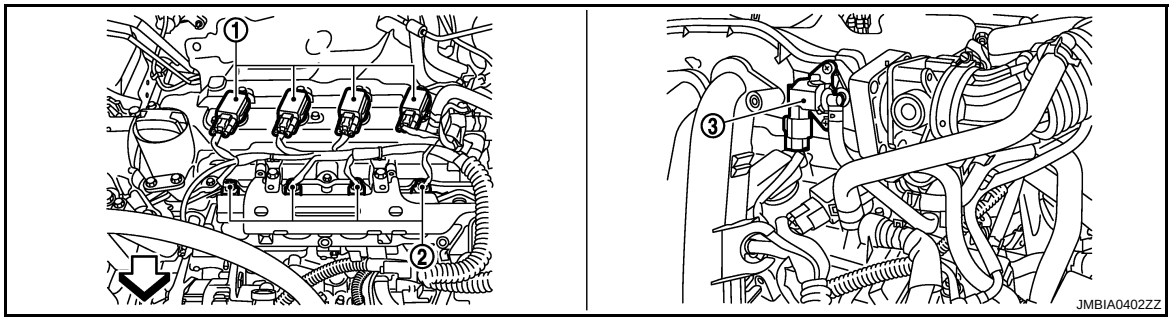
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



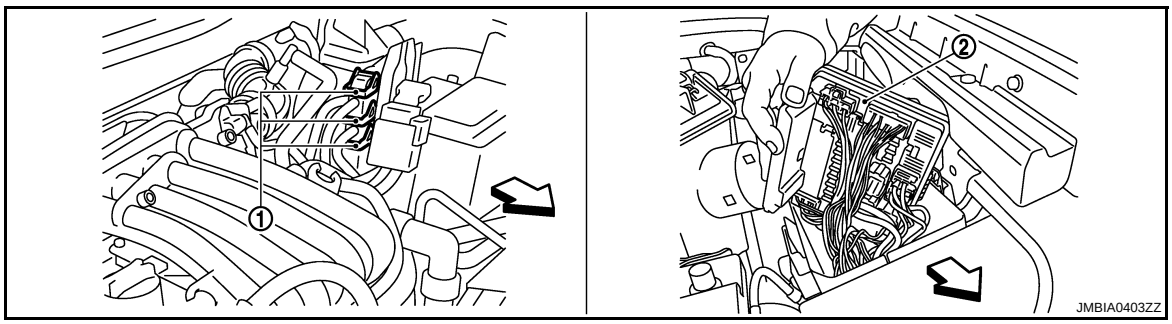
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



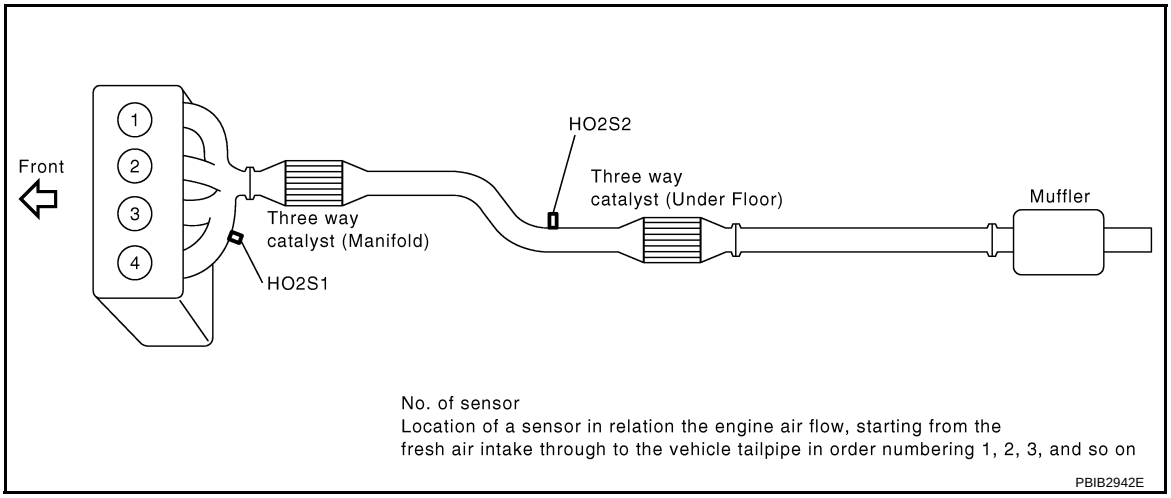
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

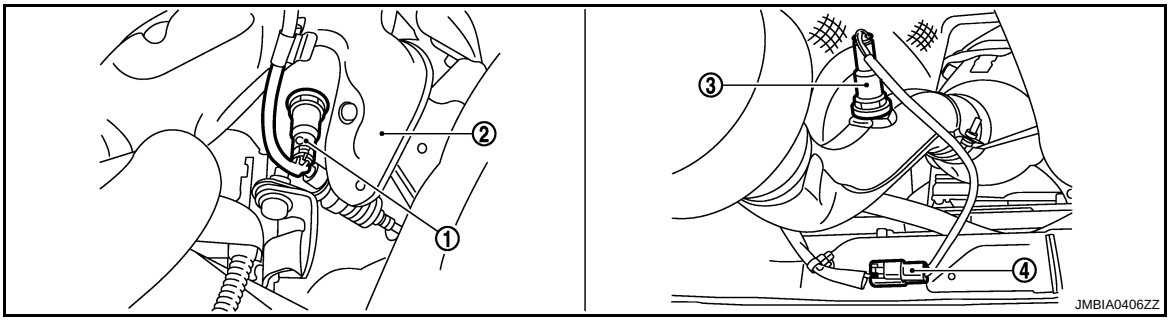
⇦ Vehicle front



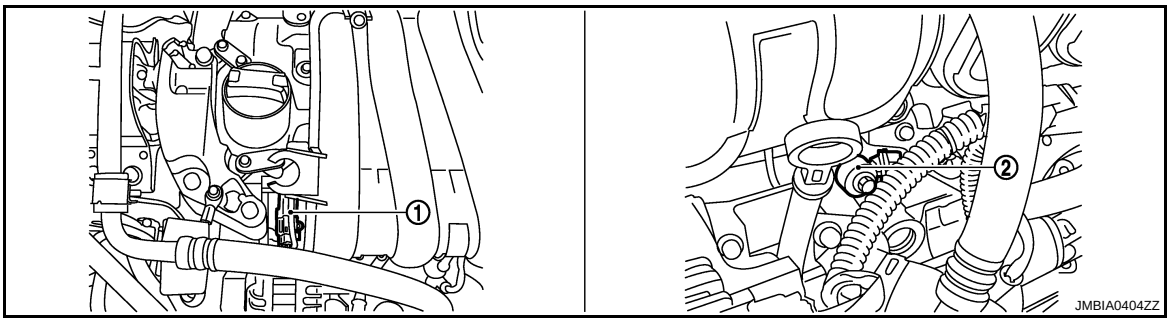
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

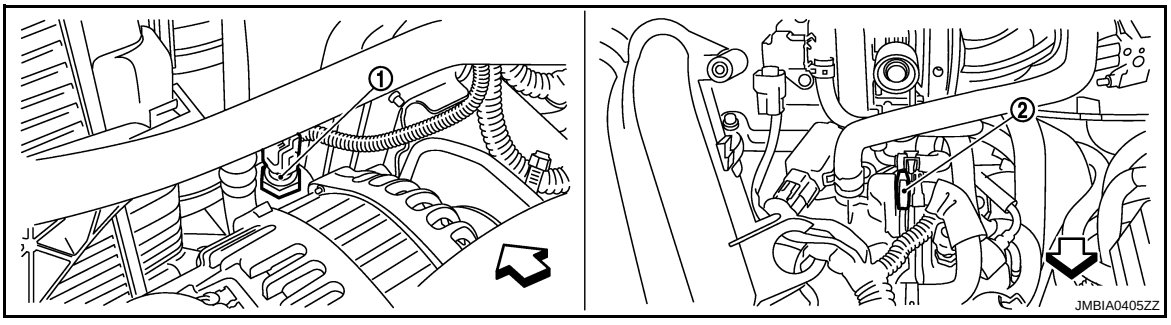




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

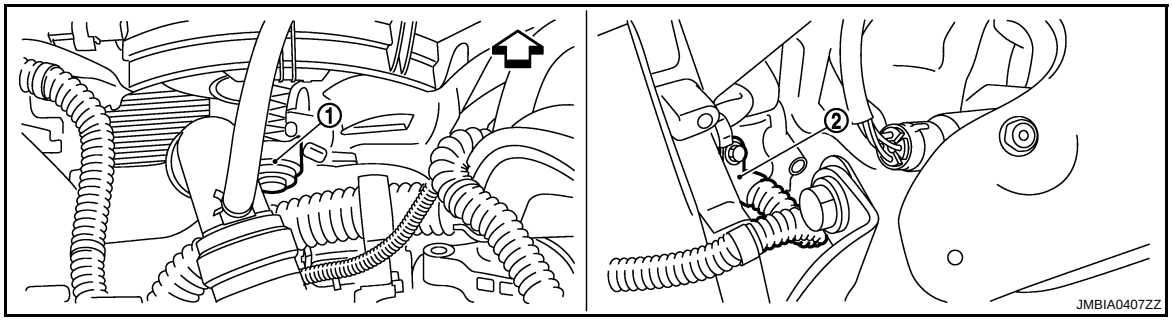


1. Intake valve timing control solenoid valve
2. Knock sensor



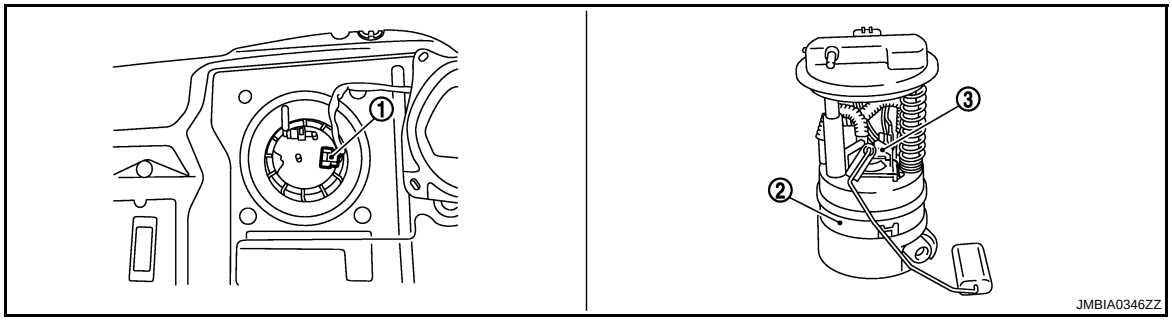
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

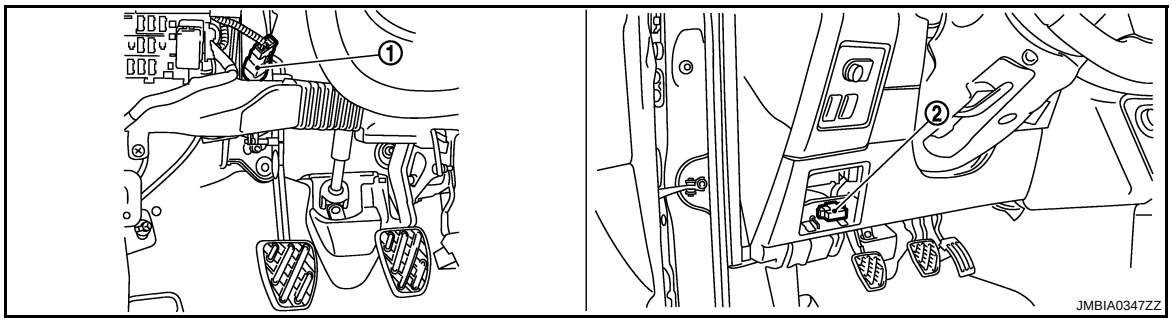


1. Cooling fan motor
2. Crankshaft position sensor (POS)

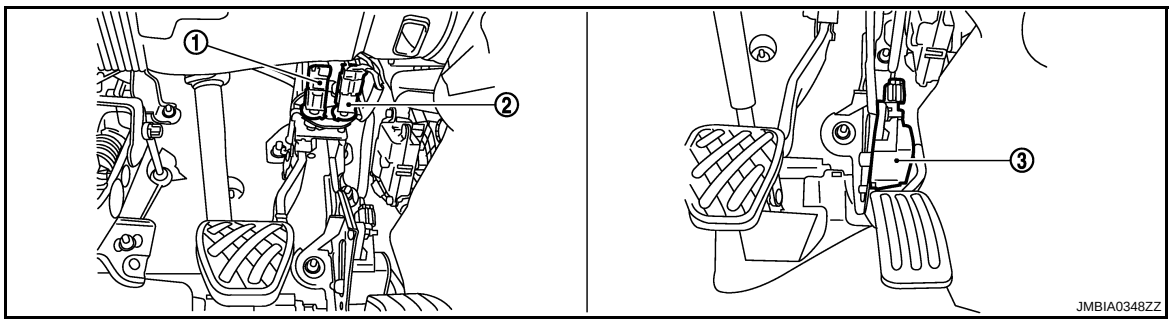
⇦ Vehicle front



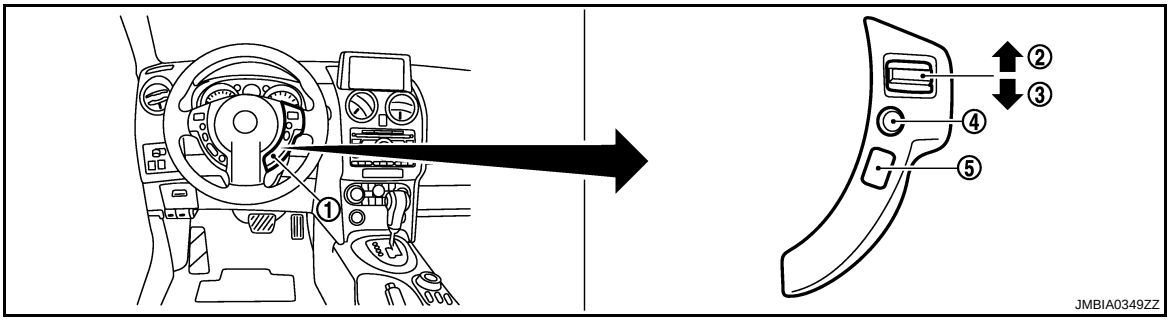
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

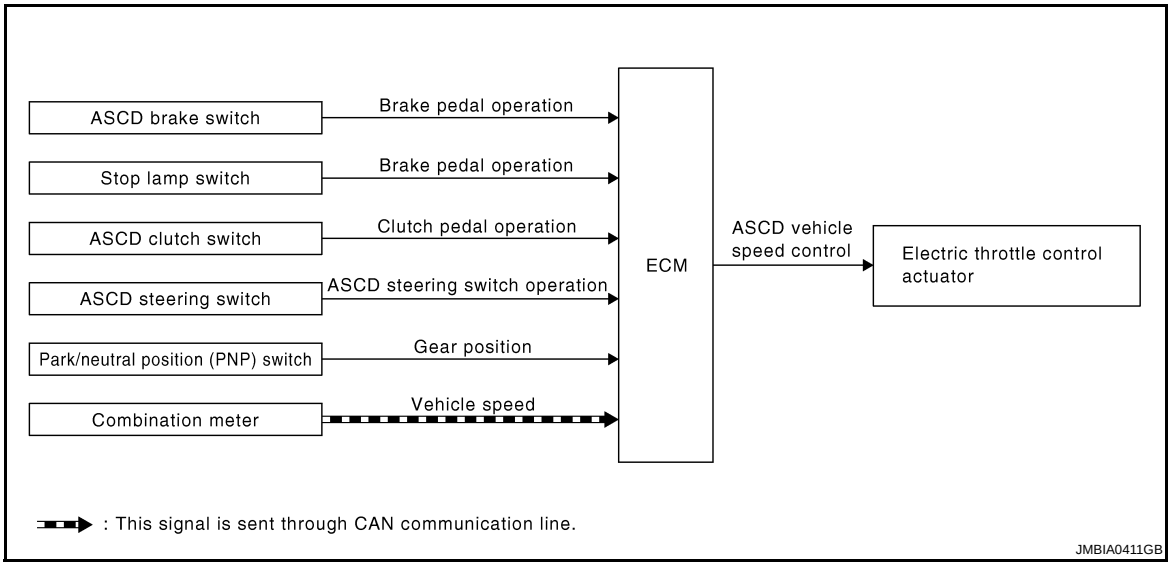
INFOID:0000000001179387

Component	Reference
Accelerator pedal position sensor	ECH-268, "Description"
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Engine coolant temperature sensor	ECH-124, "Description"
EPS contro unit	STC-4, "System Description"
Refrigerant pressure sensor	ECH-304, "Description"
Vehicle speed sensor	ECH-198, "Description"

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram

INFOID:0000000001179388



System Description

INFOID:0000000001179389

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch			
ASCD clutch switch	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation		
Park/neutral position switch	Gear position		
Combination meter*	Vehicle speed		

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

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 180 km/h (112 MPH).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE lamp and SET lamp in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.
NOTE:
Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws.

SET OPERATION

Press MAIN switch. (The CRUISE lamp in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 180 km/h (112 MPH), press SET/COAST switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

If the RESUME/ACCELERATE switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will keep the new set speed.

CANCEL OPERATION

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

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to neutral position.
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

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

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

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

COAST OPERATION

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

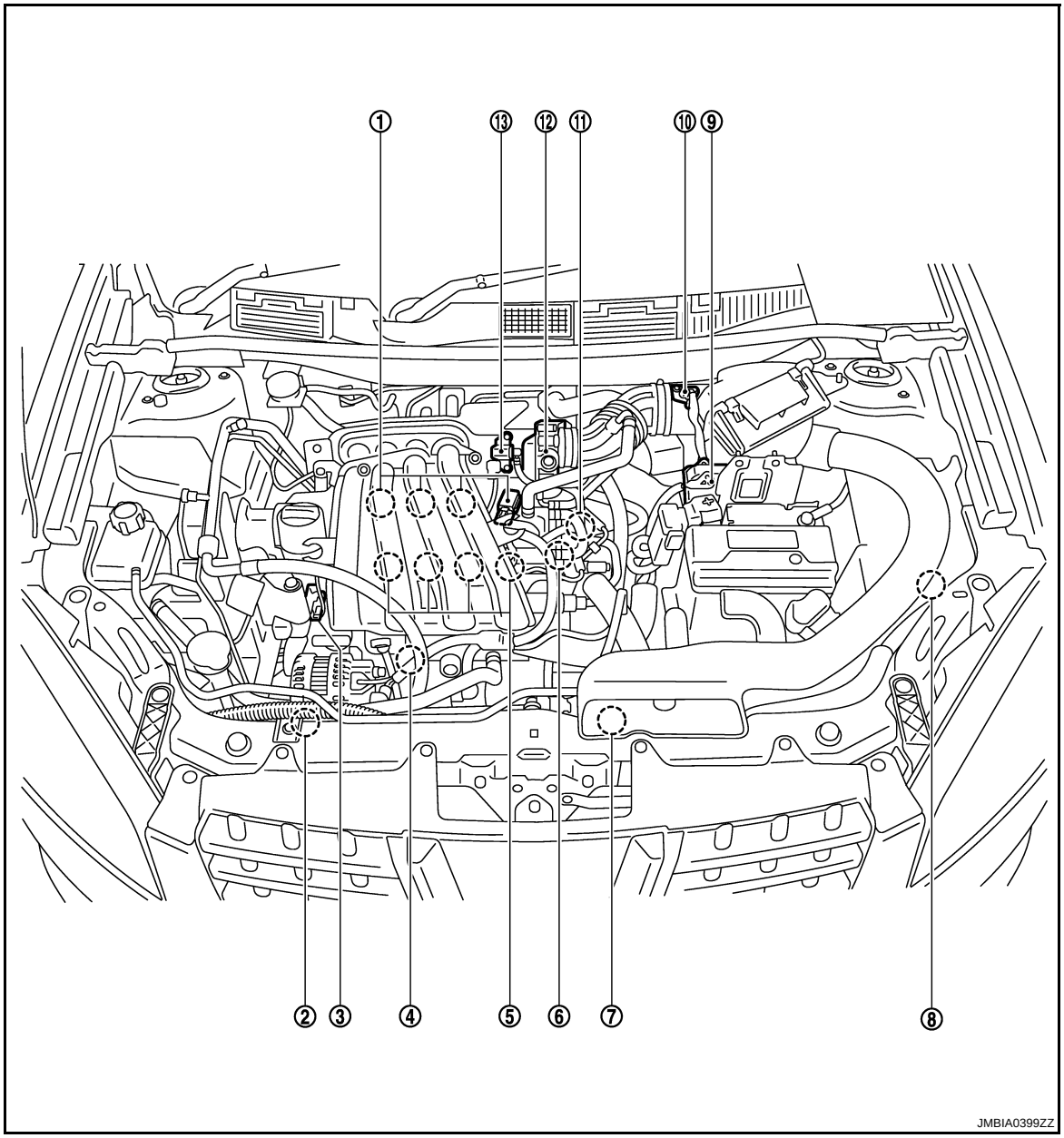
RESUME OPERATION

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

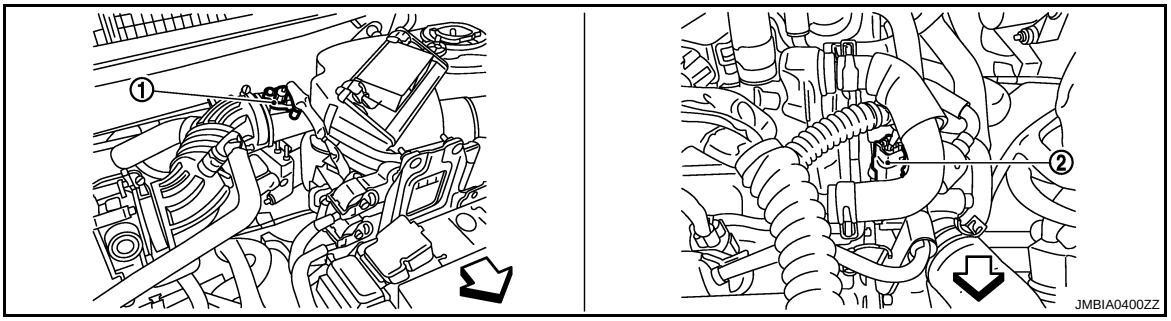
- Brake pedal is released
- Clutch pedal is released
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 180km/h (112 MPH)

Component Parts Location

INFOID:0000000001179390

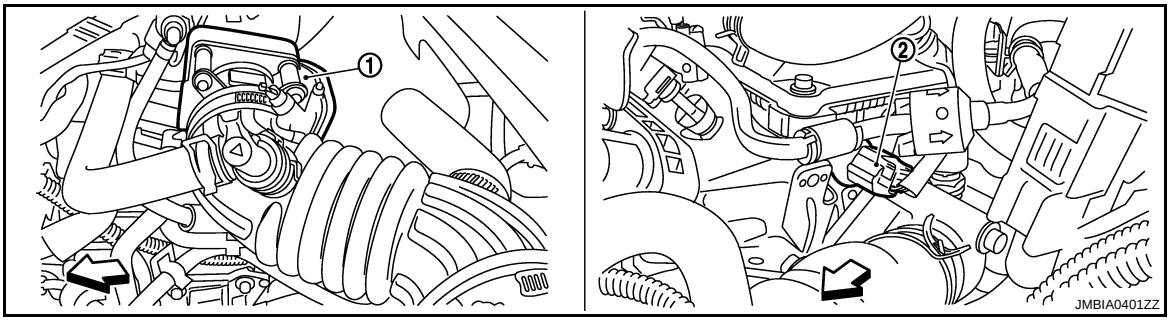


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



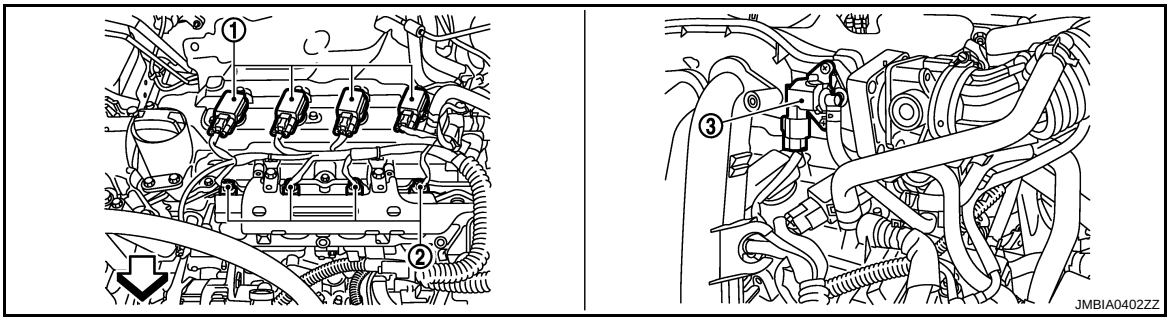
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



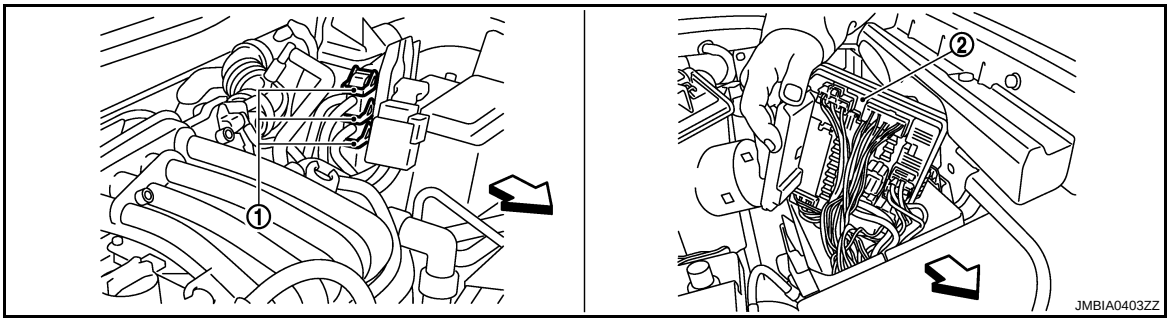
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



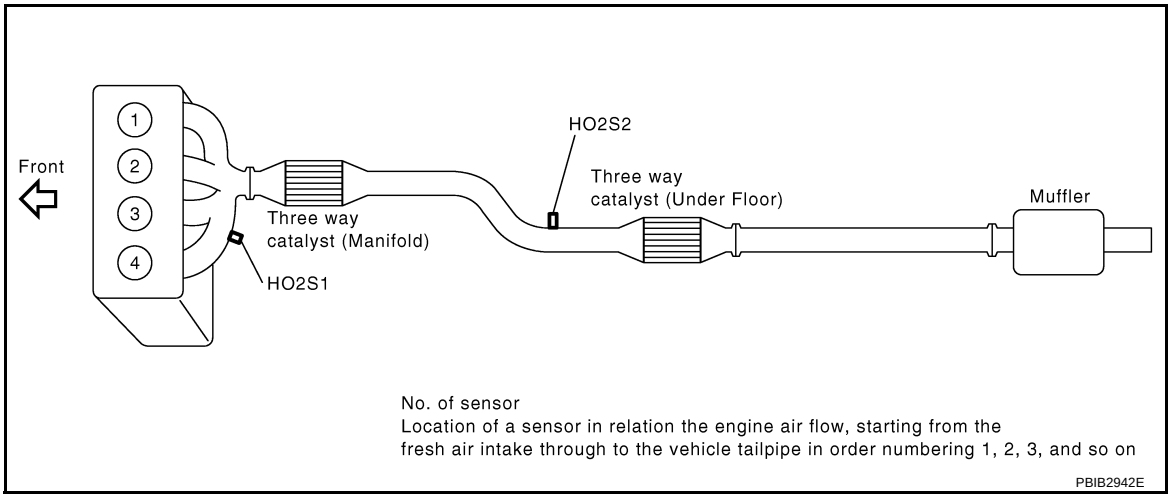
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

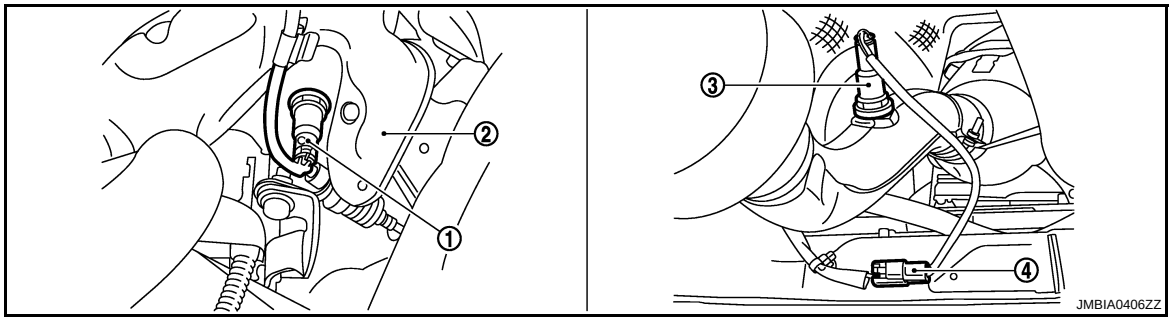
⇦ Vehicle front



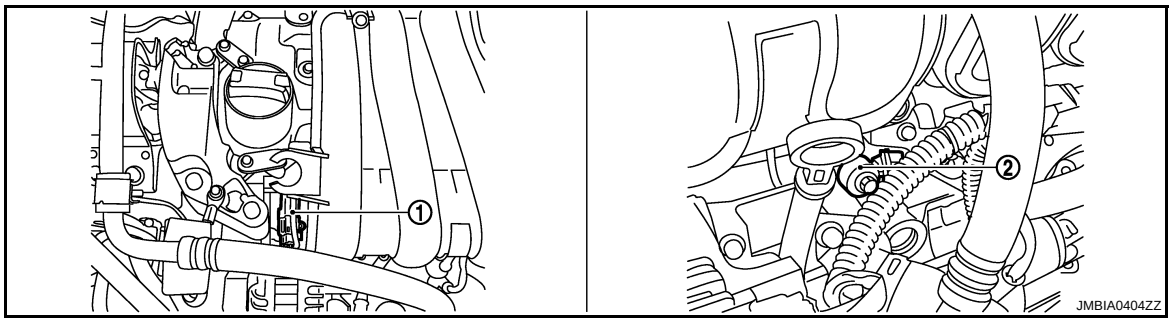
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

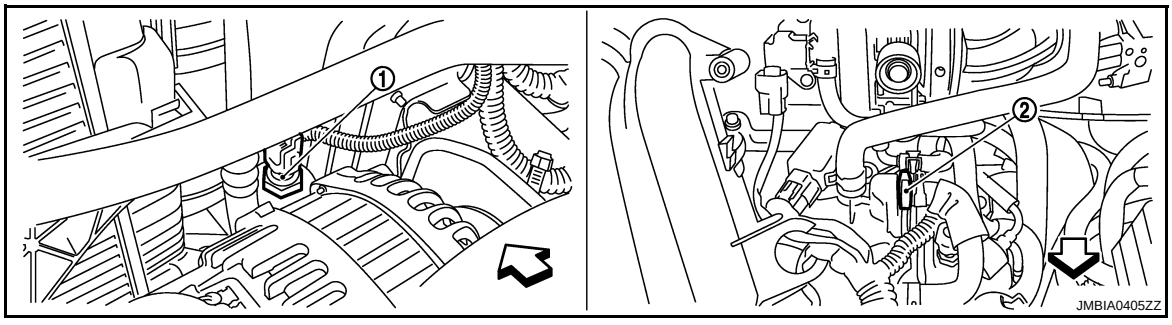




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

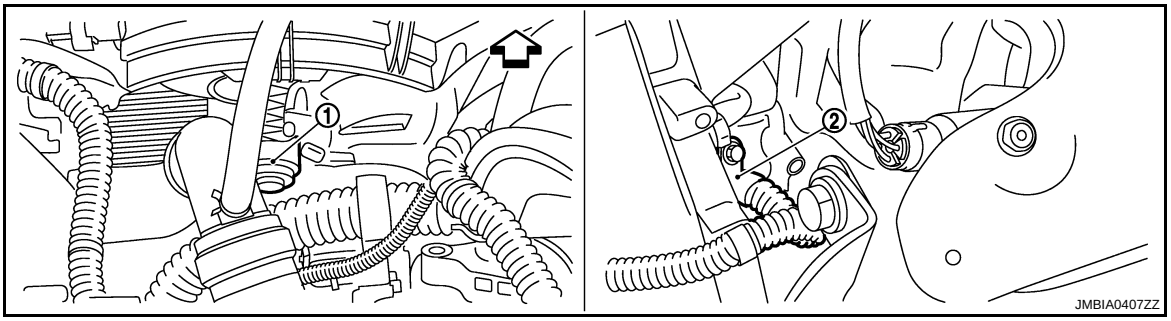


1. Intake valve timing control solenoid valve
2. Knock sensor



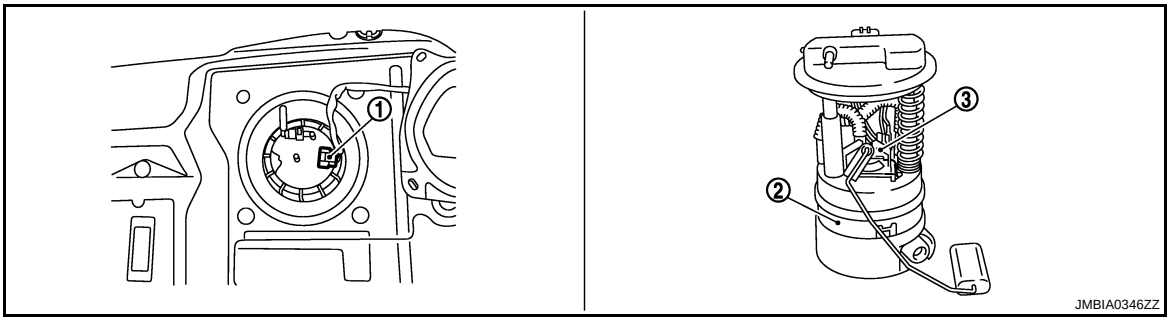
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

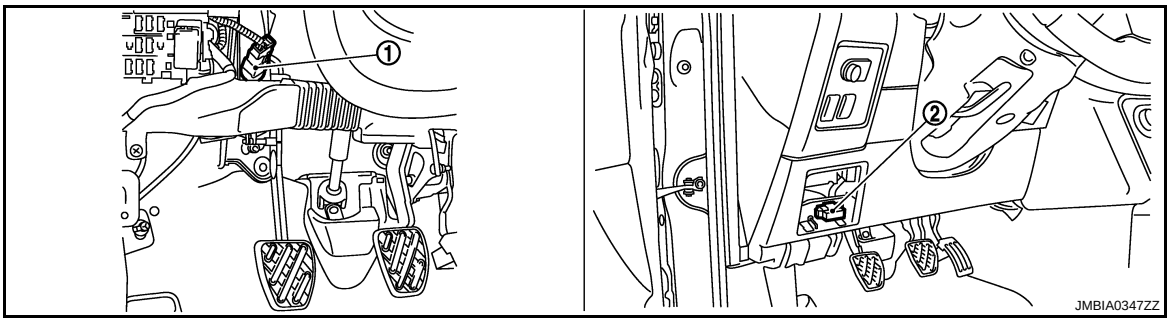


1. Cooling fan motor
2. Crankshaft position sensor (POS)

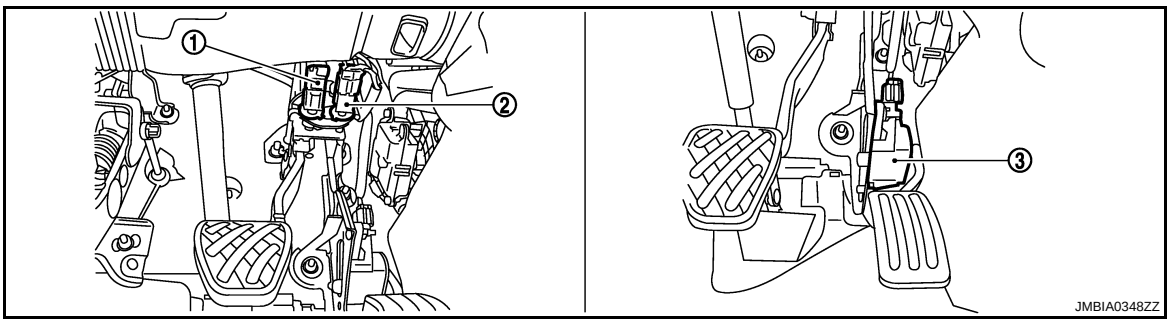
⇦ Vehicle front



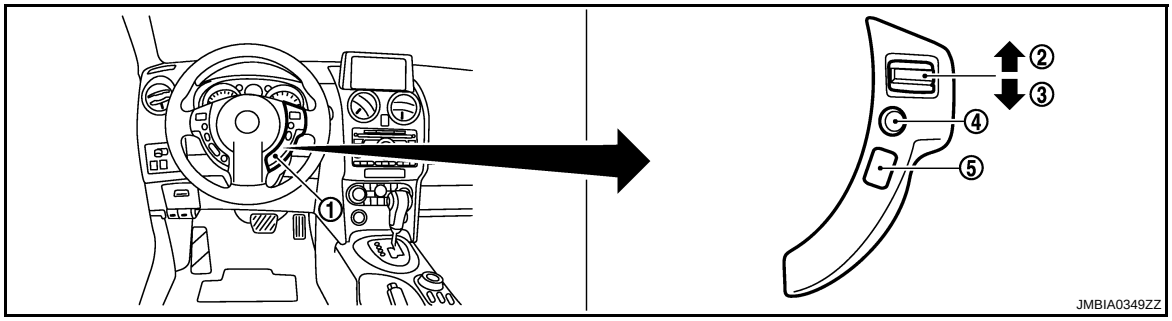
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

INFOID:0000000001179391

Component	Reference
ASCD steering switch	ECH-252, "Description"
ASCD clutch switch	ECH-282, "Description"
ASCD brake switch	ECH-282, "Description"
ASCD indicator	ECH-286, "Description"
Stop lamp switch	ECH-266, "Description"
Electric throttle control actuator	ECH-206, "Description"

CAN COMMUNICATION

System Description

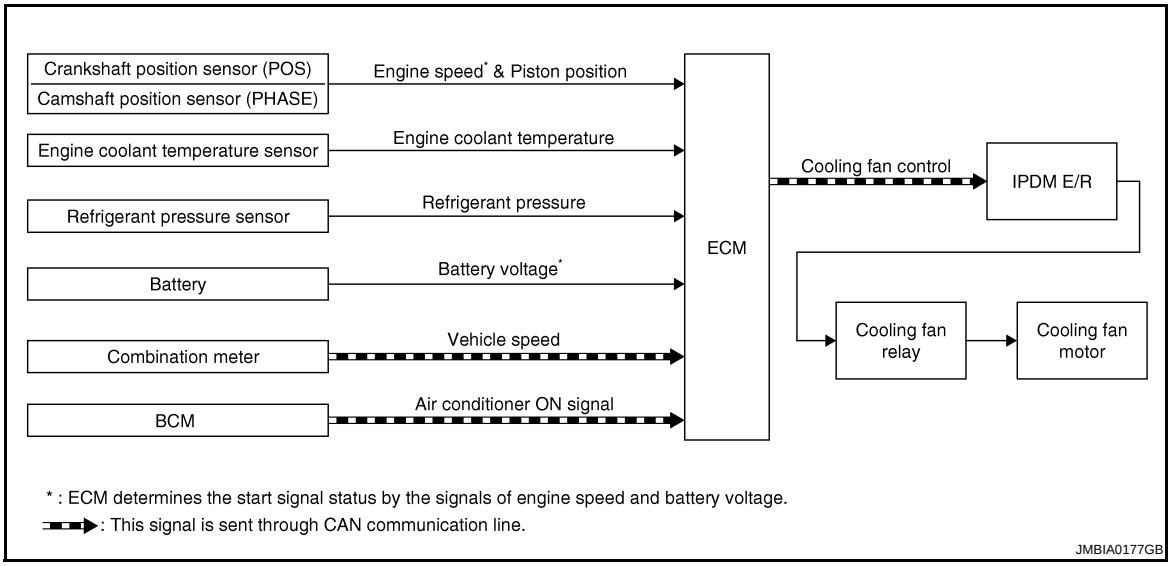
INFOID:0000000001179392

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.
Refer to LAN-28, "CAN Communication Signal Chart", about CAN communication for detail.

COOLING FAN CONTROL

System Diagram

INFOID:0000000001179393



System Description

INFOID:0000000001179394

INPUT/OUTPUT SIGNAL CHART

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

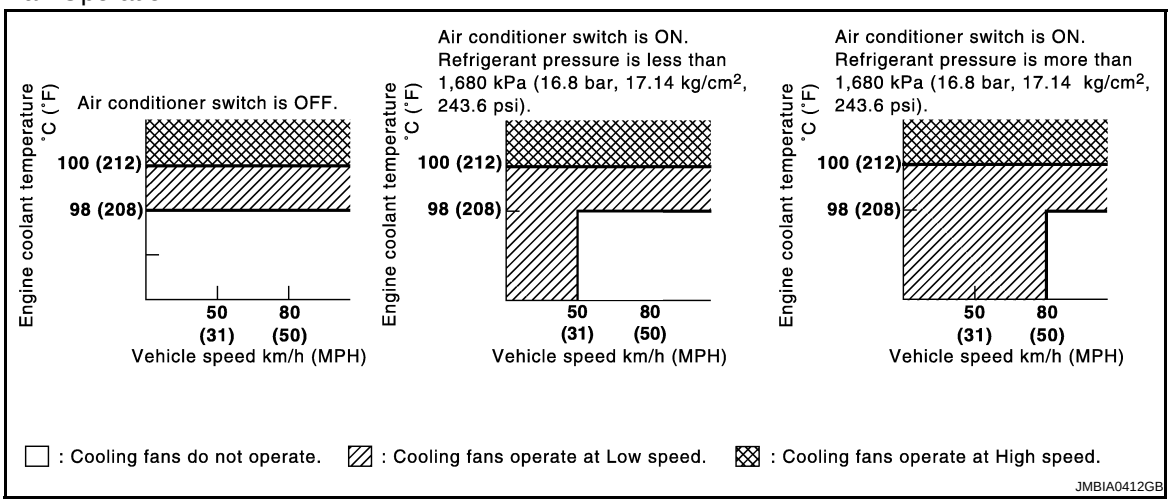
*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*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



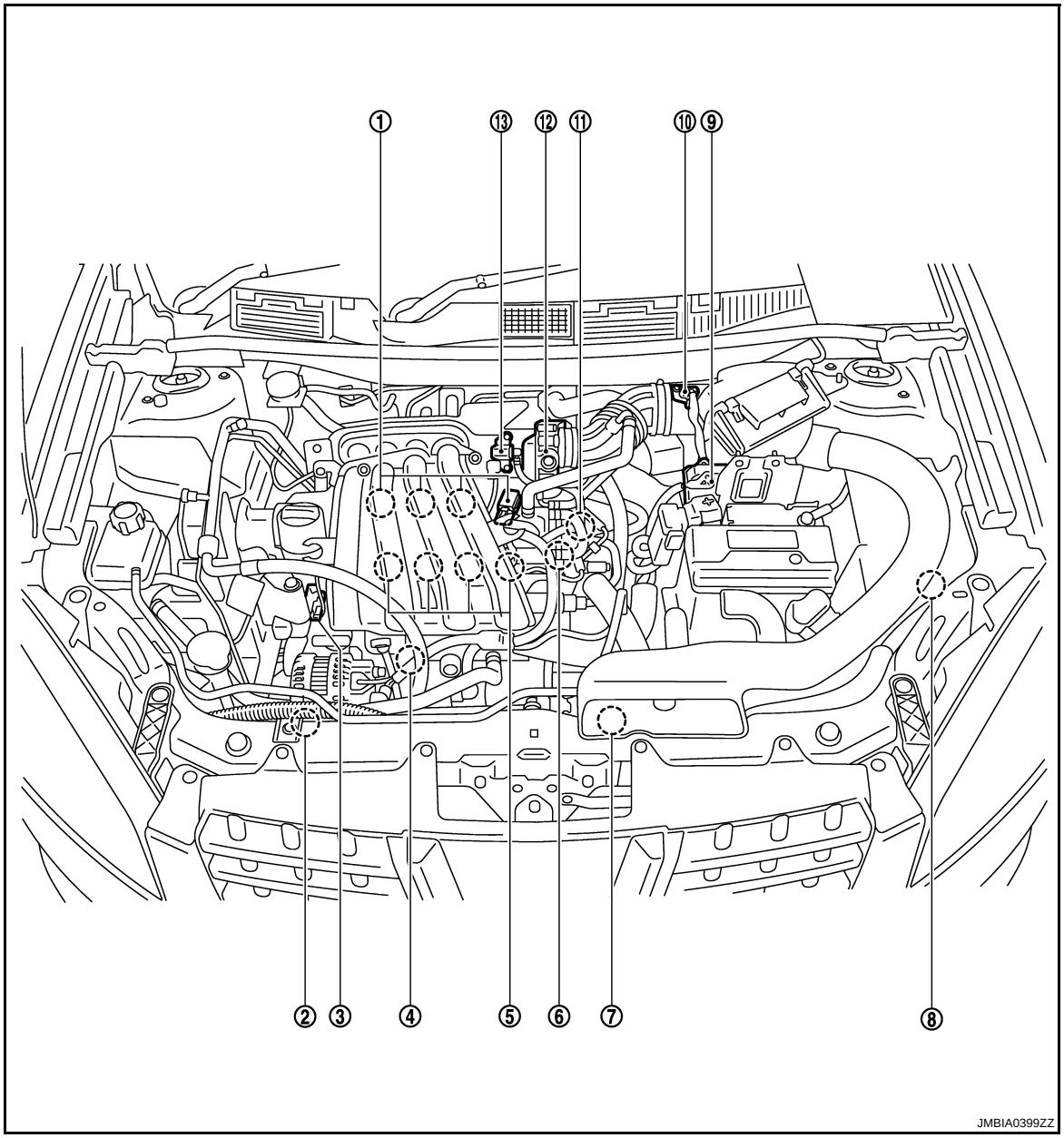
Cooling Fan Relay Operation

The ECM controls cooling fan relays through CAN communication line.

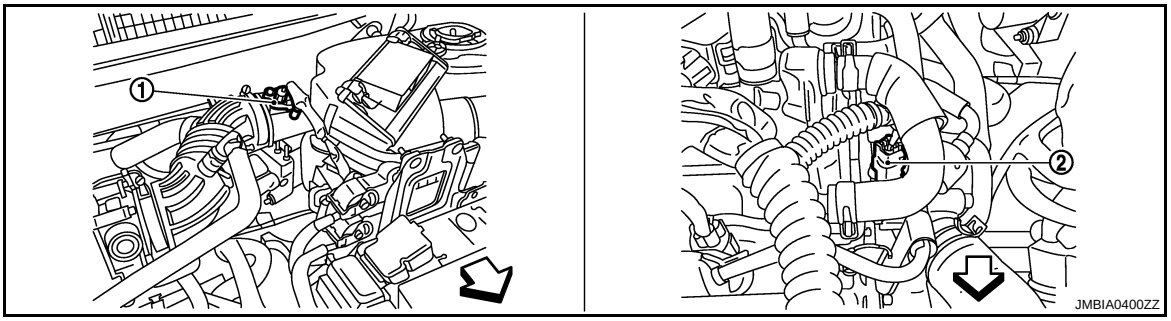
Cooling fan speed	Cooling fan relay	
	1	2
Stop (OFF)	OFF	OFF
Low (LOW)	ON	OFF
High (HI)	OFF	ON

Component Parts Location

INFOID:0000000001179395

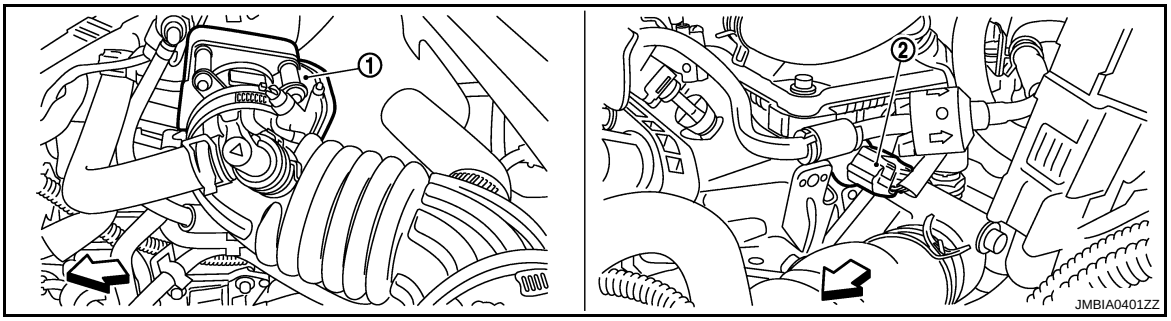


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



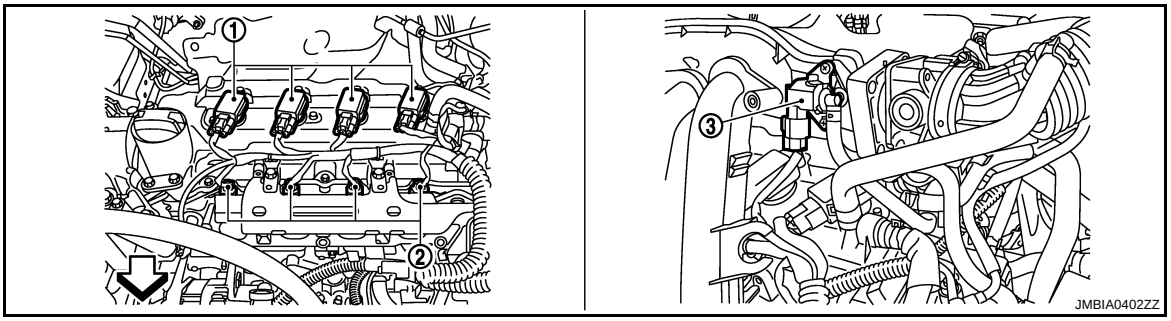
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



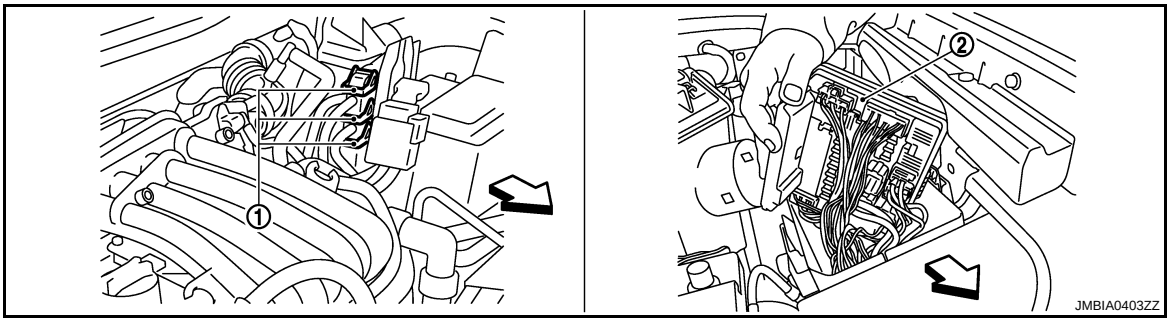
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



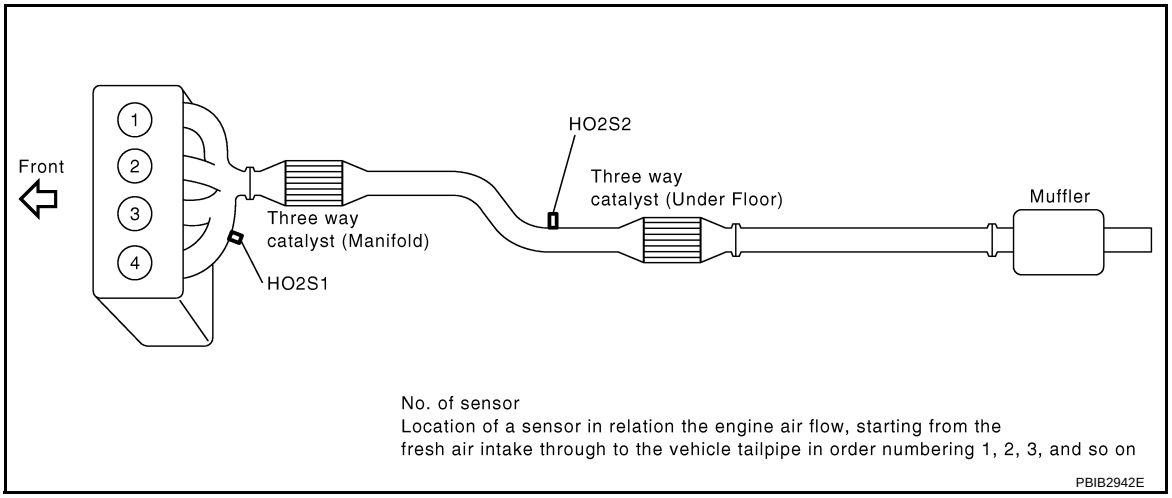
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

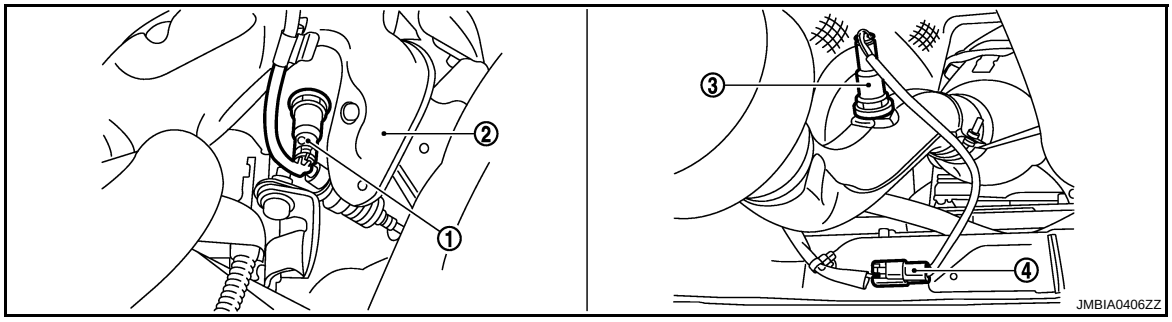
⇦ Vehicle front



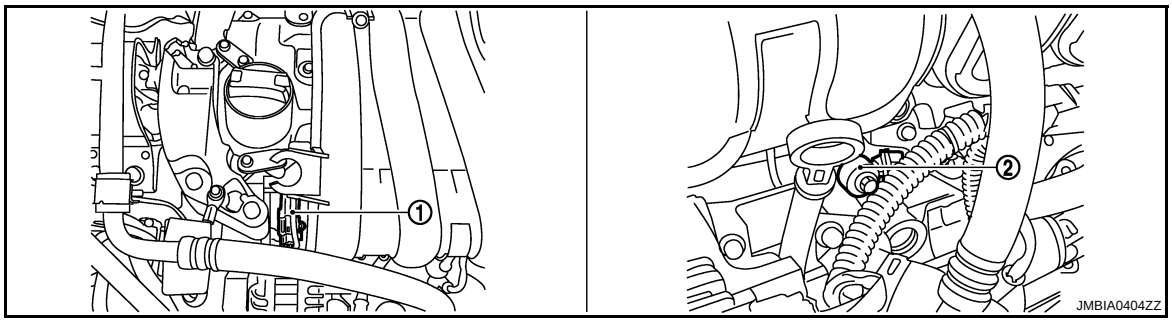
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

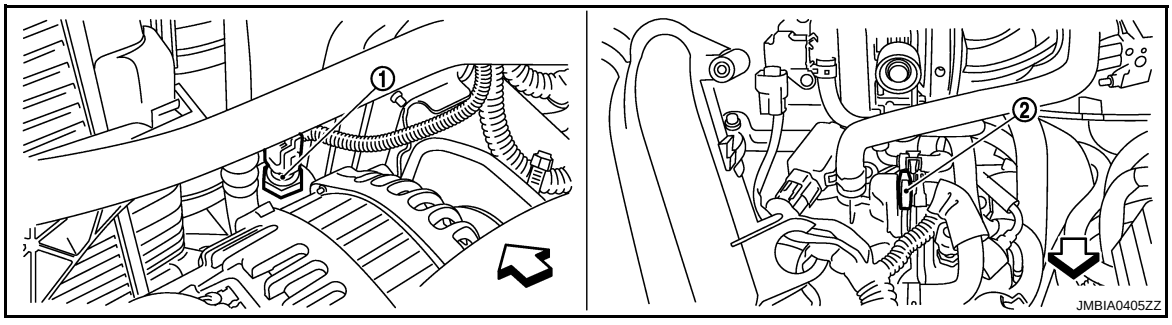




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

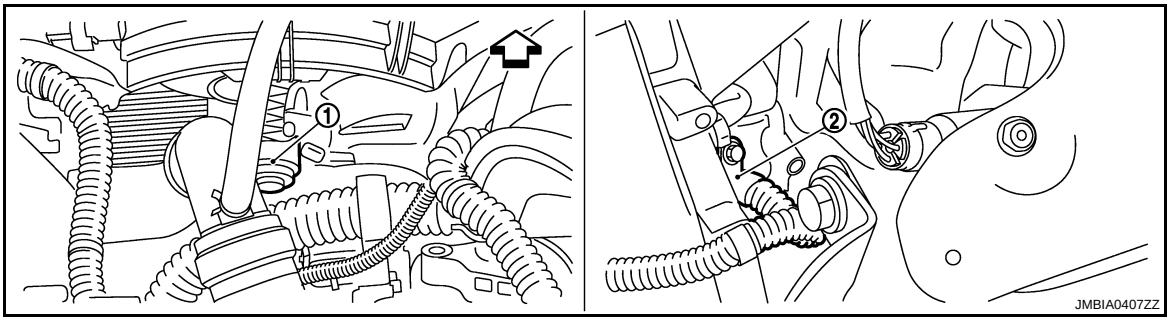


1. Intake valve timing control solenoid valve
2. Knock sensor



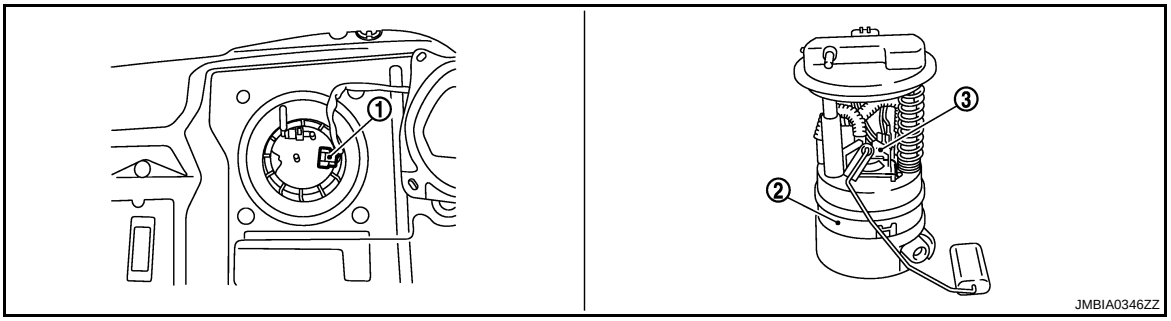
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

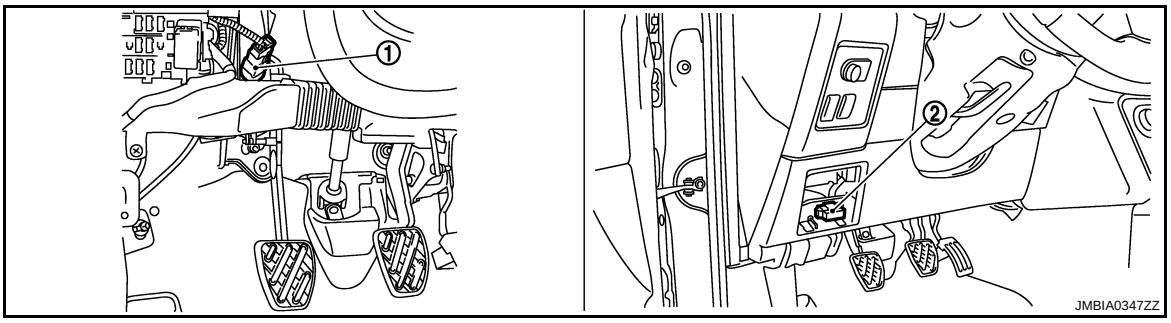


1. Cooling fan motor
2. Crankshaft position sensor (POS)

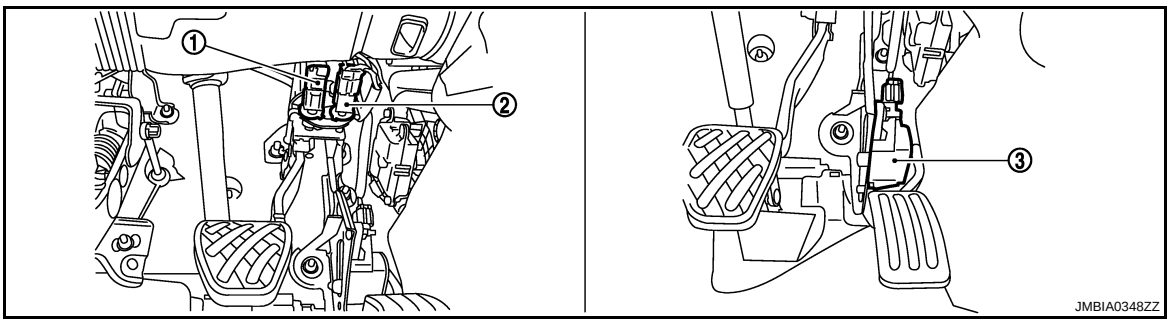
⇦ Vehicle front



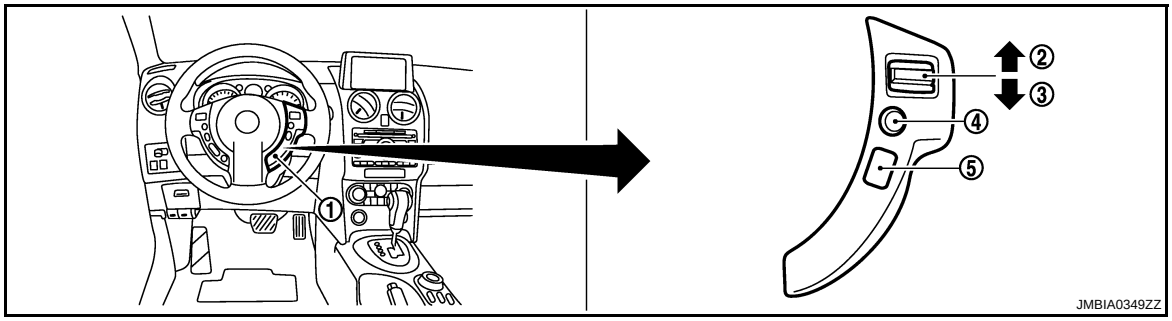
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

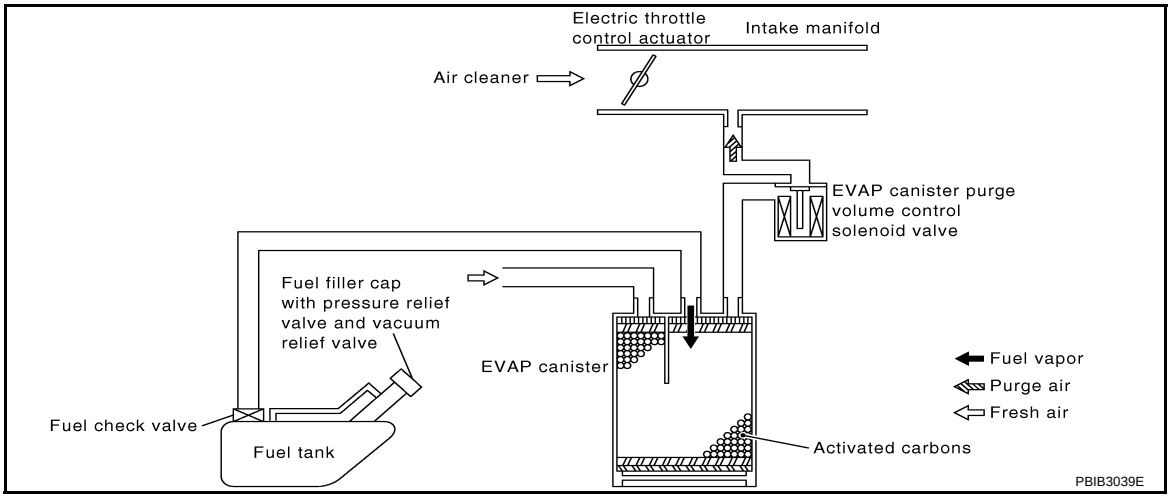
INFOID:0000000001179396

Component	Reference
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Cooling fan motor	ECH-56, "System Description"
Engine coolant temperature sensor	ECH-124, "Description"
Refrigerant pressure sensor	ECH-304, "Description"

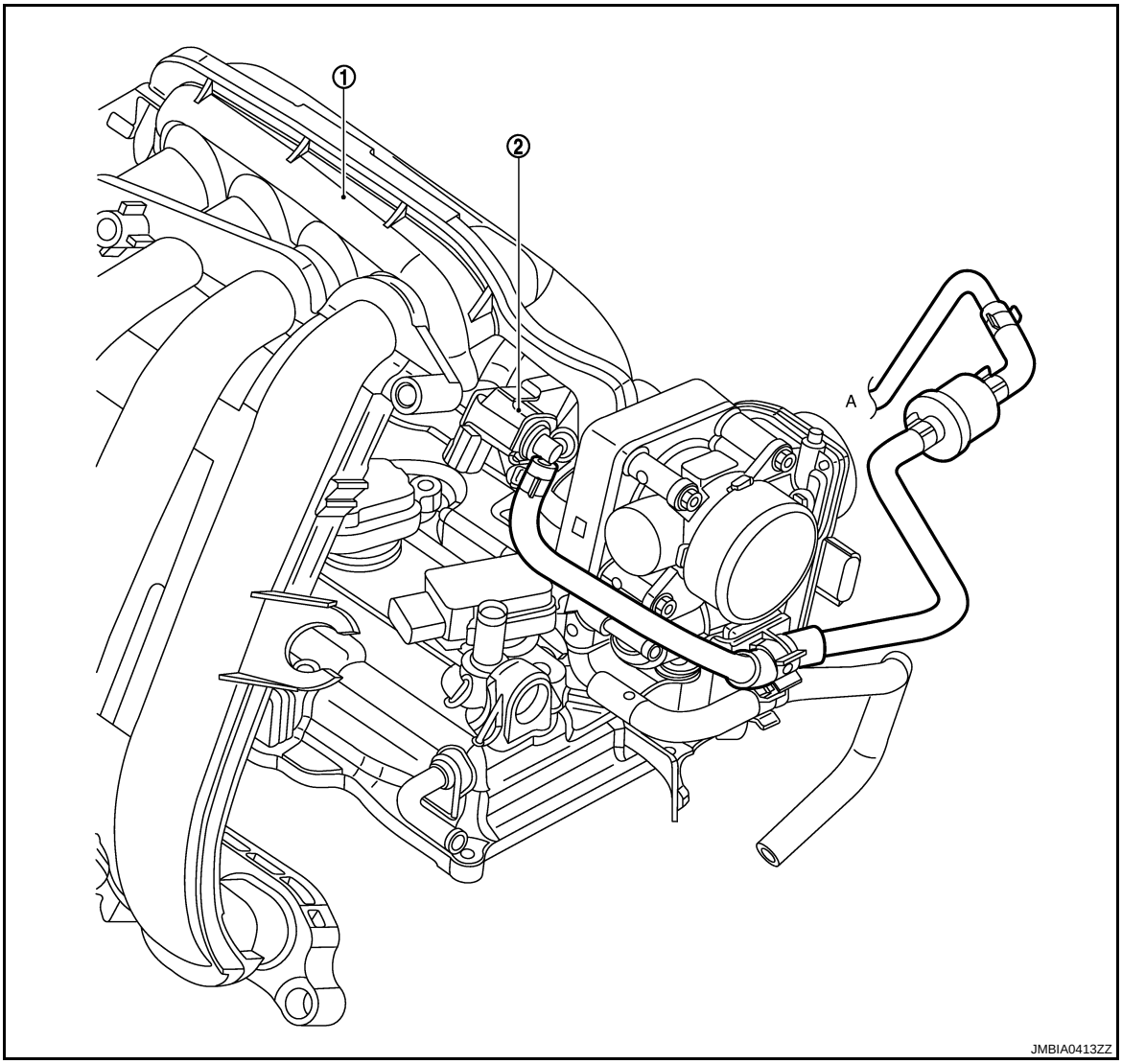
EVAPORATIVE EMISSION SYSTEM

System Diagram

INFOID:0000000001179397



EVAPORATIVE EMISSION LINE DRAWING



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

A. To EVAP canister

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

System Description

INFOID:0000000001179398

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Heated oxygen sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Combination meter*2	Vehicle speed		

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

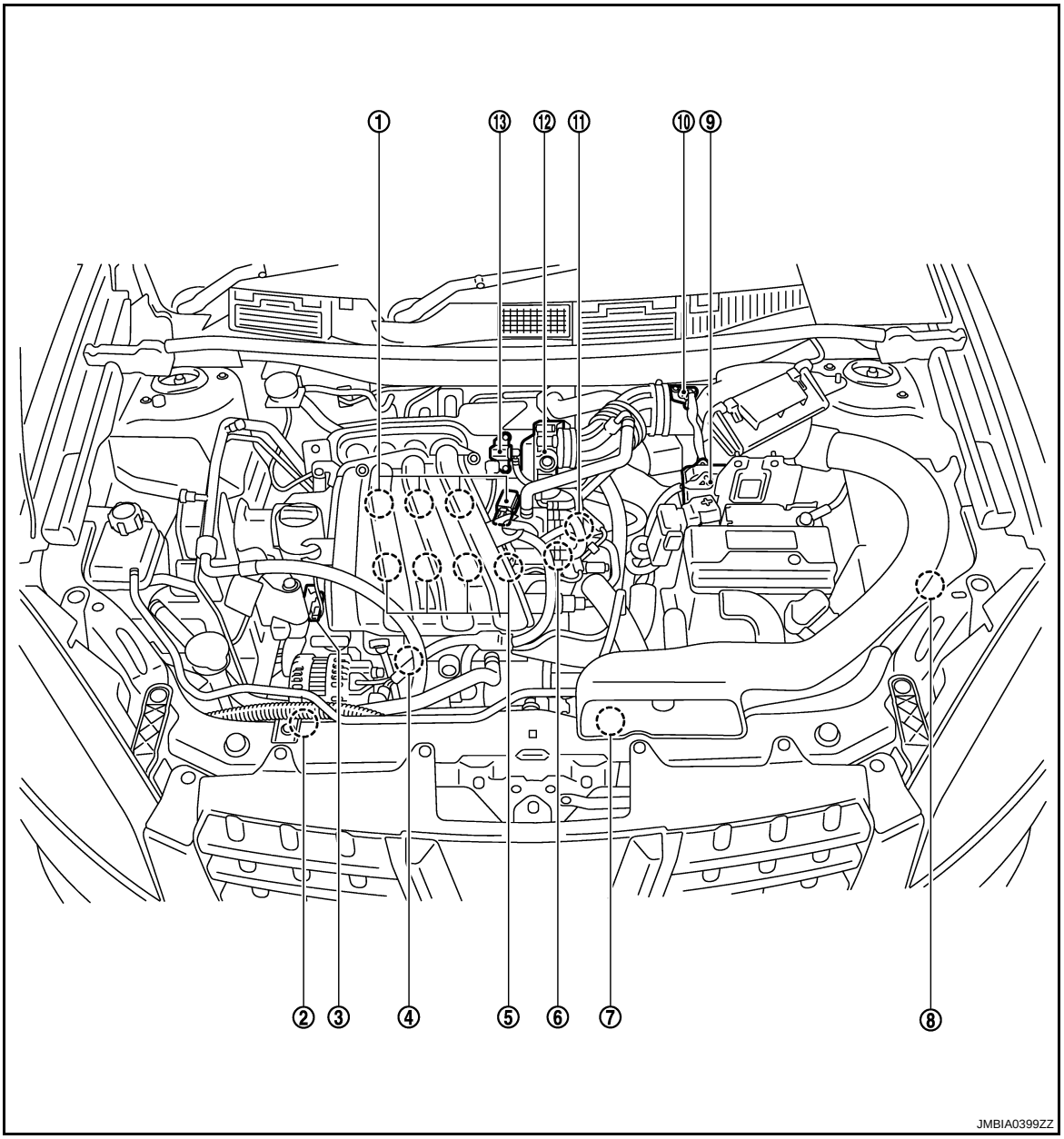
*2: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

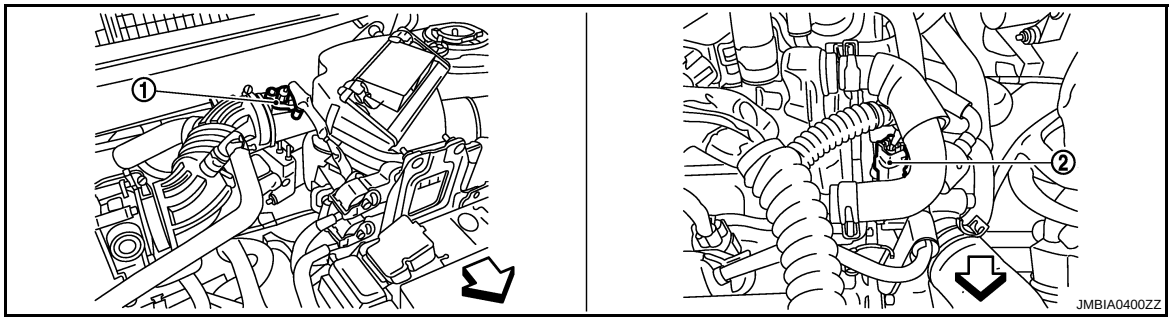
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon 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.

Component Parts Location

INFOID:0000000001179399

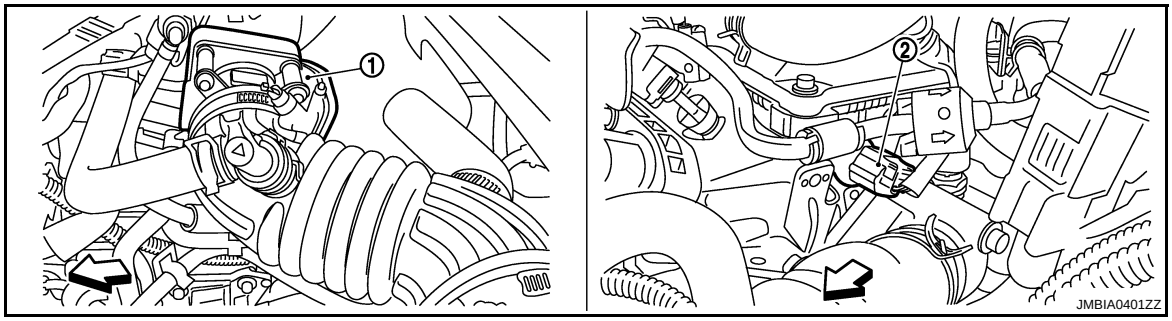


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



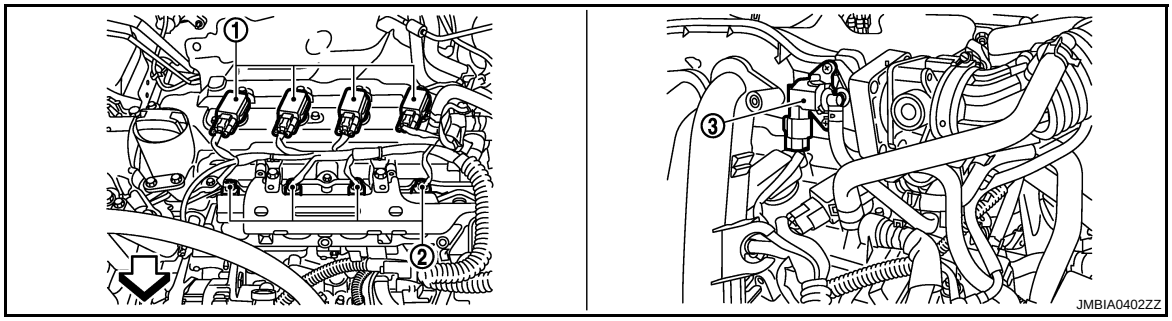
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



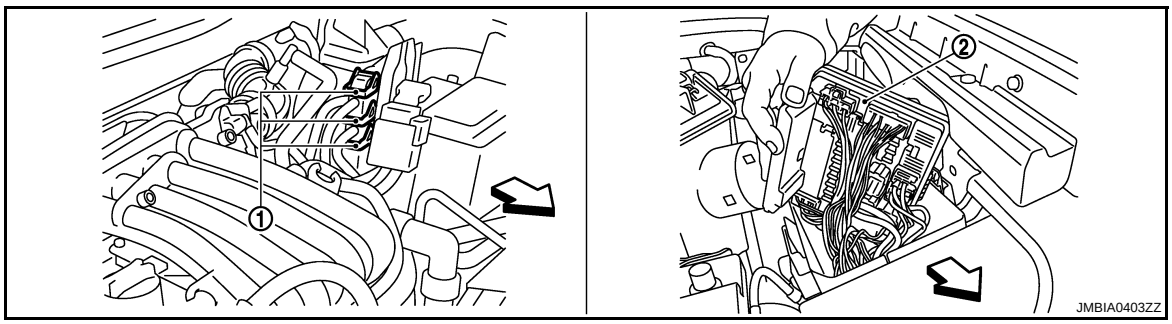
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



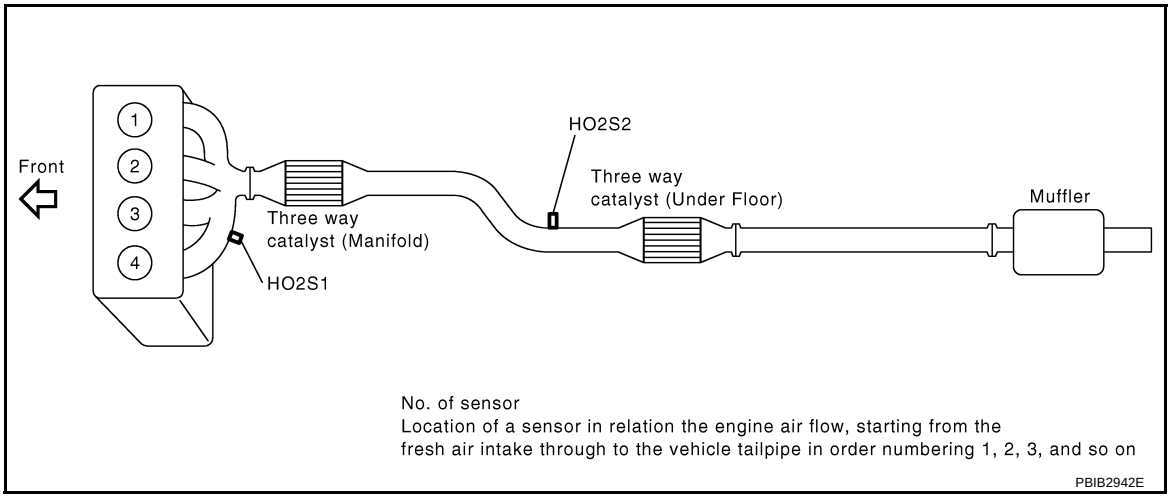
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

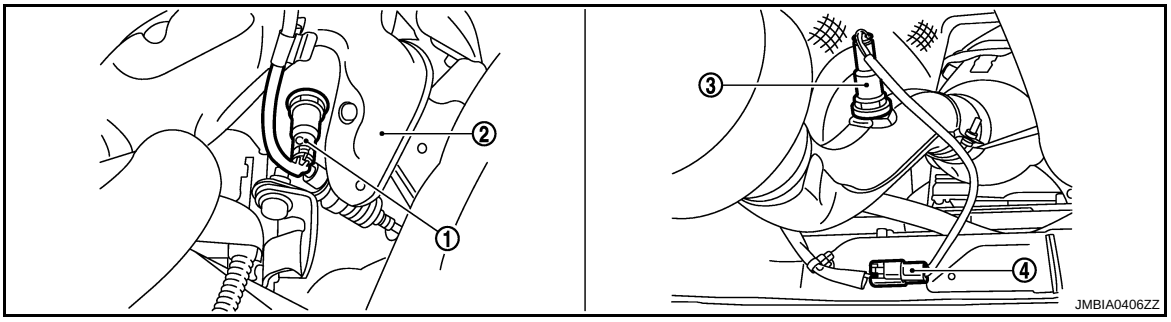
⇦ Vehicle front



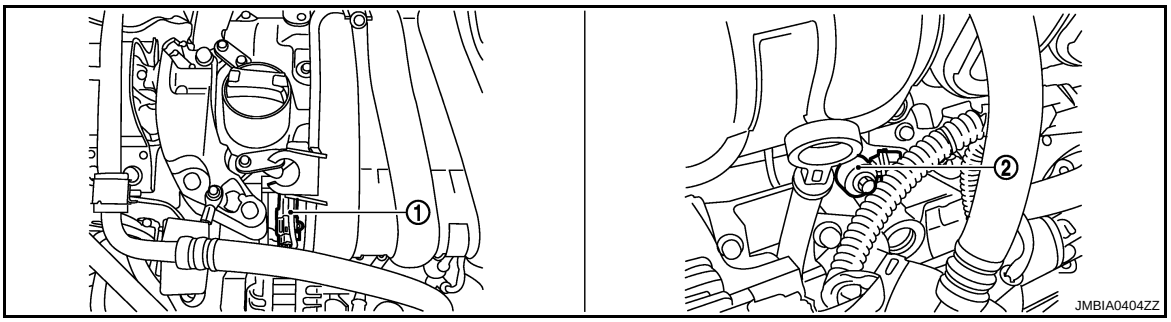
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

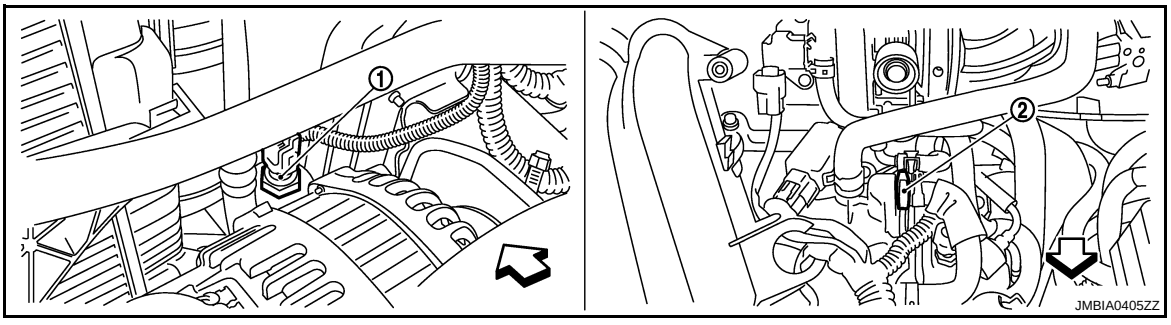




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

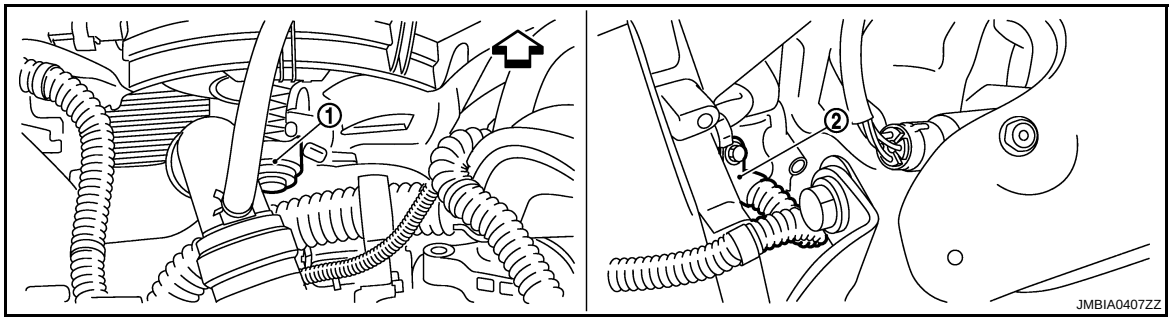


1. Intake valve timing control solenoid valve
2. Knock sensor



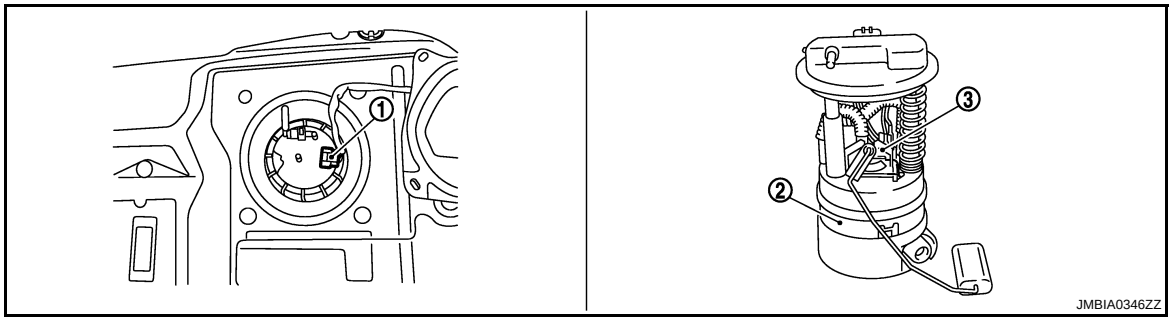
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

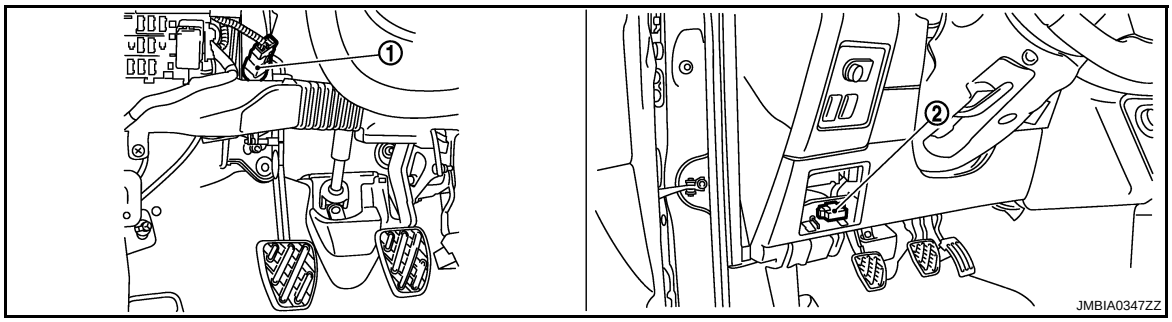


1. Cooling fan motor
2. Crankshaft position sensor (POS)

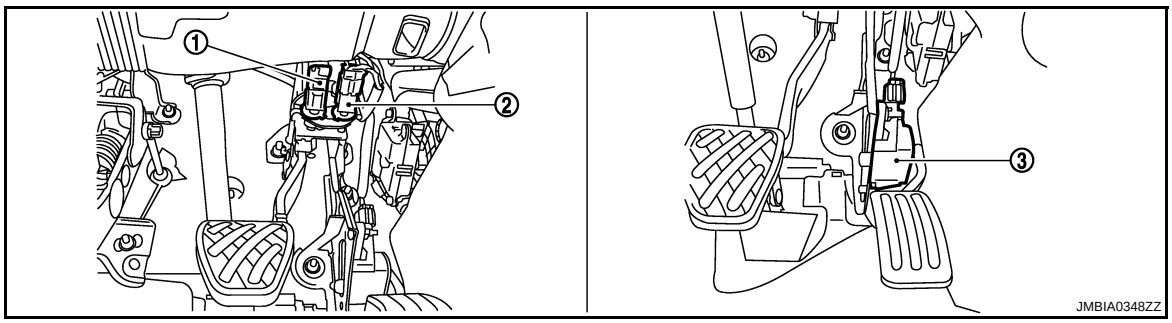
⇦ Vehicle front



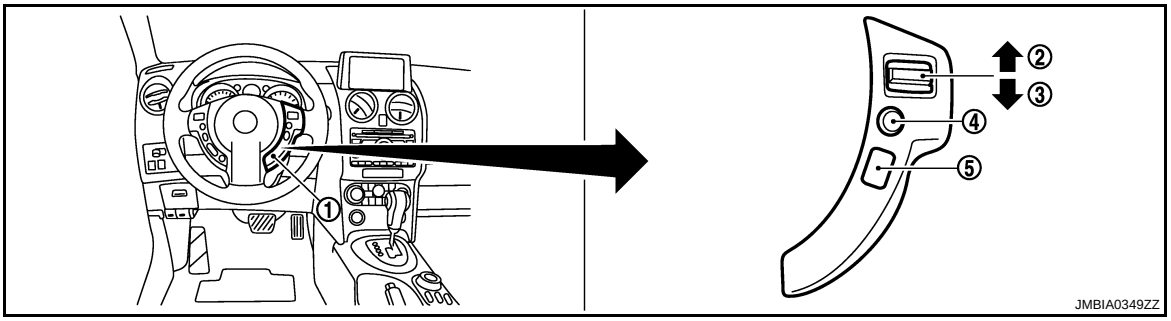
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

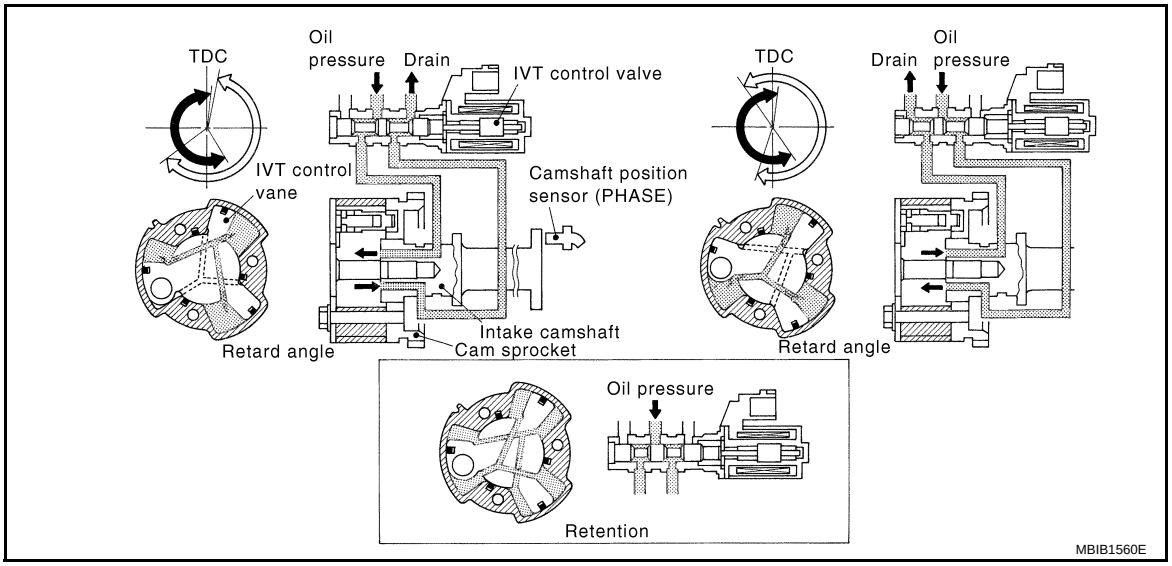
INFOID:0000000001179400

Component	Reference
Accelerator pedal position sensor	ECH-268, "Description"
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Engine coolant temperature sensor	ECH-124, "Description"
EVAP canister purge volume control solenoid valve	ECH-195, "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Mass air flow sensor	ECH-116, "Description"
Throttle position sensor	ECH-127, "Description"
Vehicle speed sensor	ECH-198, "Description"

INTAKE VALVE TIMING CONTROL

System Diagram

INFOID:0000000001179401



System Description

INFOID:0000000001179402

INPUT/OUTPUT SIGNAL CHART

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

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

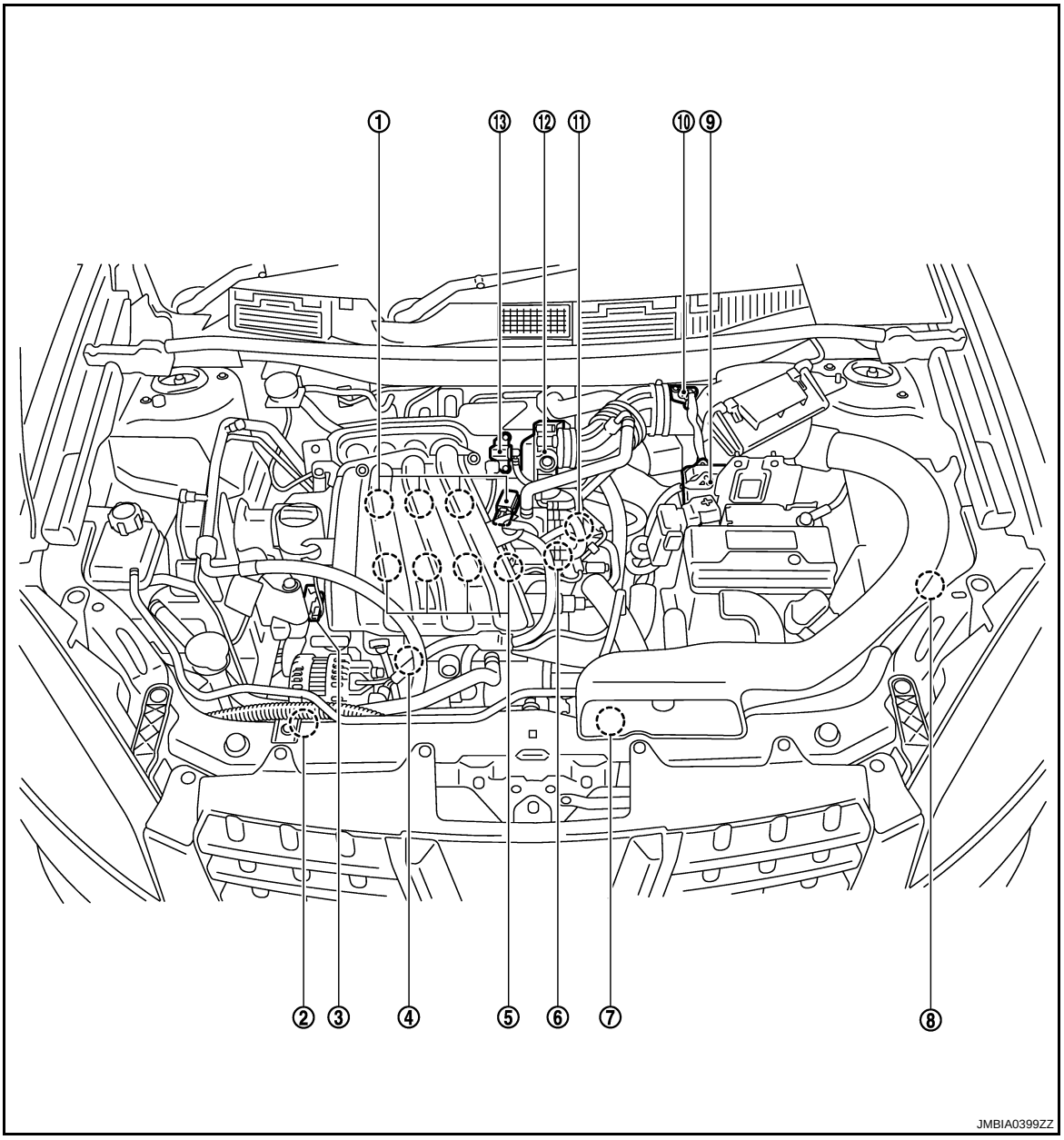
SYSTEM DESCRIPTION

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

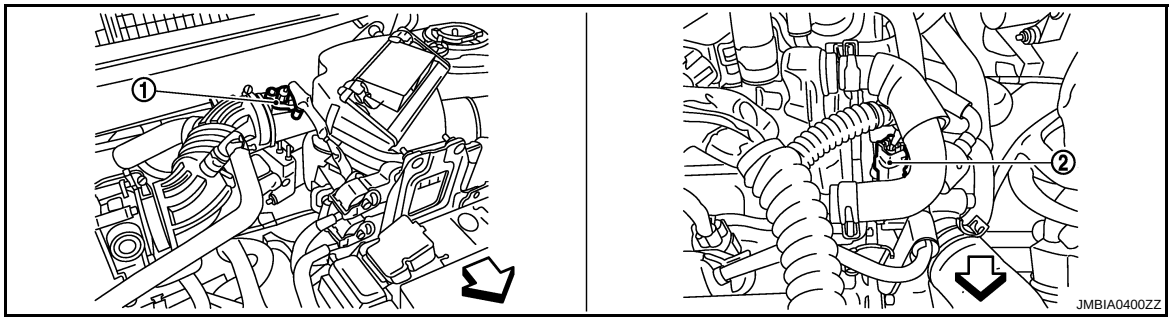
The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing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

Component Parts Location

INFOID:0000000001179403

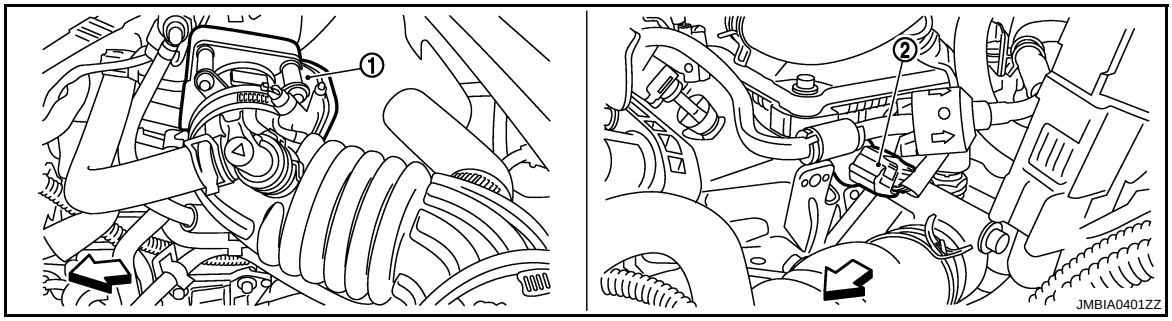


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



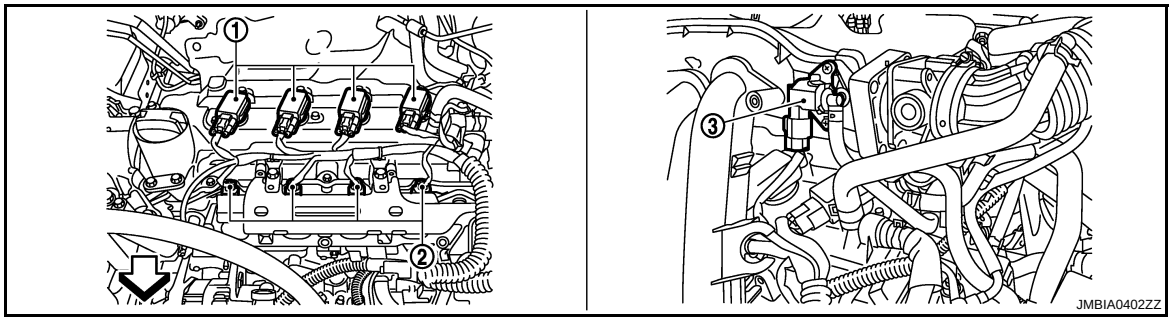
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



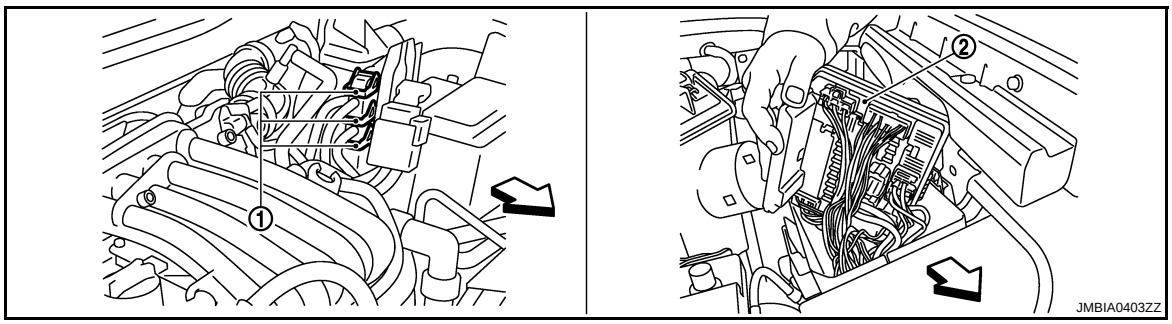
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



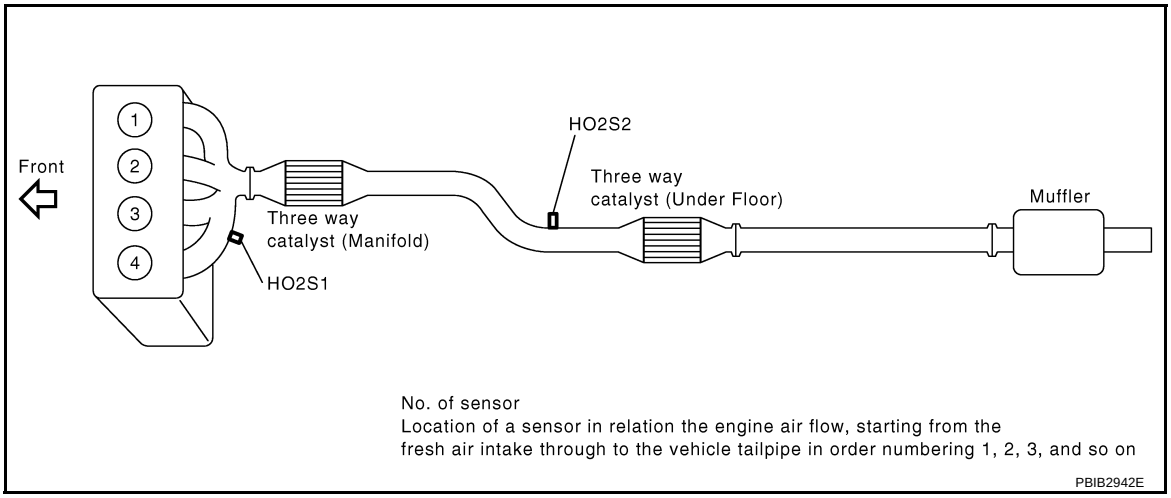
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

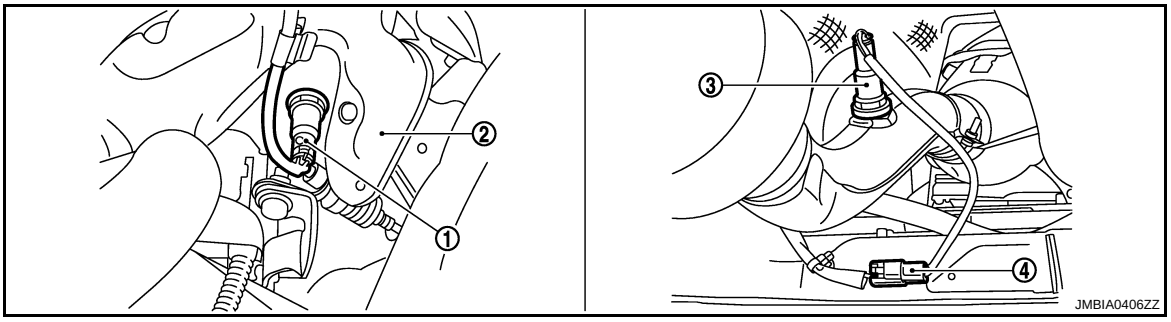
⇦ Vehicle front



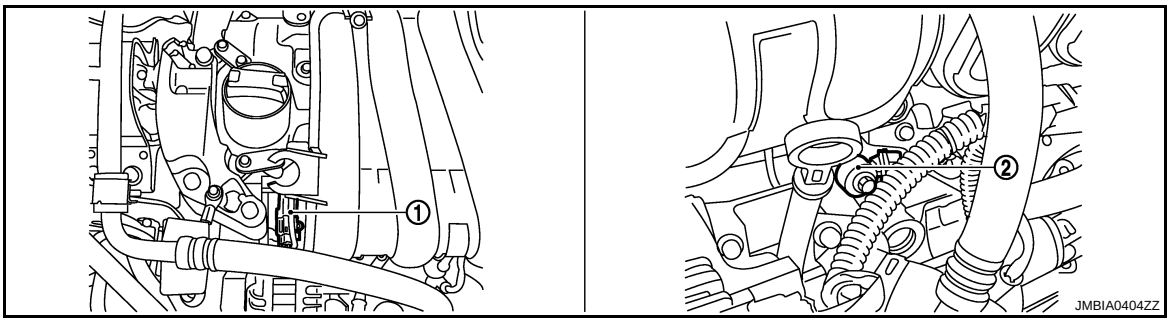
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

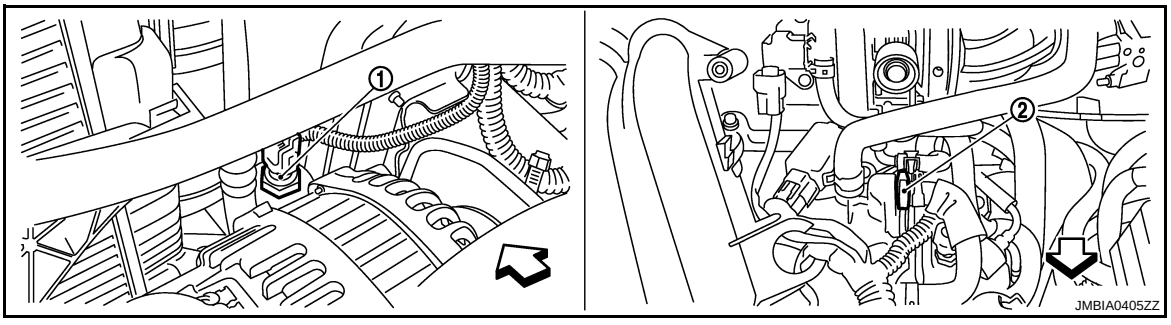




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

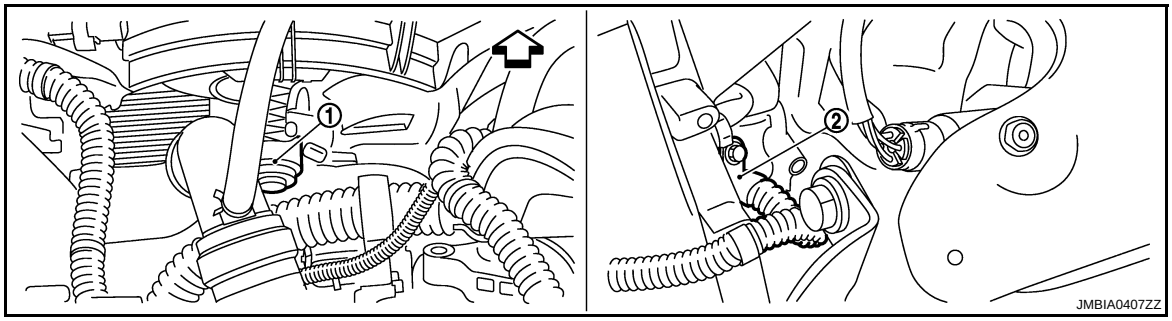


1. Intake valve timing control solenoid valve
2. Knock sensor



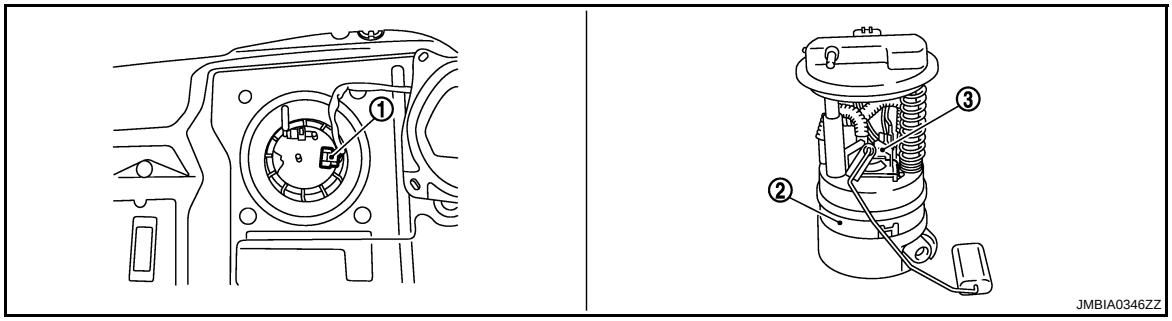
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

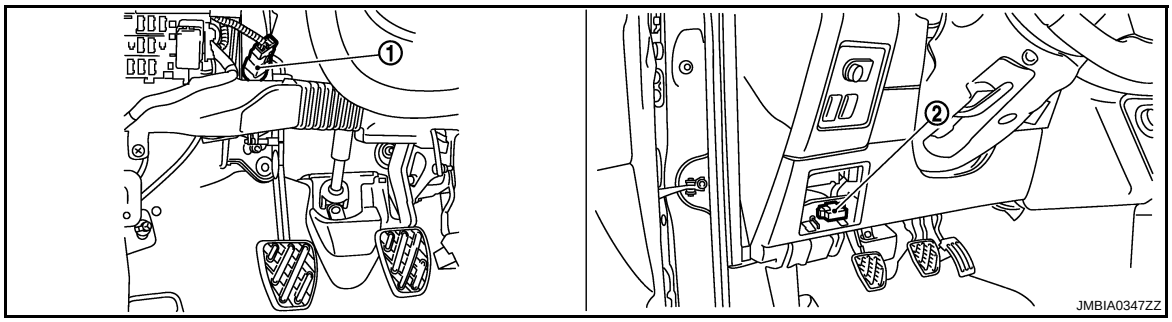


1. Cooling fan motor
2. Crankshaft position sensor (POS)

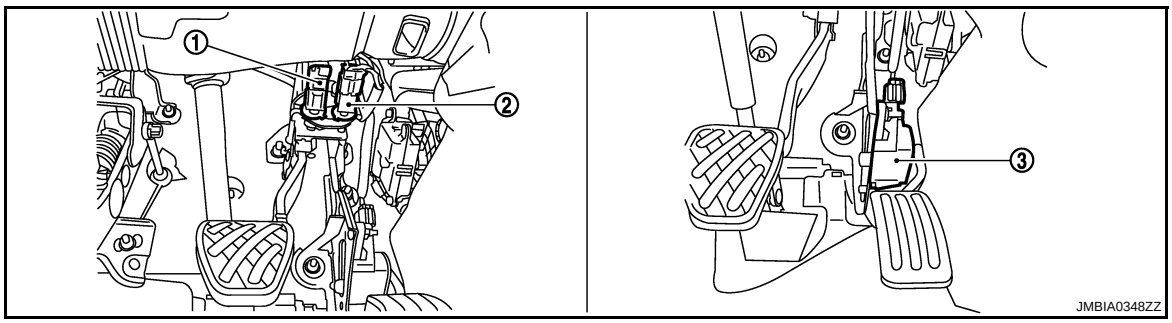
⇦ Vehicle front



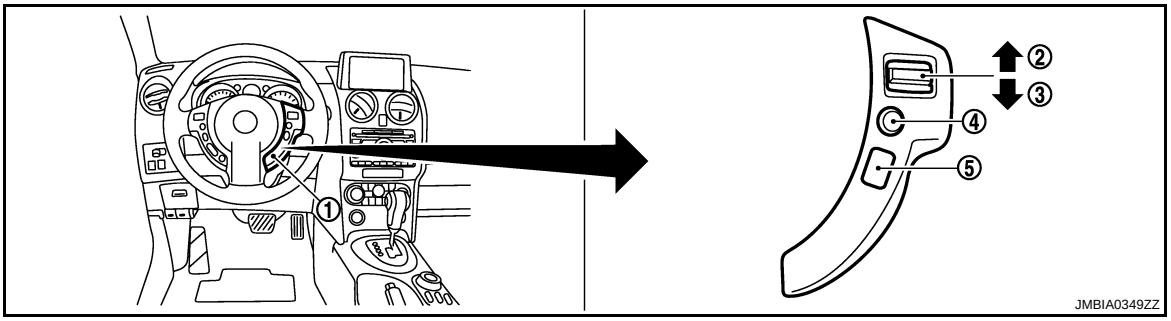
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

INFOID:0000000001179404

Component	Reference
Camshaft position sensor (PHASE)	ECH-186, "Description"
Crankshaft position sensor (POS)	ECH-182, "Description"
Engine coolant temperature sensor	ECH-124, "Description"
Intake valve timing control solenoid valve	ECH-70, "System Description"
Vehicle speed sensor	ECH-198, "Description"

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000001179405

INTRODUCTION

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information	Diagnostic service
Diagnostic Trouble Code (DTC)	Service $03 of ISO 15031-5
Freeze Frame data	Service $02 of ISO 15031-5
System Readiness Test (SRT) code	Service $01 of ISO 15031-5
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Service $07 of ISO 15031-5
1st Trip Freeze Frame data	
Test values and Test limits	Service $06 of ISO 15031-5

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data	SRT code	Test value
CONSULT-III	×	×	×	×	×	—
GST	×	×	×	—	×	×
ECM	×	×*	—	—	—	—

*: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator lamp (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to ECH-327, "Fail Safe".)

TWO TRIP DETECTION LOGIC

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 light up 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 lights up. The MI lights up 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 light up 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	Lighting up	Blinking	Lighting up				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0304 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to ECH-330, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DTC AND FREEZE FRAME DATA

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 reoccur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is stored 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 stored 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.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”.
For malfunctions in which 1st trip DTCs are displayed, refer to “EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS”. These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-III.
1st trip DTC is specified in Service $07 of ISO 15031-5. 1st trip DTC detection occurs without lighting up the MI and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
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 ECH-10, "Work Flow". Then perform DTC CONFIRMATION PROCEDURE or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

Freeze Frame Data and 1st Trip Freeze Frame Data

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-III or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-III screen, not on the GST.
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 - P0304 Fuel Injection System Function — DTC: P0171, P0172
2		Except the above items
3	1st trip freeze frame data	

For example, the EGR malfunction (Priority: 2) was detected and the freeze frame data was stored 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. Procedures for clearing the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”.

How to Read DTC and 1st Trip DTC

With CONSULT-III
With GST
CONSULT-III or GST (Generic Scan Tool) Examples: P0340, P1148, 1706, etc.
These DTCs are prescribed by ISO 15031-5.

(CONSULT-III also displays the malfunctioning component or system.)

No Tools

The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0340, 1148, 1706, etc.

These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, GST or the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-III can identify malfunction status as shown below. Therefore, using CONSULT-III (if available) is recommended.**

DTC or 1st trip DTC of a malfunction is displayed in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-III. Time data indicates how many times the vehicle was driven after the last detection of a DTC.

If the DTC is being detected currently, the time data will be [0].

If a 1st trip DTC is stored in the ECM, the time data will be [1t].

How to Erase DTC and 1st Trip DTC

With CONSULT-III

The emission related diagnostic information in the ECM can be erased by selecting “All Erase” in the “Description” of “FINAL CHECK” mode with CONSULT-III.

With GST

The emission related diagnostic information in the ECM can be erased by selecting Service $04 with GST.

1. 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.
2. Select Service $04 with GST (Generic Scan Tool).

No Tools

1. 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.
2. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal.

- **If the battery is disconnected, the emission-related diagnostic information will be lost within 24 hours.**
- **The following data are 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

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Service $01 of 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 Item

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

SRT item (CONSULT-III indication)	Performance Priority*	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420
HO2S	1	Heated oxygen sensor 1	P0133
		Heated oxygen sensor 1	P1143
		Heated oxygen sensor 1	P1144
		Heated oxygen sensor 2	P0139
		Heated oxygen sensor 2	P1146
HO2S HTR	1	Heated oxygen sensor 1 heater	P0135
		Heated oxygen sensor 2 heater	P0141

*: If completion of several SRTs is required, perform driving patterns (DTC CONFIRMATION PROCEDURE), one by one based on the priority for models with CONSULT-III.

SRT Set Timing

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

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON → OFF ← ON → OFF ← ON → OFF ← ON →			
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”
NG exists	Case 3	P0400	OK	OK	—	—
		P0402	—	—	—	—
		P1402	NG	—	NG	NG (Consecutive NG)
		(1st trip) DTC	1st trip DTC	—	1st trip DTC	DTC (= 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 showed OK results in a single cycle (Ignition OFF-ON-OFF), the SRT will indicate “CMPLT”. → Case 1 above

When all SRT related self-diagnoses showed 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 showed NG results in 2 consecutive cycles, the SRT will also indicate “CMPLT”. → Case 3 above

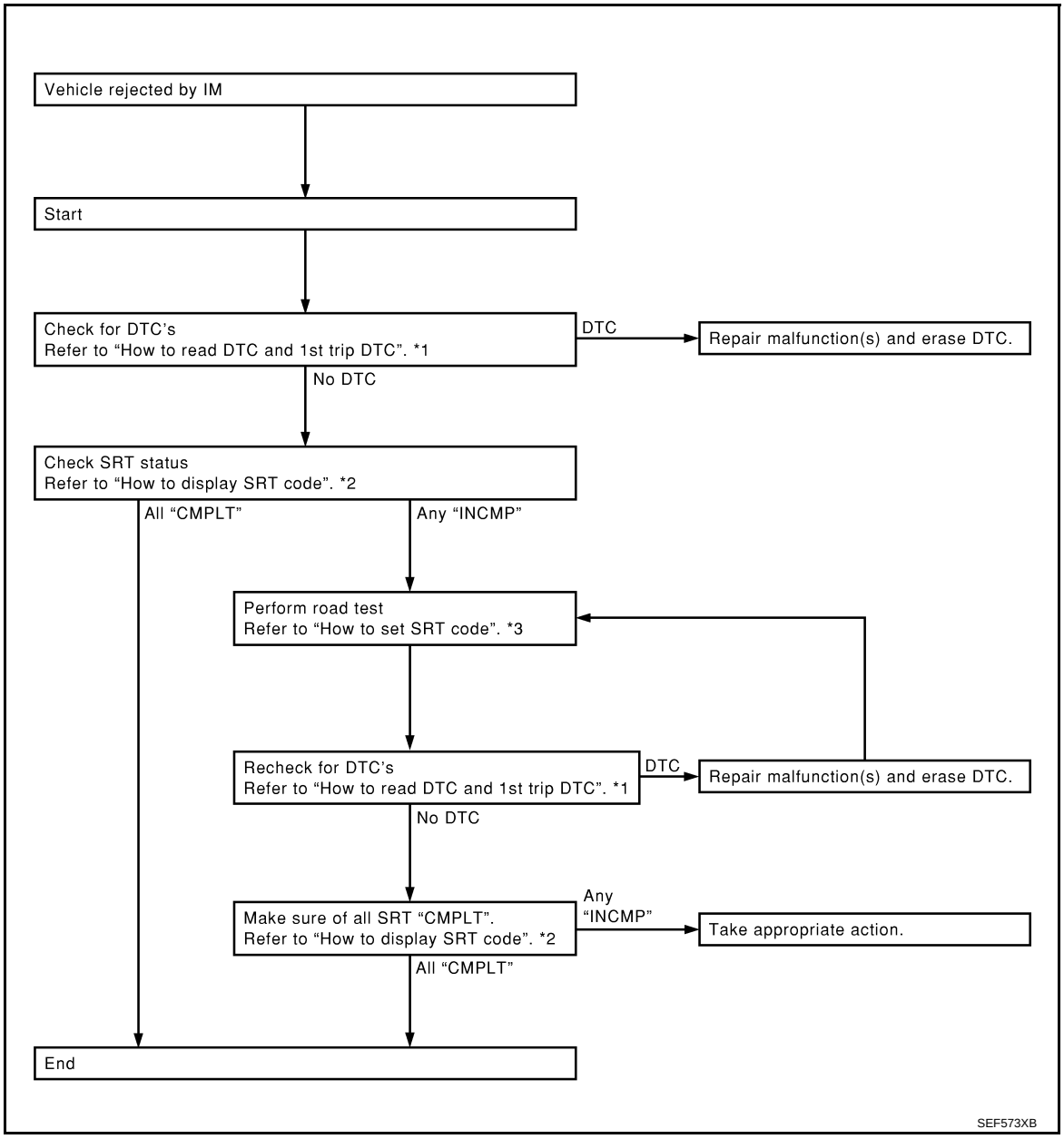
The table above shows that the minimum number of cycles for setting SRT as “INCMP” is one (1) for each self-diagnosis (Case 1 & 2) or two (2) for one of self-diagnoses (Case 3). However, in preparation for the state emissions inspection, it is unnecessary for each self-diagnosis to be executed twice (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.
- When, during SRT driving pattern, 1st trip DTC (NG) is detected prior to “CMPLT” of SRT, the self-diagnosis memory must be erased from 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”.

SRT Service Procedure

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



*1 “How to Read DTC and 1st Trip DTC” *2 “How to Display SRT Status” *3 “How to Set SRT Code”

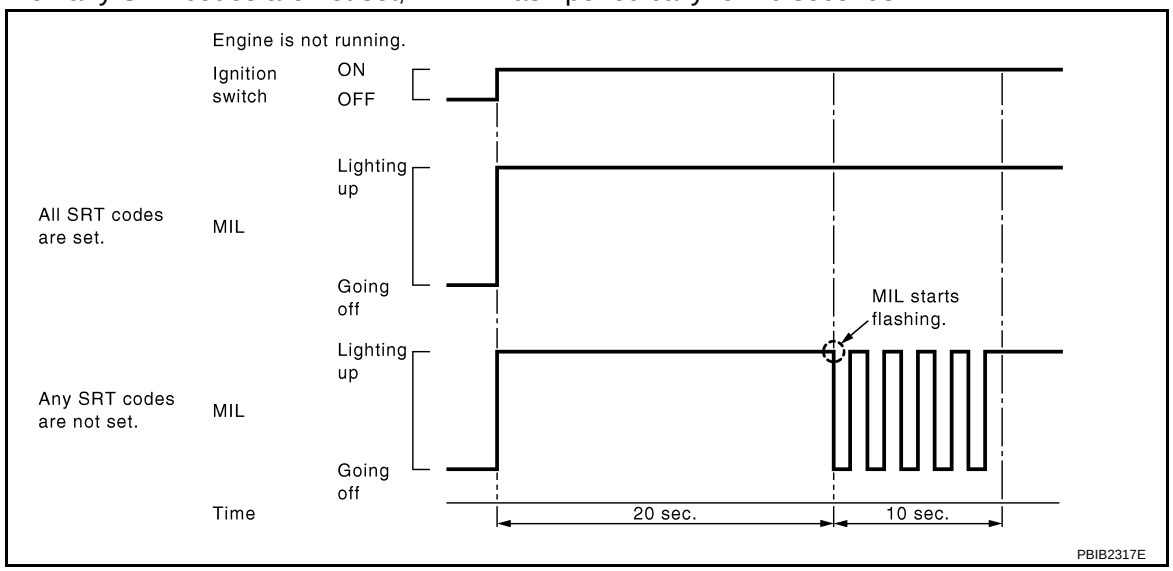
How to Display SRT Status

WITH CONSULT-III
Selecting “SRT STATUS” in “DTC CONFIRMATION” mode with CONSULT-III.
For items whose SRT codes are set, a “CMPLT” is displayed on the CONSULT-III screen; for items whose SRT codes are not set, “INCMP” is displayed.

WITH GST
Selecting Service $01 with GST (Generic Scan Tool)

NO TOOLS
A SRT code itself can not be displayed while only SRT status can be.

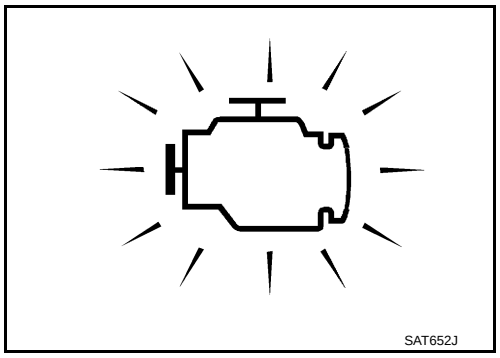
1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown below.
   - When all SRT codes are set, MI lights up continuously.
   - When any SRT codes are not set, MI will flash periodically for 10 seconds.



MALFUNCTION INDICATOR (MI)

Description
The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MI does not light up, refer to ECH-302, "Component Function Check".
2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



On Board Diagnostic System Function
The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. The following malfunctions will light up or blink the MI in the 1st trip. • Misfire (Possible three way catalyst damage) • One trip detection diagnoses
Mode II	Ignition switch in ON position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

MI Flashing Without DTC

If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. How to switch the diagnostic test function modes, and details of the above functions are described later.

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

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

Diagnostic Test Mode I — Bulb Check

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check the bulb. Refer to ECH-302, "Component Function Check".

Diagnostic Test Mode I — Malfunction Warning

MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

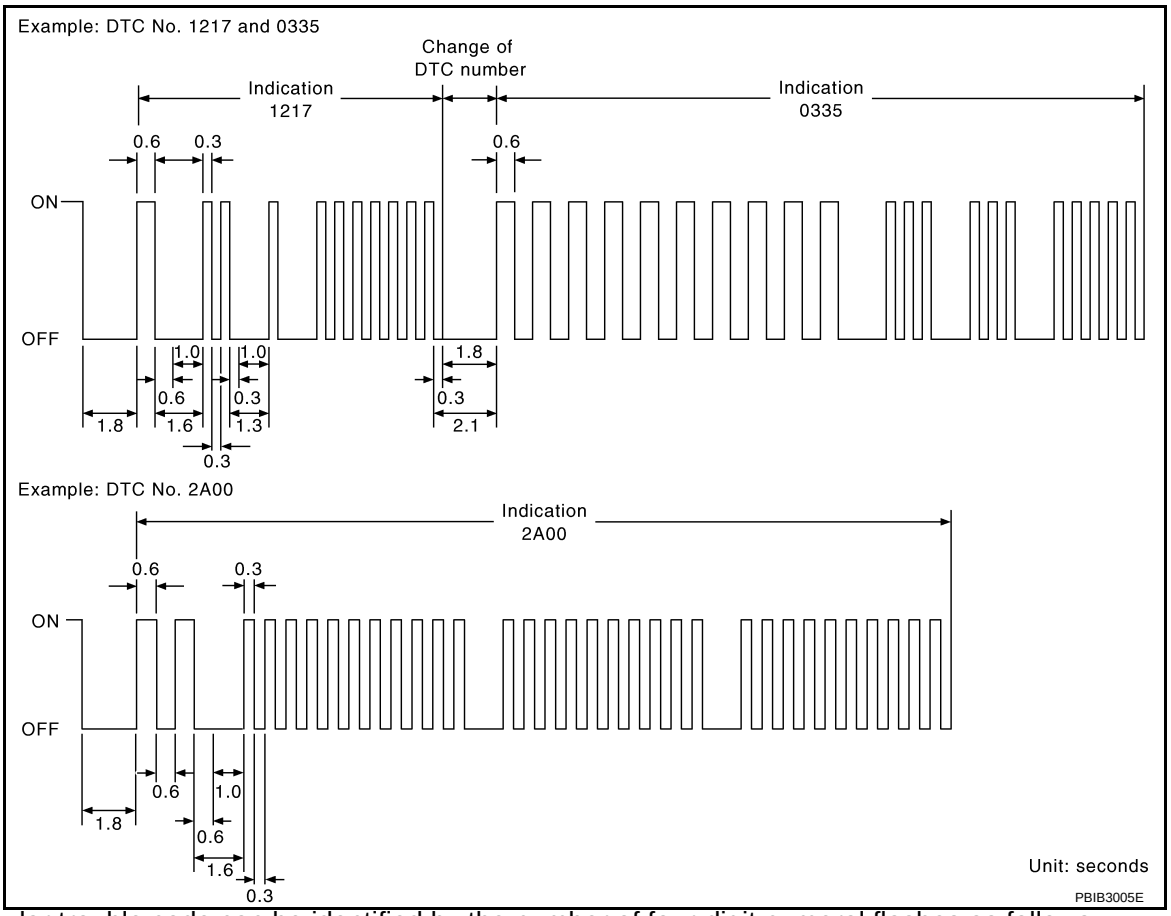
This DTC number is clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

Diagnostic Test Mode II — Self-diagnostic Results

In this mode, 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 illumi-

nates in diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



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

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-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second 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-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See ECH-330, "DTC Index")

Diagnostic Test Mode II — Heated oxygen sensor 1 monitor

In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.

To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Nest run engine at about 2,000 rpm for about 2 minutes under no load conditions. Then make sure that the MI comes ON more than 5 times within 1 seconds with engine running at 2,000 rpm under no load.

How to Switch Diagnostic Test Mode

NOTE:

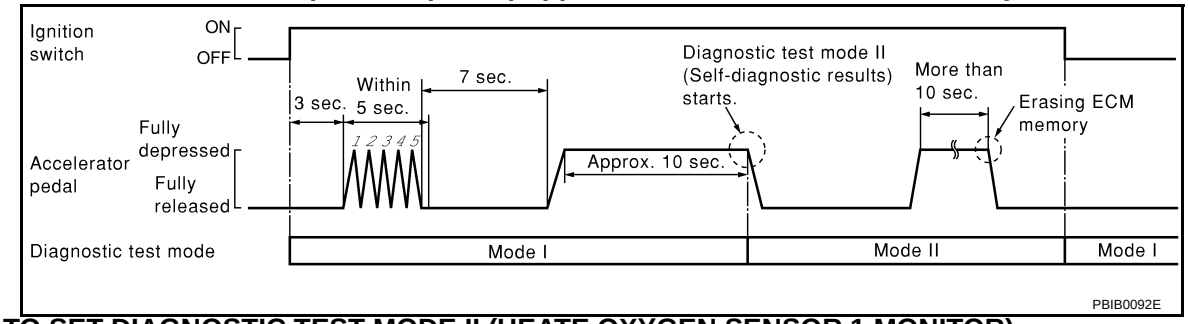
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF.**

HOW TO SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

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 for approx. 10 seconds until the MI starts blinking.
   NOTE:
   Do not release the accelerator pedal for 10 seconds if MI may start blinking on the halfway of this 10 seconds. This blinking is displaying SRT status and is continued for another 10 seconds.
4. Fully release the accelerator pedal.
   ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).
   NOTE:
   Wait until the same DTC (or 1st trip DTC) appears to confirm all DTCs certainly.



HOW TO SET DIAGNOSTIC TEST MODE II (HEATE OXYGEN SENSOR 1 MONITOR)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results).
   Refer to “How to Set Diagnostic Test Mode II (Self-diagnostic Results)”.
2. Start Engine.
   ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to “How to Set Diagnostic Test Mode II (Self-diagnostic Results)”.
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
   The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)

The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to “How to Erase Diagnostic Test Mode II (Self-diagnostic Results)”.

- **If the battery is disconnected, the DTC will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

OBD System Operation Chart

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 go off after the vehicle is driven 3 times (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 (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 (pattern C) without

the same malfunction recurring. The “TIME” in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-III will count the number of times the vehicle is driven.

- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

Summary Chart

Items	Fuel Injection System	Misfire	Other
MI (goes 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)

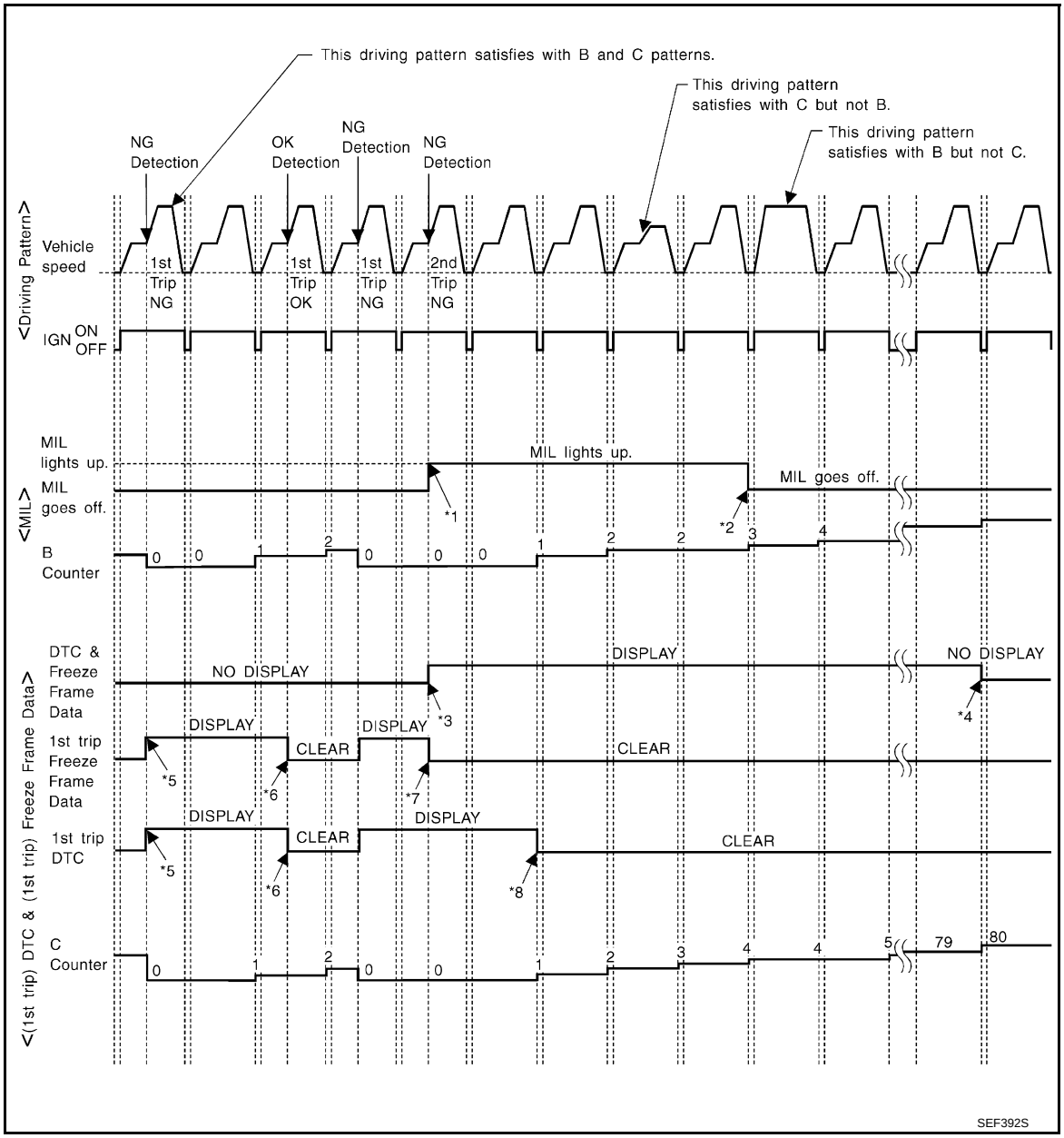
For details about patterns B and C under “Fuel Injection System” and “Misfire”, see “EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”.

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 go off after vehicle is driven 3 times (pattern B) without any malfunctions.

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

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

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

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

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

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

Explanation for Driving Patterns for “Misfire <Exhaust Quality Deterioration>”, “Fuel Injection System”
<Driving Pattern B>
Driving pattern B means the vehicle operation as follows:
All components and systems should be monitored at least once by the OBD system.

- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MI will go off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

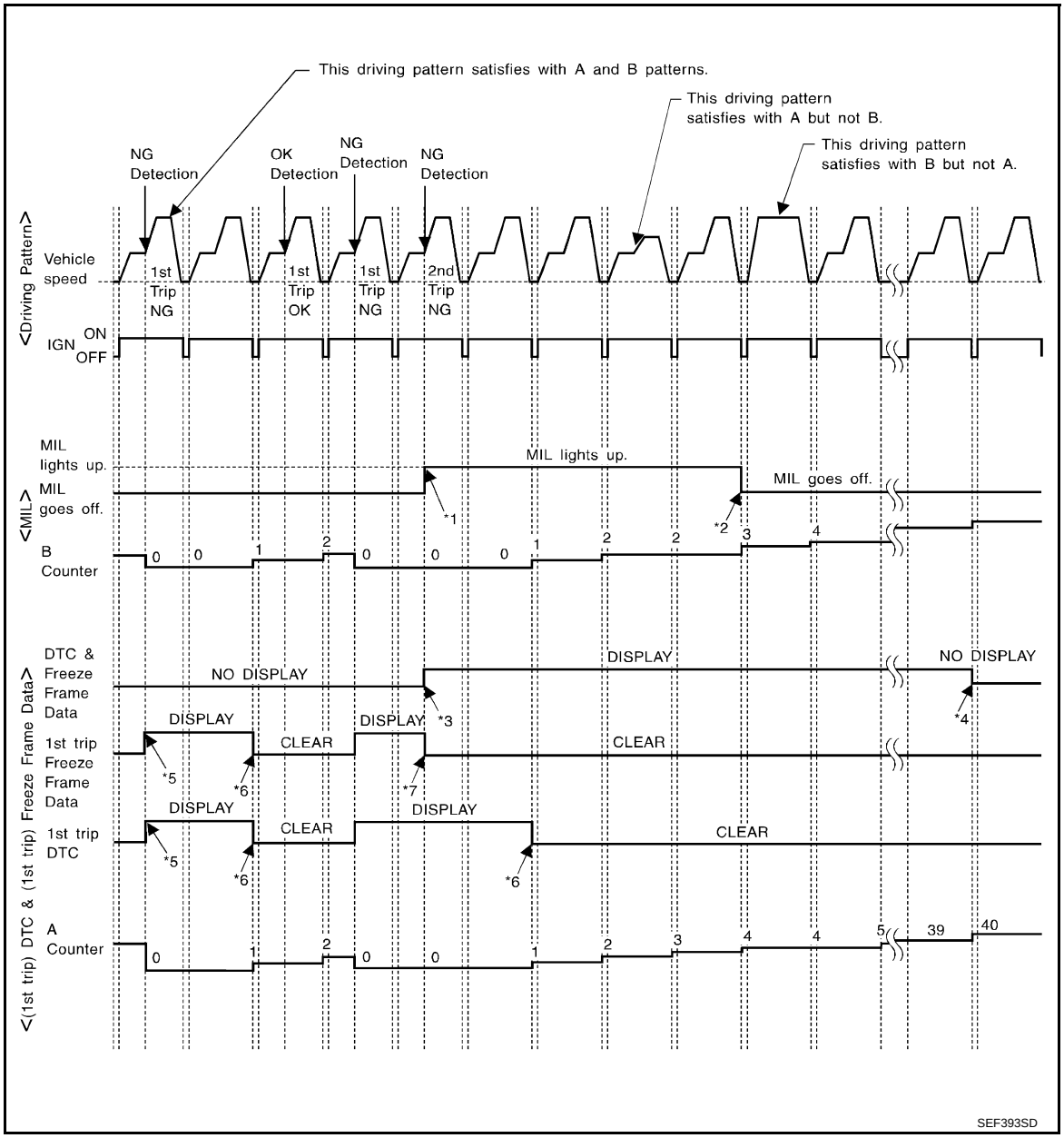
<Driving Pattern C>
Driving pattern C means the vehicle operation as follows:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:

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

Example:
If the stored freeze frame data is as follows:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)

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

Relationship Between 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 go off after vehicle is driven 3 times (pattern B) without any malfunctions.

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

*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

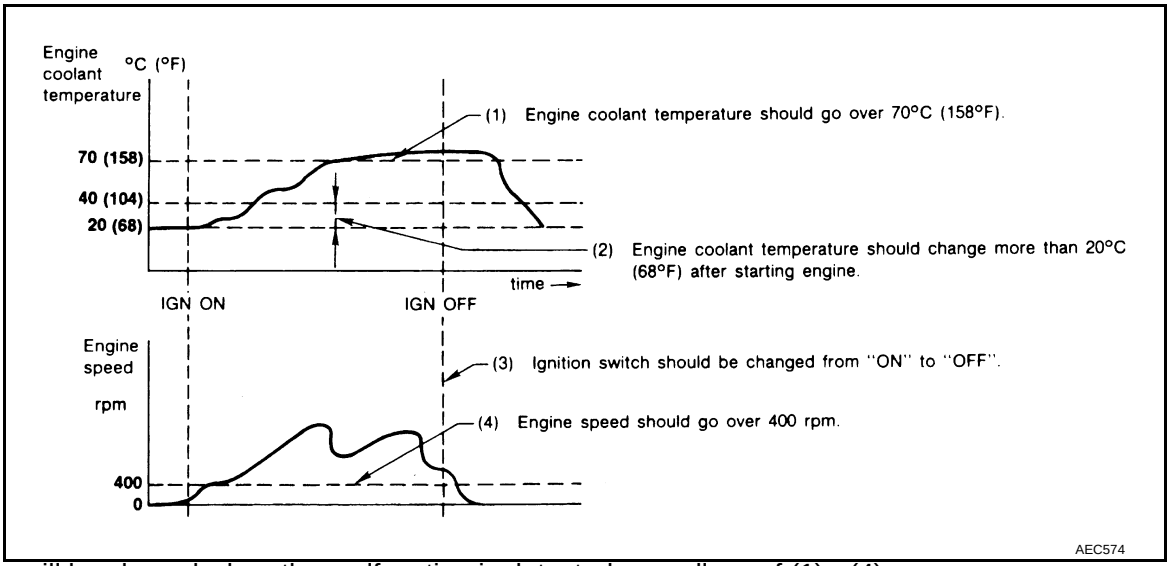
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

*6: 1st trip DTC will be cleared after vehicle is driven once (pattern B) without the same malfunction.

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

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

<Driving Pattern A>



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

<Driving Pattern B>

Driving pattern B means the vehicle operation as follows:

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

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

CONSULT-III Function

INFOID:0000000001179406

FUNCTION

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

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

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

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

		Item	DIAGNOSTIC TEST MODE						
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×			
		Camshaft position sensor (PHASE)		×	×	×			
		Mass air flow sensor		×		×			
		Engine coolant temperature sensor		×	×	×	×		
		Heated oxygen sensor 1		×		×		×	×
		Heated oxygen sensor 2		×		×		×	×
		Vehicle speed sensor		×	×	×			
		Accelerator pedal position sensor		×		×			
		Throttle position sensor		×	×	×			
		Intake air temperature sensor		×	×	×			
		Knock sensor		×					
		Refrigerant pressure sensor				×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×			
		Air conditioner switch				×			
		Park/neutral position (PNP) switch		×		×			
		Stop lamp switch		×		×			
		EPS control unit				×			
		Battery voltage				×			
		Load signal				×			
		ASCD steering switch		×		×			
		ASCD brake switch		×		×			
ENGINE COTNROL COMPONENT PARTS	OUTPUT	Fuel injector				×	×		
		Power transistor (Ignition timing)				×	×		
		Throttle control motor relay		×		×			
		Throttle control motor		×					
		EVAP canister purge volume control solenoid valve		×		×	×		×
		Air conditioner relay				×			
		Fuel pump relay	×			×	×		
		Cooling fan relay		×		×	×		
		Heated oxygen sensor 1 heater		×		×		×	
		Heated oxygen sensor 2 heater		×		×		×	
		Intake valve timing control solenoid valve		×		×	×		
		Calculated load value			×	×			

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-III screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to ECH-76, "Diagnosis Description".

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

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to ECH-330, "DTC Index".)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	• The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to ECH-330, "DTC Index".)
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
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.
INT MANI PRES [kPa]	• Always a certain value is displayed. • This item is not efficient for J10 models.

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

DATA MONITOR MODE

Monitored Item

×: Applicable

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor (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	msec	• “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	• When engine is running specification range is indicated in “SPEC”.
A/F ALPHA-B1	%	• 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.
HO2 SEN1 (B1)	V	• The A/F signal computed from the input signal of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR(B1)	RICH/LEAN	• Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH: means the mixture became ″rich″, and control is being affected toward a leaner mixture. LEAN: means the mixture became ″lean″, and control is being affected toward a rich mixture.	• After turning ON the ignition switch, ″RICH″ is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
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			
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
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.

Monitored item	Unit	Description	Remarks
CLSD THL POS	ON/OFF	• Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) switch 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 from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
CLUTCH P/P SW	ON/OFF	• Indicates [ON/OFF] condition from the clutch 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.
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·m/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.	
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.	

Monitored item	Unit	Description	Remarks
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	
HO2S1 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
IDL A/V LEARN	YET/CMPLT	• Display 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.	
O2 SEN HTR DTY	%	• Heated oxygen 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.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
SET VHCL SPD	km/h or mph	• The preset vehicle speed is displayed.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	• Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW	ON/OFF	• Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	• Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2	ON/OFF	• Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT	NON/CUT	• Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT	NON/CUT	• Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low, and ASCD operation is cut off.	
CRUISE LAMP	ON/OFF	• Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
SET LAMP	ON/OFF	• Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	

Monitored item	Unit	Description	Remarks
Voltage	V	• Voltage, frequency, duty cycle or pulse width measured by the probe.	• Only "#" is displayed if item is unable to be measured. • Figures with "#"s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency	msec, Hz or %		
DUTY-HI	—		
DUTY-LOW			
PLS WIDTH-HI			
PLS WIDTH-LOW			

NOTE:

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Heated oxygen sensor 1
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.
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-III.	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-III.	Cooling fan moves and stops.	• Harness and connectors • IPDM E/R (Cooling fan relay) • Cooling fan motor
ENG COOLANT TEMP	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector
FUEL PUMP RELAY	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay "ON" and "OFF" using CONSULT-III and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connectors • Fuel pump relay
PURG VOL CONT/V	• Engine: After warming up, run engine at 1,500 rpm. • Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.	Engine speed changes according to the opening percent.	• Harness and connectors • Solenoid valve
V/T ASSIGN ANGLE	• Engine: Return to the original trouble condition • Change intake valve timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve

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

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to ECH-76, "Diagnosis Description".

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

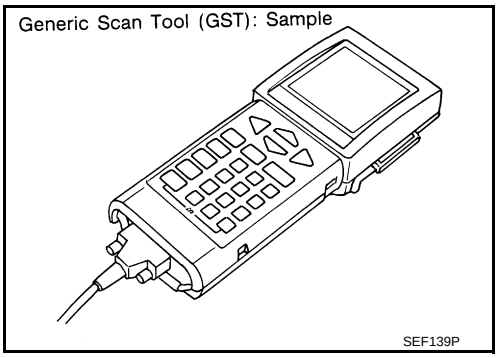
Test mode	Test item	Condition	Reference page
HO2S1	HO2S1 (B1) P0133	Refer to corresponding trouble diagnosis for DTC.	ECH-134
	HO2S1 (B1) P0134		ECH-140
	HO2S1 (B1) P1143		ECH-217
	HO2S1 (B1) P1144		ECH-222
HO2S2	HO2S2 (B1) P0139		ECH-153
	HO2S2 (B1) P1146		ECH-227
	HO2S2 (B1) P1147		ECH-234

Diagnosis Tool Function

INFOID:0000000001179407

DESCRIPTION

Generic Scan Tool (OBDII scan tool) complying with ISO 15031 has 8 different functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



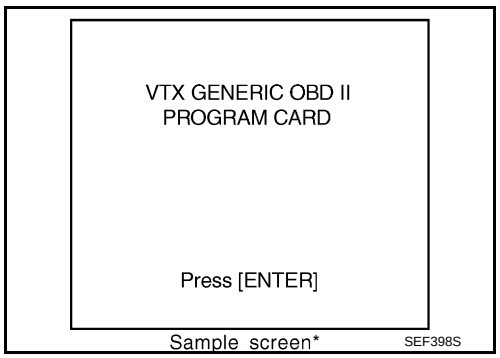
FUNCTION

Diagnostic Service		Function
Service $01	READINESS TESTS	This diagnostic service gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
Service $02	(FREEZE DATA)	This diagnostic service gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to ECH-330, "DTC Index".
Service $03	DTCs	This diagnostic service gains access to emission-related power train trouble codes which were stored by ECM.
Service $04	CLEAR DIAG INFO	This diagnostic service can clear all emission-related diagnostic information. This includes: • Clear number of diagnostic trouble codes (Service $01) • Clear diagnostic trouble codes (Service $03) • Clear trouble code for freeze frame data (Service $01) • Clear freeze frame data (Service $02) • Reset status of system monitoring test (Service $01) • Clear on board monitoring test results (Service $06 and $07)
Service $06	(ON BOARD TESTS)	This diagnostic service accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
Service $07	(ON BOARD TESTS)	This diagnostic service enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
Service $08	—	This diagnostic service is not applicable on this vehicle.
Service $09	(CALIBRATION ID)	This diagnostic service enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

INSPECTION PROCEDURE

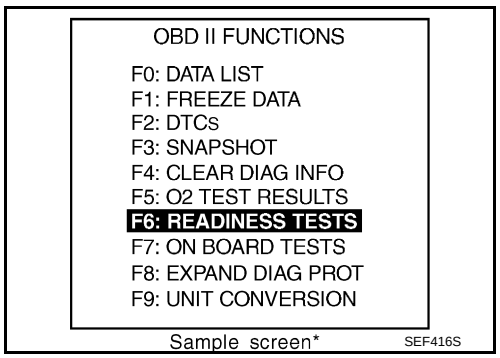
1. Turn ignition switch OFF.
2. Connect “GST” to data link connector, which is located under dash panel near the hood opener handle.

3. Turn ignition switch ON.
4. Enter the program according to instruction on the screen or in the operation manual.
   (*: Regarding GST screens in this section, sample screens are shown.)



Sample screen* SEF398S

5. Perform each diagnostic mode according to each service procedure.
   For further information, see the GST Operation Manual of the tool maker.



Sample screen* SEF416S

COMPONENT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000001179408

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” of “DATA MONITOR” mode of CONSULT-III 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:0000000001179409

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
- After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied*
- Engine speed: Idle

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

>> GO TO 2.

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

With CONSULT-III
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform ECH-14, "BASIC INSPECTION : Special Repair Requirement".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode with CONSULT-III.
3. Make sure that monitor items are within the SP value.

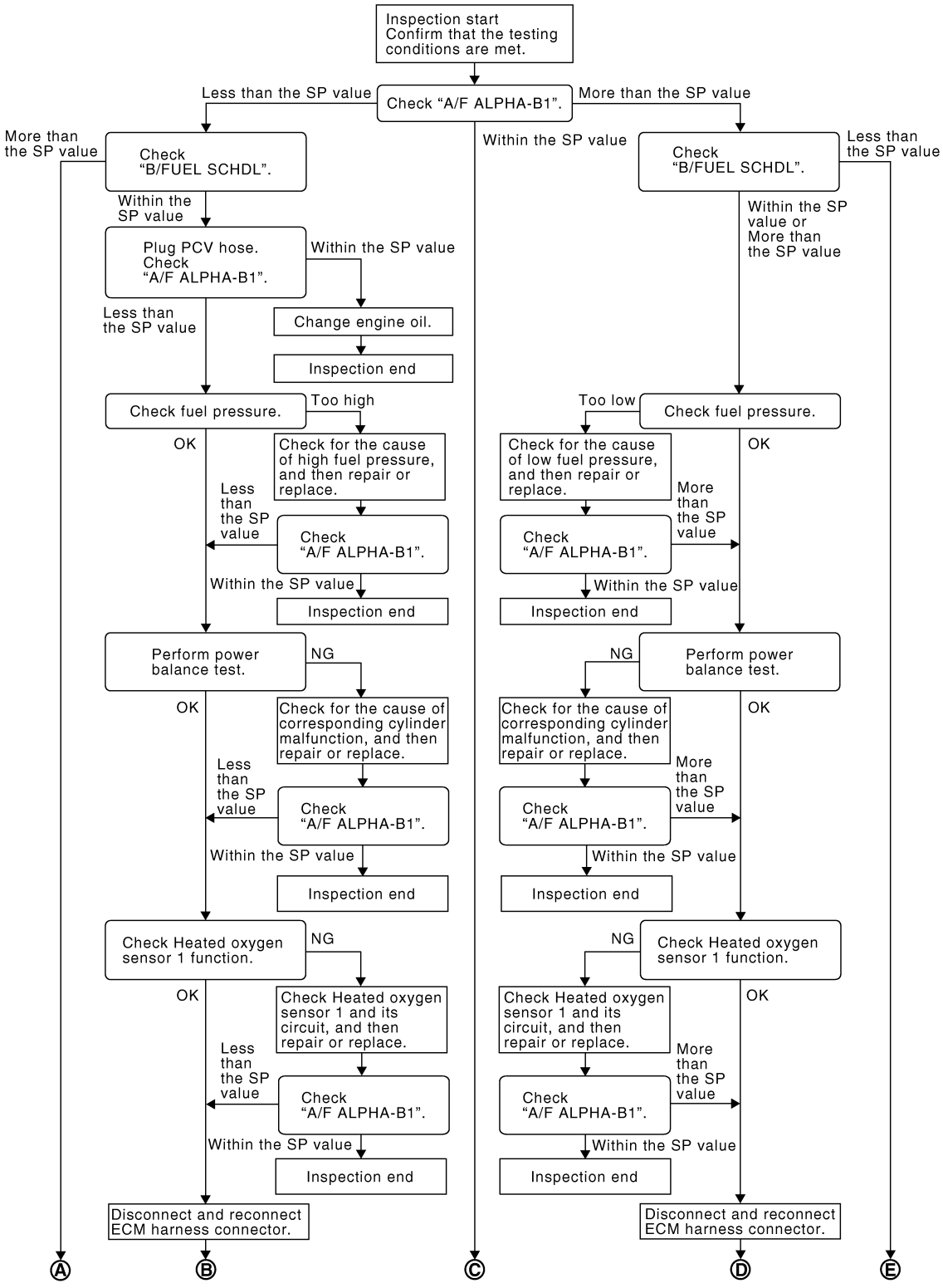
Is the inspection result normal?

YES >> END
NO >> Go to ECH-99, "Diagnosis Procedure".

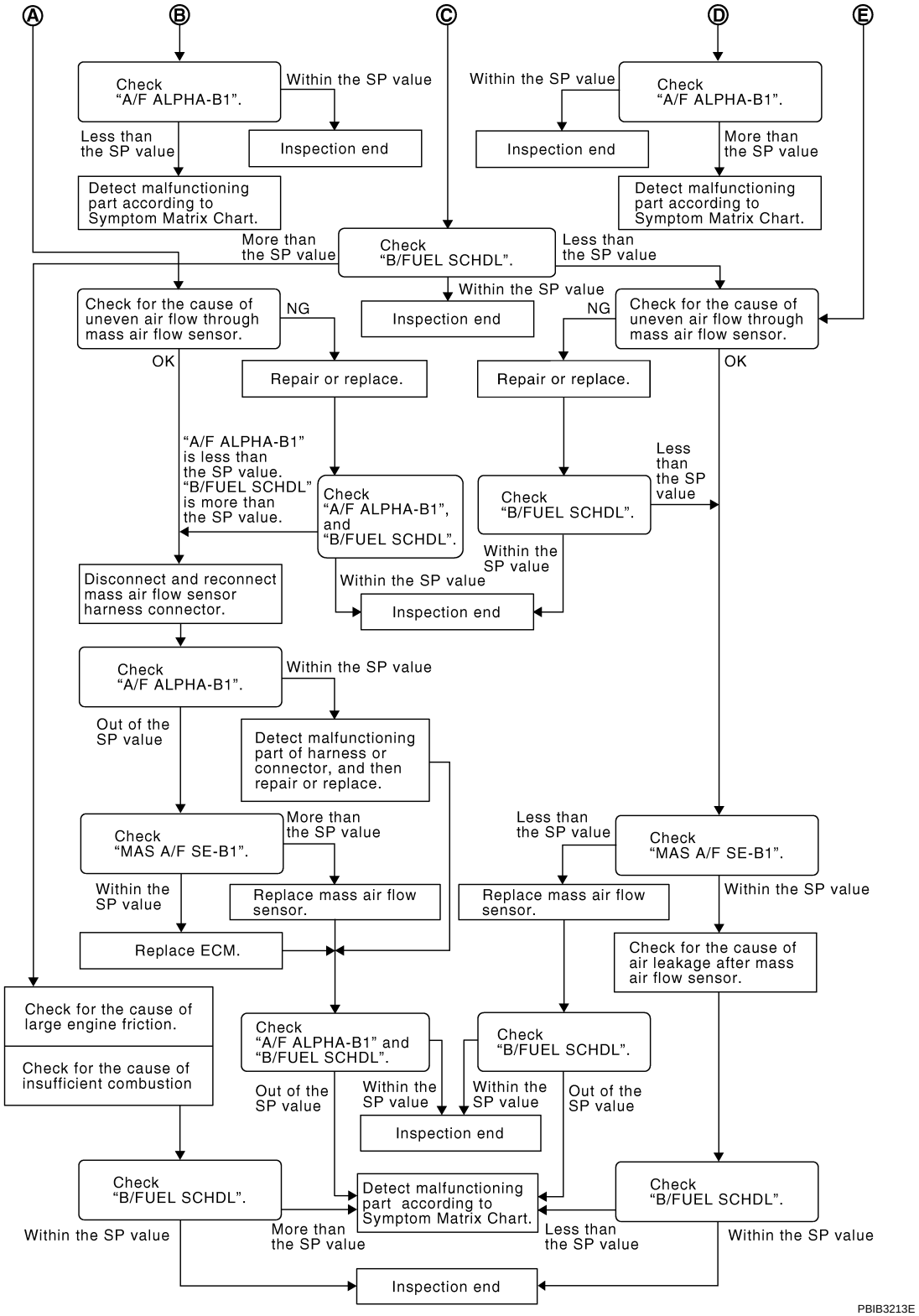
Diagnosis Procedure

INFOID:0000000001179410

OVERALL SEQUENCE



PBIB2384E



DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1"

With CONSULT-III

1. Start engine.
2. Confirm that the testing conditions are met. Refer to ECH-98, "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 they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

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

2. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

3. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

4. CHECK “A/F ALPHA-B1”

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 ECH-345, "Inspection".)

Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> Fuel pressure is too high: Replace “fuel filter and fuel pump assembly” and then GO TO 8.
NO-2 >> Fuel pressure is too low: GO TO 7.

7. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly” and then GO TO 8.
NO >> Repair or replace and then GO TO 8.

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 ECH-297, "Component Function Check".)
2. Fuel injector and its circuit (Refer to ECH-291, "Component Function Check".)
3. Intake air leakage
4. Low compression pressure (Refer to EM-25, "Inspection".)

Is the inspection result normal?

YES >> Replace fuel injector and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.

11. CHECK “A/F ALPHA-B1”

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 HEATED OXYGEN SENSOR 1 FUNCTION

1. Run engine at about 2,000 rpm for about 2minutes under no load.
2. Select “HO2S1 MNTR (B1)”, in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time : RICH → LEAN → RICH
2 times : RICH → LEAN → RICH → LEAN → RICH

Is the inspection result more than 5 times during 10 seconds?

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

13. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT

Check heated oxygen sensor and its circuit. Refer to ECH-130, "DTC Logic".

>> 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. 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 ECH-334, "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 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 the each indication is within the SP value.

Is the measurement value within the SP value?

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

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

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

>> GO TO 22.

22. CHECK “A/F ALPHA-B1”

1. 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 ECH-116, "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, and then GO TO 29.

24. REPLACE ECM

1. Replace ECM.
2. Go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> 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, 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 the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to ECH-334, "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 ECH-334, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000001179411

1.INSPECTION START

Start engine.

Is engine running?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK ECM POWER SUPPLY CIRCUIT-I

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

ECM		Ground	Voltage
Connector	Terminal		
E16	93	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E105, M77
- 10A fuse (No. 4)
- Harness for open or short between ECM and fuse

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

4.CHECK GROUND CONNECTION-I

1. Turn ignition switch OFF.
2. Check ground connection E21. Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

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

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		
E16	108		

3. Also check harness for short to power.

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between ECM and ground

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

7. CHECK ECM POWER SUPPLY CIRCUIT-II

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

IPDM E/R		Ground	Voltage
Connector	Terminal		
E11	15	Ground	Battery voltage

Is the inspection result normal?

YES >> Go to ECH-297, "Diagnosis Procedure".
NO >> GO TO 8.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

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		
E16	105	Ground	After turning ignition switch OFF, battery voltage will exist for more than a few seconds, then drop approximately 0V.

Is the inspection result normal?

YES >> GO TO 15.
NO-1 >> Battery voltage does not exist: GO TO 9.
NO-2 >> Battery voltage exists for more than a few seconds: GO TO 12.

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 10.
NO >> GO TO 12.

10. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E11.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E16	105	E11	9	Existed

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair open circuit or short to ground or short power in harness or connectors.

11. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E11.
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	E11	15	Existed

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

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 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.

13. CHECK 20A FUSE

1. Disconnect 20A fuse (No. 51) from IPDM E/R.
2. Check 20A fuse.

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace 20A fuse.

14. CHECK GROUND CONNECTION-II

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair or replace ground connection.

15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

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

ECM		Ground	Continuity
Connector	Terminal		
F7	10	Ground	Existed
	11		
E16	108		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 17.
NO >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors F121, E7
- Harness for open or short between ECM and ground

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

17.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair open circuit or short to power in harness or connectors.

U1001 CAN COMM CIRCUIT

Description

INFOID:0000000001179412

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:0000000001179413

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> ECH-110, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179414

Go toLAN-13, "Trouble Diagnosis Flow Chart".

U1010 CONTROL UNIT (CAN)

Description

INFOID:0000000001179415

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:0000000001179416

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1010	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check DTC.

Is DTC detected?

YES >> Go to ECH-111, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179417

1.INSPECTION START

With CONSULT-III

1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode with CONSULT-III.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-111, "DTC Logic".
5. Check DTC.

With GST

1. Turn ignition switch ON.
2. Select “Service $04” with GST.
3. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-111, "DTC Logic".
4. Check DTC.

Is the DTC U1010 displayed again?

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

2.REPLACE ECM

1. Replace ECM.
2. Go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P0011 IVT CONTROL

DTC Logic

INFOID:0000000001179418

DTC DETECTION LOGIC

NOTE:

- **If DTC P0011 is displayed with DTC P1111, first perform the trouble diagnosis for DTC P1111, refer to ECH-204, "Description".**

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 (POS) • Camshaft position sensor (PHASE) • Intake valve control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

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

ENG SPEED	1,200 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 3.5 msec
Shift lever	Neutral position

CAUTION:

Always drive at a safe speed.

4. Stop vehicle with engine running and let engine idle for 10 seconds.
5. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to ECH-113, "Diagnosis Procedure"

NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

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 70°C (221°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-III” above.

Is 1st trip DTC detected?

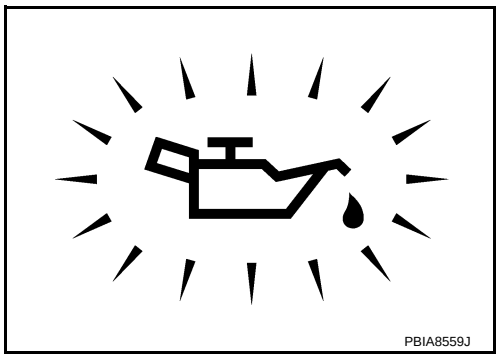
YES >> Go to ECH-113, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179419

1. CHECK OIL PRESSURE WARNING LAMP

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


PBIA8559J

Is oil pressure warning lamp illuminated?

YES >> Go to MWI-32, "Description".
NO >> GO TO 2.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to ECH-114, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace intake valve timing control solenoid valve.

3. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to ECH-185, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor (POS).

4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to ECH-188, "Component Inspection".

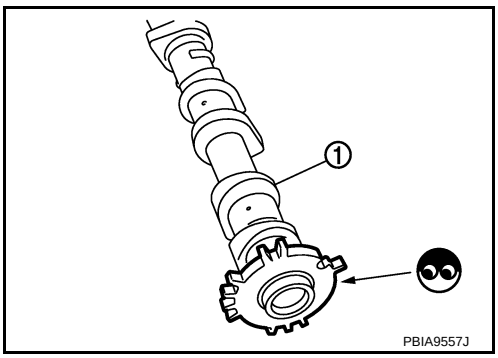
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace camshaft position sensor (PHASE).

5. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft (1) 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.

6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-47, "Removal and Installation".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Refer to LU-3, "Engine Lubrication System".

Is the inspection result normal?

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

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179420

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	6.7 - 7.7 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

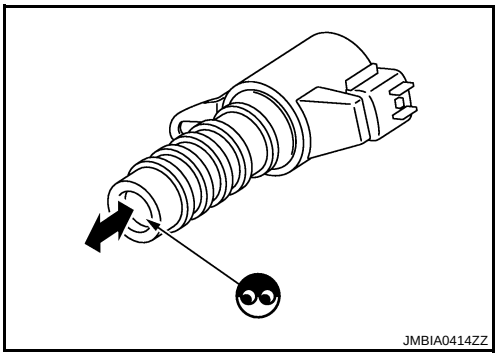
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Provide 12V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

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



Is the inspection result normal?

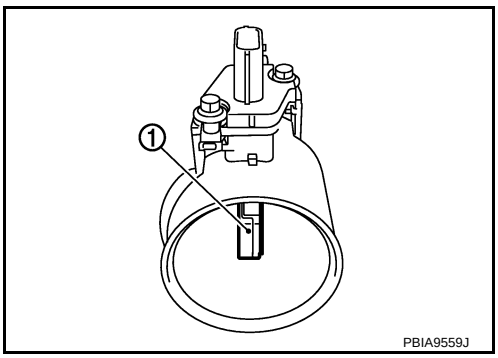
YES >> INSPECTION END
NO >> Replace intake valve timing control solenoid valve.

P0102, P0103 MAF SENSOR

Description

INFOID:0000000001179421

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.



DTC Logic

INFOID:0000000001179422

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 leaks • 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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Which DTC is detected?

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

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

Is DTC detected?

YES >> Go to ECH-117, "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 ECH-117, "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 ECH-117, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179423

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 E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

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		
E18	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	
E18	4	F8	52	Existed

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between mass air flow sensor and ECM

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

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

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E18	3	F8	45	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 MASS AIR FLOW SENSOR

Refer to ECH-118, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace mass air flow sensor.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179424

1.CHECK MASS AIR FLOW SENSOR-I

With CONSULT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
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. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. 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		Ground	Condition	Voltage
Connector	Terminal			
F8	45 (MAF sensor signal)	Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V
			Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2. CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH 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 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-III

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

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	45 (MAF sensor signal)	Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V
			Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

*: 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-III

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and check indication.

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	45 (MAF sensor signal)	Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V
			Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Is the inspection result normal?

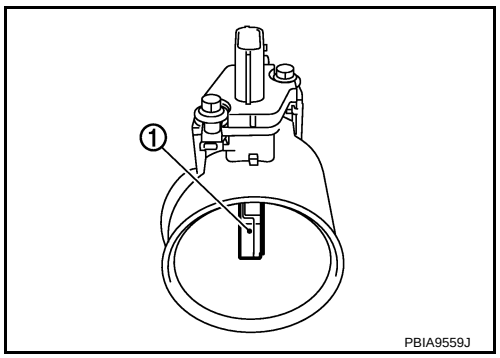
YES >> INSPECTION END
NO >> Clean or replace mass air flow sensor.

P0112, P0113 IAT SENSOR

Description

INFOID:0000000001179425

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.



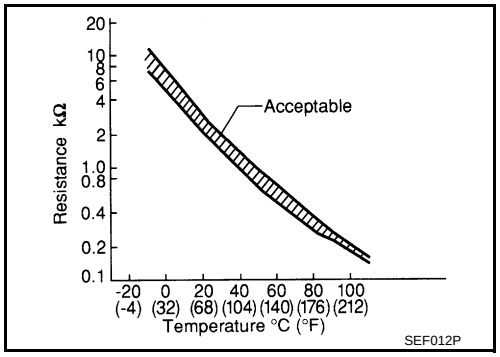
<Reference data>

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 terminal 46 (Intake air temperature sensor) and ground.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



DTC Logic

INFOID:0000000001179426

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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to ECH-122, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179427

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor		Ground	Voltage
Connector	Terminal		
E18	2	Ground	Approx. 5V

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	
E18	1	F8	55	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 ECH-122, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace mass air flow sensor (with intake air temperature sensor).

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179428

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?

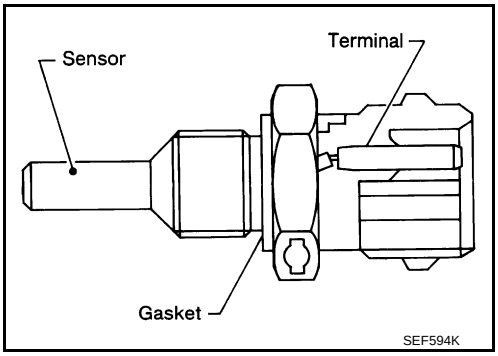
YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor).

P0117, P0118 ECT SENSOR

Description

INFOID:0000000001179429

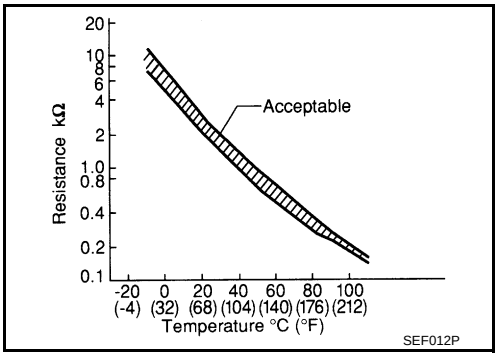
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

DTC Logic

INFOID:0000000001179430

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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to ECH-125, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179431

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

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. 5V

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	F8	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 ECH-125, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace engine coolant temperature sensor.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

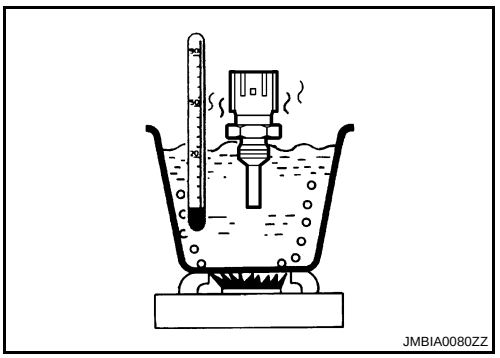
Component Inspection

INFOID:0000000001179432

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor.

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



Terminals	Condition		Resistance
1 and 2	Temperature °C (°F)	20 (68)	2.1 - 2.9 kΩ
		50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ

Is the inspection result normal?

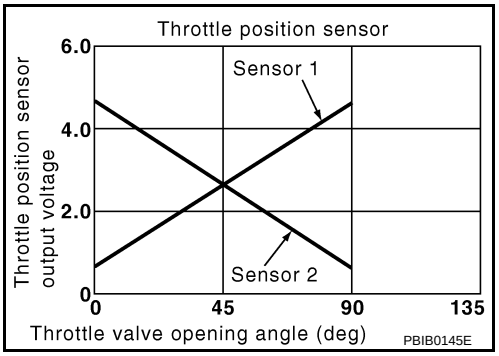
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

P0122, P0123 TP SENSOR

Description

INFOID:0000000001179433

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



DTC Logic

INFOID:0000000001179434

DTC DETECTION LOGIC

NOTE:
If DTC P0122 or P0123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 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 10V 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 ECH-127, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179435

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE POSITION SENSOR 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		
F29	1	Ground	Approx. 5V

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	
F29	4	F8	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	
F29	3	F8	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 ECH-129, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-129, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179436

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to 1st position.
6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	33 (TP sensor 1 signal)	Ground	Accelerator pedal	Fully released	More than 0.36V
				Fully depressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully depressed	More than 0.36V

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-129, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179437

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

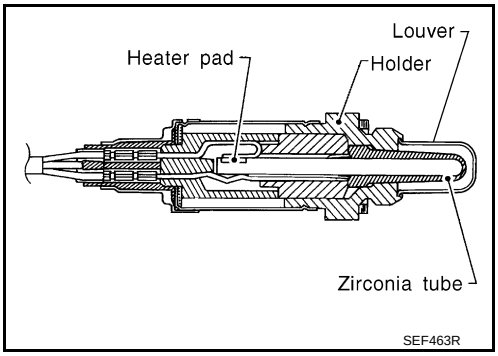
>> END

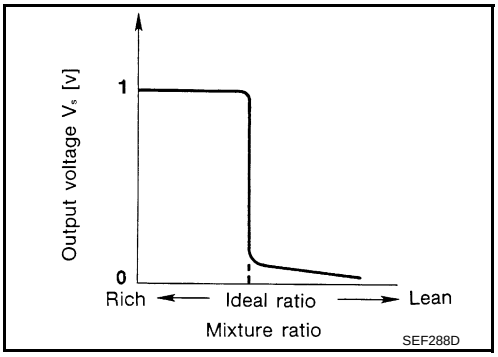
P0132 HO2S1

Description

INFOID:0000000001179438

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



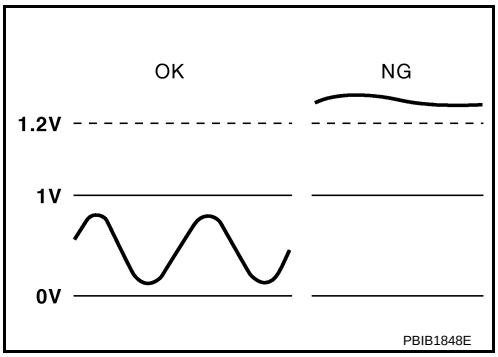


DTC Logic

INFOID:0000000001179439

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. 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 2 minutes.
4. Check 1st trip DTC.

Is 1st trip DTC is detected?

YES >> Go to ECH-131, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179440

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 50 N·m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	existed

2. Check harness continuity between HO2S1 harness connector or ECM harness connector.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	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 HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connector for water.

Is the inspection result normal?

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

6.CHECK HEATED OXYGEN SENSOR 1

Refer to ECH-132, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace heated oxygen sensor 1.

7.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> **INSPECTION END**

Component Inspection

INFOID:0000000001179441

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

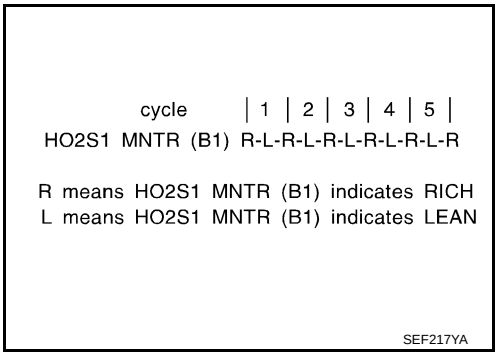
YES >> GO TO 2.
NO >> GO TO 3.

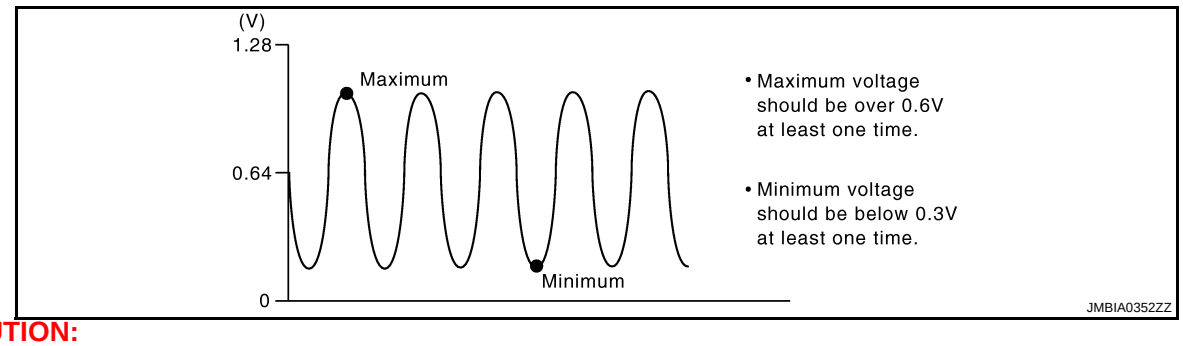
2.CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.
6. Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 tool and approved anti-seize lubricant.**

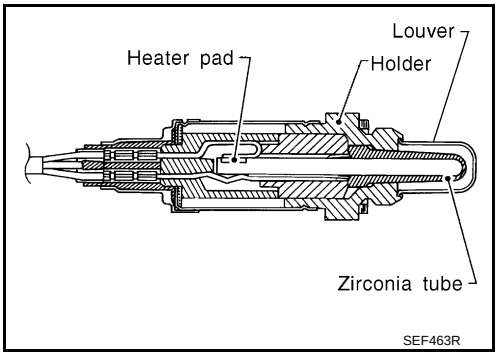
>> INSPECTION END

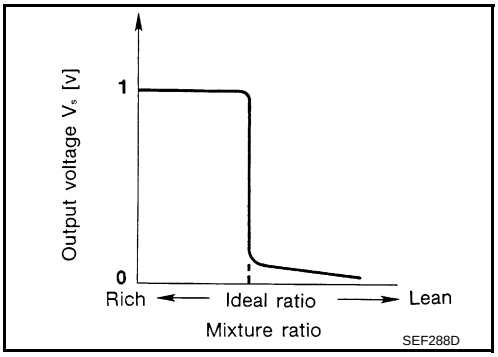
P0133 HO2S1

Description

INFOID:0000000001179442

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



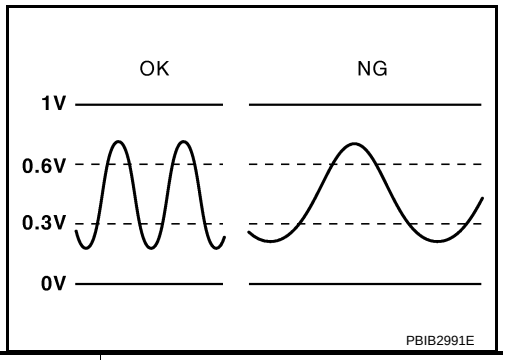


DTC Logic

INFOID:0000000001179443

DTC DETECTION LOGIC

To judge the malfunction of heated oxygen sensor 1, this diagnosis measures response time of heated oxygen sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and heated oxygen sensor 1 temperature index. Judgment is based on whether the compensated time (heated oxygen sensor 1 cycling time index) is inordinately long or not.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0133	Heated oxygen sensor 1 circuit slow response	• The response of the voltage signal from the sensor takes more than the specified time.	• Harness or connectors (The sensor circuit is open or shorted.) • Heated oxygen sensor 1 • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks • PCV valve • Mass air flow sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:
Always perform at a temperature above -10°C (14°F).
Before performing the following procedure, confirm that battery voltage is more than 11V at idle.

Do you have CONSULT-III?

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

2. PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch ON and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 40 to 50 seconds.)
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	2,400 - 4,200 rpm
VHCL SPEED SE	More than 80 km/h (50 MPH)
B/FUEL SCHDL	2.8 - 12.0 msec
Shift lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Touch “SELF-DIAG RESULTS”.

Which displayed on COUSULT-III screen?

OK >> INSPECTION END.
NG >> Go to ECH-135, "Diagnosis Procedure".

3. PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 yo 0.3v and 0.6 to 1.0v more than 5 times within 10 seconds. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-135, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179444

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.RETIGHTEN HEATED OXYGEN SENSOR 1

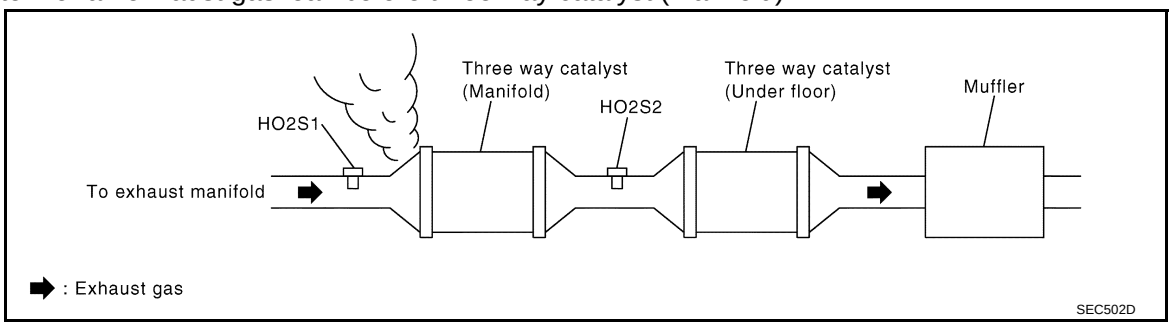
Loosen and retighten the heated oxygen sensor 1.

Tightening torque: 50 N-m (5.1 kg-m, 37 ft-lb)

>> 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 (manifold).



Is exhaust gas leak detected?

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

4.CHECK FOR INTAKE AIR LEAK

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

Is intake air leak detected?

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

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P172 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0172. Refer to ECH-163, "DTC Logic" or ECH-167, "DTC Logic".
NO >> GO TO 6.

6.CHECK HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	Existed

4. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not existed

5. Also check harness for 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

Check mass air flow sensor.
Refer to ECH-118, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace mass air flow sensor.

8.CHECK PCV VALVE

Refer to ECH-303, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace PCV valve.

9.CHECK HEATED OXYGEN SENSOR 1

Perform ECH-137, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace heated oxygen sensor 1.

10.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179445

1.INSPECTION START

Do you have CONSULT-III?

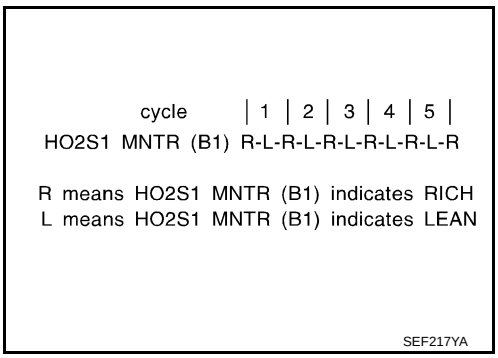
Do you have CONSULT-III?

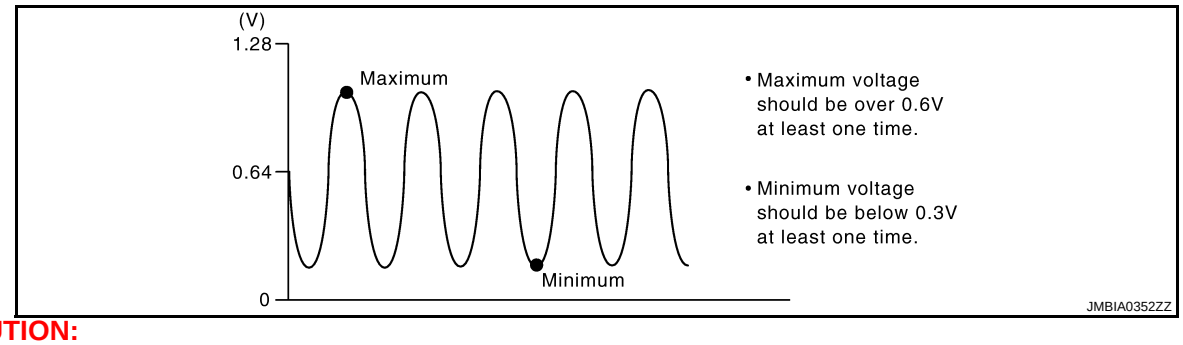
YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III
1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.

6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III
1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.
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 tool and approved anti-seize lubricant.**

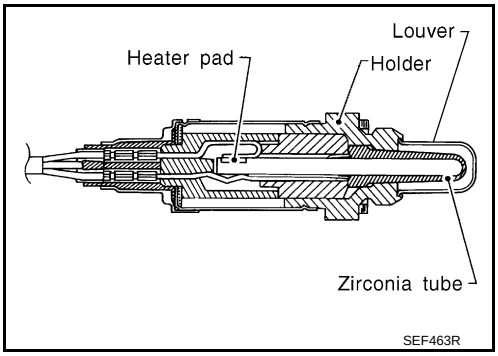
>> INSPECTION END

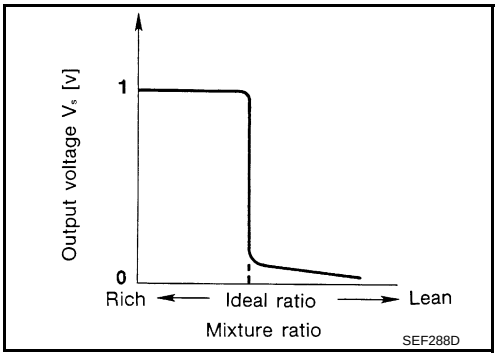
P0134 HO2S1

Description

INFOID:0000000001179446

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



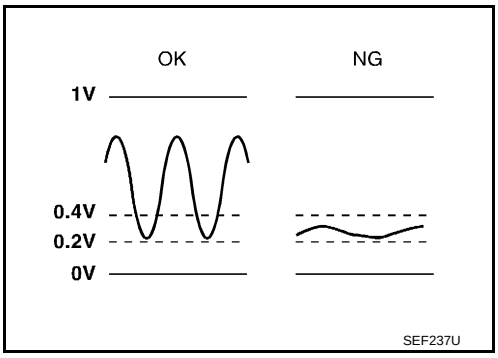


DTC Logic

INFOID:0000000001179447

DTC DETECTION LOGIC

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	• Harness or connectors (The sensor circuit is open or shorted.) • Heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F).

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

Do you have CONSULT-III?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch ON and select “HO2S1 (B1) P0133” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 40 to 50 seconds.)
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	1,800 - 3,400 rpm
VHCL SPEED SE	More than 60 km/h (40 MPH)
B/FUEL SCHDL	2.0 - 12.0 msec
Shift lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Touch “SELF-DIAG RESULTS”.

Which displayed on COUSULT-III screen?

OK >> INSPECTION END.
NG >> Go to ECM-137, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

WITH GST

1. Start engine and warm it up to normal operating temperature.
2. Set volmeter probes between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage dose not remain in the range of 0.2 to 0.4.

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECM-137, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179448

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.

3. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	Existed

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

Is inspection result normal?

YES >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector 49.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	Existed

2. Check harness continuity between ECM harness connector 49 or HO2S1 harness connector and ground.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not existed

3. Also check harness for short to power.

Is 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 HEATED OXYGEN SENSOR 1

Refer to ECH-142, "Component Inspection".

Is inspection result normal?

YES >> GO TO 5.
NO >> Replace heated oxygen sensor 1.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> **INSPECTION END**

Component Inspection

INFOID:0000000001179449

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

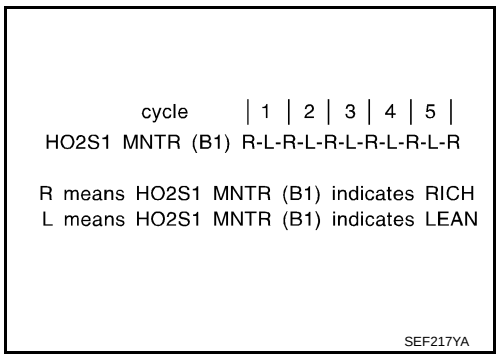
YES >> GO TO 2.
NO >> GO TO 3.

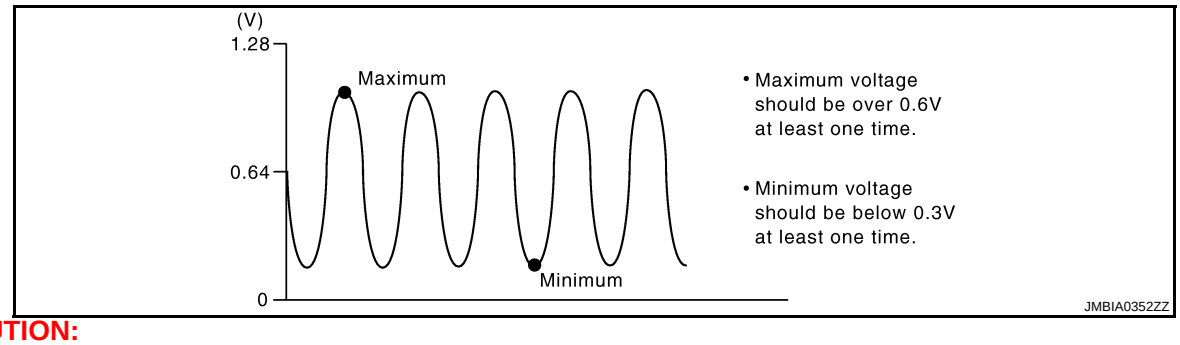
2.CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.

6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III
1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.
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 tool and approved anti-seize lubricant.**

>> INSPECTION END

P0135 HO2S1 HEATER

Description

INFOID:0000000001179450

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Mass air flow sensor	Amount of intake air		

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

OPERATION

Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600 rpm after the following conditions are met. • Engine: After warming up	ON

DTC Logic

INFOID:0000000001179451

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031	Heated oxygen sensor 1 heater control circuit low	The current amperage in the heated oxygen sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 1 heater.)	• Harness or connectors (The heated oxygen sensor 1 heater circuit is open or shorted.) • heated oxygen sensor 1 heater

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 between 11V 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 ECH-145, "Diagnosis Procedure".
NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179452

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Disconnect HO2S1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S1 harness connector and ground.

HO2S1		Ground	Voltage
Connector	Terminal		
F30	2	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 10A fuse (No. 56)
- Harness for open or short between HO2S1 and fuse

>> Repair or replace harness or connectors.

4.CHECK HO2S1 HEATER OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	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 or short to ground or short to power in harness or connectors.

5.CHECK HO2S1 HEATER

Refer to ECH-147, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE HO2S1

Replace HO2S1.

CAUTION:
- **Discard any heated oxygen sensor 1 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new heated oxygen sensor 1, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.**

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

>> Repair or replace.

Component Inspection

INFOID:0000000001179453

1. CHECK HEATED OXYGEN SENSOR 1

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check resistance between HO2S1 terminals as follows.

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

Is the inspection result normal?

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

2. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.**

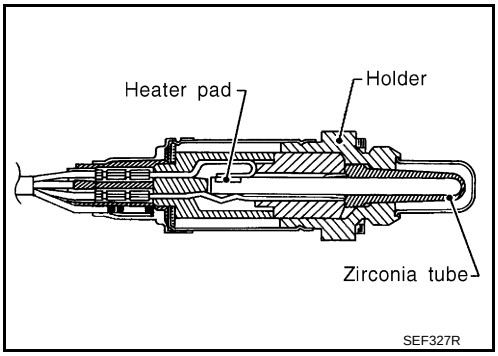
>> INSPECTION END

P0138 HO2S2

Description

INFOID:0000000001179454

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen 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 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

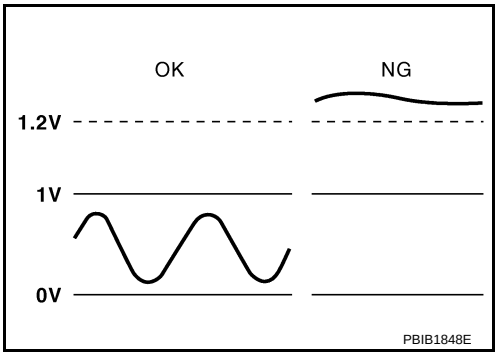


DTC Logic

INFOID:0000000001179455

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen 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 voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138	Heated oxygen sensor 2 circuit high voltage	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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. 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 2 minutes.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-149, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179456

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK 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	
E58	1	F8	59	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.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

>> 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	
E58	4	F8	50	Existed

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

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E58	4	F8	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

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

6.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace harness or connectors.

7.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-150, "Component Inspection".

Is the inspection result normal?

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

8.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179457

1.INSPECTION START

Do you have CONSULT-III?

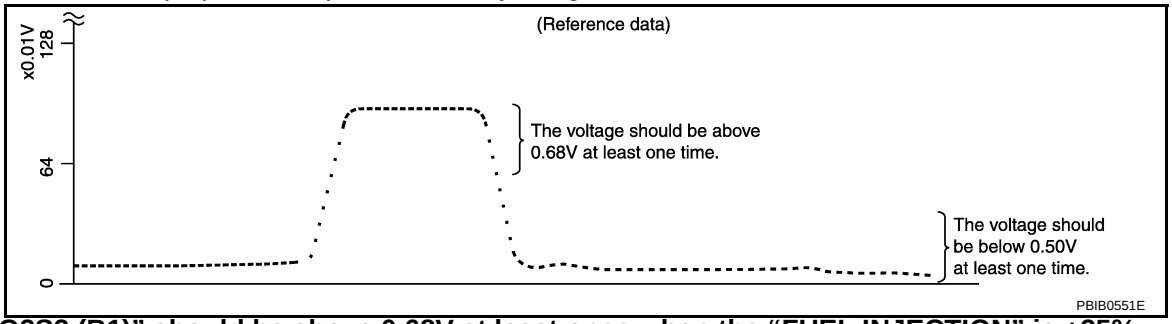
Do you have CONSULT-III?

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

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 heated oxygen sensor 2.

CAUTION:

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

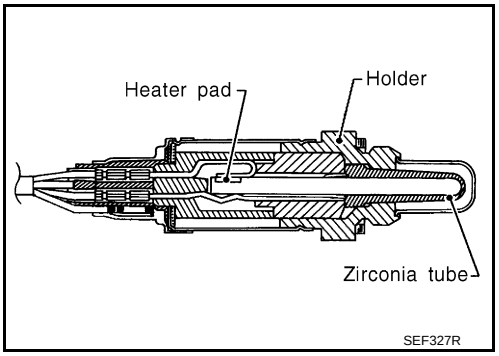
>> INSPECTION END

P0139 HO2S2

Description

INFOID:0000000001179458

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen 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 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

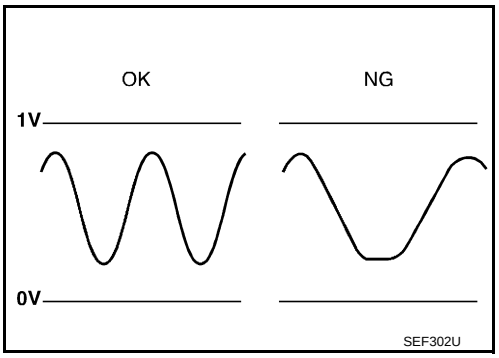


DTC Logic

INFOID:0000000001179459

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen 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-III?

Do you have CONSULT-III?

YES >> GO TO 2.
NO >> GO TO 11.

2.PRECONDITIONING

NOTE:
- If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds.
- **For the best results, perform DTC WORK SUPPORT at a temperature of 0 to 30°C (32 to 86°F)**
- **"COMPLETED" will appear on CONSULT-III screen when all tests "COND1", "COND2" and "COND3" are completed.**

TESTING CONDITION:
Never stop engine during this procedure. If the engine is stopped, retry this procedure from 4. PERFORM PROCEDURE FOR COND1-I.

>> GO TO 3.

3.PERFORM PROCEDURE FOR COND1

Start engine and warm it up to normal operating temperature.

>> GO TO 4.

4.PERFORM PROCEDURE FOR COND1-I

Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 5.

5.PERFORM PROCEDURE FOR COND1-II

1. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
2. Let engine idle 1 minute.
3. Select “HO2S2 (B1) P0139” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm two or three times quickly under no load.

Is “CONPLETED” appears on CONSULT-III screen?

YES >> GO TO 9.
NO >> GO TO 6.

6.PERFORM PROCEDURE FOR COND1-I

When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-III screen. Maintain the condition continuously until “TESTING” changes to “COMPLETED” (It will take approximately 60 seconds.)

ENG SPEED	More than 1,000 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLAN TEMP/S	More than 70°C (158°F)
Shift level	Suitable position

Which displayed on CONSULT-III screen?

COND1: OUT OF CONDITION>>GO TO 4.
COND1: COMPLETED COND2: INCOMPLETED>>GO TO 7.
COND1: COMPLETED COND2: COMPLETED>>GO TO 8.

7.PERFORM PROCEDURE FOR COND2

While driving, release accelerator pedal completely from the above condition until “INCOMPLETED” at “COND2” on CONSULT-III screen has turned to “COMPLETED”. (It will take approximately 4 seconds.)

Which displayed on CONSULT-III screen?

COND2: COMPLETED COND3: INCOMPLETED>>GO TO 8.
COND2: COMPLETED COND3: COMPLETED>>GO TO 9.

8.PERFORM PROCEDURE FOR COND3

Stop vehicle and let it idle until “INCOMPLETED” of “COND3” on CONSULT-III screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)

>> GO TO 9.

9.PERFORM PROCEDURE FOR COND3-I

Touch “SELF DIAGRESULTS”.

Which displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to ECH-156, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 10.

10. PERFORM PROCEDURE FOR COND3-II

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Turn ignition switch ON and select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
3. Start engine and warm it up while monitoring “COOLAN TEMP/S” indication on CONSULT-III.
4. When “COOLAN TEMP/S” indication reaches to 70°C (158°F).

>> GO TO 5.

11. PREFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-157, "Component Inspection".

NOTE:

Use component function check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-157, "Component Inspection".

Component Function Check

INFOID:0000000001179460

1. PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.12V 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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	A change of voltage should be more than 0.12V 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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	A change of voltage should be more than 0.12V for 1 second during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-156, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179461

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
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 ECH-163, "DTC Logic" or ECH-167, "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	
E58	1	F8	59	Existed

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

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

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

5.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	
E58	4	F8	50	Existed

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

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E58	4	F8	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

6. 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	
E58	1	F8	59	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.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

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

8. CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-157, "Component Inspection".

Is the inspection result normal?

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

9. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

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

>> INSPECTION END

10. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179462

1. INSPECTION START

Do you have CONSULT-III?

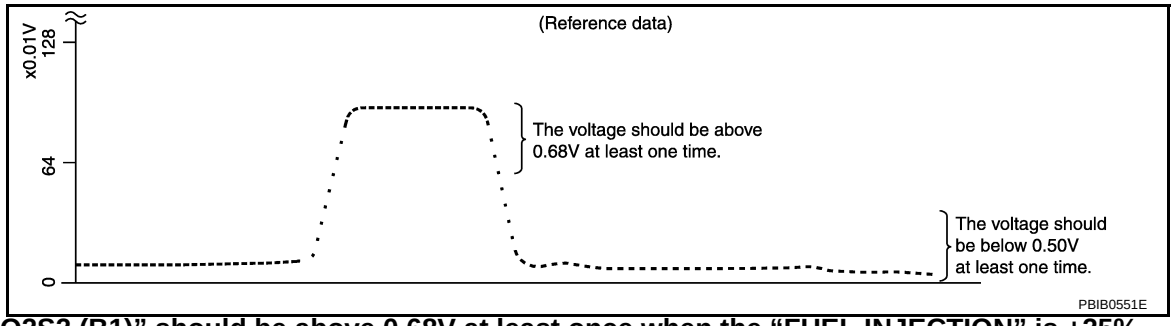
Do you have CONSULT-III?

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

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P0141 HO2S2 HEATER

Description

INFOID:0000000001179463

SYSTEM DESCRIPTION

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

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

OPERATION

Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,900	OFF
Below 3,900 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

DTC Logic

INFOID:0000000001179464

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0141	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 (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater

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 11V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. 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 1st trip DTC.

Is 1st tip DTC detected?

YES >> Go to ECH-160, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179465

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Disconnect HO2S2 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S2 harness connector and ground.

HO2S2		Ground	Voltage
Connector	Terminal		
E58	2	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse (No. 56)
- Harness for open or short between heated oxygen sensor 2 and fuse

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

4.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E58	3	F7	5	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 connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM

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

6.CHECK HO2S2 HEATER

Refer to ECH-162, "Component Inspection".

Is the inspection result normal?

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

7.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179466

1.CHECK HEATED OXYGEN SENSOR 2 HEATER

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

Terminals	Resistance [at 25°C (77°F)]
2 and 3	3.3 - 4.4 Ω
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

Is the inspection result normal?

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

2.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P0171 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000001179467

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 heated oxygen sensors 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
Heated oxygen 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 • Heated oxygen 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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
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.

Does engine start?

YES >> Go to ECH-164, "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 ECH-164, "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).

3. Check 1st trip DTC.

Is 1st trip DTC detected?

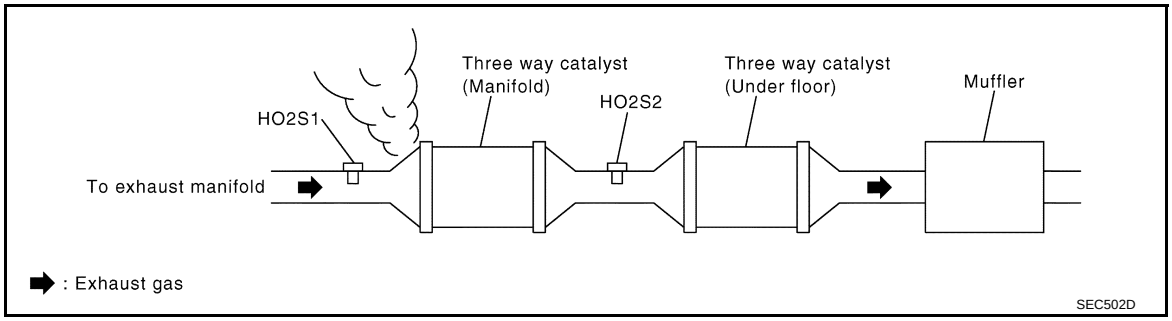
YES >> Go to ECH-164, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179468

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 HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT

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

Heated oxygen sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	Existed

5. Check the continuity between heated oxygen sensor 1 harness connector or ECM harness connector and ground.

Heated oxygen sensor 1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not existed

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 ECH-345, "Inspection".
2. Install fuel pressure gauge and check fuel pressure. Refer to ECH-345, "Inspection".

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. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”.
NO >> Repair or replace

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.

1.0 - 4.0 g·m/sec: at idling
2.0 - 10.0 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in Service $01 with GST.

1.0 - 4.0 g·m/sec: at idling
2.0 - 10.0 g·m/sec: 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 ECH-116, "DTC Logic".

7. CHECK FUNCTION OF FUEL INJECTOR

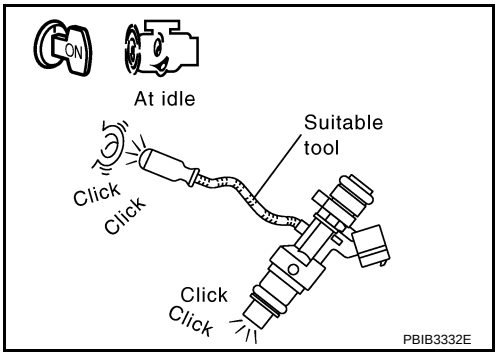
With CONSULT-III

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-III

1. Let engine idle.

2. Listen to each fuel injector operating sound.



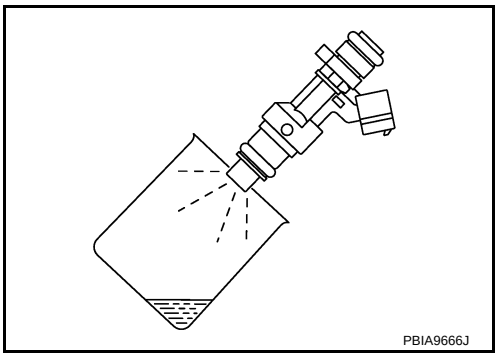
Clicking noise should be heard.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to ECH-291, "Component Function Check".

8. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Confirm that the engine is cooled down and there are no fire hazards near the vehicle.
3. Disconnect all fuel injector harness connectors.
4. Remove fuel tube assembly. Refer to EM-36, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
5. Disconnect all ignition coil harness connectors.
6. Prepare pans or saucers under each fuel injector.
7. Crank engine for 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.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P0172 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000001179469

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 heated oxygen sensors 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
heated oxygen 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.)	• Heated oxygen 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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
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.

Does engine start?

YES >> Go to ECH-168, "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.

Is 1st trip DTC detected?

YES >> Go to ECH-168, "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).

3. Check 1st trip DTC.

Is 1st trip DTC detected?

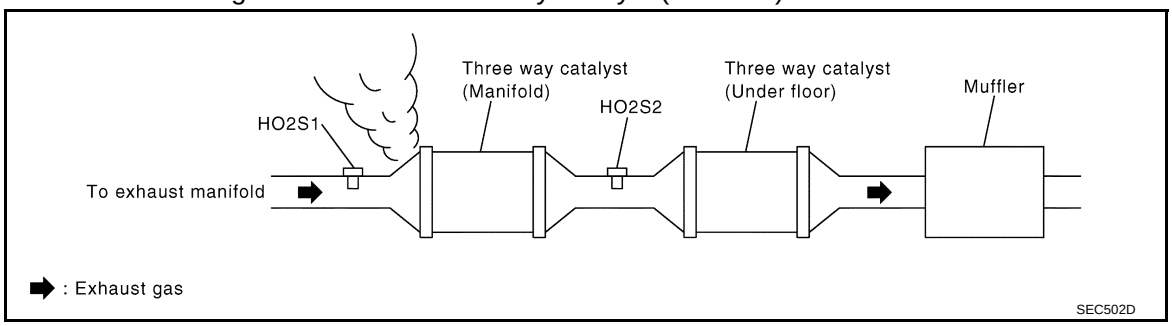
YES >> Go to ECH-168, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179470

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 HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT

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

Heated oxygen sensor 1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	Existed

5. Check the continuity between heated oxygen sensor 1 harness connector or ECM harness connector and ground.

Heated oxygen sensor 1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not existed

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 ECH-345, "Inspection".
2. Install fuel pressure gauge and check fuel pressure. Refer to ECH-345, "Inspection".

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. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”.
NO >> Repair or replace

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.

1.0 - 4.0 g·m/sec: at idling
2.0 - 10.0 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in “Service $01” with GST.

1.0 - 4.0 g·m/sec: at idling
2.0 - 10.0 g·m/sec: 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 ECH-116, "DTC Logic".

7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT-III

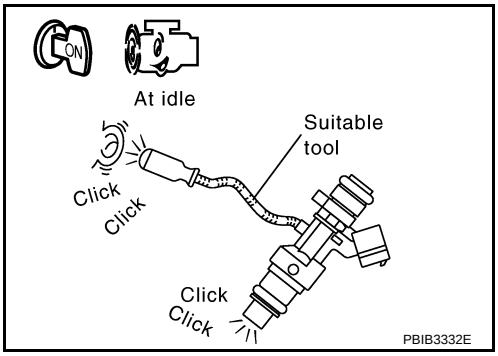
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT-III

1. 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 ECH-291, "Component Function Check".

8. CHECK FUELINJECTOR

1. Remove fuel injector assembly. Refer to EM-36, "Removal and Installation".
   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.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

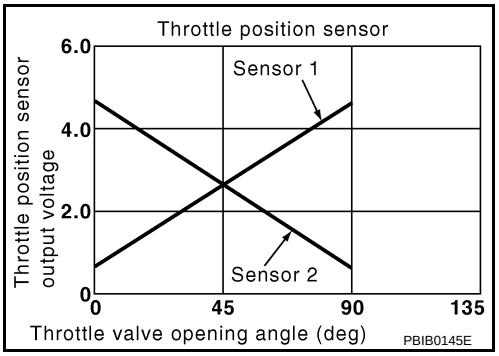
>> INSPECTION END

P0222, P0223 TP SENSOR

Description

INFOID:0000000001179471

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



DTC Logic

INFOID:0000000001179472

DTC DETECTION LOGIC

NOTE:
If DTC P0222 or P0223 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 10V 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 ECH-171, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179473

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

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		
F29	1	Ground	Approx. 5V

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	
F29	4	F8	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	
F29	2	F8	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 ECH-173, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-173, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179474

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to 1st position.
6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	33 (TP sensor 1 signal)	Ground	Accelerator pedal	Fully released	More than 0.36V
				Fully depressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully depressed	More than 0.36V

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-173, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179475

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P0300, P0301, P0302, P0303, P0304 MISFIRE

DTC Logic

INFOID:0000000001179476

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 that 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 • Heated oxygen 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 CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-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 15 minutes.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-175, "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 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-175, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179477

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-III: GO TO 3.
YES-2 >> Without CONSULT-III: GO TO 4.
NO >> Repair or replace it.

3. PERFORM POWER BALANCE TEST

With CONSULT-III
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that each circuit produces a momentary engine speed drop.

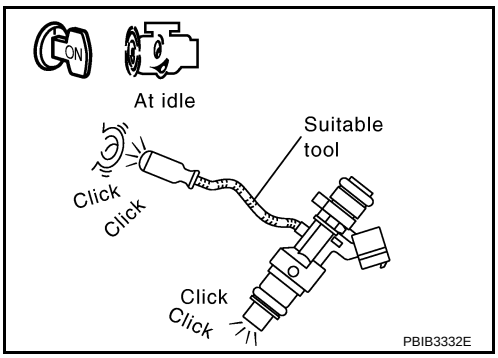
Is the inspection result normal?

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.

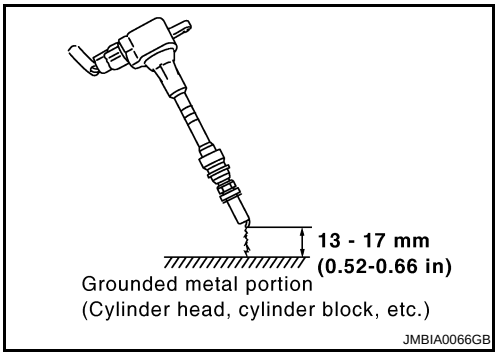
Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to ECH-292, "Component Inspection".

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-III to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
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 20kV 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 ECH-297, "Component Function Check".

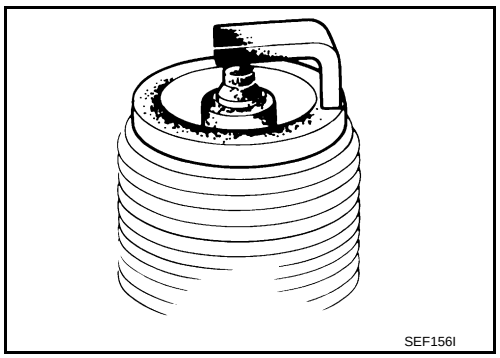
7. CHECK SPARK PLUG

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 EM-20, "Removal and Installation".

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 EM-20, "Removal and Installation".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-25, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.

NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to ECH-345, "Inspection".
3. Install fuel pressure gauge and check fuel pressure. Refer to ECH-345, "Inspection".

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”.

NO >> Repair or replace.

12. CHECK IGNITION TIMING

Check the following items.

For procedure, refer to ECH-14, "BASIC INSPECTION : Special Repair Requirement".

For specification, refer to ECH-348, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 13.

NO >> Follow the ECH-14, "BASIC INSPECTION : Special Repair Requirement".

13. CHECK HO2S1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.

2. Disconnect corresponding HO2S1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	Existed

5. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not existed

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 HO2S1 HEATER

Refer to ECH-147, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace HO2S sensor 1.

15. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.

1.0 - 4.0 g·m/sec : at idling
2.0 - 10.0 g·m/sec : at 2,500 rpm

With GST

Check mass air flow sensor signal in Service $01 with GST.

1.0 - 4.0 g·m/sec : at idling
2.0 - 10.0 g·m/sec : 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 ECH-116, "DTC Logic".

16. CHECK SYMPTOM TABLE

Check items on the rough idle symptom in ECH-334, "Symptom Table".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Repair or replace.

17. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.
Erase the 1st trip DTC from the ECM memory after performing the tests. Refer to ECH-76, "Diagnosis Description".

>> GO TO 18.

18. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P0327, P0328 KS

Description

INFOID:0000000001179478

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.

DTC Logic

INFOID:0000000001179479

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 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 10V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-180, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179480

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector and disconnect ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

Knock sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F12	2	F8	40	Existed

3. 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	
F12	1	F8	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 ECH-181, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace knock sensor.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179481

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?

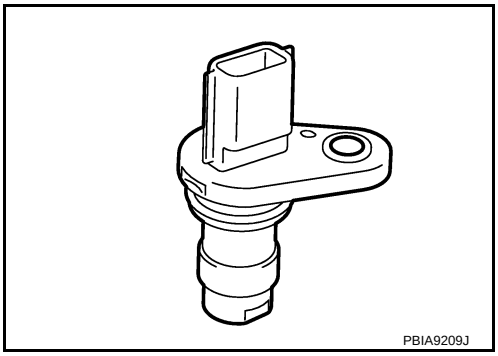
YES >> INSPECTION END
NO >> Replace knock sensor.

P0335 CKP SENSOR (POS)

Description

INFOID:0000000001179482

The crankshaft position sensor (POS) 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.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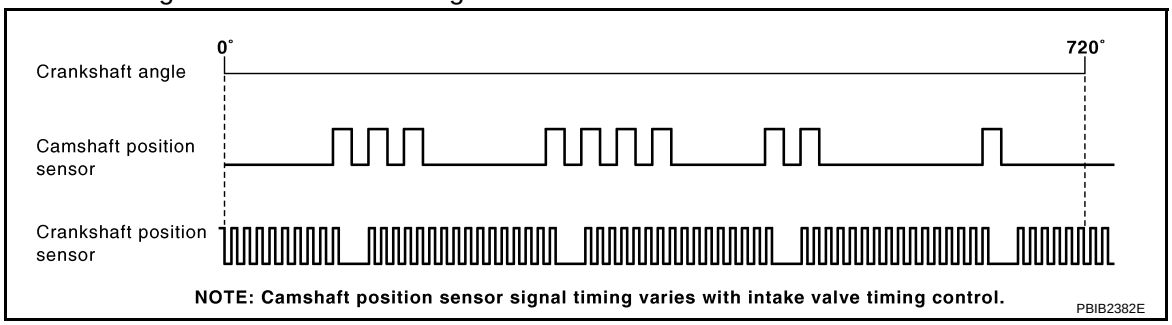


DTC Logic

INFOID:0000000001179483

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.] (Refrigerant pressure sensor circuit is shorted.) (Accelerator pedal position sensor circuit is shorted.) • Crankshaft position sensor (POS) • Refrigerant pressure sensor • Accelerator pedal position sensor • Signal plate

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 10.5V 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 ECH-183, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179484

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

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. 5V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II

1. Turn ignition switch 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	F8	75	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	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.

- Refrigerant pressure sensor (Refer to HAC-172, "Component Inspection")

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning components.

6.CHECK APP SENSOR

Refer to ECH-273, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-274, "Special Repair Requirement".

>> INSPECTION END

8.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	F8	62	Existed

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

Is the inspection result normal?

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

9.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	F8	61	Existed

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 CRANKSHAFT POSITION SENSOR (POS)

Refer to ECH-185, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace crankshaft position sensor (POS).

11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace the signal plate.

12.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

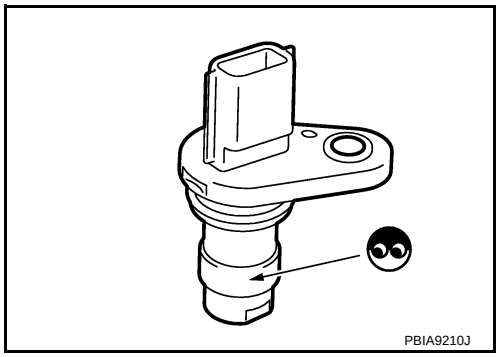
INFOID:0000000001179485

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.
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor (POS).



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?

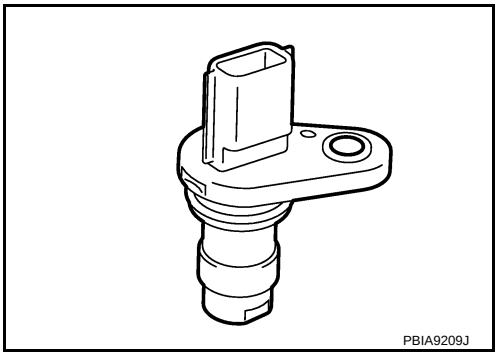
YES >> INSPECTION END
NO >> Replace crankshaft position sensor (POS).

P0340 CMP SENSOR (PHASE)

Description

INFOID:0000000001179486

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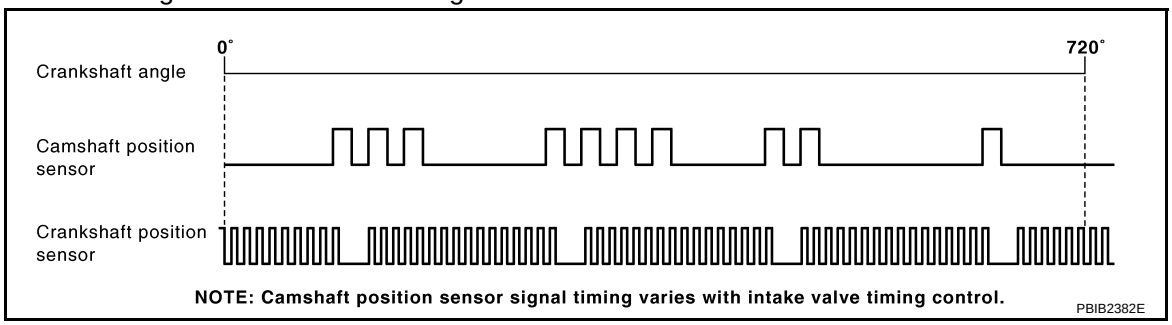


DTC Logic

INFOID:0000000001179487

DTC DETECTION LOGIC

NOTE:
If DTC P0340 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 (The sensor circuit is open or shorted) • Camshaft position sensor (PHASE) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery

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 10.5V 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 ECH-187, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-187, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179488

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 E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

3.CHECK 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
Connector	Terminal		
F26	1	Ground	Approx. 5V

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. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F26	2	F8	63	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 CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F26	3	F8	65	Existed

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

Is the inspection result normal?

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

6.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to ECH-188, "Component Inspection".

Is the inspection result normal?

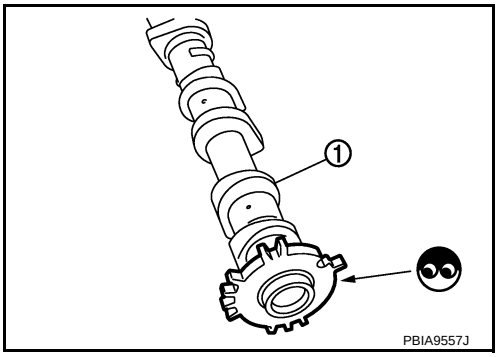
YES >> GO TO 7.
NO >> Replace camshaft position sensor (PHASE).

7.CHECK CAMSHAFT (INT)

Check the following.
- Accumulation of debris to the signal plate of camshaft (1) 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.



8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

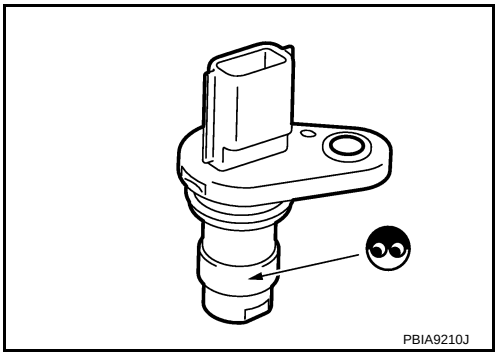
INFOID:0000000001179489

1.CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position sensor (PHASE) harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace camshaft position sensor (PHASE).



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) 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 (PHASE).

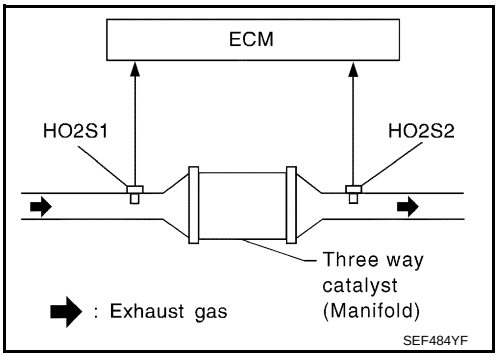
P0420 THREE WAY CATALYST FUNCTION

DTC Logic

INFOID:0000000001179490

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of heated oxygen 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 heated oxygen 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-III?

Do you have CONSULT-III?

YES >> GO TO 2.
NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III
1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. 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 to 70°C (158°F).
7. Open engine hood.
8. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-III.
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-III 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 ECH-192, "Diagnosis Procedure".
NO >> INSPECTION END

7. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-191, "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 ECH-192, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179491

1. PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
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		Ground	Condition	Specification
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Keeping engine speed at 2,000 rpm constant under no load	The voltage switch peridically more than 5 times within 10 seconds.

Is the inspection result normal?

YES >> GO TO 2
NO >> Go to ECM-136, "DTC Logic".

2. PERFORM COMPONENT FUNCTION CHECK-II

Without CONSULT-III

1. Set voltmeter probes between ECM terminals and ground.
2. Make sure that the voltage switching frequency (high&low) HO2S2 voltage is very less than that of HO2S1 voltage under the following condition.

ECM		Ground	Condition	Specification
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Keeping engine speed at 2,000 rpm constant under no load	Switching freqency ratio (A/B) : Less than 0.75 A : Heated oxygen sensor 2 voltage switching frequency B : Heated oxygen sensor 1 voltage switching frequency
	50 (HO2S2 signal)			

Is the inspection result normal?

YES >> INSPECTION END
NO >> If the ratio is greater than above (0.75), it means three way catalyst does not operate properly. Go to ECM-191, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179492

1.CHECK EXHAUST SYSTEM

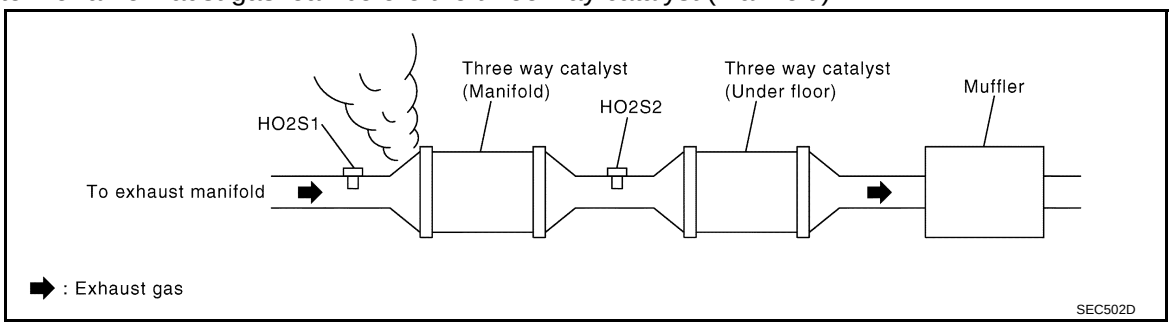
Visually check exhaust tubes and muffler for dent.

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 ECH-14, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to ECH-348, "Ignition Timing"
For specification, refer to ECH-348, "Idle Speed".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the ECH-14, "BASIC INSPECTION : Special Repair Requirement".

5.CHECK FUEL INJECTOR

1. Stop engine and then turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal		
F7	31	Ground	Battery voltage
	30		
	29		
	25		

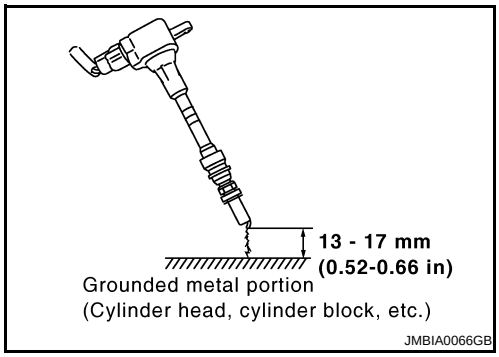
Is the inspection result normal?

YES >> GO TO 6.
NO >> Perform ECH-291, "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-III to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
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 20kV 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 ECH-297, "Diagnosis Procedure".

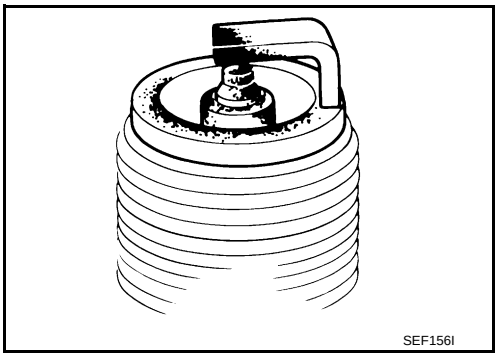
8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc. EM-21, "Inspection"

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-44, "Removal and Installation".

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 three seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-44, "Removal and Installation".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to EM-36, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.

Does fuel drip from fuel injector?

YES >> GO TO 11.

NO >> Replace the fuel injector(s) from which fuel is dripping.

11. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the trouble fixed?

YES >> INSPECTION END

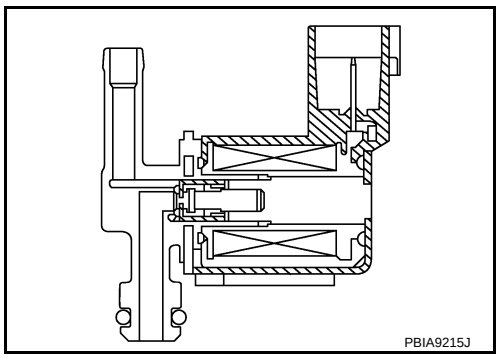
NO >> Replace three way catalyst assembly.

P0444 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000001179493

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.



DTC Logic

INFOID:0000000001179494

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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11V 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 ECH-195, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179495

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 connectors E7, F121
- 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-III: GO TO 4.
YES-2 >> Without CONSULT-III: 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-III
1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to ECH-196, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

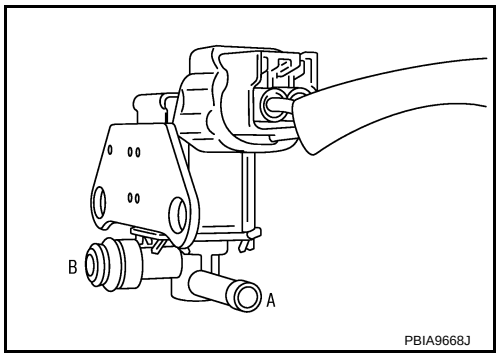
Component Inspection

INFOID:0000000001179496

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Turn ignition switch ON.

5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III.
6. Touch “Qd” and “Qu” on CONSULT-III screen to adjust “PURG VOL CONT/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve

P0500 VSS

Description

INFOID:0000000001179497

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:0000000001179498

DTC DETECTION LOGIC

NOTE:

- **If DTC P0500 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001.Refer to** ECH-110, "DTC Logic".
- **If DTC P0500 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-111, "DTC Logic"**.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	Vehicle speed sensor	The almost 0 km/h (0 MPH) signal from vehicle speed sensor 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) • Wheel sensor • Combination meter

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.PRECONDITIONING

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

>> 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-III

1. Start engine.
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-III. The vehicle speed on CONSULT-III should exceed 10 km/h (6 mph) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to ECH-199, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT-III.
2. Warm engine up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	2,500 - 6,000 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	4.3 - 31.8 msec
Shift lever	Except Neutral position
PW/ST SIGNAL	OFF

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-199, "Diagnosis Procedure".
NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-199, "Component Function Check".
Use component function check to check the overall function of the vehicle speed sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-199, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179499

1. PERFORM COMPONENT FUNCTION CHECK

With GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed sensor signal in Service $01 with GST.
   The vehicle speed sensor 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 ECH-199, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179500

1. CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-57, "DTC No. Index".

Is the inspection result normal?

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

2. CHECK COMBINATION METER

Refer to MWI-57, "DTC Index".

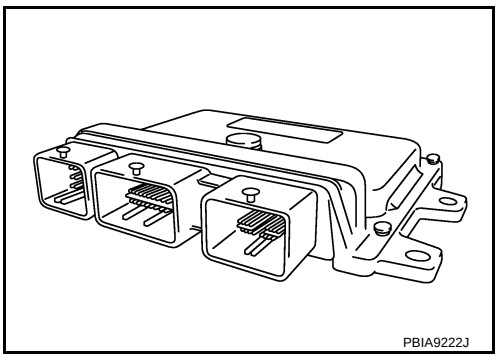
>> INSPECTION END

P0605 ECM

Description

INFOID:0000000001179501

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


PBIA9222J

DTC Logic

INFOID:0000000001179502

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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-201, "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 ECH-201, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and waitait 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 ECH-201, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179503

1.INSPECTION START

With CONSULT-III

1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode with CONSULT-III.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-200, "DTC Logic".

With GST

1. Turn ignition switch ON.
2. Select Service $04 with GST.
3. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-200, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

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

2.REPLACE ECM

1. Replace ECM.
2. Go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

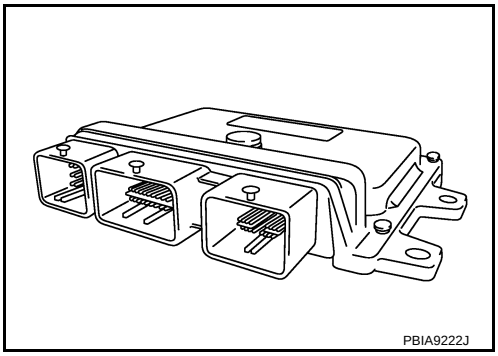
>> INSPECTION END

P1065 ECM

Description

INFOID:0000000001179504

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.


PBIA9222J

DTC Logic

INFOID:0000000001179505

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065	Engine control module	ECM back-up RAM system does not function properly.	• 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Start engine and let it idle for 1 second.
3. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
4. Repeat steps 2 and 3 for four times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-202, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179506

1.INSPECTION START

With CONSULT-III
1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode with CONSULT-III.
3. Touch “ERASE”.
4. **Perform DTC CONFIRMATION PROCEDURE.**
   See ECH-202, "DTC Logic".

With GST
1. Turn ignition switch ON.
2. Select Service $04 with GST.
3. **Perform DTC CONFIRMATION PROCEDURE.**
   See ECH-202, "DTC Logic".

Is the 1st trip DTC P1065 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

1. Replace ECM.
2. Go to ECH-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

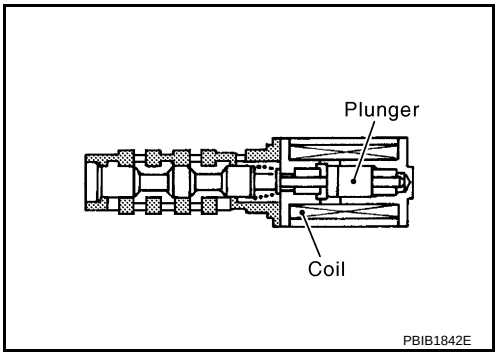
>> INSPECTION END

P1111 IVT CONTROL SOLENOID VALVE

Description

INFOID:0000000001179507

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.



DTC Logic

INFOID:0000000001179508

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> 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 ECH-204, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179509

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

1. Turn ignition switch OFF.
2. Disconnect intake valve timing 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	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN

AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	1	F8	73	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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to ECH-205, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace intake valve timing control solenoid valve.

4. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179510

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	6.7 - 7.7 Ω
1 or 2 and ground	∞Ω (Continuity should not exist)

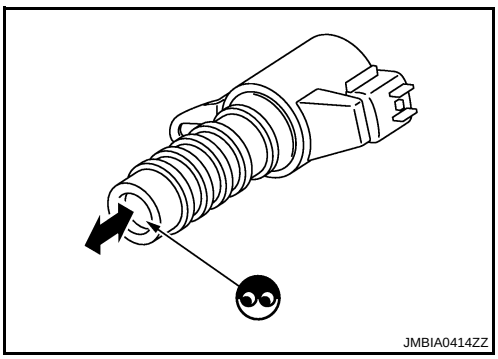
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Provide 12V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

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



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace intake valve timing control solenoid valve.

P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

INFOID:0000000001179511

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

DTC Logic

INFOID:0000000001179512

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Set shift lever to 1st position and wait at least 3 seconds.
3. Set shift lever to Neutral 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 shift lever to 1st position and wait at least 3 seconds.
7. Set shift lever to Neutral position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to ECH-206, "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 shift lever to 1st position and wait at least 3 seconds.
3. Set shift lever to Neutral position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Go to ECH-206, "Diagnosis Procedure".
NO >> INSPECTION END

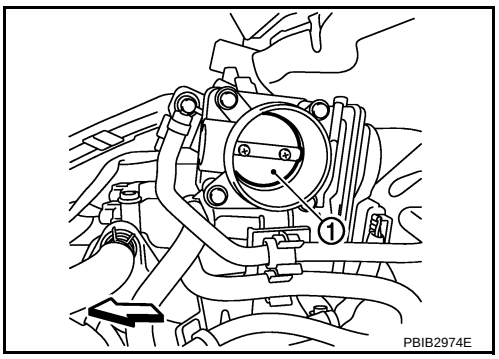
Diagnosis Procedure

INFOID:0000000001179513

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

⇦ : Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-207, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179514

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000001179515

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 control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:0000000001179516

DTC DETECTION LOGIC

NOTE:
If DTC P1122 is displayed with DTC P1121 or P1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to ECH-212, "DTC Logic" or ECH-206, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122	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 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 11V 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 ECH-208, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179517

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F7	2	Ground	Ignition switch OFF	Approx. 0V
			Ignition switch ON	Battery voltage

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

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

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E12	32	F7	2	Existed

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F12, E9
- Harness for open or short between throttle motor relay and ECM

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

5. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Check voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal		
F7	15	Ground	Battery voltage

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between throttle motor relay and ECM

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

7. CHECK FUSE

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace 15A fuse.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

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	
F29	5	F7	1	Not existed
			4	Existed
	6		1	Existed
			4	Not existed

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

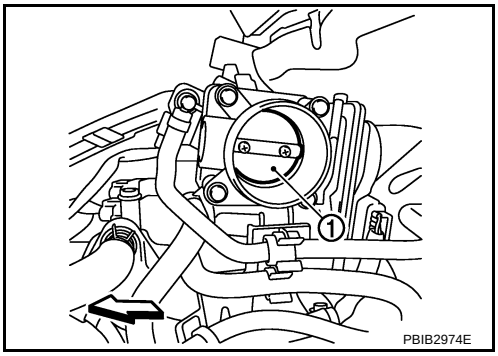
Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
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 11.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

11. CHECK THROTTLE CONTROL MOTOR

Refer to ECH-211, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 13.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

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

13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunction electric throttle control actuator.
2. Go to ECH-211, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000001179518

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

1. Replace electric throttle control actuator.
2. Go to ECH-211, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179519

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:0000000001179520

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.

DTC Logic

INFOID:0000000001179521

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124	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
P1126	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

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 8V.

Witch DTC is detected?

P1124 >> GO TO 2.
P1126 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1124

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

Is DTC detected?

YES >> Go to ECH-212, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1126

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 ECH-212, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179522

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		Ground	Voltage
Connector	Terminal		
F7	15	Ground	Battery voltage

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between throttle motor relay and ECM

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

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E12.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	15	E12	25	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between throttle motor relay and ECM

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

5. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Reconnect ECM and IPDM E/R harness connectors.
2. Turn ignition switch ON.
3. Check voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal		
F7	2	Ground	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. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	E12	32	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F12, E9
- Harness for open or short between throttle motor relay and ECM

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

8. CHECK FUSE

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

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace 15A fuse.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

P1128 THROTTLE CONTROL MOTOR

Description

INFOID:0000000001179523

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

DTC Logic

INFOID:0000000001179524

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	• Harness or connectors (Throttle control motor circuit is shorted.) • Electric throttle control actuator (Throttle control motor)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to ECH-215, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179525

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
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	
F29	5	F7	1	Not existed
			4	Existed
	6		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.

3.CHECK THROTTLE CONTROL MOTOR

Refer to ECH-216, "Component Inspection".

Is the inspection result normal?

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

4.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

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

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-216, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000001179526

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

1. Replace electric throttle control actuator.
2. Go to ECH-216, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179527

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

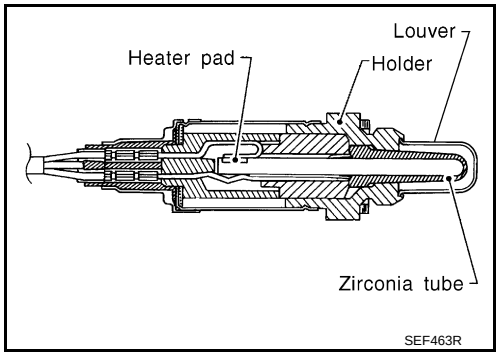
>> END

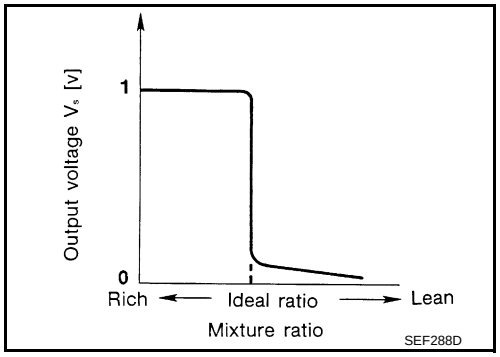
P1143 HO2S1

Description

INFOID:0000000001179528

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



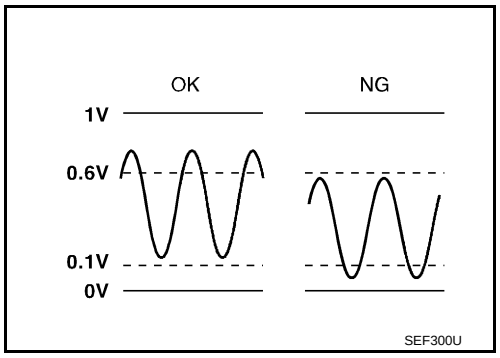


DTC Logic

INFOID:0000000001179529

DTC DETECTION LOGIC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and whether the “lean” output is sufficiently low. When both the outputs are shifting to the lean side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1143	Heated oxygen sensor 1 lean shift monitoring	The maximum and minimum voltage from the sensor are not reached to the specified voltages.	• Heated oxygen sensor 1 • Heated oxygen sensor 1 heater • Fuel pressure • Fuel injector • Intake air leaks

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F)

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

Do you have CONSULT-III?

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

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch ON and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	1,500 - 3,900 rpm
VHCL SPEED SE	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.0 - 12.0 msec
Shift lever	Suitable position

   If “TESTING” is not displayed after 5 minutes, retry from step 2.
7. Touch “SELF-DIAG RESULT”

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to ECH-218, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between EM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load	• The maximum voltage is over 0.6 at least 1 time. • The minimum voltage is over 0.1 at least 1 time.

NOTE:
Use component function check to check the overall function of the heated oxygen 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 ECH-218, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179530

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 50 N·m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CLEAR THE SELF-LEARNING DATA

1. Clear the mixture ratio self-learning value, refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
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 ECH-163, "DTC Logic".
No >> GO TO 4.

4.CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to ECH-219, "Component Inspection".

Is inspection result normal?

YES >> GO TO 5.
NO >> Replace heated oxygen sensor 1.

5.CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

>> INSPECTION END

Component Inspection

INFOID:0000000001179531

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

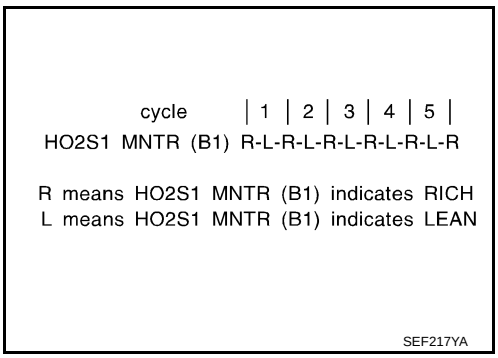
YES >> GO TO 2.
NO >> GO TO 3.

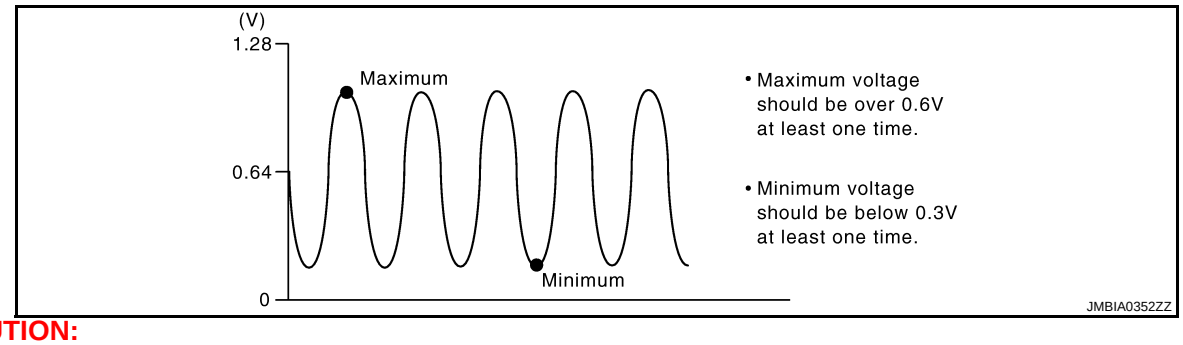
2.CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.

6. Check the following.
- "HO2S1 MNTR (B1)" in "DATA MONITOR" mode changes from "RICH" to "LEAN" to "RICH" more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- "HO2S1 (B1)" voltage goes above 0.6V at least once.
- "HO2S1 (B1)" voltage goes below 0.3V at least once.
- "HO2S1 (B1)" voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III
1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.
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 tool and approved anti-seize lubricant.**

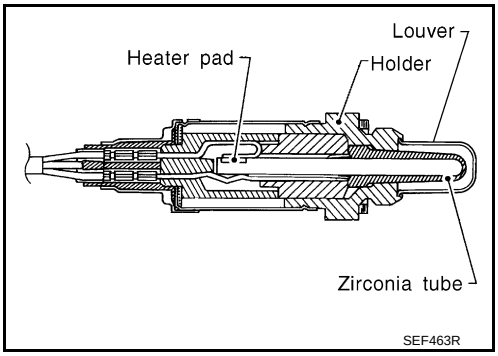
>> INSPECTION END

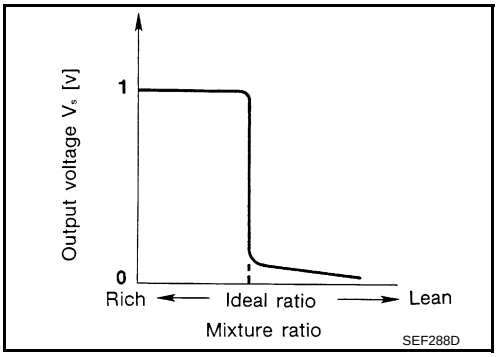
P1144 HO2S1

Description

INFOID:0000000001179532

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



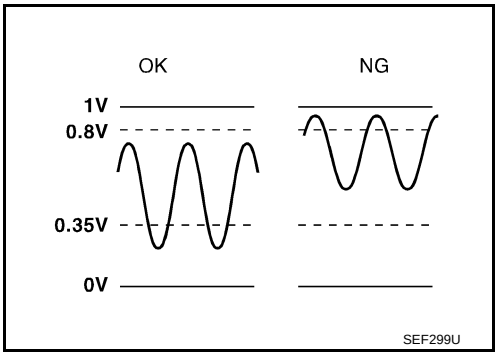


DTC Logic

INFOID:0000000001179533

DTC DETECTION LOGIC

To judge the malfunction, the output from the heated oxygen sensor 1 is monitored to determine whether the “rich” output is sufficiently high and “lean” output is sufficiently low. When both the outputs are shifting to the rich side, the malfunction will be detected.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1144	Heated oxygen sensor 1 rich shift monitoring	The maximum and minimum voltages from the sensor are beyond the specified voltages.	• Heated oxygen sensor 1 • Heated oxygen sensor 1 heater • Fuel pressure • Fuel injector

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F).

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

Do you have CONSULT-III?

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

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Turn ignition switch ON and select “HO2S1 (B1) P1143” of “HO2S1” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 3 minutes.
   NOTE:
   Never raise engine speed above 3,600 rpm after this step. If the engine speed limit is exceeded, return to step 5.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take approximately 50 seconds or more.)
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	1,500 - 3,900 rpm
VHCL SPEED SE	Less than 100 km/h (62 MPH)
B/FUEL SCHDL	2.0 - 12.0 msec
Shift lever	Suitable position

If “TESTING” is not displayed after 5 minutes, retry from step 2.

7. Touch “SELF-DIAG RESULT”

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to ECH-218, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes between EM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load	• The maximum voltage is over 0.8 at least 1 time. • The minimum voltage is over 0.35 at least 1 time.

NOTE:
Use component function check to check the overall function of the heated oxygen 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 ECH-218, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179534

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E9. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 50 N·m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CLEAR THE SELF-LEARNING DATA

1. Clear the mixture ratio self-learning value, refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

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

Yes >> Perform trouble diagnosis for DTC P0172. Refer to ECH-167, "DTC Logic".
No >> GO TO 4

4.CHECK HO2S1 CONNECTOR FOR WATER

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check connectors for water.

Water should not exist.

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 1 HEATER

Refer to ECH-147, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace heated oxygen sensor 1.

6.CHECK HEATED OXYGEN SENSOR 1

Refer to ECH-231, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace heated oxygen sensor 1.

7.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".
For circuit, refer to ECH-317, "Wiring Diagram - ENGINE CONTROL SYSTEM -".

>> **INSPECTION END**

Component Inspection

INFOID:0000000001179535

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

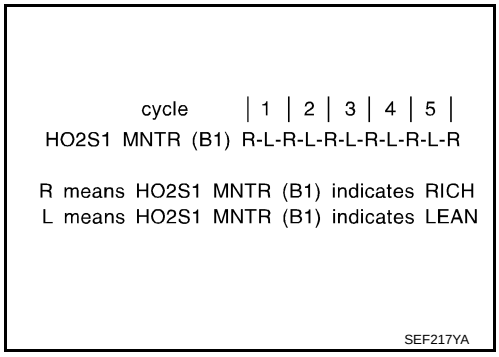
2.CHECK HEATED OXYGEN SENSOR 1

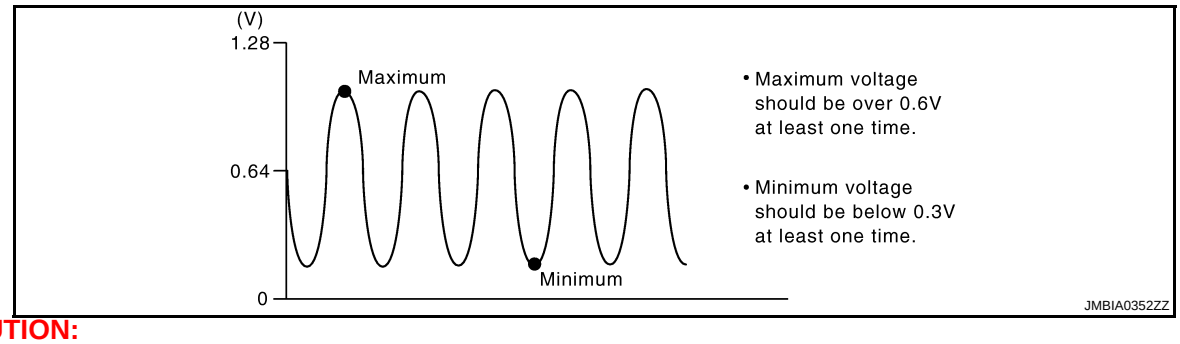
With CONSULT-III

1. Start engine and warm it up to normal operating temperature.

2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.
6. Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 tool and approved anti-seize lubricant.**

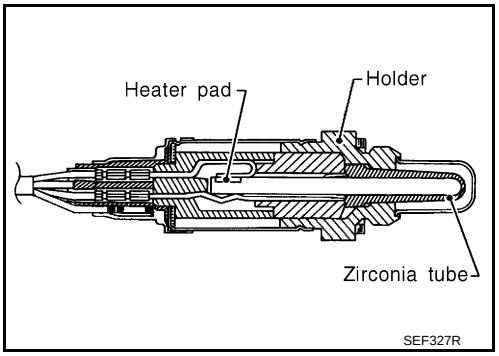
>> INSPECTION END

P1146 HO2S2

Description

INFOID:0000000001179536

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen 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 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

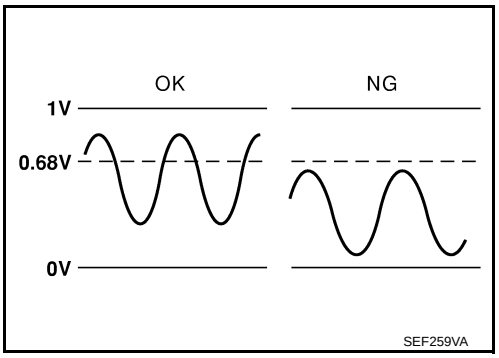


DTC Logic

INFOID:0000000001179537

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1146	Heated oxygen sensor 2 circuit low voltage	The maximum 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 • Intake air leaks

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.
NO >> GO TO 11.

2.PRECONDITIONING

"COMPLETED" will appear on CONSULT-III screen when all tests "COND1", "COND2" and "COND3" are completed.
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For the best results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30°C (32 to 86°F).
Never stop engine during this procedure. If the engine is stopped, retry this procedure from 4. PERFORM PROCEDURE FOR COND1-I.

>> GO TO 3.

3. PERFORM PROCEDURE FOR COND1

Start engine and warm it up to normal operating temperature.

>> GO TO 4.

4. PERFORM PROCEDURE FOR COND1-I

Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 5.

5. PERFORM PROCEDURE FOR COND1-II

1. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
2. Let engine idle 1 minute.
3. Select “HO2S2 (B1) P1146” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm two or three times quickly under no load.

Is “CONPLETED” appears on CONSULT-III screen?

YES >> GO TO 7.
NO >> GO TO 4.

6. PERFORM PROCEDURE FOR COND1-I

When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-III screen. Maintain the condition continuously until “TESTING” changes to “COMPLETED” (It will take approximately 60 seconds.)

ENG SPEED	More than 1,200 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLAN TEMP/S	More than 70°C (158°F)
Shift level	Suitable position

Which displayed on CONSULT-III screen?

COND1: OUT OF CONDITION>>GO TO 4.
COND1: COMPLETED COND2: INCOMPLETED>>GO TO 7.
COND1: COMPLETED COND2: COMPLETED>>GO TO 8.

7. PERFORM PROCEDURE FOR COND2

While driving, release accelerator pedal completely from the above condition until “INCOMPLETED” at “COND2” on CONSULT-III screen has turned to “COMPLETED”. (It will take approximately 4 seconds.)

Which displayed on CONSULT-III screen?

COND2: COMPLETED COND3: INCOMPLETED>>GO TO 8.
COND2: COMPLETED COND3: COMPLETED>>GO TO 9.

8. PERFORM PROCEDURE FOR COND3

Stop vehicle and let it idle until “INCOMPLETED” of “COND3” on CONSULT-III screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)

>> GO TO 9.

9. PERFORM PROCEDURE FOR COND3-I

Touch “SELF DIAGRESULTS”.

Which displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to ECH-230, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 10.

10. PERFORM PROCEDURE FOR COND3-II

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Turn ignition switch ON and select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
3. Start engine and warm it up while monitoring “COOLAN TEMP/S” indication on CONSULT-III.
4. When “COOLAN TEMP/S” indication reaches to 70°C (158°F).

>> GO TO 5.

11. PREFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-231, "Component Inspection".

NOTE:

Use component function check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-230, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179538

1. PERFORM COMPONENT FUNCTION CHECK-I

With GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. 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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-230, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179539

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CLEAR THE SELF-LEARNING DATA

1. Clear the mixture ratio self-learning value, refer to ECH-21, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
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 ECH-167, "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	
E58	1	F8	59	Existed

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

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

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

5.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	
E58	4	F8	50	Existed

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

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E58	4	F8	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

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

7. CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-231, "Component Inspection".

Is the inspection result normal?

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

8. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

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

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179540

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

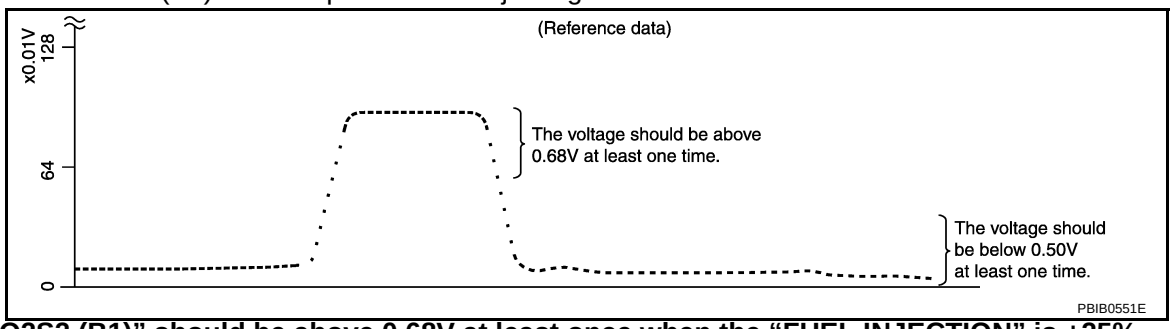
YES >> GO TO 2.
NO >> GO TO 3.

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-III.

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



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 heated oxygen sensor 2.

CAUTION:

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

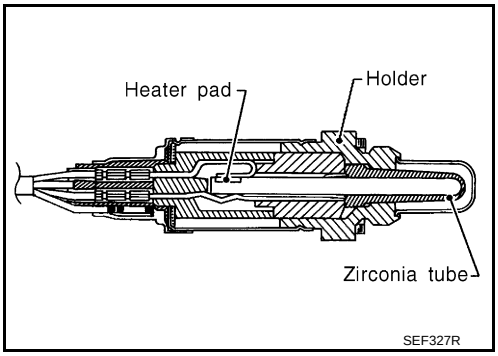
>> INSPECTION END

P1147 HO2S2

Description

INFOID:0000000001179541

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen 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 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

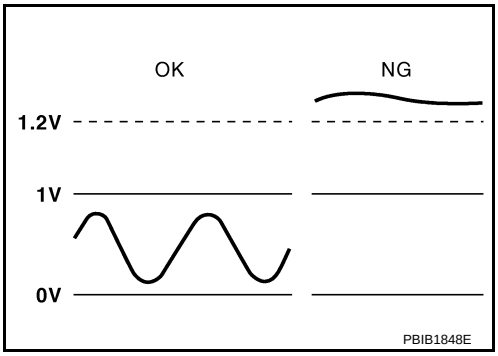


DTC Logic

INFOID:0000000001179542

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen 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 voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1147	Heated oxygen sensor 2 circuit high voltage	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

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

YES >> GO TO 2.
NO >> GO TO 11.

2.PRECONDITIONING

"COMPLETED" will appear on CONSULT-III screen when all tests "COND1", "COND2" and "COND3" are completed.
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
For the best results, perform DTC WORK SUPPORT at a temperature of 0 to 30°C (32 to 86°F).
Never stop engine during this procedure. If the engine is stopped, retry this procedure from 4. PERFORM PROCEDURE FOR COND1-I.

>> GO TO 3.

3. PERFORM PROCEDURE FOR COND1

Start engine and warm it up to normal operating temperature.

>> GO TO 4.

4. PERFORM PROCEDURE FOR COND1-I

Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 5.

5. PERFORM PROCEDURE FOR COND1-II

1. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
2. Let engine idle 1 minute.
3. Select “HO2S2 (B1) P1147” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”.
5. Start engine and let it idle for at least 30 seconds.
6. Rev engine up to 2,000 rpm two or three times quickly under no load.

Is “CONPLETED” appears on CONSULT-III screen?

YES >> GO TO 9.
NO >> GO TO 6.

6. PERFORM PROCEDURE FOR COND1-I

When the following conditions are met, “TESTING” will be displayed at “COND1” on the CONSULT-III screen. Maintain the condition continuously until “TESTING” changes to “COMPLETED” (It will take approximately 60 seconds.)

ENG SPEED	More than 1,200 rpm
B/FUEL SCHDL	More than 1.0 msec
COOLAN TEMP/S	More than 70°C (158 °F)
Shift level	Suitable position

Which displayed on CONSULT-III screen?

COND1: OUT OF CONDITION>>GO TO 4.
COND1: COMPLETED COND2: INCOMPLETED>>GO TO 7.
COND1: COMPLETED COND2: COMPLETED>>GO TO 8.

7. PERFORM PROCEDURE FOR COND2

While driving, release accelerator pedal completely from the above condition until “INCOMPLETED” at “COND2” on CONSULT-III screen has turned to “COMPLETED”. (It will take approximately 4 seconds.)

Which displayed on CONSULT-III screen?

COND2: COMPLETED COND3: INCOMPLETED>>GO TO 8.
COND2: COMPLETED COND3: COMPLETED>>GO TO 9.

8. PERFORM PROCEDURE FOR COND3

Stop vehicle and let it idle until “INCOMPLETED” of “COND3” on CONSULT-III screen has turned to “COMPLETED”. (It will take a maximum of approximately 6 minutes.)

>> GO TO 9.

9. PERFORM PROCEDURE FOR COND3-I

Touch “SELF DIAGRESULTS”.

Which displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to ECH-237, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 10.

10. PERFORM PROCEDURE FOR COND3-II

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
2. Turn ignition switch ON and select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
3. Start engine and warm it up while monitoring “COOLAN TEMP/S” indication on CONSULT-III.
4. When “COOLAN TEMP/S” indication reaches to 70°C (158°F).

>> GO TO 5.

11. PREFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-238, "Component Inspection".
NOTE:
Use component function check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-237, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179543

1. PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT-III
1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.50V at least once during this procedure.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-237, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179544

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2. CHECK 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	
E58	1	F8	59	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

- Harness connectors F121, E7.
- Harness for open or short between HO2S2 and ECM.

>> 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	
E58	4	F8	50	Existed

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

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E58	4	F8	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

- Harness connectors F121, E7.
- Harness for open or short between HO2S2 and ECM.

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

6. CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace harness or connectors.

7.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-238, "Component Inspection".

Is the inspection result normal?

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

8.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179545

1.INSPECTION START

Do you have CONSULT-III?

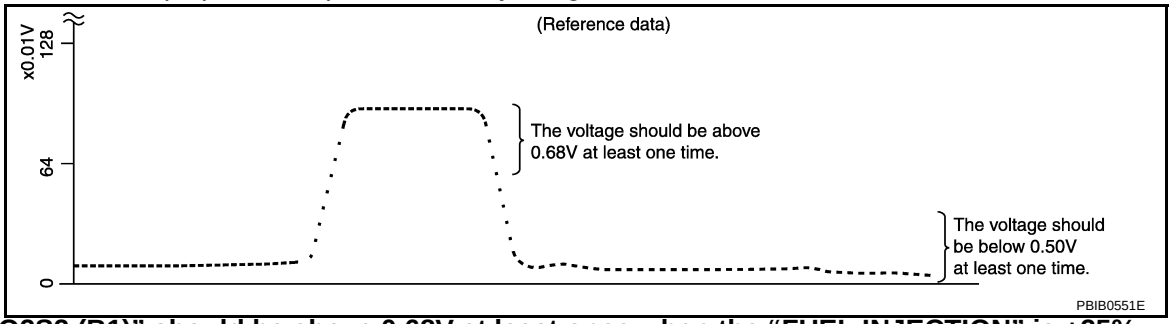
Do you have CONSULT-III?

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

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000001179546

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and “ABS actuator and electric unit (control unit)”.
Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000001179547

DTC DETECTION LOGIC

NOTE:
- **If DTC P1212 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-110, "DTC Logic".**
- **If DTC P1212 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-111, "DTC Logic".**

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1212	TCS communication line	ECM can not receive the information from “ABS actuator and electric unit (control unit)” continuously.	• Harness or connectors (The CAN communication line is open or short-ed.) • ABS actuator and electric unit (control unit) • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-241, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179548

Go to BRC-6, "Work Flow".

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000001179549

DTC DETECTION LOGIC

NOTE:

- **If DTC P1217 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-110, "DTC Logic".**
- **If DTC P1217 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-111, "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 relays -1 and -2) • 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 CO-9, "Inspection". Also, replace the engine oil. Refer to LU-6, "Inspection".

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 LU-6, "Inspection".**
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 ECH-242, "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 ECH-243, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179550

1.PERFORM COMPONENT FUNCTION CHECK-I

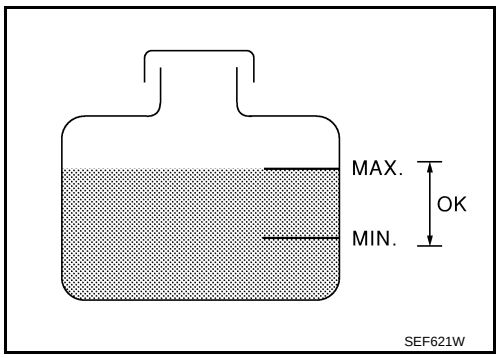
WARNING:

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 ECH-243, "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 ECH-243, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

With CONSULT-III
1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that cooling fan motor operate at each speed (LOW/HI).

Without CONSULT-III
Perform IPDM E/R auto active test and check cooling fan motor operation, refer to PCS-9, "Diagnosis Description".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to PCS-9, "Diagnosis Description".

Diagnosis Procedure

INFOID:0000000001179551

1.CHECK COOLING FAN OPERATION

With CONSULT-III
1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that cooling fan motor operate at each speed (LOW/HI).

Without CONSULT-III
1. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to PCS-9, "Diagnosis Description".
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 ECH-287, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-9, "Inspection".

Is leakage detected?

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

3.CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak. Refer to CO-9, "Inspection".
- Hose
- Radiator
- Water pump

>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap. Refer to CO-13, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace radiator cap.

5. CHECK THERMOSTAT

Check thermostat. Refer to CO-19, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat.

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to ECH-125, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor.

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	CO-9, "Inspection"
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-9, "Inspection"
	4	• Radiator cap	• Pressure tester	59 - 98 kPa (0.6 - 1.0 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	CO-14, "Inspection"
ON*2	5	• Coolant leaks	• Visual	No leaks	CO-9, "Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-20, "Inspection"
ON*1	7	• Cooling fan motor	• CONSULT-III	Operating	ECH-288, "Component Inspection (Cooling Fan Motor)"
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	CO-9, "Inspection"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-9, "Inspection"
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-81, "Inspection"
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-102, "Inspection"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to CO-5, "Troubleshooting Chart".

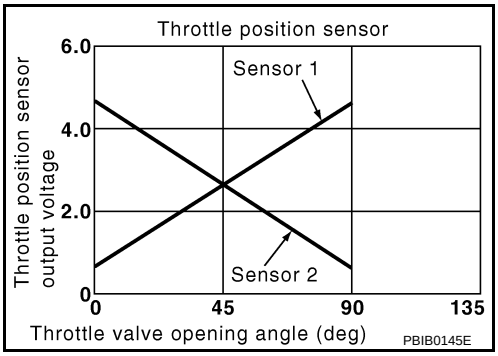
>> INSPECTION END

P1225 TP SENSOR

Description

INFOID:0000000001179552

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



DTC Logic

INFOID:0000000001179553

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 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 10V 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 ECH-246, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

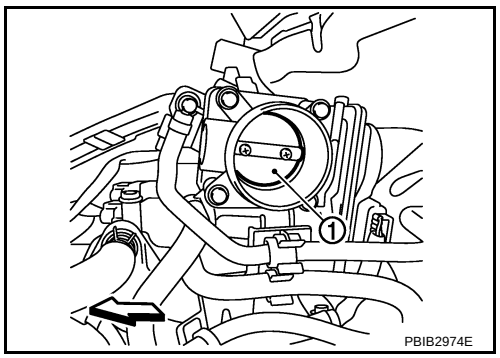
INFOID:0000000001179554

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

⇦ : Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-247, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179555

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

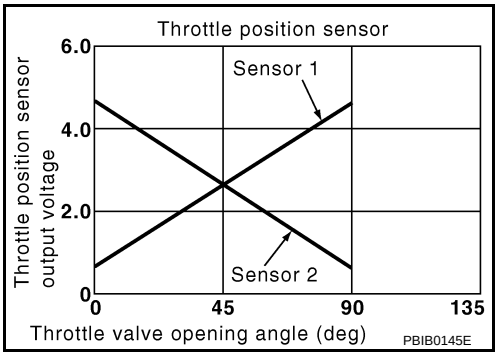
>> END

P1226 TP SENSOR

Description

INFOID:0000000001179556

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



DTC Logic

INFOID:0000000001179557

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 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 10V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF, 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 ECH-248, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

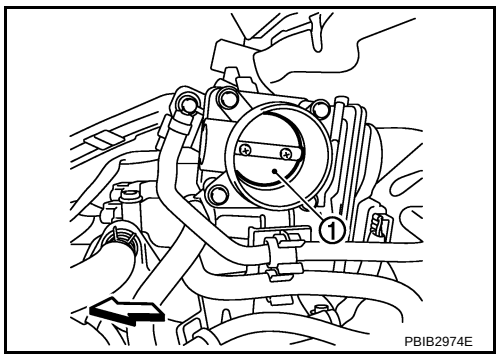
INFOID:0000000001179558

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

⇦ : Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-247, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179559

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1229 SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000001179560

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	• Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [Camshaft position sensor (PHASE) circuit is shorted.] • Accelerator pedal position sensor • Throttle position sensor • Camshaft position sensor (PHASE)

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 10V 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 ECH-250, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179561

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage
Connector	Terminal		
E110	4	Ground	Approx. 5V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	72	Electric throttle control actuator	F29	1
	78	CMP sensor (PHASE)	F26	1
E16	106	APP sensor	E110	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.
- Camshaft position sensor (PHASE) (Refer to ECH-188, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5. CHECK TP SENSOR

Refer to ECH-173, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> INSPECTION END

7. CHECK APP SENSOR

Refer to ECH-270, "Component Inspection".

Is the inspection result normal?

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

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P1564 ASCD STEERING SWITCH

Description

INFOID:0000000001179562

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to ECH-48, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000001179563

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to ECH-200, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ASCD steering switch	• An excessively high voltage signal from the ASCD steering switch is sent to ECM. • ECM detects that input signal from the ASCD steering switch is out of the specified range. • ECM detects that the ASCD steering switch is stuck ON.	• Harness or connectors (The switch circuit is open or shorted.) • ASCD steering switch • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Wait at least 10 seconds.
3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Check DTC.

Is DTC detected?

YES >> Go to ECH-252, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179564

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-III
1. Turn ignition switch ON.

2. Select “MAIN SW”, “CANCEL SW”, “RESUME/ACC SW” and “SET SW” in “DATA MONITOR” mode with CONSULT-III.
3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
		Released	OFF
RESUME/ACC SW	RESUME/ACCELERATE switch	Pressed	ON
		Released	OFF
SET SW	SET/COAST switch	Pressed	ON
		Released	OFF

Without CONSULT-III
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
E16	94 (ASCD steering switch signal)	Ground	MAIN switch: Pressed	Approx. 0V
			CANSEL switch: Pressed	Approx. 1V
			SET/COAST switch: Pressed	Approx. 2V
			RESUME/ACCELERATE switch: Pressed	Approx. 3V
			All ASCD steering switches: Released	Approx. 4V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector M352.
4. Check the continuity between ASCD steering switch and ECM harness connector.

ASCD steering switch	ECM		Continuity
Terminal	Connector	Terminal	
15	E16	95	Existed

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M77, E105
- Combination switch (spiral cable)
- Harness for open and short between ECM and ASCE steering switch

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

5. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM harness connector and ASCD steering switch.

ASCD steering switch	ECM		Continuity
Terminal	Connector	Terminal	
14	E16	94	Existed

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M77, E105
- Combination switch (spiral cable)
- Harness for open and short between ECM and ASCE steering switch

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

7. CHECK ASCD STEERING SWITCH

Refer to ECH-254, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179565

1. CHECK ASCD STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector.
2. Check the continuity between combination switch harness connector terminals under following conditions.

Combination meter		Condition	Resistance
Connector	Terminals		
M325	14 and 15	MAIN switch: Pressed	Approx. 0 Ω
		CANCEL switch: Pressed	Approx. 250 Ω
		SET/COAST switch: Pressed	Approx. 660 Ω
		RESUME/ACCELERATE switch: Pressed	Approx. 1,480 Ω
		All ASCD steering switches: Released	Approx. 4,000 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD steering switch

P1572 ASCD BRAKE SWITCH

Description

INFOID:0000000001179566

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to ECH-48, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000001179567

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to ECH-200, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1572	ASCD brake switch	A)	When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time.	• Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ASCD brake switch circuit is shorted.) • Harness or connectors (The ASCD clutch switch circuit is shorted.) • Stop lamp switch • ASCD brake switch • ASCD clutch switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • Incorrect ASCD clutch switch installation • ECM
		B)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

NOTE:

Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

With CONSULT-III

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-III.
3. Press MAIN switch and make sure that CRUISE indicator is displayed in combination meter.
4. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Shift lever	Suitable position

5. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to ECH-256, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT-III

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to ECH-256, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179568

1. CHECK OVERALL FUNCTION-I

With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal and clutch pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

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

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	100 (ASCD brake switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.

NO >> GO TO 3.

2. CHECK ASCD BRAKE SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD Clutch switch		Ground	Condition		Voltage (V)
Connector	Terminal				
E112	1	Ground	Clutch pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD clutch switch harness connector and ground.

ASCD clutch switch		Ground	Voltage
Connector	Terminal		
E111	1	Ground	Battery voltage

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Junction block connector E105, M77
- 10A fuse (No.4)
- Harness for open or short between ASCD brake switch and fuse

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

5. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ASCD brake switch harness connector and ASCD clutch switch harness connector.

ASCD brake switch		ASCD clutch switch		Continuity
Connector	Terminal	Connector	Terminal	
E112	1	E111	2	Existed

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

Is the inspection result normal?

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

6. CHECK ASCD BRAKE SWITCH

Refer to ECH-259, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 14.

NO >> Replace ASCD brake switch.

7. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

ECM		ASCD brake switch		Continuity
Connector	Terminal	Connector	Terminal	
E16	100	E112	2	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.

8. CHECK ASCD CLUTCH SWITCH

Refer to ECH-259, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace ASCD clutch switch.

9. 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	1	Ground	Battery voltage

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse (No.11)
- 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.

11. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

ECM		Stop lamp switch		Continuity
Connector	Terminal	Connector	Terminal	
E10	106	E114	2	Existed

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

Is the inspection result normal?

YES >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

• Harness for open or short between ECM and stop lamp switch

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

13. CHECK STOP LAMP SWITCH

Refer to ECH-260, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace stop lamp switch.

14. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000001179569

1. CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2. CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-18, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

Component Inspection (ASCD Clutch Switch)

INFOID:0000000001179570

1. CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to CL-9, "Removal and Installation".
2. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD clutch switch.

Component Inspection (Stop Lamp Switch)

INFOID:0000000001179571

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

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

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-18, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch.

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000001179572

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to ECH-48, "System Description" for ASCD functions.

DTC Logic

INFOID:0000000001179573

DTC DETECTION LOGIC

NOTE:

- **If DTC P1574 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-110, "DTC Logic".**
- **If DTC P1574 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-111, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to ECH-198, "DTC Logic"**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to ECH-200, "DTC Logic"**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) (Combination meter circuit is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
3. Check DTC.

Is DTC detected?

YES >> Go to ECH-261, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179574

1.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-17, "CONSULT-III Function (ABS)".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2.CHECK COMBINATION METER

Check combination meter function.
Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

>> INSPECTION END

P1706 PNP SWITCH

Description

INFOID:0000000001179575

When the shift lever position is in the neutral position, ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:0000000001179576

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	• Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] • Park/neutral position (PNP) switch

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.PRECONDITIONING

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

>> GO TO 3.

3.CHECK PNP SWITCH FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-III. Then check the “P/N POSI SW” signal under the following conditions.

Position (Shift lever)	Known-good signal
Neutral position	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to ECH-264, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT-III.
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	1,925 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.5 - 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 ECH-264, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to ECH-264, "Component Function Check".
NOTE:
Use component function check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-264, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179577

1.PERFORM COMPONENT FUNCTION CHECK

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

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	69 (PNP switch signal)	Ground	Shift lever	Neutral position	Approx. 0V
				Except above	BATTERY VOLTAGE

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-264, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179578

1.CHECK PNP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect Park/neutral position (PNP) switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between PNP switch harness connector and ground.

PNP switch		Ground	Voltage
Connector	Terminal		
F46	2	Ground	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following
- Harness connectors E6, F123
- Harness for open or short between neutral position switch and IPDM E/R

>> 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 PNP switch harness connector and ECM harness connector.

PNP switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F46	3	F8	69	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 PNP SWITCH

Refer to TM-13, "PARK/NEUTRAL POSITION (PNP) SWITCH : Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace PNP switch.

5. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P1805 BRAKE SWITCH

Description

INFOID:0000000001179579

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 driving.

DTC Logic

INFOID:0000000001179580

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 the DTC with CONSULT-III.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-266, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179581

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 1st trip DTC detected?

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	1	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
• Harness connectors E105, M77

- 10A fuse (No. 11)
- 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 ECM harness connector.
2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

ECM		Stop lamp switch		Continuity
Connector	Terminal	Connector	Terminal	
E16	99	E114	2	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK STOP LAMP SWITCH

Refer to ECH-267, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace stop lamp switch.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000001179582

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

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

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-18, "Inspection and Adjustment"(LHD) or BR-65, "Inspection and Adjustment"(LHD).
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

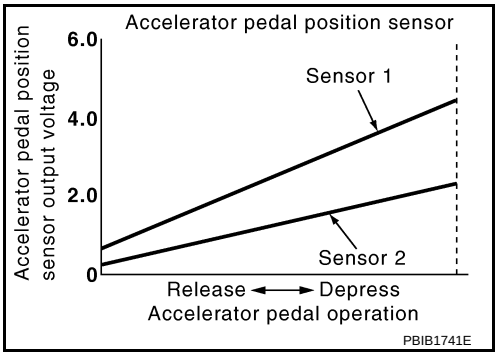
YES >> INSPECTION END
NO >> Replace stop lamp switch.

P2122, P2123 APP SENSOR

Description

INFOID:0000000001179583

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 potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic

INFOID:0000000001179584

DTC DETECTION LOGIC

NOTE:
If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 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 10V 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 ECH-268, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179585

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

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		
E110	4	Ground	Approx. 5V

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	
E110	2	E16	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	
E110	3	E16	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 ECH-270, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-270, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179586

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		Ground	Condition		Voltage
Connector	Terminal				
E16	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-270, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179587

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

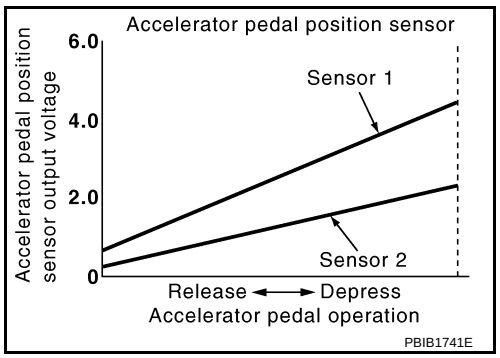
>> END

P2127, P2128 APP SENSOR

Description

INFOID:0000000001179588

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 potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



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

DTC Logic

INFOID:0000000001179589

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.) [Crankshaft position sensor (POS) circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • 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 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 10V 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 ECH-271, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179590

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

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		
E110	5	Ground	Approx. 5V

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	
E110	5	E16	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 APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	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.
- Crankshaft position sensor (POS) (Refer to ECH-185, "Component Inspection".)
- Refrigerant pressure sensor (Refer to HAC-70, "Component Inspection".)

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	
E110	1	E16	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	
E110	6	E16	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 ECH-273, "Component Inspection".

Is the inspection result normal?

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

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-274, "Special Repair Requirement".

>> INSPECTION END

10.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179591

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		Ground	Condition		Voltage
Connector	Terminal				
E16	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-274, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179592

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

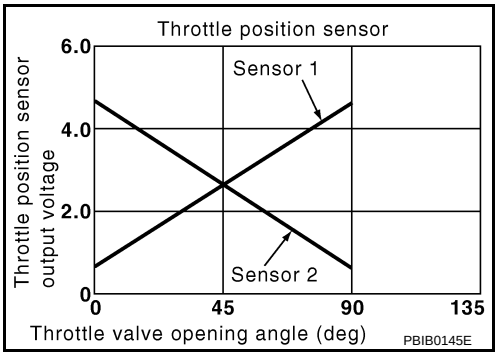
>> END

P2135 TP SENSOR

Description

INFOID:0000000001179593

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



DTC Logic

INFOID:0000000001179594

DTC DETECTION LOGIC

NOTE:
If DTC P2135 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 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 10V 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 ECH-275, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179595

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.

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

Electric throttle control actuator		Ground	Voltage
Connector	Terminal		
F29	1	Ground	Approx. 5V

Is the inspection result normal?

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

3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

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	
F29	1	F8	72	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4. 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	
F29	4	F8	36	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 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	
F29	2	F8	33	Existed
	3		34	

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 THROTTLE POSITION SENSOR

Refer to ECH-277, "Component Inspection".

Is the inspection result normal?

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

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. ECH-277, "Special Repair Requirement"

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179596

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform ECH-277, "Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to 1st position.
6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	33 (TP sensor 1 signal)	Ground	Accelerator pedal	Fully released	More than 0.36V
				Fully depressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully depressed	More than 0.36V

Is the inspection result normal?

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

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-277, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179597

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

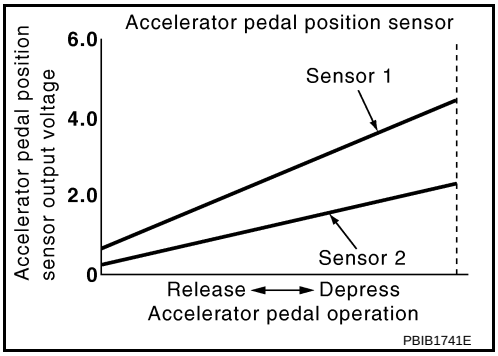
>> END

P2138 APP SENSOR

Description

INFOID:0000000001179598

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 potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic

INFOID:0000000001179599

DTC DETECTION LOGIC

NOTE:
If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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.) [Crankshaft position sensor (POS) circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 and 2) • Crankshaft position sensor (POS) • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V 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 ECH-278, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179600

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

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		
E110	4	Ground	Approx. 5V

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

1. Turn ignition switch ON.
2. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage
Connector	Terminal		
E110	5	Ground	Approx. 5V

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	
E110	5	E16	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 APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	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.
- Crankshaft position sensor (POS) (Refer to ECH-185, "Component Inspection".)
- Refrigerant pressure sensor (Refer to HAC-70, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 11.
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	
E110	1	E16	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	
E110	3	E16	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 ECH-280, "Component Inspection".

Is the inspection result normal?

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

10.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-281, "Special Repair Requirement".

>> INSPECTION END

11.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179601

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		Ground	Condition		Voltage
Connector	Terminal				
E110	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-281, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179602

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-18, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

ASCD BRAKE SWITCH

Description

INFOID:0000000001179603

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to ECH-48, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000001179604

1.CHECK FOR ASCD BRAKE SWITCH FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal and clutch pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

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

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	100 (ASCD brake switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-282, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179605

1.CHECK ASCD BRAKE SWITCH CIRCUIT - I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD clutch switch		Ground	Voltage (V)
Connector	Terminal		
E112	1	Ground	Battery voltage

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

Is the inspection result normal?

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

2.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT - II

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD clutch switch harness connector and ground.

ASCD clutch switch		Ground	Voltage (V)
Connector	Terminal		
E111	1	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E105, M77
- 10A fuse (No. 4)
- Harness for open or short between ASCD brake switch and fuse

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

4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Check the continuity between ASCD brake switch harness connector and ASCD clutch switch harness connector.

ASCD brake switch		ASCD clutch switch		Continuity
Connector	Terminal	Connector	Terminal	
E112	1	E111	2	Existed

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

Is the inspection result normal?

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

5. CHECK ASCD CLUTCH SWITCH

Refer to ECH-284, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace ASCD clutch switch.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

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

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112	2	E16	100	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 ASCD BRAKE SWITCH

Refer to ECH-284, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD brake switch.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000001179606

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-17, "Removal and Installation" (LHD) or BR-64, "Removal and Installation" (RHD).
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

Component Inspection (ASCD Clutch Switch)

INFOID:0000000001179607

1.CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to CL-9, "Removal and Installation".
2. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD clutch switch.

ASCD INDICATOR

Description

INFOID:0000000001179608

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE lamp illuminates when MAIN switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET lamp illuminates when following conditions are met.
- CRUISE lamp is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET lamp remains lit during ASCD control.
Refer to ECH-48, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000001179609

1.ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	• Ignition switch: ON	• MAIN switch: Pressed at the 1st time →at the 2nd time	ON → OFF
SET LAMP	• MAIN switch: ON • When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	• ASCD: Operating	ON
		• ASCD: Not operating	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-286, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179610

1.CHECK DTC

Check that DTC U1001 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC U1001. Refer to ECH-110, "DTC Logic".

2.CHECK COMBINATION METER OPERATION

Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Check combination meter circuit. Refer to MWI-49, "Wiring Diagram - METER -".

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

COOLING FAN

Description

INFOID:0000000001179611

Cooling fan operates at low and high speed when the current flows in the cooling fan motor.
Refer to ECH-56, "System Diagram" for cooling fan operation.

Component Function Check

INFOID:0000000001179612

1. CHECK COOLING FAN LOW SPEED FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that cooling fan operates at low and high speed.

Without CONSULT-III

1. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to PCS-9, "Diagnosis Description".
2. Make sure that cooling fan operates at low and high speed.

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-287, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179613

1. CHECK IPDM E/R POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E14.
3. Check the voltage between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Voltage
Connector	Terminal		
E14	53	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit or short to ground or short to power in harness or connectors

2. CHECK COOLING FAN MOTOR CIRCUIT FOR OPEN AND SHORT

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

Cooling fan motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E3	1	E14	52	Existed
			54	

4. Check the continuity between cooling fan motor harness connector and ground.

Cooling fan motor		IPDM/ER		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E3	2	E10	5	Ground	Existed
			6		

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Resistor E57.
- Harness for open or short between IPDM E/R and cooling fan.
- Harness for open or short between cooling fan and ground.
- Harness for open or short between IPDM E/R and ground.

>> Repair or replace malfunctioning part.

4. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

5. CHECK COOLING FAN MOTOR

Refer to ECH-288, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning cooling fan motor.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connector.

Component Inspection (Cooling Fan Motor)

INFOID:0000000001179614

1. CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connector E3.
3. Supply cooling fan motor terminals with battery voltage and check operation.

Terminals		Operation
(+)	(–)	
1	2	Cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan motor.

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000001179615

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line from BCM to ECM via IPDM E/R.

Component Function Check

INFOID:0000000001179616

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Connect CONSULT-III and select “DATA MONITOR” mode.
3. Select “LOAD SIGNAL” and check indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Rear window defogger switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to ECH-289, "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 ECH-289, "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 ECH-289, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179617

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to ECH-289, "Component Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2
Headlamp>>GO TO 3.
Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-3, "Work Flow".

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Refer toEXL-7, "Work Flow".

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to GI-39, "Intermittent Incident".

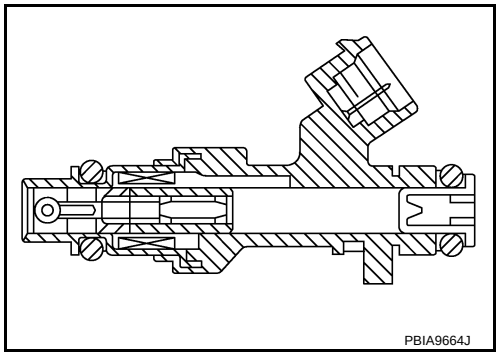
>> INSPECTION END

FUEL INJECTOR

Description

INFOID:0000000001179618

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.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Component Function Check

INFOID:0000000001179619

1. INSPECTION START

Turn ignition switch to START.

Is any cylinder ignited?

YES >> GO TO 2.
NO >> Go to ECH-291, "Diagnosis Procedure".

2. CHECK FUEL INJECTOR FUNCTION

With CONSULT-III

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that each circuit produces a momentary engine speed drop.

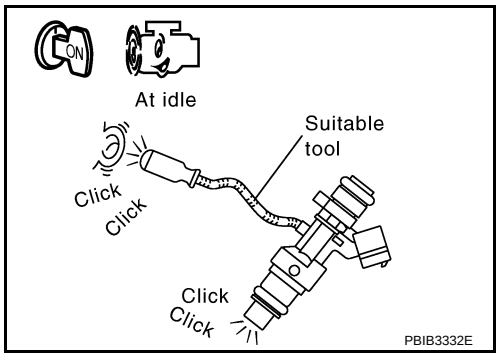
Without CONSULT-III

1. 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 ECH-291, "Diagnosis Procedure".



PBIB3332E

Diagnosis Procedure

INFOID:0000000001179620

1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel injector harness connector and ground.

Fuel injector			Ground	Voltage
Cylinder	Connector	Terminal		
1	F37	1	Ground	Battery voltage
2	F38	1		
3	F39	1		
4	F40	1		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 10A fuse (No. 58)
- 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	Terminal	Connector	Terminal	
1	F37	2	F7	31	Existed
2	F38	2		30	
3	F39	2		29	
4	F40	2		25	

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 ECH-292, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning fuel injector.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

Component Inspection

INFOID:0000000001179621

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 [at 10 - 60°C (50 - 140°F)]
1 and 2	11.1 - 14.5 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector.

FUEL PUMP

Description

INFOID:0000000001179622

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 several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor 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.

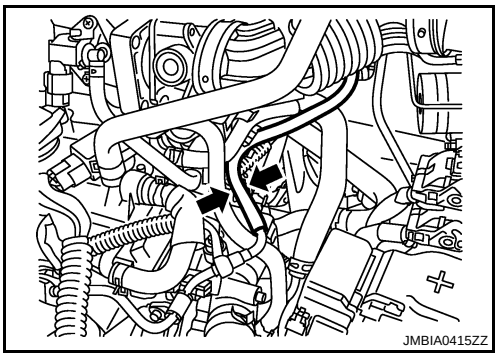
Component Function Check

INFOID:0000000001179623

1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.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Is the inspection result normal?

YES >> INSPECTION END
NO >> ECH-294, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179624

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		Ground	Voltage
Connector	Terminal		
F7	23	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	23	E13	33	Existed

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. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E6, F123.
- Harness for open or short to ground and short power.

>> Repair harness or connectors.

4. 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 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 exist 1 second after ignition switch is turn ON.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

5. CHECK 10A FUSE

1. Turn ignition switch OFF.
2. Disconnect 10A fuse (No. 57) from IPDM E/R.
3. Check 10A fuse.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace fuse.

6. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between IPDM E/R harness connector and “fuel level sensor unit and fuel pump” harness connector.

IPDM E/R		Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
F13	42	B40	1	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B10, E101
- Harness for open or short between IPDM E/R and “fuel level sensor unit and fuel pump”

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

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Check the continuity between “fuel level sensor unit and fuel pump” and ground.

Fuel level sensor unit and fuel pump		Ground	Continuity
Connector	Terminal		
B40	3	Ground	Existed

2. Also heck 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 FUEL PUMP

Refer to ECM-299, "Component Inspection (Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace fuel pump.

10.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

Component Inspection (Fuel Pump)

INFOID:0000000001179625

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”.

IGNITION SIGNAL

Description

INFOID:0000000001179626

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

Component Function Check

INFOID:0000000001179627

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT-III: GO TO 2.
YES-2 >> Without CONSULT-III: GO TO 3.
NO >> Go to ECH-297, "Diagnosis Procedure".

2.IGNITION SIGNAL FUNCTION

With CONSULT-III

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
2. Make sure that each circuit produces a momentary engine speed drop.

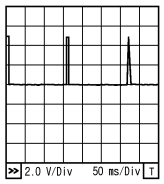
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-297, "Diagnosis Procedure".

3.IGNITION SIGNAL FUNCTION

Without CONSULT-III

1. Let engine idle.
2. Read the voltage signal between ECM harness connector and ground.

ECM		Ground	Voltage signal
Connector	Terminal		
F7	17	Ground	
	18		
	22		
	21		

PBIA9265J

NOTE:
The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-297, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179628

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		Ground	Voltage
Connector	Terminal		
E16	105	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to ECH-106, "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 4.
NO >> GO TO 3.

3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E11.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
E11	10	F13	1	Existed

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

Is the inspection result normal?

YES >> Go to ECH-106, "Diagnosis Procedure".
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

4.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 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK CONDENSER

Refer to ECH-300, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 6.
NG >> Replace condenser.

6.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

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

7. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

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 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

8. 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 9.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to ECH-300, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace malfunctioning ignition coil with power transistor.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000001179629

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 [at 25°C (77°F)]
1 and 2	Except 0 or ∞ Ω
1 and 3	Except 0 Ω
2 and 3	

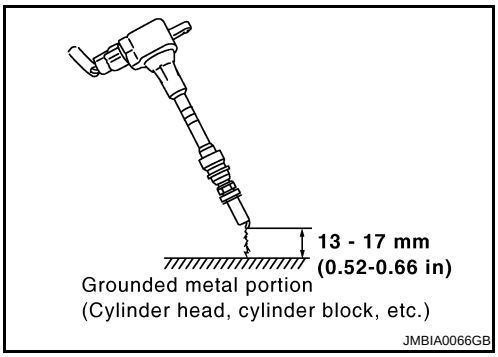
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor.

2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:
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-III to release fuel pressure, or fuel pressure applies again during the following procedure.
4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
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 20kV 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.

Component Inspection (Condenser)

INFOID:0000000001179630

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?

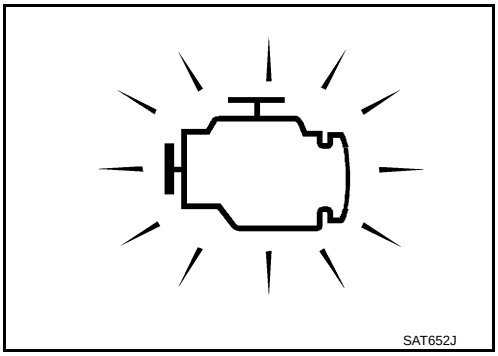
YES >> INSPECTION END
NO >> Replace condenser.

MALFUNCTION INDICATOR

Description

INFOID:0000000001179631

The Malfunction Indicator (MI) is located on the combination meter.
The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MI should go off. If the MI remains on, the on board diagnostic system has detected an engine system malfunction.
For details, refer to ECH-302, "Diagnosis Procedure".



Component Function Check

INFOID:0000000001179632

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 ECH-302, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179633

1.CHECK DTC

Check that DTC U1001 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC U1001. Refer to ECH-110, "Diagnosis Procedure".

2.CHECK COMBINATION METER

Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

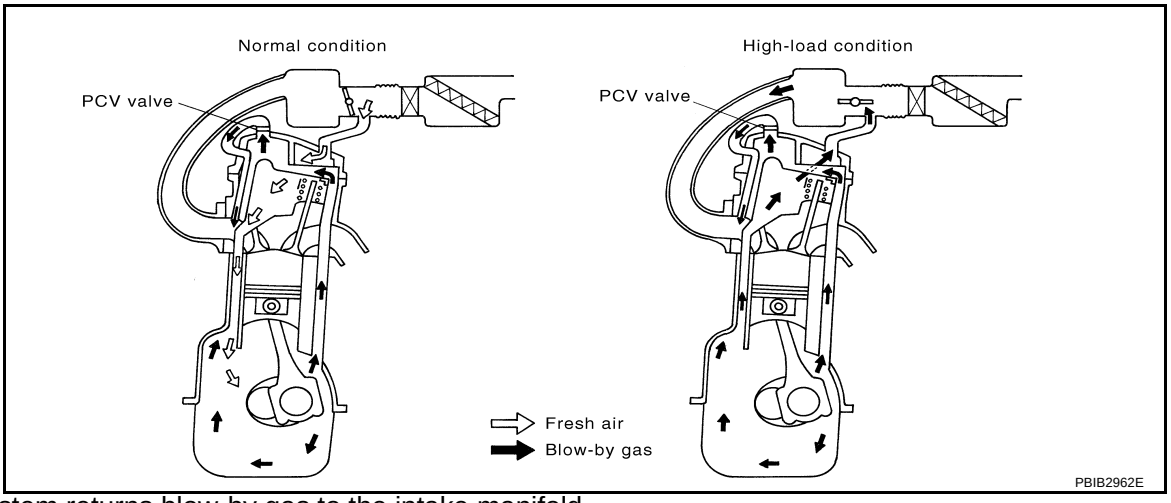
Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace.

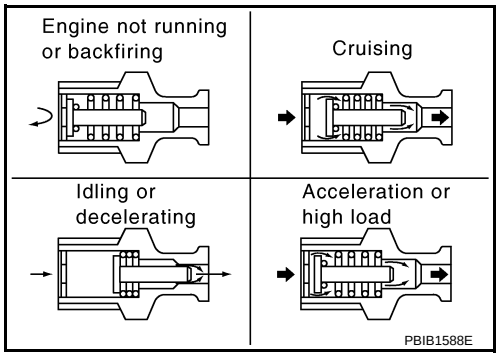
POSITIVE CRANKCASE VENTILATION

Description

INFOID:0000000001179634



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.



Component Inspection

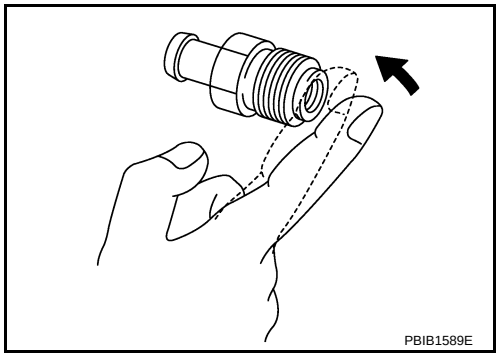
INFOID:0000000001179635

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.

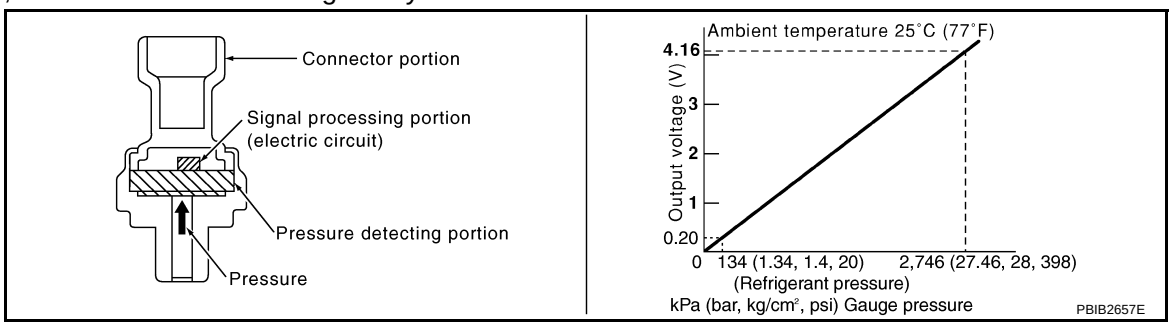


REFRIGERANT PRESSURE SENSOR

Description

INFOID:0000000001179636

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.



Component Function Check

INFOID:0000000001179637

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		Ground	Voltage
Connector	Terminal		
F8	41 (Refrigerant pressure sensor signal)	Ground	1.0 - 4.0V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-304, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179638

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 E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pressure sensor		Ground	Voltage
Connector	Terminal		
E49	3	Ground	Approx. 5V

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 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	F8	48	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 connectors F123, E6
- 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	F8	41	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 connectors F123, E6
- 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 GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.
NO >> Repair or replace.

ECU DIAGNOSIS

ECM

Reference Value

INFOID:0000000001179639

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-III value with the tachometer indication.		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See ECH-99, "Diagnosis Procedure".		
B/FUEL SCHDL	See ECH-99, "Diagnosis Procedure".		
A/F ALPHA-B1	See ECH-99, "Diagnosis Procedure".		
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158F)
HO2S1 (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
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 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds
HO2S2 MNTR (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ←→ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9V
		Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9V
		Accelerator pedal: Fully depressed	3.9 - 4.8V
THRL SEN 1-B1	• Ignition switch: ON (Engine stopped) • Shift lever: 1st	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
THRL SEN 2-B1	• Ignition switch: ON (Engine stopped) • Shift lever:1st	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
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

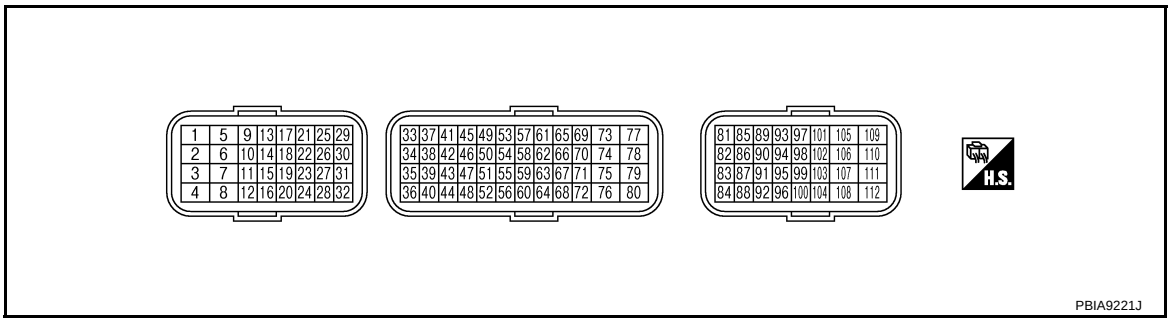
Monitor Item	Condition		Values/Status
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	• Ignition switch: ON	Shift lever: Neutral	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel: Not being turned	OFF
		Steering wheel: Being turned	ON
LOAD SIGNAL	• Ignition switch: ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
		Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	• Engine: After warming up, idle the engine	Heater fan switch: ON	ON
		Heater fan switch: OFF	OFF
BRAKE SW	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	• Engine: After warming up • Shift lever: Neutral • 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 • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	10° - 20° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/ALD VALUE	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	10% - 35%
		2,500 rpm	10% - 35%
MASS AIRFLOW	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	1.0 - 4.0 g·m/s
		2,500 rpm	2.0 - 10.0 g·m/s
PURG VOL C/V	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	0%
		2,000 rpm	0% - 50%
INT/V TIM (B1)	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 40°CA
INT/V SOL (B1)	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	0% - 2%
		2,000 rpm	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
THRTL RELAY	• Ignition switch: ON		ON

Monitor Item	Condition		Values/Status
COOLING FAN	• Engine: After warning up, idle the engine • Air conditioner switch: OFF	Engine coolant temperature is 98°C (208F) 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
HO2S1 HTR (B1)	• Engine: After warming up • Engine speed: Below 3,600rpm		ON
	• Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B1)	• Engine speed: Below 3,900 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
VEHICLE SPEED	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
IDL A/V LEARN	• Engine: running	Idle air volume learning has not been performed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	• Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,723 miles)
O2 SEN HTR DTY	• Engine coolant temperature when engine started: More than 80°C (176 − F) • Engine speed: Below 3,600 rpm		Approx. 30%
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0V
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
SET VHCL SPD	• Engine: Running	ASCD: Operating	The preset vehicle speed is displayed
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	• Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	• Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1 (ASCD brake switch)	• Ignition switch: ON	Brake pedal and clutch pedal: Fully released	ON
		Brake pedal and/or clutch pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
VHCL SPD CUT	• Ignition switch: ON		NON
LO SPEED CUT	• Ignition switch: ON		NON
AT OD MONITOR	• Ignition switch: ON		OFF
AT OD CANCEL	• Ignition switch: ON		OFF
CRUISE LAMP	• Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF

Monitor Item	Condition		Values/Status
SET LAMP	• MAIN switch: ON • When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Operating	ON
		ASCD: Not operating	OFF

*: 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.

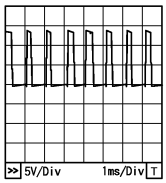
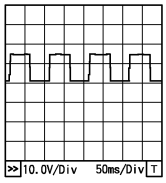
TERMINAL LAYOUT

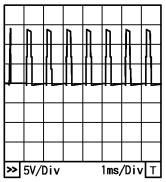
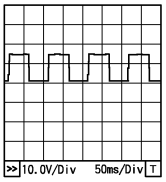
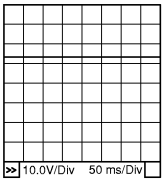
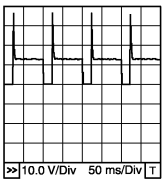


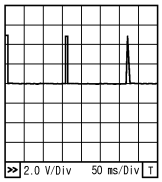
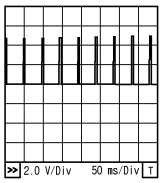
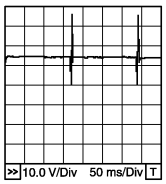
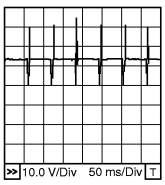
PHYSICAL VALUES

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

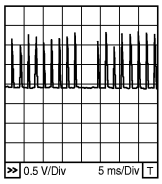
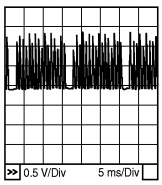
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

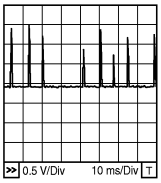
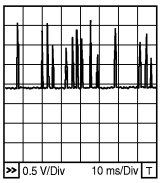
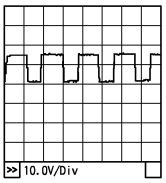
Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/Output	Condition	Value (Approx.)
1	Ground	L/W	Throttle control motor (Open)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully depressed	3.2V★  PBIA8150J
2	Ground	R/Y	Throttle control motor relay power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
3	Ground	LG/R	Heated oxygen sensor 1 heater	Output	[Engine is running] • Warm up condition • Engine speed: Below 3,600 rpm	Approximately 3.2V★  PBIA8148J
					[Engine is running] • Warm-up condition • Idle speed [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)

Terminal No. +	Terminal No. –	Wire color	Description Signal name	Description Input/ Output	Condition	Value (Approx.)
4	Ground	P	Throttle control motor (Close)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully released	0 - 14V★  PBIA8149J
5	Ground	R	Heated oxygen sensor 2 heater	Output	[Engine is running] • Engine speed: Below 3,900 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	10V★  PBIA8148J
					[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,900 rpm	BATTERY VOLTAGE (11 - 14V)
9	Ground	W/B	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
					[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.)	BATTERY VOLTAGE (11 - 14V)★  PBIB0520E
10 11	Ground	B B/W	ECM ground	—	[Engine is running] • Idle speed	Body ground
15	Ground	G/L	Throttle control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)
					[Ignition switch: ON]	0 - 1.0V

Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
17 18 21 22	Ground	L/Y BR/Y R/G SB	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 4 Ignition signal No. 3	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.3V★  PBIA9265J
					[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	0.2 - 0.5V★  PBIA9266J
23	Ground	B/O	Fuel pump relay	Output	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0V
					[Ignition switch: ON] • More than a few seconds after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)
25 29 30 31	Ground	R/O Y O L	Fuel injector No. 4 Fuel injector No. 3 Fuel injector No. 2 Fuel injector No. 1	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
					[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIA4943J
32	Ground	Y/L	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: OFF] • A few seconds after turning ignition switch OFF	0 - 1.0V
					[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)

Terminal No.		Wire color	Description		Condition	Value (Approx.)
+	–		Signal name	Input/ Output		
33	Ground	L/R	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully released	More than 0.36V
					[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully depressed	Less than 4.75V
34	Ground	L/O	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully released	Less than 4.75V
					[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully depressed	More than 0.36V
36	Ground	V/W	Sensor ground (Throttle position sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
37	Ground	W	Knock sensor	Input	[Engine is running] • Idle speed	2.5V
38	Ground	GR/B	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8V Output voltage varies with engine coolant temperature.
40	Ground	—	Sensor ground (Knock sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
41	Ground	G/P	Refrigerant pressure sensor	Input	[Engine is running] • Warm-up condition • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0V
44	Ground	B	Sensor ground (Engine coolant temperature sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
45	Ground	BR	Mass air flow sensor	Input	[Ignition switch ON] • Engine stopped	0.4V
					[Engine is running] • Warm-up condition • Idle speed	1.0 - 1.3V
					[Engine is running] • Warm-up condition • Engine is revving from idle to about 4,000 rpm	1.0 - 1.3 to 2.4V (Check for linear voltage rise in response to engine being increased to about 4,000 rpm.)
46	Ground	V	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8V Output voltage varies with intake air temperature.
48	Ground	R/L	Sensor ground (Refrigerant pressure sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V

Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
49	Ground	L/G	Heated oxygen sensor 1	—	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0 - 1.0V (Periodically change)
50	Ground	Y	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 - 1.0V
52	Ground	LG	Sensor ground (Mass air flow sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
55	Ground	O	Sensor power supply (Intake air temperature sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
56	Ground	P	Sensor ground (Heated oxygen sensor 1)	—	[Engine is running] • Warm-up condition • Idle speed	0V
59	Ground	SB	Sensor ground (Heated oxygen sensor 2)	—	[Engine is running] • Warm-up condition • Idle speed	0V
61	Ground	LG/B	Crankshaft position sensor (POS)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 1.0V★  MBIB1453E
					[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0V★  MBIB1454E
62	Ground	GR/L	Sensor ground [Crankshaft position sensor (POS)]	—	[Engine is running] • Warm-up condition • Idle speed	0V
63	Ground	L	Sensor ground [Camshaft position sensor (PHASE)]	—	[Engine is running] • Warm-up condition • Idle speed	0V

Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
65	Ground	G	Camshaft position sensor (PHASE)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 1.0V★  MBIB1455E
					[Engine is running] • Engine speed is 2,000 rpm	0 - 1.0V★  MBIB1456E
69	Ground	W/B	Neutral position switch	Input	[Ignition switch: ON] • Neutral	BATTERY VOLTAGE (11 - 14V)
					[Ignition switch: ON] • Shift lever: Except above position	0V
72	Ground	V/R	Sensor power supply (Throttle position sensor)	—	[Ignition switch: ON]	5V
73	Ground	Y/R	Intake valve timing control solenoid valve	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14V)
					[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 10V★  PBIA4937J
74	Ground	Y/W	Sensor power supply (Refrigerant pressure sensor)	—	[Ignition switch: ON]	5V
75	Ground	L/W	Sensor power supply [Crankshaft position sensor (POS)]	—	[Ignition switch: ON]	5V
78	Ground	Y/V	Sensor power supply [Camshaft position sensor (PHASE)]	—	[Ignition switch: ON]	5V
83	Ground	P	CAN communication line	Input/ Output	—	—
84	Ground	L	CAN communication line	Input/ Output	—	—
88	Ground	O	Data link connector	Input/ Output	[Ignition switch: ON] • CONSULT-III or GST: Disconnected	2.7V
93	Ground	W/L	Ignition switch	Input	[Ignition switch: OFF]	0V
					[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)

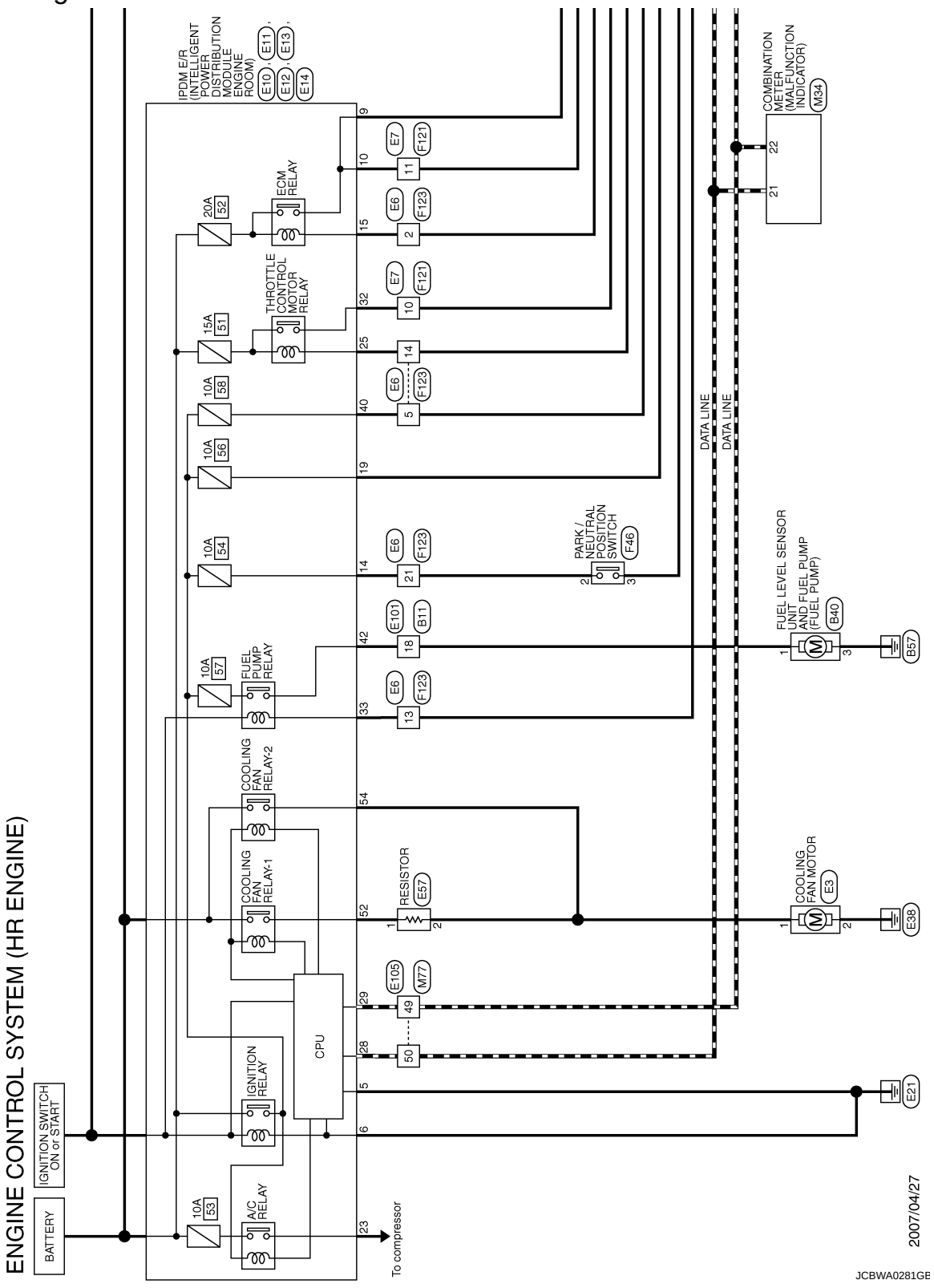
Terminal No. +	Terminal No. –	Wire color	Description Signal name	Description Input/ Output	Condition	Value (Approx.)
94	Ground	V	ASCD steering switch	Input	[Ignition switch: ON] • ASCD steering switch: OFF	4V
					[Ignition switch: ON] • CANCEL switch: Pressed	1V
					[Ignition switch: ON] • MAIN switch: Pressed	0V
					[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3V
					[Ignition switch: ON] • SET/COAST switch: Pressed	2V
95	Ground	B	Sensor ground (ASCD steering switch)	—	[Engine is running] • Warm-up condition • Idle speed	0V
99	Ground	R/W	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	0V
					[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)
100	Ground	R	ASCD brake switch	Input	[Ignition switch: ON] • Brake pedal and clutch pedal: Slightly depressed	0V
					[Ignition switch: ON] • Brake pedal and/or clutch pedal: Fully released	BATTERY VOLTAGE (11 - 14V)
102	Ground	BR	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5V
103	Ground	GR	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
					[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Ground	Y	Sensor ground (Accelerator pedal position sensor 2)	—	[Engine is running] • Warm-up condition • Idle speed	0V
105	Ground	G	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
106	Ground	V	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5V
108	Ground	B	ECM ground	—	[Engine is running] • Idle speed	Body ground

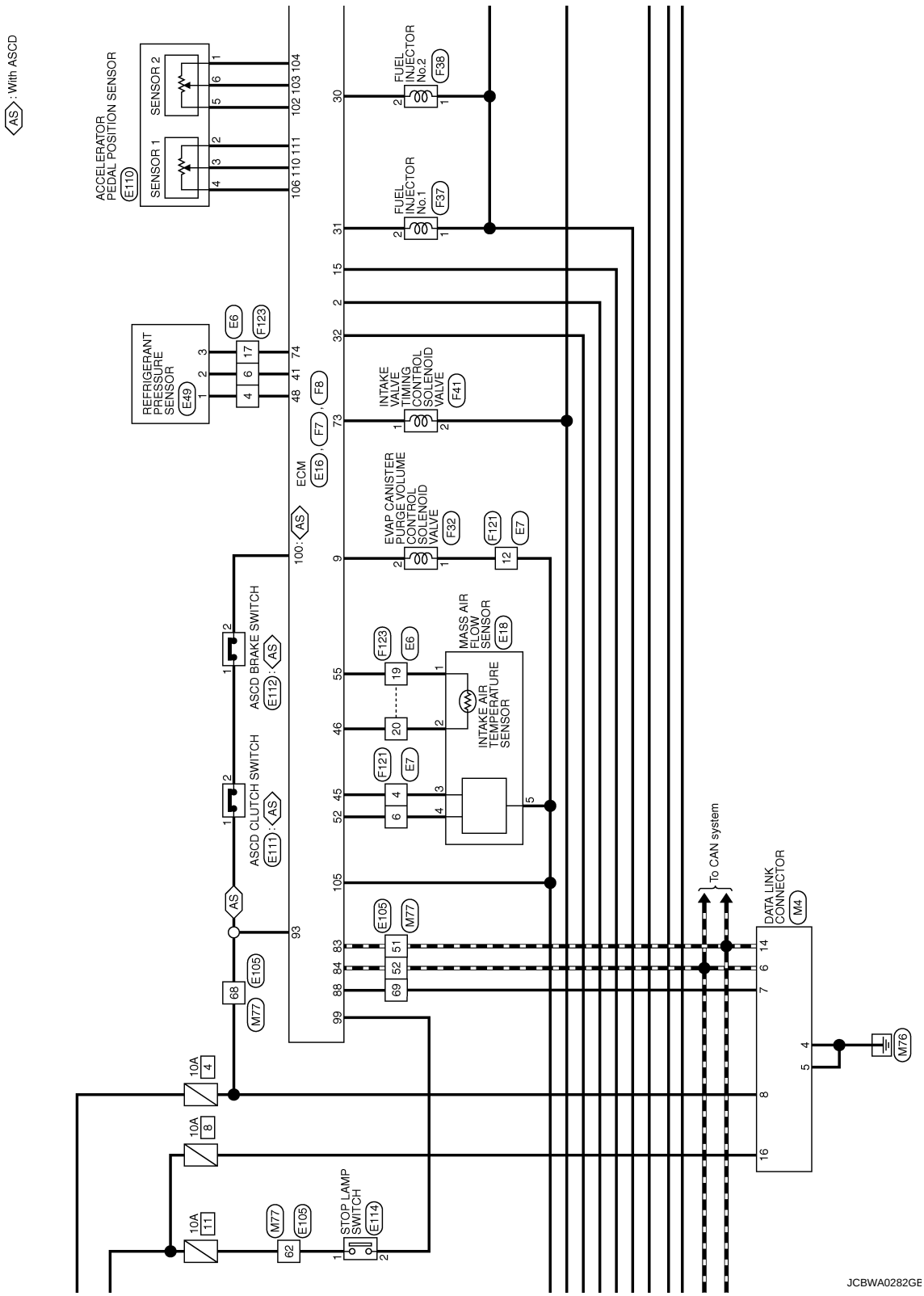
Terminal No.		Wire color	Description		Condition	Value (Approx.)
+	–		Signal name	Input/ Output		
110	Ground	G	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
					[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	Ground	R	Sensor ground (Accelerator pedal position sensor 1)	—	[Engine is running] • Warm-up condition • Idle speed	0V

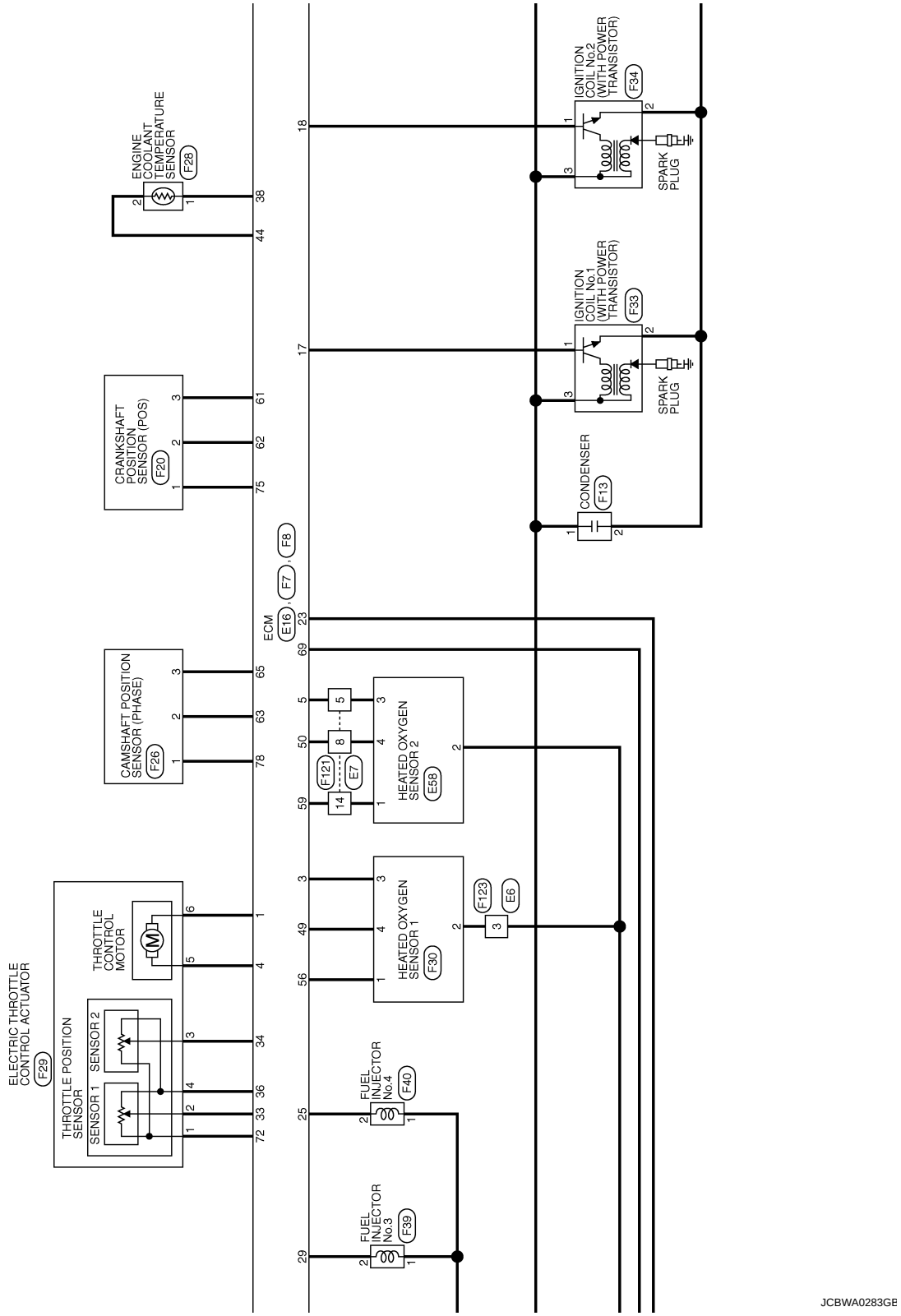
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

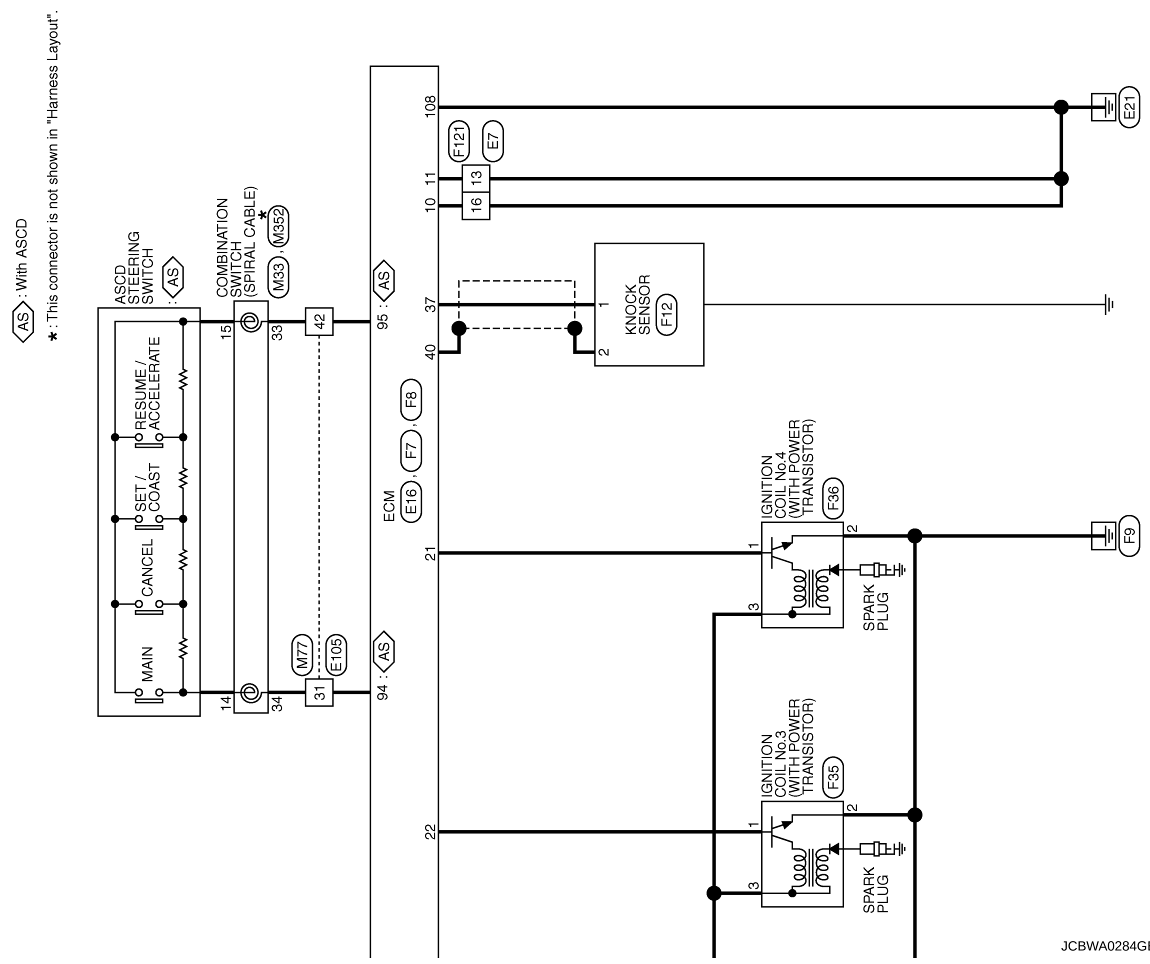
Wiring Diagram - ENGINE CONTROL SYSTEM -

INFOID:0000000001179640



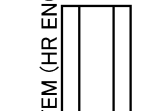

AS : With ASCD
ACCELERATOR PEDAL POSITION SENSOR
E110
SENSOR 1
SENSOR 2
106 110 111
102 103 104
FUEL INJECTOR No.1
F37
FUEL INJECTOR No.2
F38
REFRIGERANT PRESSURE SENSOR
E49
E6
F123
F8
F7
ECM
E16
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
F41
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
F32
F121
E7
MASS AIR FLOW SENSOR
E18
INTAKE AIR TEMPERATURE SENSOR
ASCD BRAKE SWITCH
E112
ASCD CLUTCH SWITCH
E111
STOP LAMP SWITCH
E114
10A 4
10A 8
10A 11
E105
M77
M76
DATA LINK CONNECTOR
M4
To CAN system
JCBWA0282GE


ELECTRIC THROTTLE CONTROL ACTUATOR F29
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
THROTTLE CONTROL MOTOR
CAMSHAFT POSITION SENSOR (PHASE) F26
CRANKSHAFT POSITION SENSOR (POS) F20
ENGINE COOLANT TEMPERATURE SENSOR F28
ECM E16, F7, F8
HEATED OXYGEN SENSOR 1 F30
HEATED OXYGEN SENSOR 2 E58
F121
E7
F123
E6
FUEL INJECTOR No.4 F40
FUEL INJECTOR No.3 F39
CONDENSER F13
IGNITION COIL No.1 (WITH POWER TRANSISTOR) F33
IGNITION COIL No.2 (WITH POWER TRANSISTOR) F34
SPARK PLUG
JCBWA0283GE


AS : With ASCD
* : This connector is not shown in "Harness Layout".
ASCD STEERING SWITCH
RESUME / ACCELERATE
SET / COAST
CANCEL
MAIN
COMBINATION SWITCH (SPIRAL CABLE)
M33
M352
M77
E105
ECM
E16
F7
F8
F121
E7
KNOCK SENSOR
F12
IGNITION COIL No.4 (WITH POWER TRANSISTOR)
F36
IGNITION COIL No.3 (WITH POWER TRANSISTOR)
F35
SPARK PLUG
F9
E21
JCBWA0284GB

ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	B11
Connector Name	WIRE TO WIRE
Connector Type	TK10MW-NS8



Terminal No.	Color of Wire	Signal Name [Specification]
18	B/Y	–

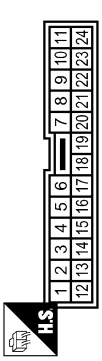
Connector No.	B40
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP
Connector Type	E04FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	–
3	B	–

Connector No.	E3
Connector Name	COOLING FAN MOTOR
Connector Type	P80103895160Z

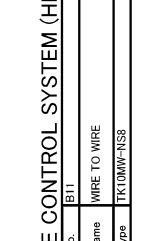
Terminal No.	Color of Wire	Signal Name [Specification]
1	R	–
2	B	–

Connector No.	E6
Connector Name	WIRE TO WIRE
Connector Type	TK24MW-1V



Terminal No.	Color of Wire	Signal Name [Specification]
2	Y/L	–
3	R/O	-[Except A/T]
4	R/L	–
5	SB	-[Except M9R engine]
6	G/P	–
13	B/O	–
14	G/L	-[Except M9R engine]
17	Y/W	–
19	O	-[With gasoline engine]
20	V	-[With gasoline engine]
21	R/B	–

Connector No.	E7
Connector Name	WIRE TO WIRE
Connector Type	NS16MW-CS



Terminal No.	Color of Wire	Signal Name [Specification]
4	BR	-[With gasoline engine]
5	R	-[Except M9R engine]
6	LG	-[With gasoline engine]
8	Y	–
10	R/Y	-[With gasoline engine]
11	L/R	-[With gasoline engine]
12	G	–
13	B	–
14	SB	-[Except M9R engine]
16	B	-[Except M9R engine]

Connector No.	E10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FB-LC

Terminal No.	Color of Wire	Signal Name [Specification]
5	B	–
6	B	–

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FBR-CS

Terminal No.	Color of Wire	Signal Name [Specification]
9	G	–
10	L/R	–
14	R/B	–
15	Y/L	-[With gasoline engine]
19	R/O	–

Connector No.	E12
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
23	Y/B	–
25	G/L	–
28	L	–
29	P	–
32	R/Y	–

JCBWA0285GE

ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	E13
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS16FW-CS

H.S.

39	38	37	36		35	34	33
46	47	46	45	44	43	42	41	40

Terminal No.	Color of Wire	Signal Name [Specification]
33	B/O	–
40	BR/Y	– [With HR engine]
42	B/Y	–

Connector No.	E14
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	YZK 7283-5591-40-F

H.S.

51	50	49
54	53	52

Terminal No.	Color of Wire	Signal Name [Specification]
52	W	–
54	R	–

Connector No.	E16
Connector Name	ECM
Connector Type	MAA24FB-MEA8-LH

H.S.

81	85	89	93	97	101	105	109
82	86	90	94	98	102	106	110
83	87	91	95	99	103	107	111
84	88	92	96	100	104	108	112

Terminal No.	Color of Wire	Signal Name [Specification]
83	P	CAN-LI
84	L	CAN-HI
88	O	K-LINE
93	W/L	IGN SW
94	V	ASCD STRG SW
95	B	GND ASCD STRG SW
99	R/W	BRAKE
100	R	BNCSW(BNC)
102	BR	AVCC-APS2[With HR engine]
103	GR	APS2
104	Y	GND-A-APS2[With HR engine]

105	G	VBR
106	V	AVCC-APS1[With HR engine]
108	B	GND
110	G	APS1[With HR engine]
111	R	GND-A-APS1[With HR engine]

Connector No.	E18
Connector Name	MASS AIR FLOW SENSOR
Connector Type	RH06FB

H.S.

1 2 3 4 5 6

Terminal No.	Color of Wire	Signal Name [Specification]
1	O	–
2	V	–
3	BR	–
4	LG	–
5	G	–

Connector No.	E49
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB

H.S.

1 2 3

Terminal No.	Color of Wire	Signal Name [Specification]
1	R/L	–
2	G/P	–
3	Y/W	–

Connector No.	E57
Connector Name	RESISTOR
Connector Type	P8010388516O2

H.S.

1 2

Terminal No.	Color of Wire	Signal Name [Specification]
1	W	–
2	R	–

Connector No.	E58
Connector Name	HEATED OXYGEN SENSOR 2
Connector Type	AFZ04FB

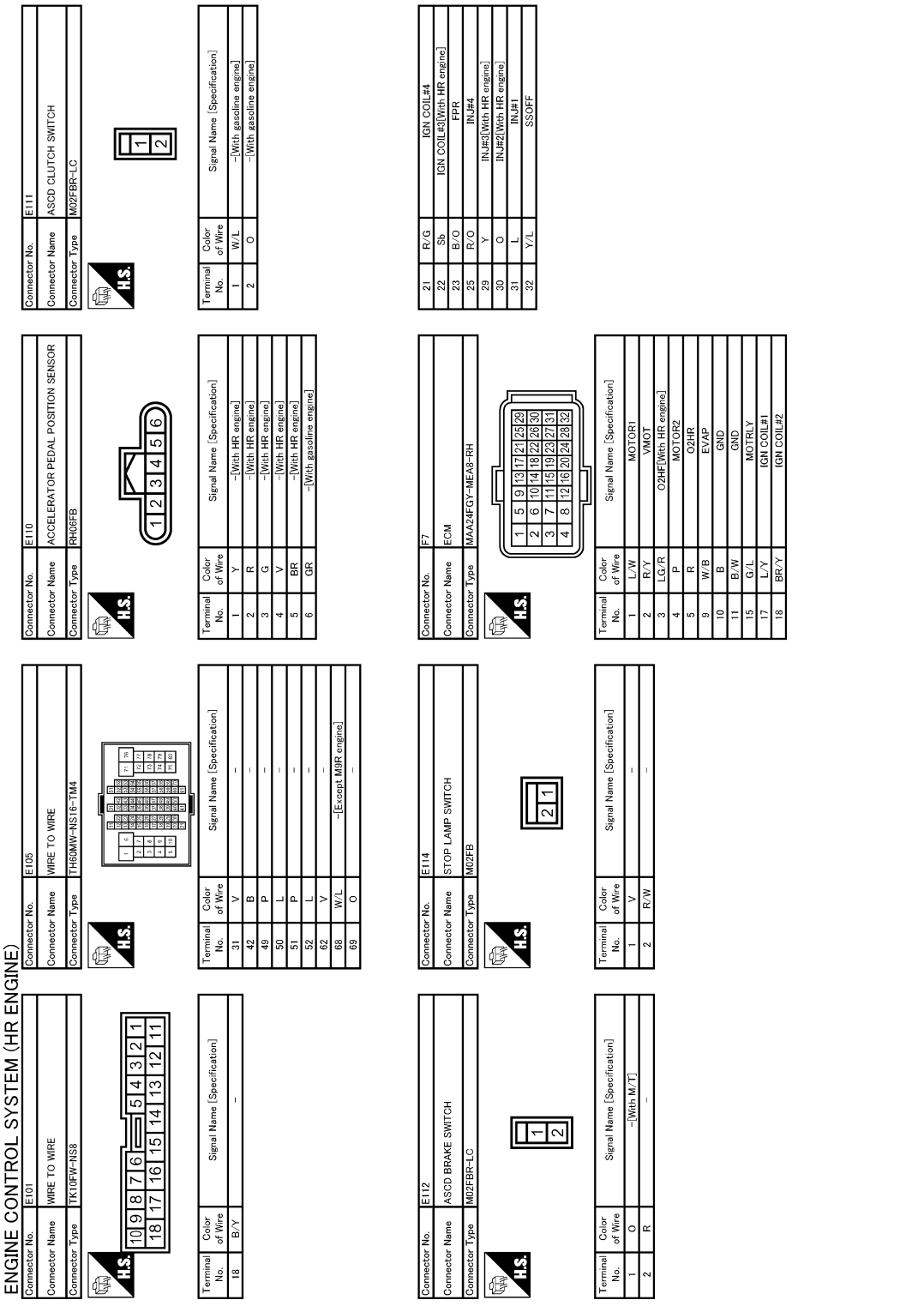
H.S.

1 2 3 4

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	R/O	–
3	R	–
4	Y	–

JCBWA0286GE

ENGINE CONTROL SYSTEM (HR ENGINE)



JCBWA0287GE

ENGINE CONTROL SYSTEM (HR ENGINE)

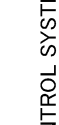
Connector No.	F8
Connector Name	ECM
Connector Type	MAA40FBR-MEA8-LH

33	37	41	45	49	53	57	61	65	69	73	77
34	38	42	46	50	54	58	62	66	70	74	78
35	39	43	47	51	55	59	63	67	71	75	79
36	40	44	48	52	56	60	64	68	72	76	80

Terminal No.	Color of Wire	Signal Name [Specification]
33	L/R	TPS1[With HR engine]
34	L/O	TPS2[With HR engine]
36	V/W	GND-A TPS[With HR engine]
37	W	KNK
38	GR/B	TW[With HR engine]
40	SHIELD	GND-A KNK
41	G/P	PDPRESS
44	B	GND-A TW[With HR engine]
45	BR	QA+
46	V	TA
48	R/L	GND-A(PDPRES)

49	L/G	O2SF[With HR engine]
50	Y	O2SR
52	LG	QA-
55	O	GND-TA
56	P	GND-A O2SF[With HR engine]
59	SB	O2SR-GND
61	LG/B	POS
62	GR/L	GND-POS[With HR engine]
63	L	GND-(A)-PHASE[With HR engine]
65	G	PHASE[With HR engine]
69	W/B	NEUT HIGH
72	V/R	AVCC-TPS[With HR engine]
73	Y/R	CVTC
74	Y/W	AVCC(PDPRES)
75	L/W	POS AVCC
78	Y/V	PHASE AVCC

Connector No.	F20
Connector Name	CRANKSHAFT POSITION SENSOR (POS)
Connector Type	RH03FB



Terminal No.	Color of Wire	Signal Name [Specification]
1	L/W	-
2	GR/L	-[With HR engine]
3	LG/B	-

Connector No.	F26
Connector Name	CAMSHAFT POSITION SENSOR (PHASE)
Connector Type	RH03FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/V	-
2	L	-[With HR engine]
3	G	-[With HR engine]

Connector No.	F12
Connector Name	KNOCK SENSOR
Connector Type	BS02FB-AHY-S

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

Connector No.	F13
Connector Name	CONDENSER
Connector Type	M02FW-GY-LC

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

Connector No.	F28
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	GR/B	-[With HR engine]
2	B	-[With HR engine]

Connector No.	F29
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Type	RH06FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	V/R	-[With HR engine]
2	L/R	-[With HR engine]
3	L/O	-[With HR engine]
4	V/W	-[With HR engine]
5	P	-
6	L/W	-

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ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	F30
Connector Name	HEATED OXYGEN SENSOR 1
Connector Type	AFZ04FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	P	–[With HR engine]
2	R/O	–
3	LG/R	–[With HR engine]
4	L/G	–[With HR engine]

Connector No.	F32
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	E02FL-RS-LGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	G	–
2	W/B	–

Connector No.	F33
Connector Name	IGNITION COIL NO.1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	L/Y	–
2	B	–
3	L/R	–

Connector No.	F34
Connector Name	IGNITION COIL NO.2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	BR/Y	–
2	B	–
3	L/R	–

Connector No.	F35
Connector Name	IGNITION COIL NO.3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–[With HR engine]
2	B	–
3	L/R	–

Connector No.	F36
Connector Name	IGNITION COIL NO.4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	R/G	–
2	B	–
3	L/R	–

Connector No.	F37
Connector Name	FUEL INJECTOR NO.1
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	L	–

Connector No.	F38
Connector Name	FUEL INJECTOR NO.2
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	O	–[With HR engine]

JCBWA0289GE

ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	F39
Connector Name	FUEL INJECTOR NO.3
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	Y	–[With HR engine]

Connector No.	F40
Connector Name	FUEL INJECTOR NO.4
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	R/O	–

Connector No.	F41
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE
Connector Type	E02FG-RS-LGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/R	–
2	L/R	–

Connector No.	F46
Connector Name	PARK/NEUTRAL POSITION SWITCH
Connector Type	FEA03FG

Terminal No.	Color of Wire	Signal Name [Specification]
2	R/B	–
3	W/B	–

Connector No.	F121
Connector Name	WIRE TO WIRE
Connector Type	NS16FW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
4	BR	–[With gasoline engine]
5	R	–[Except M9R engine]
6	LG	–[With gasoline engine]
8	Y	–
10	R/Y	–[With gasoline engine]
11	L/R	–[With gasoline engine]
12	G	–
13	B	–
14	SB	–[Except M9R engine]
16	B	–[Except M9R engine]

Connector No.	F123
Connector Name	WIRE TO WIRE
Connector Type	TK24FW-1V

Terminal No.	Color of Wire	Signal Name [Specification]
2	Y/L	–
3	R/O	–[Except A/T]
4	R/L	–
5	SB	–[Except M9R engine]
6	G/P	–
13	B/O	–
14	G/L	–[Except M9R engine]
17	Y/W	–
19	O	–[With gasoline engine]
20	V	–[With gasoline engine]
21	R/B	–

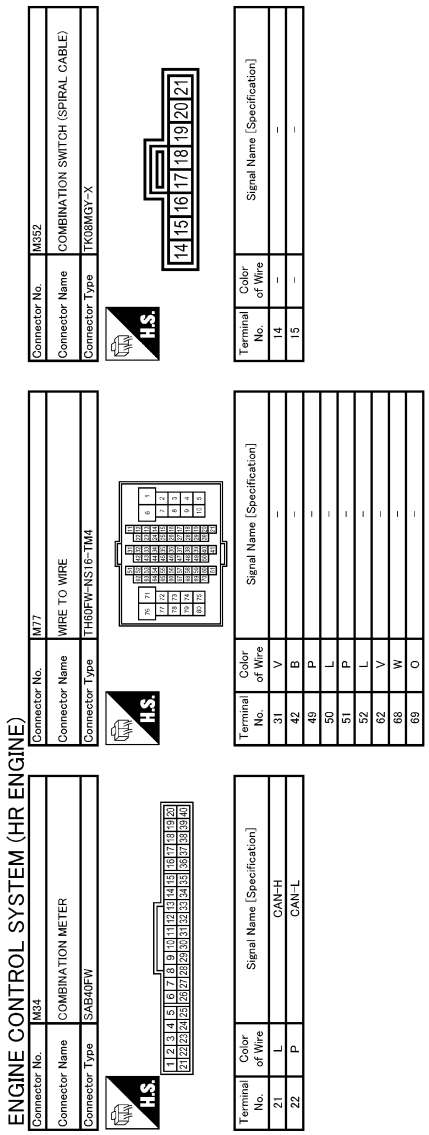
Connector No.	M4
Connector Name	DATA LINK CONNECTOR
Connector Type	BD16FW

Terminal No.	Color of Wire	Signal Name [Specification]
4	B	–
5	B	–
6	L	–
7	O	–
8	W	–
14	P	–
16	Y	–

Connector No.	M33
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY-1V

Terminal No.	Color of Wire	Signal Name [Specification]
33	B	–
34	V	–

JCBWA0290GE



JCBWA0291GE

Fail Safe

INFOID:0000000001179641

NON DTC RELATED ITEM

Engine operating condition in fail-safe mode	Detected items	Remarks	Reference page
Engine speed will not rise more than 2,500 rpm due to the fuel cut	Malfunction indicator lamp circuit	When there is an open circuit on 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.	ECH-302

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.	
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 time after turning ignition switch ON or START. CONSULT-III displays the engine coolant temperature decided by ECM.	
		Condition	Engine coolant temperature decided (CONSULT-III display)
		Just as ignition switch is turned ON or START	40°C (104°F)
		More than approx. 4 minutes after ignition ON or START	80°C (176°F)
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.	
P0605	ECM	(When ECM calculation function is malfunctioning:) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ECM deactivates ASCD operation.	
P1121	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 Neutral position, and engine speed will not exceed 1,000 rpm or more.	
P1122	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.	
P1124 P1126	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.	

DTC No.	Detected items	Engine operating condition in fail-safe mode
P1128	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.
P1229	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 / Driving condition
		When engine is idling / Normal
		When accelerating / Poor acceleration
P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening 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:0000000001179642

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	• U1001 CAN communication line • U1010 CAN communication • 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 • P0327 P0328 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 Camshaft position sensor (PHASE) • P0500 Vehicle speed sensor • P0605 ECM • P1229 Sensor power supply • P1610 - P1615 NATS • P1706 Park/neutral position (PNP) switch • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	• P0132 P0133 P0134 P1143 P1144 Heated oxygen sensor 1 • P0135 Heated oxygen sensor 1 heater • P0138 P0139 P1146 P1147 Heated oxygen sensor 2 • P0141 Heated oxygen sensor 2 heater • P0444 EVAP canister purge volume control solenoid valve • P1065 ECM • P1111 Intake valve timing control solenoid valve • P1122 Electric throttle control function • P1124 P1126 Throttle control motor relay • P1128 Throttle control motor • P1217 Engine over temperature (OVERHEAT) • P1805 Brake switch • P1564 ASCD steering switch • P1572 ASCD brake switch • P1574 ASCD vehicle speed sensor
3	• P0011 Intake valve timing control • P0171 P0172 Fuel injection system function • P0300 - P0304 Misfire • P0420 Three way catalyst function • P1121 Electric throttle control actuator • P1212 ESP communication line

DTC Index

INFOID:0000000001179643

×:Applicable —: Not applicable

DTC*1		Items (CONSULT-III screen terms)	SRT code	Test value/ Test limit (GST only)	Trip	MI	Reference page
CONSULT-III GST*2	ECM*3						
U1001	1001*4	CAN COMM CIRCUIT	—	—	2	—	ECH-110
U1010	1010	CONTROL UNIT(CAN)	—	—	2	—	ECH-111
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	—	**Flashing***7	**—**
P0011	0011	INT/V TIM CONT-B1	—	—	2	—	ECH-112
P0102	0102	MAF SEN/CIRCUIT-B1	—	—	1	×	ECH-116
P0103	0103	MAF SEN/CIRCUIT-B1	—	—	1	×	ECH-116
P0112	0112	IAT SEN/CIRCUIT-B1	—	—	2	×	ECH-121
P0113	0113	IAT SEN/CIRCUIT-B1	—	—	2	×	ECH-121
P0117	0117	ECT SEN/CIRC	—	—	1	×	ECH-124
P0118	0118	ECT SEN/CIRC	—	—	1	×	ECH-124
P0122	0122	TP SEN 2/CIRC-B1	—	—	1	×	ECH-127
P0123	0123	TP SEN 2/CIRC-B1	—	—	1	×	ECH-127
P0132	0132	HO2S1 (B1)	—	×	2	×	ECH-130
P0133	0133	HO2S1 (B1)	×	×	2	×	ECH-134
P0134	0134	HO2S1 (B1)	—	×	2	×	ECH-140
P0135	0135	HO2S1 HTR (B1)	×	×	2	×	ECH-145
P0138	0138	HO2S2 (B1)	×	×	2	×	ECH-148
P0139	0139	HO2S2 (B1)	×	×	2	×	ECH-153
P0141	0141	HO2S2 HTR (B1)	×	×	2	×	ECH-160
P0171	0171	FUEL SYS-LEAN-B1	—	—	2	×	ECH-163
P0172	0172	FUEL SYS-RICH-B1	—	—	2	×	ECH-167
P0222	0222	TP SEN 1/CIRC-B1	—	—	1	×	ECH-171
P0223	0223	TP SEN 1/CIRC-B1	—	—	1	×	ECH-171
P0300	0300	MULTICYL MISFIRE	—	—	2	×	ECH-174
P0301	0301	CYL 1 MISFIRE	—	—	2	×	ECH-174
P0302	0302	CYL 2 MISFIRE	—	—	2	×	ECH-174
P0303	0303	CYL 3 MISFIRE	—	—	2	×	ECH-174
P0304	0304	CYL 4 MISFIRE	—	—	2	×	ECH-174
P0327	0327	KNOCK SEN/CIRC-B1	—	—	2	—	ECH-180
P0328	0328	KNOCK SEN/CIRC-B1	—	—	2	—	ECH-180
P0335	0335	CKP SEN/CIRCUIT	—	—	2	×	ECH-182
P0340	0340	CMP SEN/CIRC-B1	—	—	2	×	ECH-186
P0420	0420	TW CATALYST SYS-B1	×	×	2	×	ECH-190
P0444	0444	PURG VOLUME CONT/V	—	—	2	×	ECH-195
P0500	0500	VEH SPEED SEN/CIRC*5	—	—	2	×	ECH-198
P0605	0605	ECM	—	—	1 or 2	× or —	ECH-200
P1065	1065	ECM BACK UP/CIRCUIT	—	—	2	×	ECH-202
P1111	1111	INT/V TIM C/CIRC	—	—	1	×	ECH-204

DTC*1		Items (CONSULT-III screen terms)	SRT code	Test value/ Test limit (GST only)	Trip	MI	Reference page
CONSULT-III GST*2	ECM*3						
P1121	1121	ETC ACTR-B1	—	—	1	×	ECH-206
P1122	1122	ETC FUNCTION/CIRC-B1	—	—	1	×	ECH-208
P1124	1124	ETC MOT PWP	—	—	1	×	ECH-212
P1126	1126	ETC MOT PWP-B1	—	—	1	×	ECH-212
P1128	1128	ETC MOT-B1	—	—	1	×	ECH-215
P1143	1143	HO2S1 (B1)	×	×	2	×	ECH-217
P1144	1144	HO2S1 (B1)	×	×	2	×	ECH-222
P1146	1146	HO2S2 (B1)	×	×	2	×	ECH-227
P1147	1147	HO2S2 (B1)	×	×	2	×	ECH-234
P1212	1212	TCS/CIRC	—	—	2	—	ECH-241
P1217	1217	ENG OVER TEMP	—	—	1	×	ECH-242
P1225	1225	CTP LEARNING-B1	—	—	2	—	ECH-246
P1226	1226	CTP LEARNING-B1	—	—	2	—	ECH-248
P1229	1129	SENSOR POWER/CIRC	—	—	1	×	ECH-250
P1564	1564	ASCD SW	—	—	1	—	ECH-252
P1572	1572	ASCD BRAKE SW	—	—	1	—	ECH-255
P1574	1574	ASCD VHL SPD SEN	—	—	1	—	ECH-261
P1610	1610	LOCK MODE	—	—	2	—	SEC-15
P1611	1611	ID DISCARD IMM-ECM	—	—	2	—	SEC-15
P1612	1612	CHAIN OF ECM-IMMU	—	—	2	—	SEC-15
P1615	1615	DIFFERENCE OF KEY	—	—	2	—	SEC-15
P1706	1706	P-N POS SW/CIRCUIT	—	—	2	×	ECH-263
P1805	1805	BRAKE SW/CIRCUIT	—	—	2	—	ECH-266
P2122	2122	APP SEN 1/CIRC	—	—	1	×	ECH-268
P2123	2123	APP SEN 1/CIRC	—	—	1	×	ECH-268
P2127	2127	APP SEN 2/CIRC	—	—	1	×	ECH-271
P2128	2128	APP SEN 2/CIRC	—	—	1	×	ECH-271
P2135	2135	TP SENSOR-B1	—	—	1	×	ECH-275
P2138	2138	APP SENSOR	—	—	1	×	ECH-278

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

*2: This number is prescribed by 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-III.

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

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

*7: When the ECM is in the mode of displaying SRT status, MI may flash. For the details, refer to “How to Display SRT Status”.

How to Set SRT Code

INFOID:0000000001179644

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

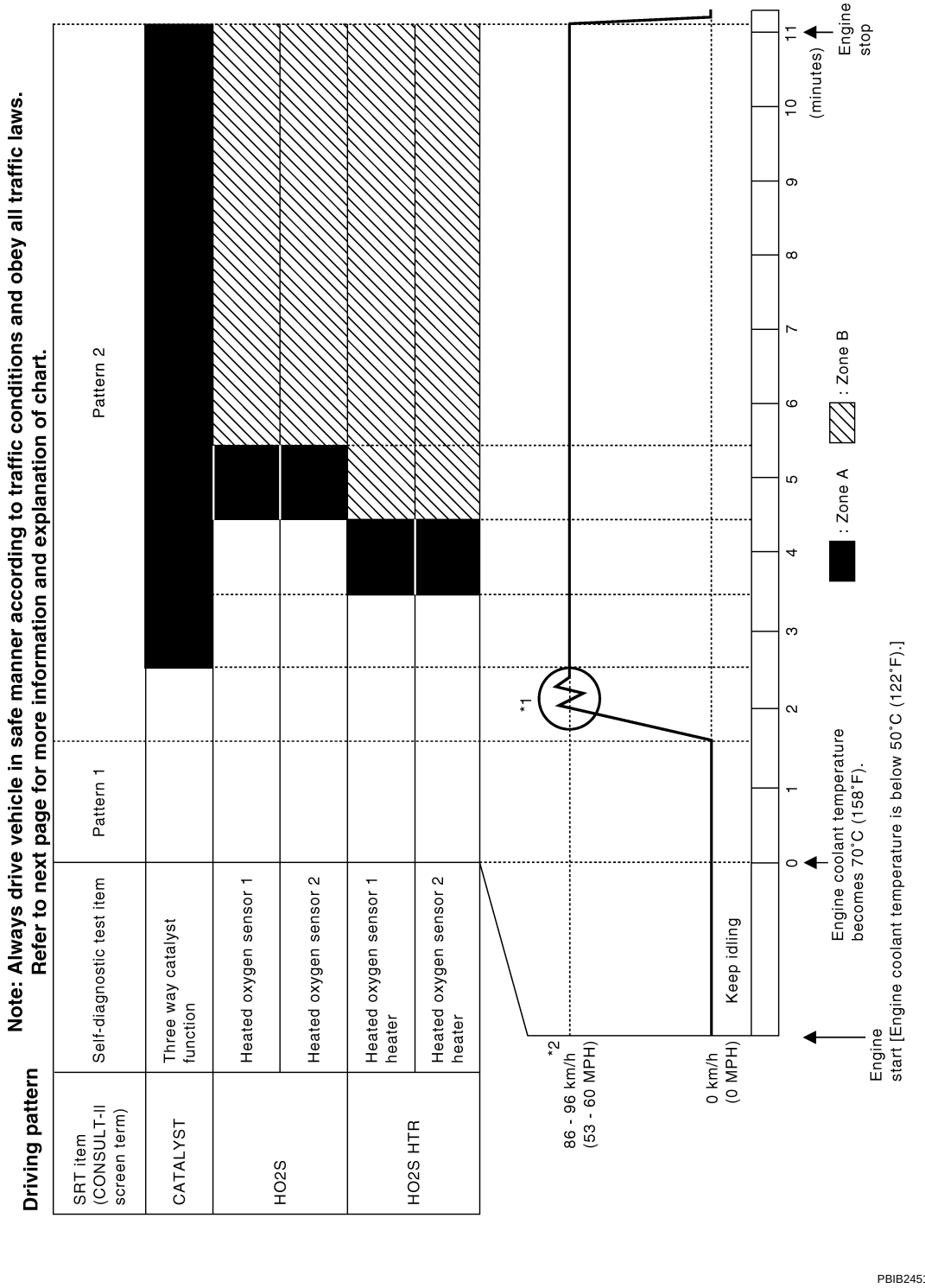
WITH CONSULT-III

Perform corresponding DTC CONFIRMATION PROCEDURE one by one based on Performance Priority in the table on “SRT Item”.

WITHOUT CONSULT-III

The most efficient driving pattern in which SRT codes can be properly set is explained on the next page. The driving pattern should be performed one or more times to set all SRT codes.

DRIVING PATTERN



- 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.

Pattern 1:

- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 38 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 38 and ground is lower than 1.4V).**

Pattern 2:

- 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.

*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.

Test Value and Test Limit

INFOID:0000000001179645

The following is the information specified in Service $06 of ISO 15031-5.

The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.

These data (test value and test limit) are specified by Test ID (TID) and Component ID (CID) and can be displayed on the GST screen.

Item	Self-diagnostic test item	DTC	Test value (GST display)		Test limit
			TID	CID	
CATALYST	Three way catalyst function	P0420	01H	81H	Min.
		P0420	02H	81H	Min.
HO2S	Heated oxygen sensor 1	P0133	09H	04H	Max.
		P1143	0AH	84H	Min.
		P1144	08H	04H	Max.
		P0132	0CH	04H	Max.
		P0134	0DH	04H	Max.
	Heated oxygen sensor 2	P0139	19H	86H	Min.
		P1147	1AH	86H	Min.
		P1146	1BH	06H	Max.
		P0138	1CH	06H	Max.
HO2S HEATER	Heated oxygen sensor 1 heater	P0135	29H	08H	Max.
			2AH	88H	Min.
	Heated oxygen sensor 2 heater	P0141	2DH	0AH	Max.
			2EH	8AH	Min.

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000001179646

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	ECH-294
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			ECH-345
	Fuel injector circuit	1	1	2	3	2		2	2			2			ECH-291
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			ECH-63
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		ECH-303
	Incorrect idle speed adjustment						1	1	1	1		1			ECH-18
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	ECH-206, ECH-208, ECH-215
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			ECH-18
	Ignition circuit	1	1	2	2	2		2	2			2			ECH-297
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			ECH-106
Mass air flow sensor circuit		1			2										ECH-116, ECH-116
Engine coolant temperature sensor circuit					3		3			3					ECH-124
Heated oxygen sensor 1 circuit			1	2	3	2		2	2			2			ECH-130, ECH-134, ECH-140, ECH-140, ECH-145
Throttle position sensor circuit							2			2					ECH-127, ECH-171, ECH-246, ECH-248, ECH-275
Accelerator pedal position sensor circuit				3	2	1									ECH-268, ECH-271, ECH-278
Knock sensor circuit				2								3			ECH-180

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Crankshaft position sensor (POS) circuit	2	2												ECH-182
Camshaft position sensor (PHASE) circuit	3	2												ECH-186
Vehicle speed signal circuit		2	3		3						3			ECH-198
ECM	2	2	3	3	3	3	3	3	3	3	3			ECH-200, ECH-202
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			ECH-204
PNP switch circuit			3		3		3	3			3			ECH-263
Refrigerant pressure sensor circuit		2				3			3		4			ECH-304
Electrical load signal circuit							3							ECH-289
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-122 ,HAC-212
ABS actuator and electric unit (control unit)			4											BRC-9

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FL-15 ,FL-17
	Fuel piping			5	5	5		5	5			5			FL-5
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—
Air	Air duct														EM-29
	Air cleaner														EM-29
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5	5	5	5	5	5	5	5	5		5			EM-29
	Electric throttle control actuator														EM-30
	Air leakage from intake manifold/ Collector/Gasket														EM-30
Cranking	Battery	1	1	1		1		1	1			1		1	PG-2
	Generator circuit														CHG-15
	Starter circuit	3													STR-21
	Signal plate	6													EM-102
	PNP switch	4													TM-13
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-81
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-102
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-54
	Camshaft														EM-66
	Intake valve timing control														EM-54
	Intake valve												3		EM-81
	Exhaust valve														

		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	
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-76, EM-33
	Three way catalyst														
Lubrica-tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-43, EM-93, LU-9, LU-3
	Oil level (Low)/Filthy oil														LU-6
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-12
	Thermostat									5					CO-20
	Water pump														CO-18
	Water gallery														CO-22
	Cooling fan									5					CO-15
	Coolant level (Low)/Contaminat-ed coolant														CO-9
NATS (NISSAN Vehicle Immobilizer System)		1	1												SEC-15

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

Description

INFOID:0000000001179647

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,500 rpm under no load (for example, the shift lever position is neutral and engine speed is over 2,500 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, ECH-28, "System Description".

PRECAUTION

PRECAUTIONS

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

INFOID:0000000001179648

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

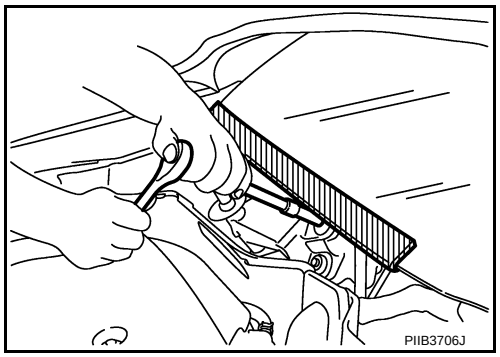
WARNING:

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

Precaution for Procedure without Cowl Top Cover

INFOID:0000000001583153

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



Precautions For Xenon Headlamp Service

INFOID:0000000001179650

WARNING:

Comply with the following warnings to prevent any serious accident.

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

CAUTION:

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

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

On Board Diagnostic (OBD) System of Engine

INFOID:0000000001179651

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

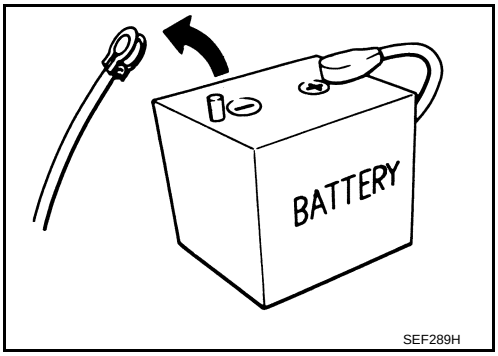
CAUTION:

- **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 PG-104, "Description".**
- **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 EVAP system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

General Precautions

INFOID:0000000001179652

- **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.**



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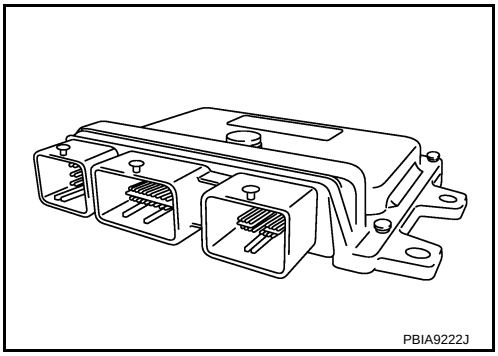
- **Do not disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.
- **If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.**
  - **Diagnostic trouble codes**
  - **1st trip diagnostic trouble codes**
  - **Freeze frame data**
  - **1st trip freeze frame data**
  - **System readiness test (SRT) codes**
  - **Test values**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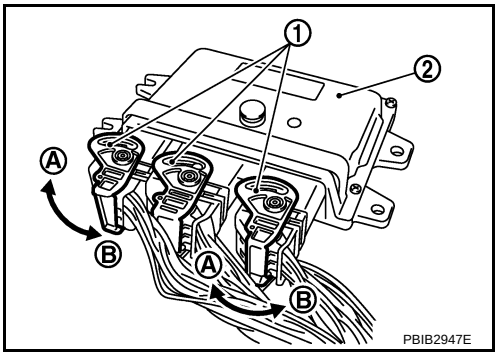
- **When connecting ECM harness connector (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.**

2. ECM
A. Loosen



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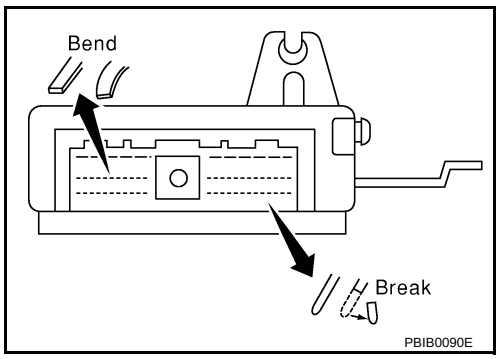
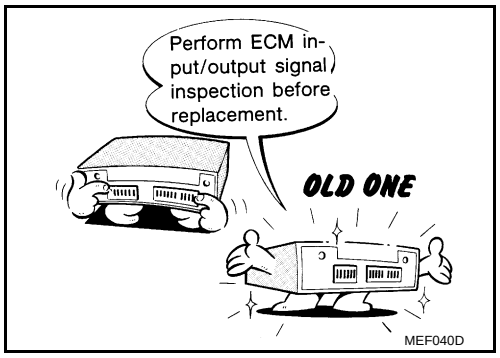
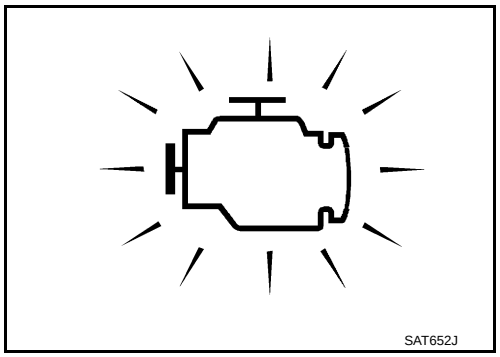
- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to ECH-306, "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).**

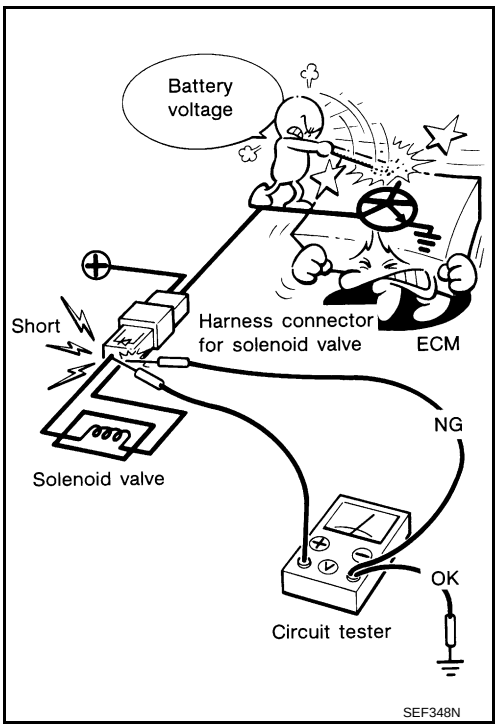




- **After performing each TROUBLE DIAGNOSIS, perform DTC CONFIRMATION PROCEDURE or Component Function Check.** The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.

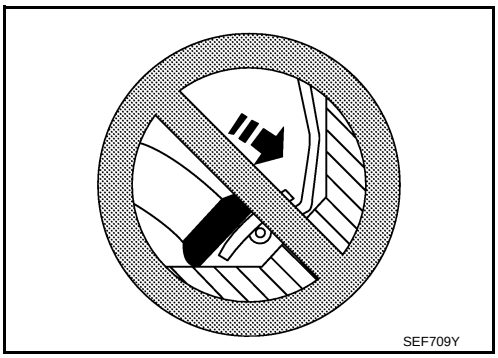


- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

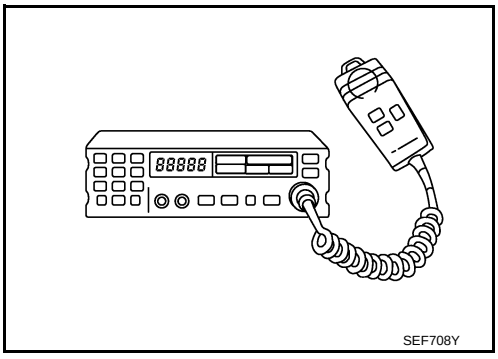


- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

- **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.**

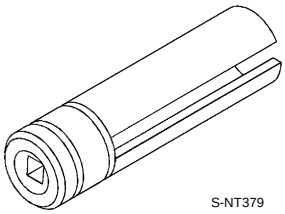
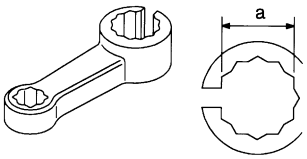
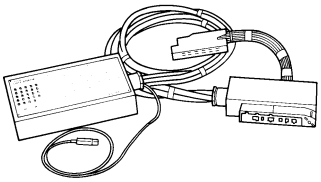
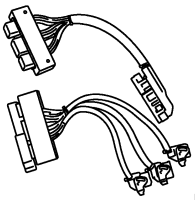
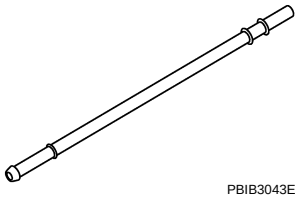


PREPARATION

PREPARATION

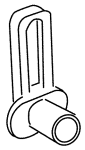
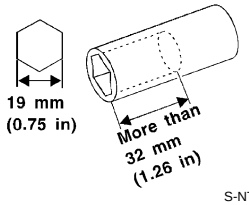
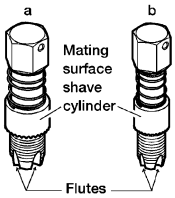
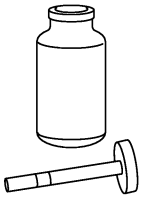
Special Service Tools

INFOID:0000000001179653

Tool number Tool name		Description
KV10117100 Heated oxygen sensor wrench	 S-NT379	Loosening or tightening heated oxygen sensor with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench	 S-NT636	Loosening or tightening heated oxygen sensor 2 **a: 22 mm (0.87 in)**
EG17550000 Break-out box	 ZZA1194D	Measuring ECM signals with a circuit tester
EG17680000 Y-cable adapter	 PBIA9379J	Measuring ECM signals with a circuit tester
KV10118400 Fuel tube adapter	 PBIB3043E	Measuring fuel pressure

Commercial Service Tools

INFOID:0000000001179654

Tool name	Description
Quick connector release  PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Par No. 16441 6N210)
Socket wrench  S-NT705	Removing and installing engine coolant temperature sensor
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.

ON-VEHICLE MAINTENANCE

FUEL PRESSURE

Inspection

INFOID:0000000001179655

FUEL PRESSURE RELEASE

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-III.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.

With CONSULT-III

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.

FUEL PRESSURE CHECK

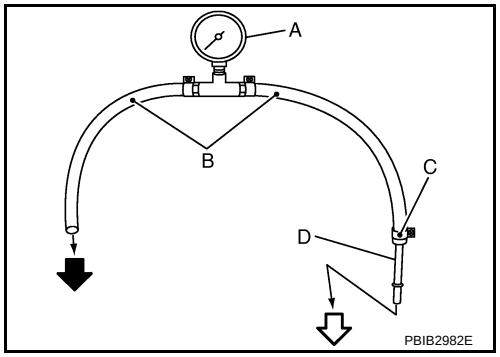
CAUTION:

- **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 sealability 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:

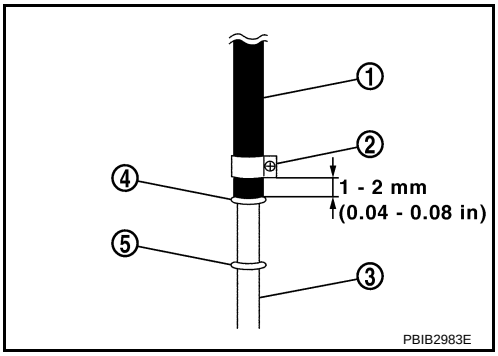
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because J10 models do not have fuel return system.

1. Release fuel pressure to zero.
2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
   - ⇦: To quick connector
   - ⬅: To fuel tube (engine side)
   - C: Clamp
   - 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.
   - Do not twist or kink fuel hose because it is plastic hose.

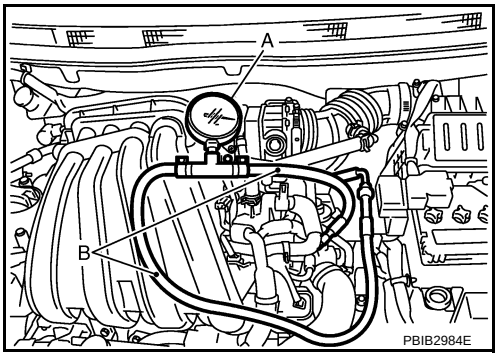
4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
   - No.2 spool (5)
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 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.
   - A: Fuel pressure gauge
   - B: Fuel hose for fuel pressure check
6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
7. 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.
   - 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)

10. If result is unsatisfactory, go to next step.
11. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

EVAPORATIVE EMISSION SYSTEM

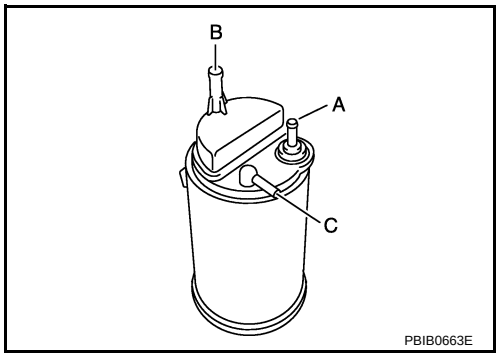
Inspection

INFOID:0000000001179656

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 (B). Orally blow air through port (A). Check that air flows freely through port (C).

b. Block port (A). Orally blow air through port (B). Check that air flows freely through port (C).

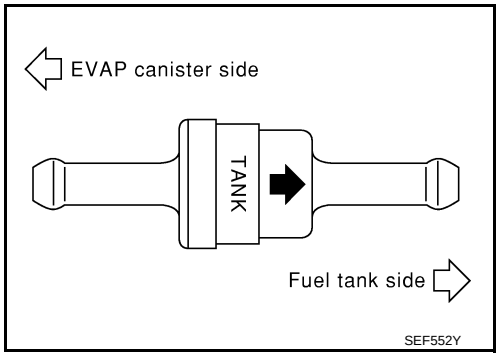


3. Visually inspect the fuel check valve for cracks, damage, loose connections chafing and deterioration.
4. Check fuel check valve as follows:

a. Blow air through connector on the fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.

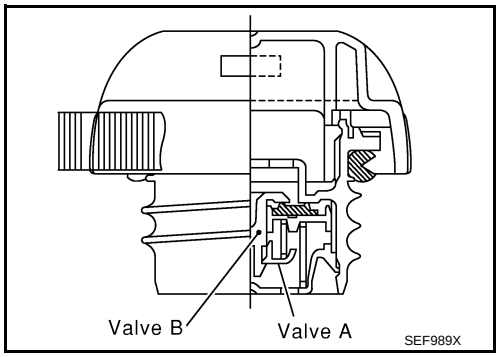
b. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.

c. If fuel check valve is suspected or not properly functioning in step 1 and 2 above, replace it.



5. Inspect fuel tank filler cap vacuum relief valve for clogging, sticking, etc.

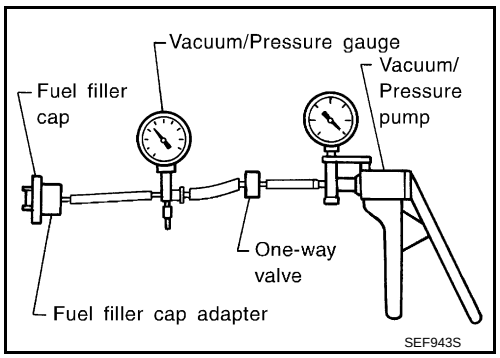
a. Wipe clean valve housing.



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.



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000001179657

Transmission	Condition	Specification
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:0000000001179658

Transmission	Condition	Specification
M/T	No load* (in Neutral position)	15 ± 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:0000000001179659

Condition	Specification (Using CONSULT-III or GST)
At idle	10 – 35 %
At 2,500 rpm	10 – 35 %

Mass Air Flow Sensor

INFOID:0000000001179660

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	1.0 – 1.3V*
Mass air flow (Using CONSULT-III or GST)	1.0 – 4.0 g·m/sec at idle* 2.0 – 10.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

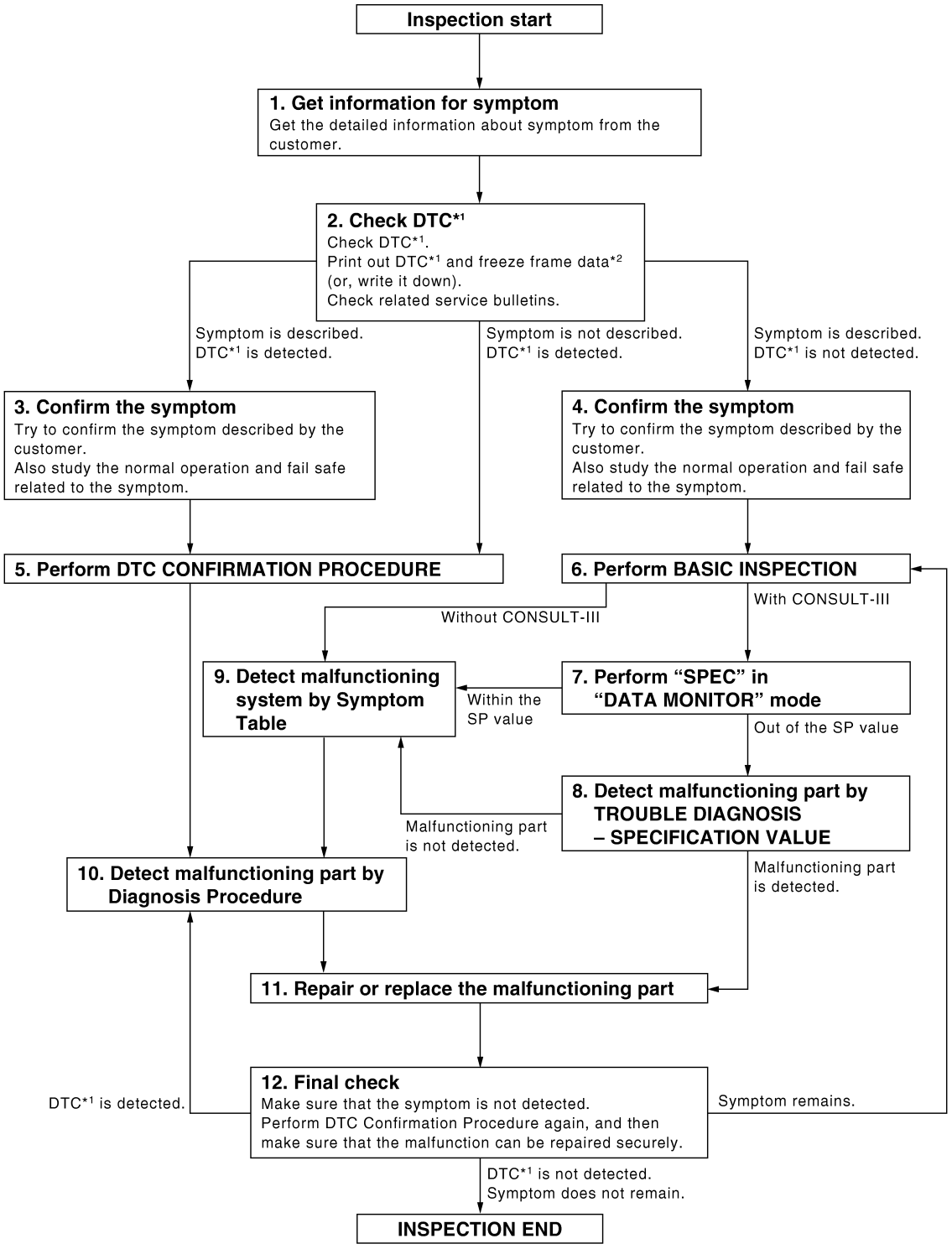
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000001179661

OVERALL SEQUENCE



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

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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 ECH-351, "Diagnostic Work Sheet".)

>> GO TO 2.

2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.

- Record DTC and freeze frame data. (Print them out with CONSULT-III.)
- Erase DTC. (Refer to ECH-415, "Diagnosis Description".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to ECH-611, "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 ECH-615, "Description" and ECH-606, "Fail Safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail safe related to the symptom. Refer to ECH-615, "Description" and ECH-606, "Fail Safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.
If two or more DTCs are detected, refer to ECH-608, "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 ECH-608, "DTC Index".

6.PERFORM BASIC INSPECTION

Perform ECH-353, "BASIC INSPECTION : Special Repair Requirement".

Do you have CONSULT-III?

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

7. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT-III

Make sure that “MAS A/F SE-B1”, “B/FUEL SCHDL” and “A/F ALPHA-B1” are within the SP value using CONSULT-III in “SPEC” of “DATA MONITOR” mode. Refer to ECH-427, "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 ECH-428, "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 ECH-611, "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 Circuit Inspection in GI-41, "Circuit Inspection".

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-III. Refer to ECH-586, "Reference Value".

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnosis Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it. Refer to ECH-415, "Diagnosis Description".

>> 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. (Refer to ECH-415, "Diagnosis Description".)

Diagnostic Work Sheet

INFOID:0000000001179662

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 a incident. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the one on the next page in order to organize all the information for troubleshooting.

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

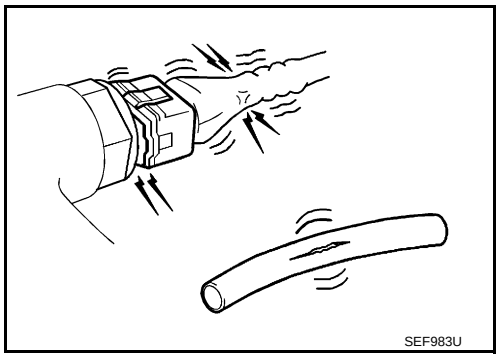
INSPECTION AND ADJUSTMENT
BASIC INSPECTION

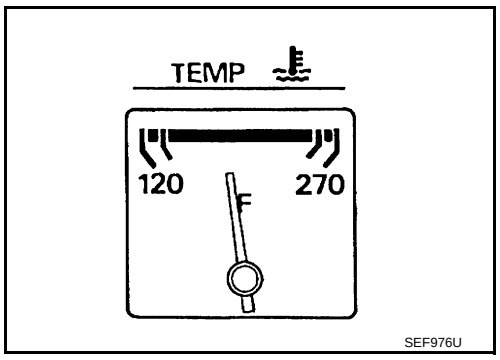
BASIC INSPECTION : Special Repair Requirement

INFOID:0000000001179663

1.INSPECTION START

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


SEF983U

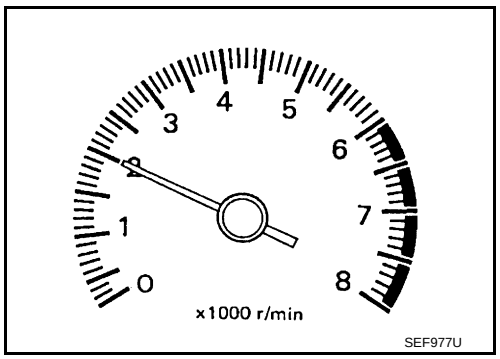


SEF976U

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

Is any DTC detected?

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



SEF977U

2.REPAIR OR REPLACE

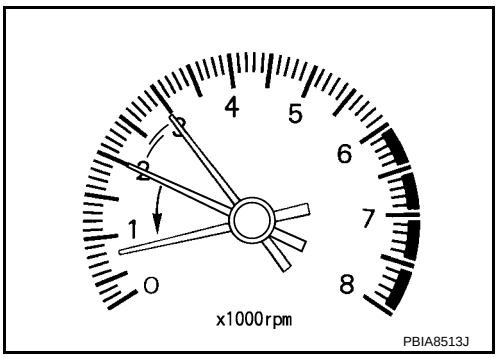
Repair or replace components as necessary according to corresponding Diagnostic Procedure.

>> 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 ECH-357, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to ECH-625, "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 ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

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 ECH-357, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to ECH-625, "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 ECH-478, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to ECH-474, "DTC Logic".

Is the inspection result normal?

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

9. CHECK ECM FUNCTION

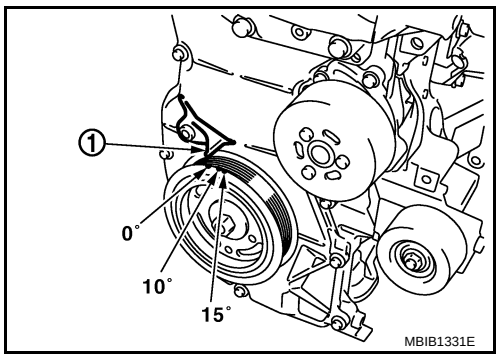
1. Substitute another known-good ECM to check ECM function. (ECM may be the cause of an incident, but this is a rare case.)
2. Perform initialization of NATS system and registration of all NATS ignition key IDs. Refer to SEC-9, "ECM RE-COMMUNICATING FUNCTION : Description".

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.

2. Check ignition timing with a timing light.
For procedure, refer to ECH-357, "IGNITION TIMING : Special Repair Requirement".
For specification, refer to ECH-625, "Ignition Timing".



1 : Timing indicator

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 ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

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

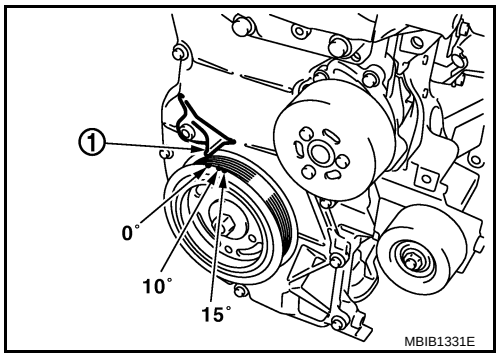
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
For procedure, refer to ECH-357, "IDLE SPEED : Special Repair Requirement".
For specification, refer to ECH-625, "Idle Speed".

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 ECH-357, "IGNITION TIMING : Special Repair Requirement".
For specification, refer to ECH-625, "Ignition Timing".



1 : Timing indicator

Is the inspection result normal?

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

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-47, "Removal and Installation".

Is the inspection result normal?

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

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to ECH-478, "DTC Logic".
- Check crankshaft position sensor (POS) and circuit. Refer to ECH-474, "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 and registration of all NATS ignition key IDs. Refer to SEC-9, "ECM RE-COMMUNICATING FUNCTION : Description".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:0000000001179664

When replacing ECM, this procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement

INFOID:0000000001179665

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

Refer to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> GO TO 2.

2. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> GO TO 3.

3. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-19, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 4.

4. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-19, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

IDLE SPEED

IDLE SPEED : Description

INFOID:0000000001179666

This describes how to check the idle speed. For the actual procedure, follow the instructions in “BASIC INSPECTION”.

IDLE SPEED : Special Repair Requirement

INFOID:0000000001179667

1.CHECK IDLE SPEED

With CONSULT-III
Check idle speed in “DATA MONITOR” mode with CONSULT-III.

Without CONSULT-III
Check the idle speed by installing the pulse type tachometer clamp on No.4 ignition coil harness.

>> INSPECTION END

IGNITION TIMING

IGNITION TIMING : Description

INFOID:0000000001179668

This describes how to check the ignition timing. For the actual procedure, follow the instructions in “BASIC INSPECTION”.

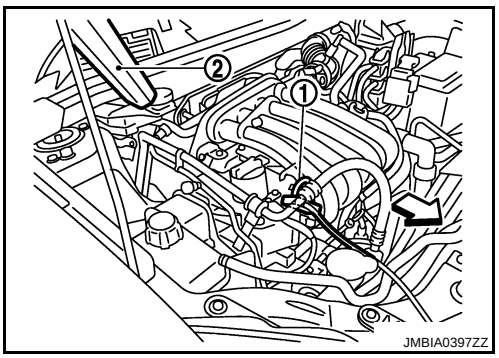
IGNITION TIMING : Special Repair Requirement

INFOID:0000000001179669

1.CHECK IGNITION TIMING

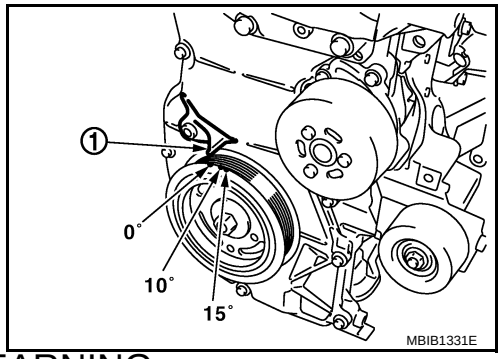
1. Attach timing light to No.1 ignition coil wire harness (1) as shown.

2 : Timing light
⇦ : Vehicle front



2. Check ignition timing.

1 : Timing indicator



>> INSPECTION END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description

INFOID:0000000001179670

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.

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Re-

quirement

INFOID:0000000001179671

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

THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:0000000001179672

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.

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:0000000001179673

1.START

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

>> END

IDLE AIR VOLUME LEARNING

IDLE AIR VOLUME LEARNING : Description

INFOID:0000000001179674

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.

IDLE AIR VOLUME LEARNING : Special Repair Requirement

INFOID:0000000001179675

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 12.9V (At idle)
- Engine coolant temperature: 70 - 100°C (158 - 212°F)
- Park/neutral position switch: ON
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, set lighting switch to the 1st position to light only small lamps.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- Drive vehicle for 10 minutes

Do you have CONSULT-III?

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

2.IDLE AIR VOLUME LEARNING

With CONSULT-III

1. Perform Accelerator Pedal Released Position Learning. Refer to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
3. Start engine and warm it up to normal operating temperature.
4. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
5. Touch “START” and wait 20 seconds.

Is “CMPLT” displayed on CONSULT-III screen?

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

3. IDLE AIR VOLUME LEARNING

Without CONSULT-III

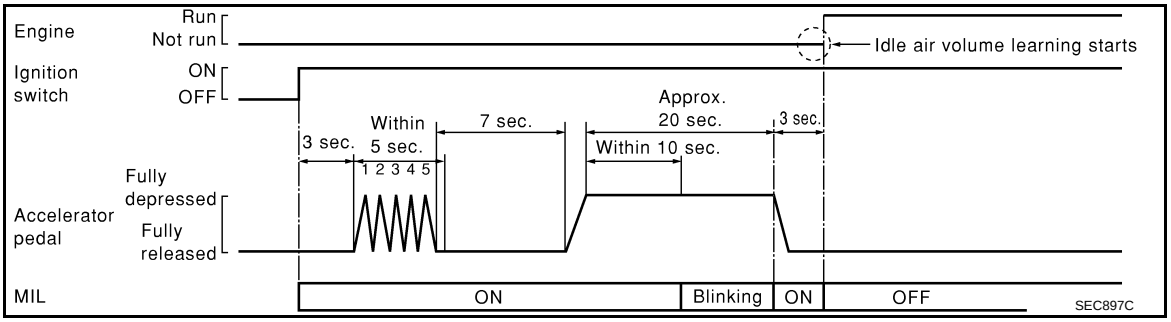
NOTE:

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

1. Perform Accelerator Pedal Released Position Learning. Refer to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
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 ECH-625, "Idle Speed" and ECH-625, "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 ECH-427, "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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:0000000001179676

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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:0000000001179677

1. START

With CONSULT-III

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

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Make sure that DTC P0102 is displayed.
6. Erase the DTC memory. Refer to ECH-415, "Diagnosis Description".
7. Make sure that DTC P0000 is displayed.

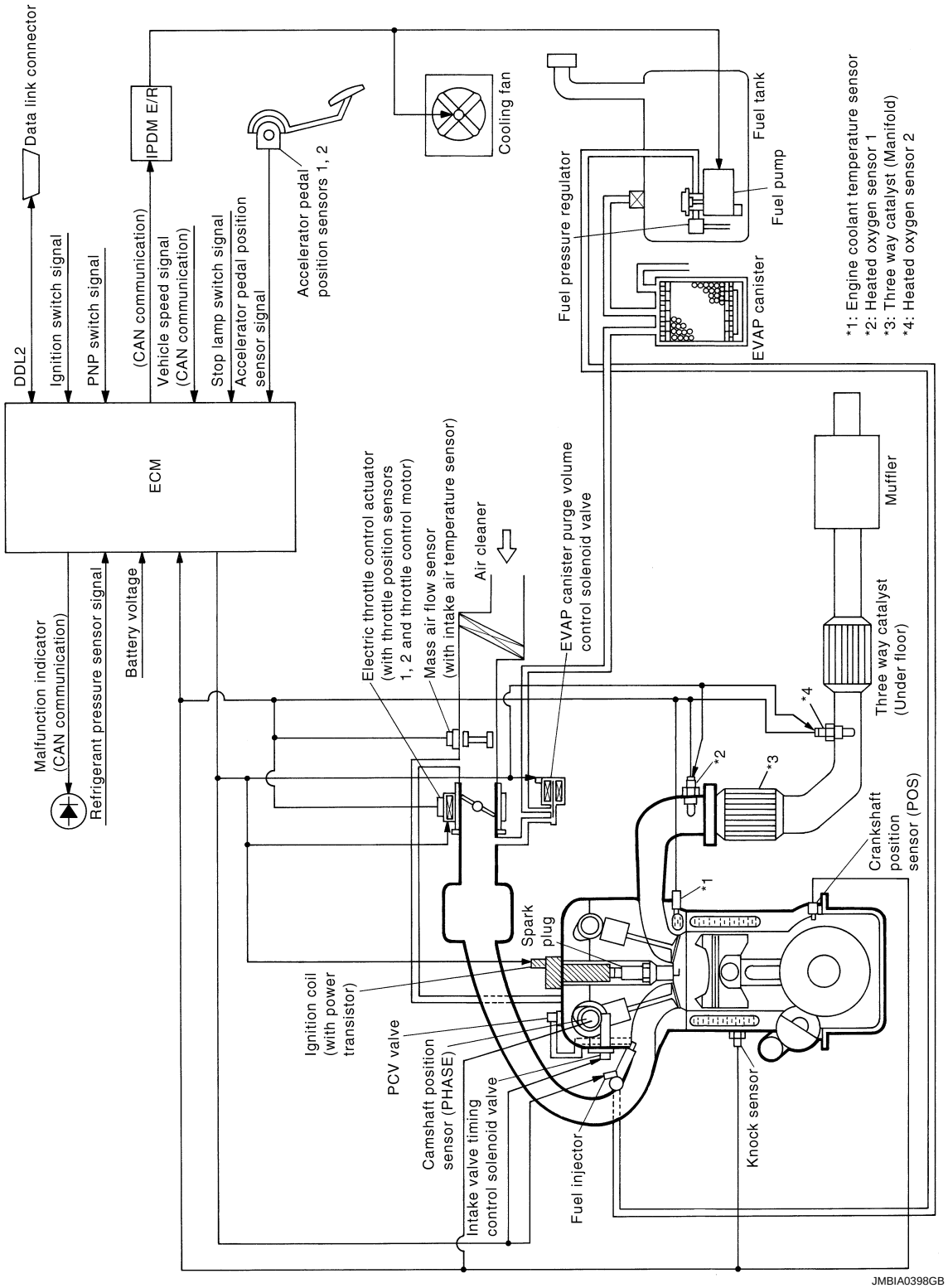
>> END

FUNCTION DIAGNOSIS

ENGINE CONTROL SYSTEM

System Diagram

INFOID:0000000001179678



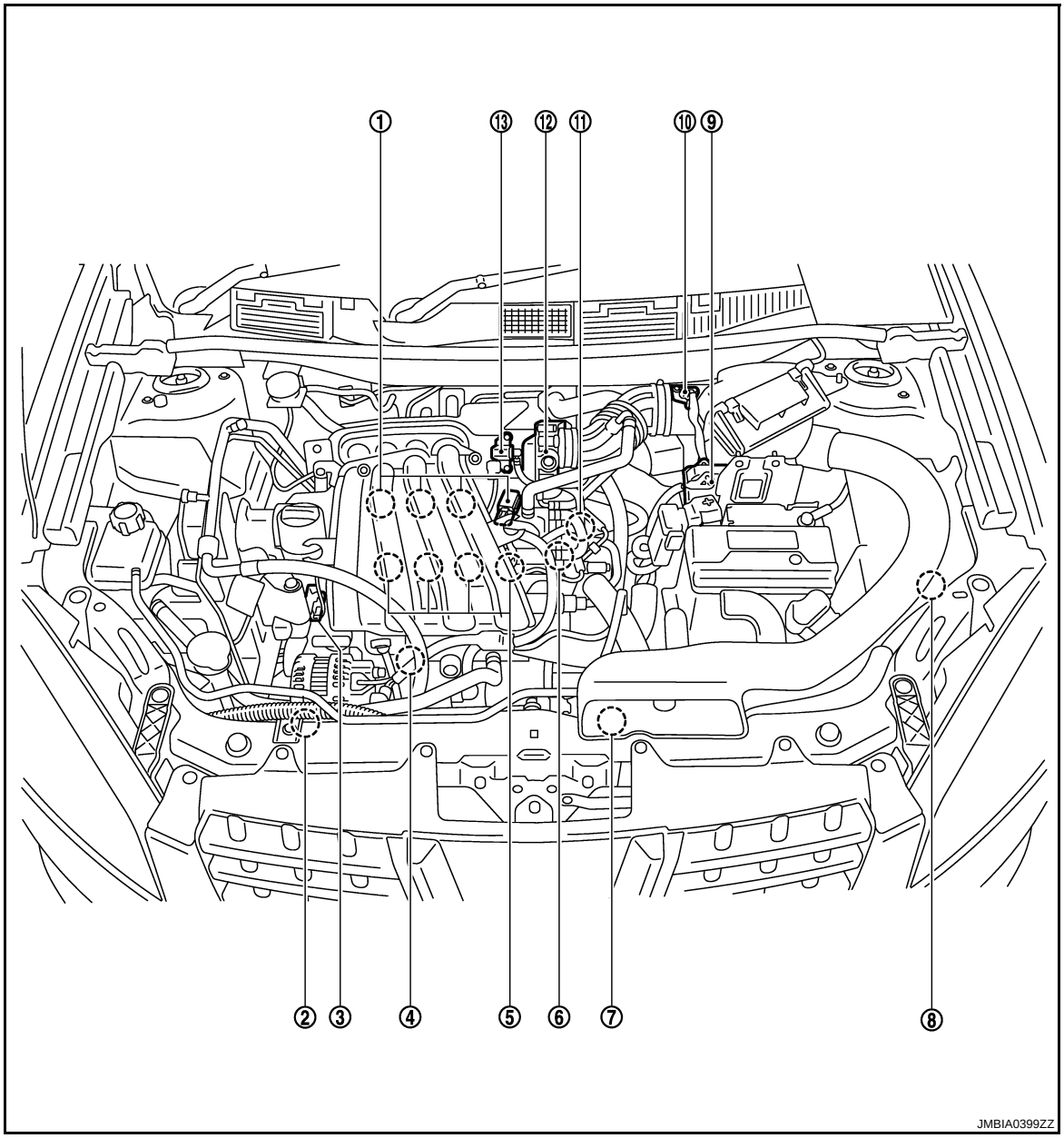
System Description

INFOID:0000000001179679

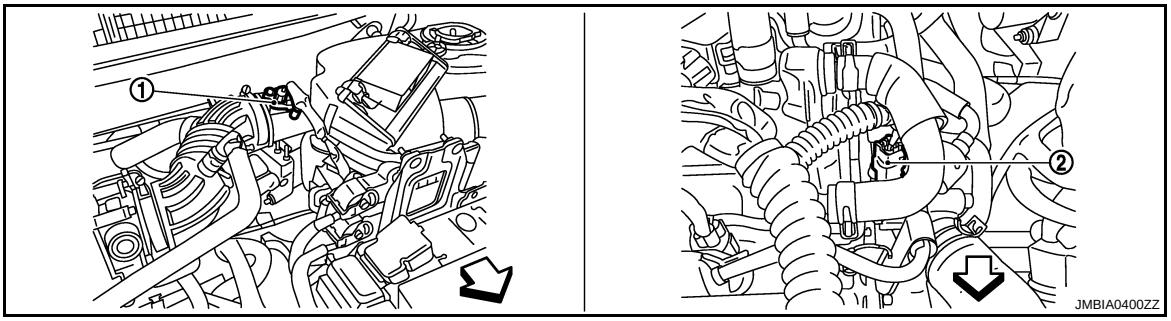
ECM performs various controls such as fuel injection control and ignition timing control.

Component Parts Location

INFOID:0000000001179680

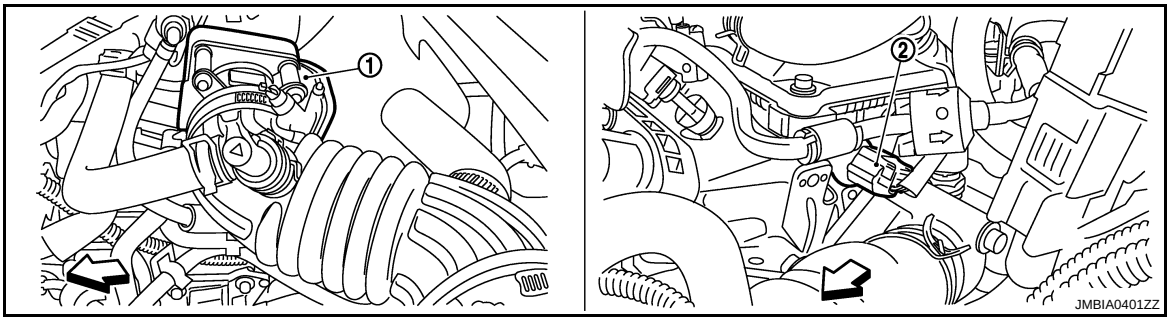


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



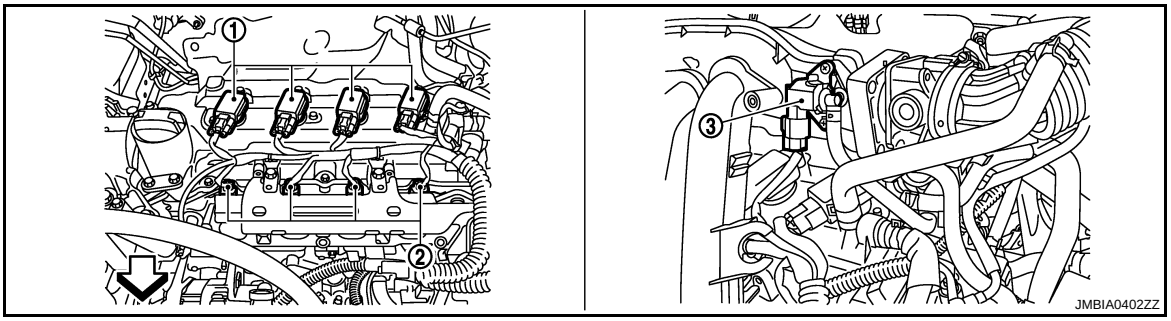
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



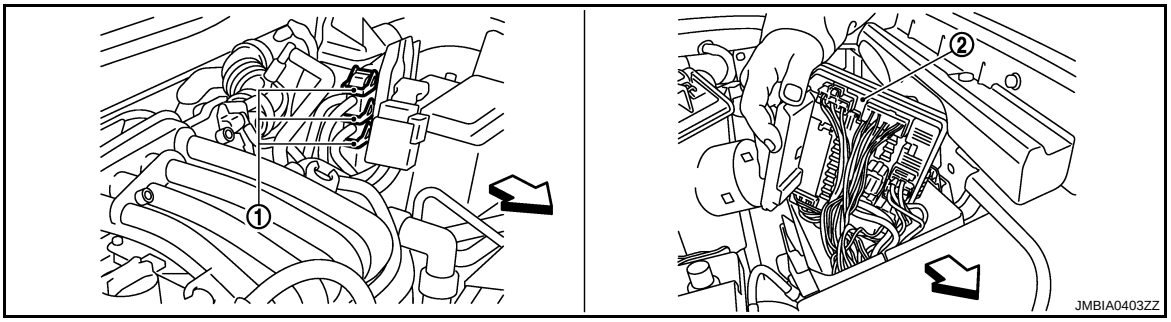
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



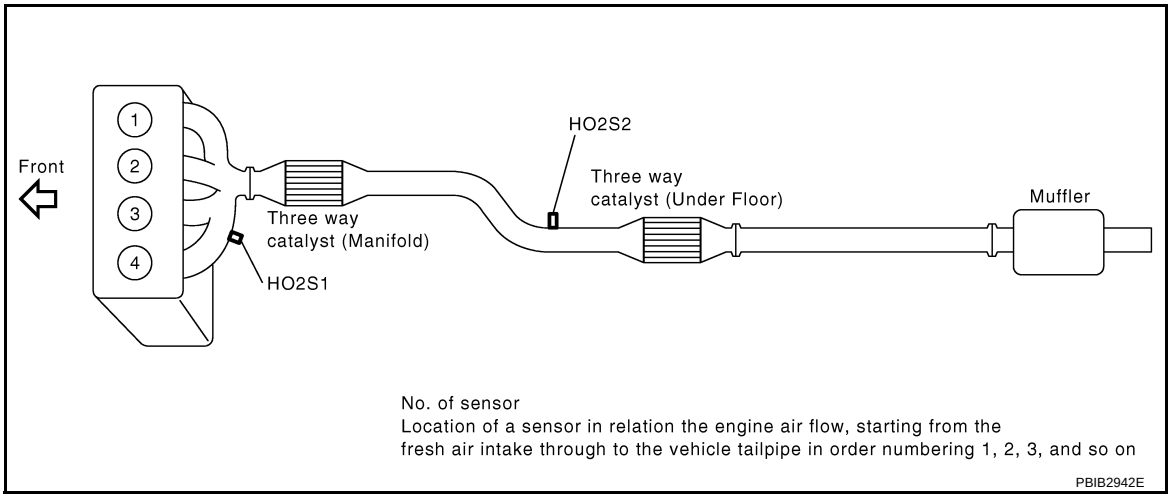
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

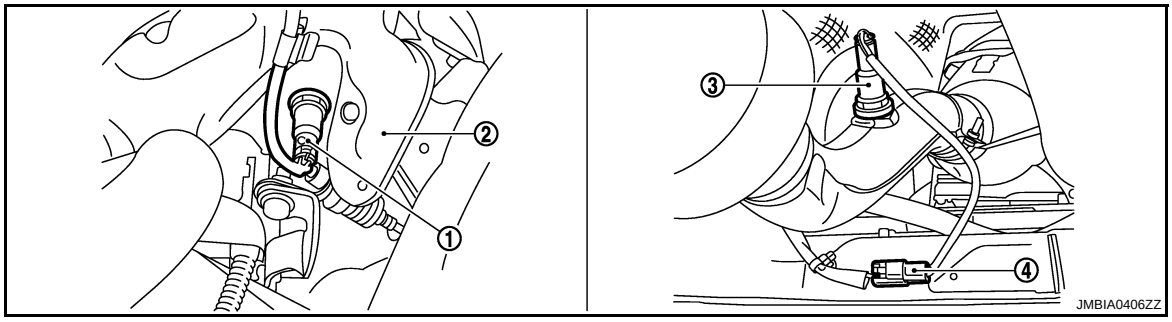
⇦ Vehicle front



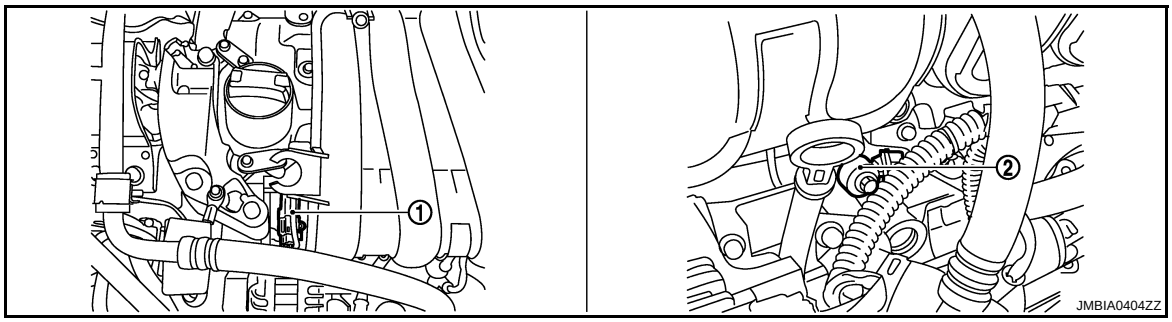
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

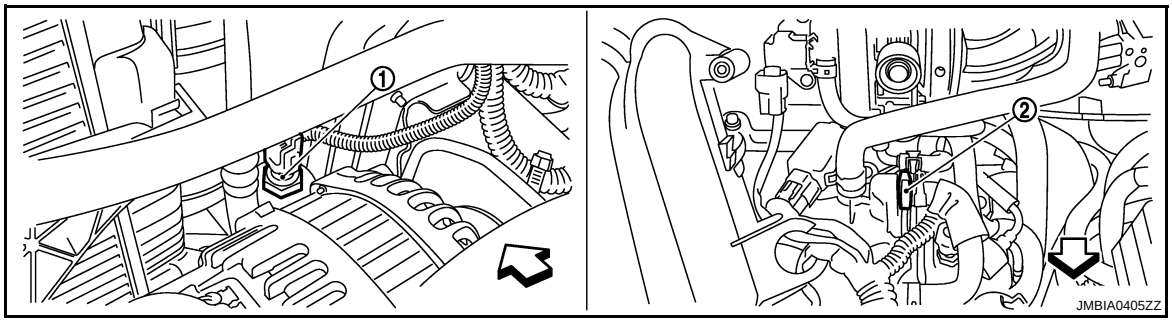




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

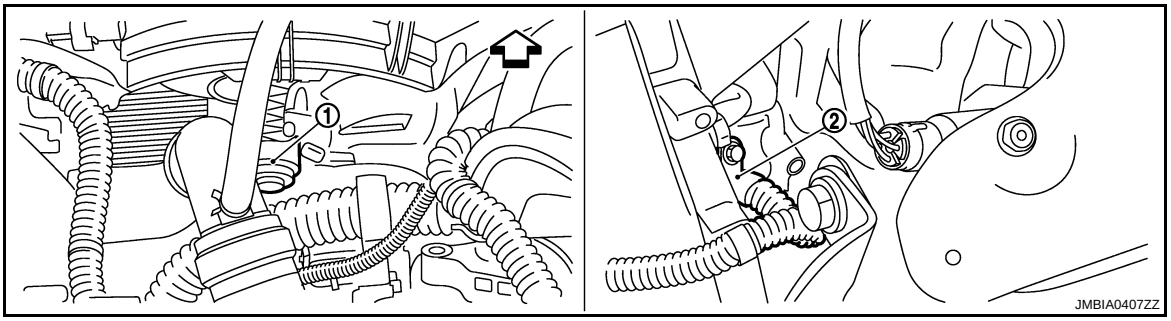


1. Intake valve timing control solenoid valve
2. Knock sensor



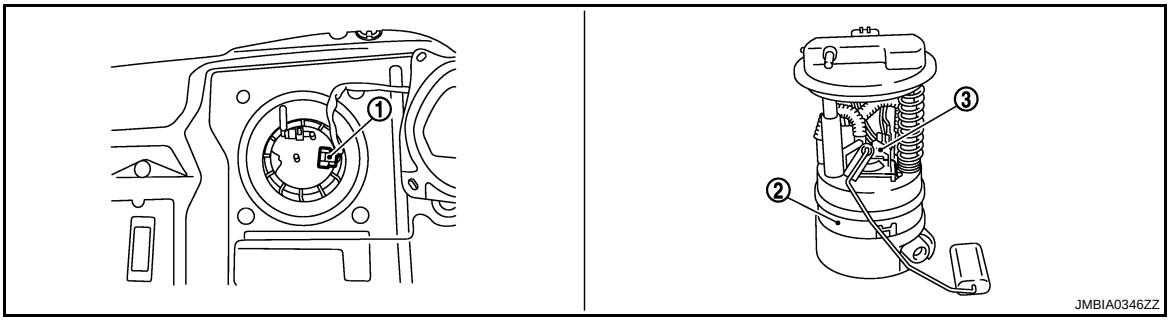
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

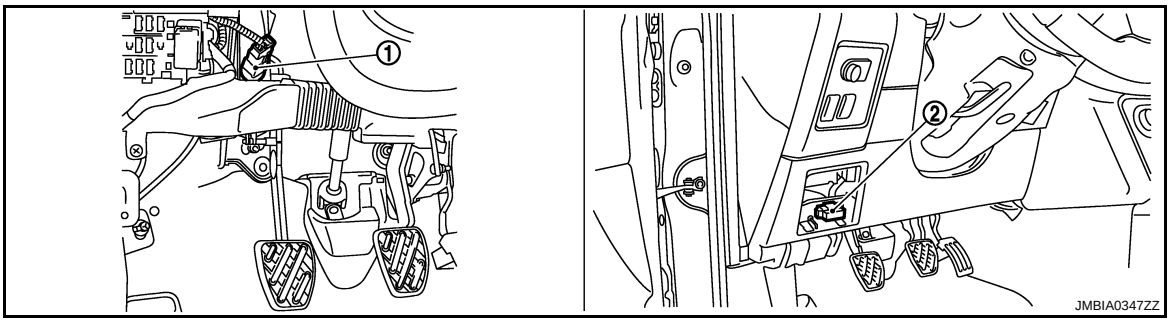


1. Cooling fan motor
2. Crankshaft position sensor (POS)

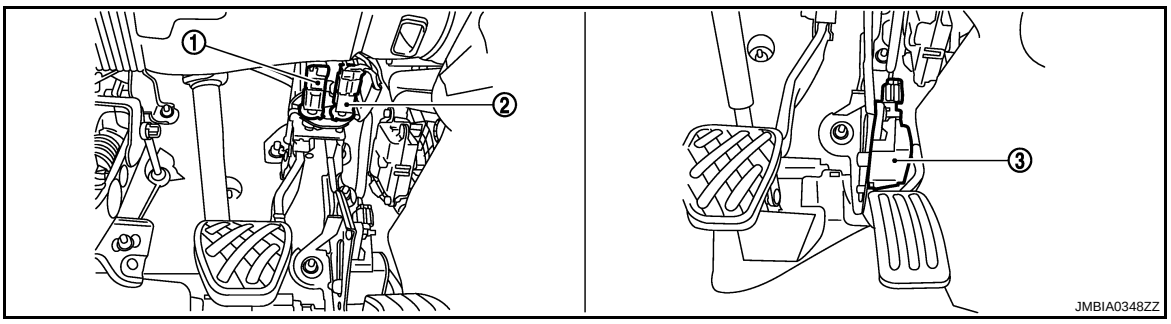
⇦ Vehicle front



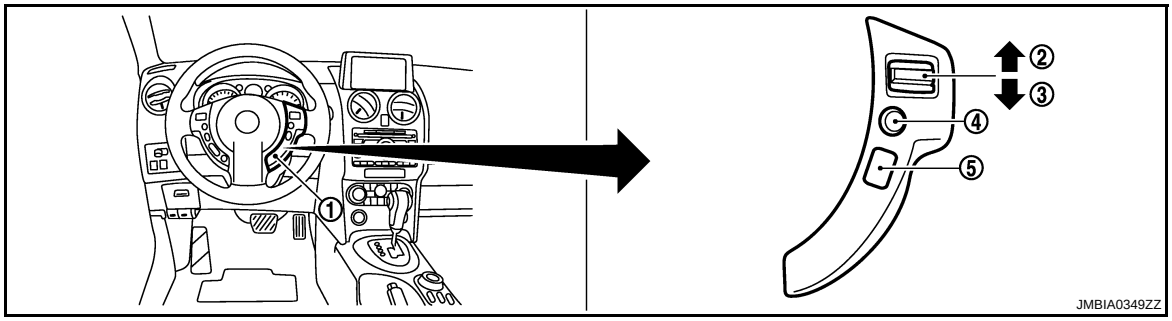
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

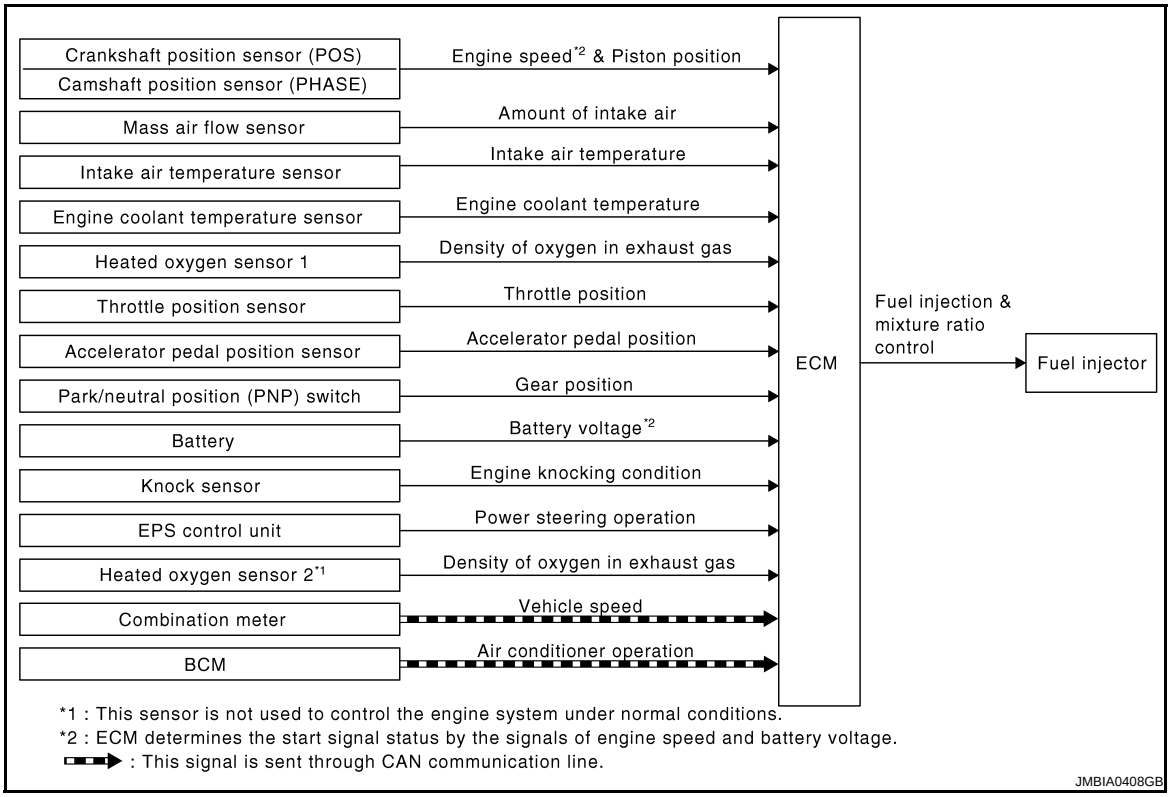
INFOID:0000000001179681

Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
ASCD brake switch	ECH-541, "Description"
ASCD steering switch	ECH-252, "Description"
ASCD vehicle speed sensor	ECH-261, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Cooling fan motor	ECH-546, "Description"
Electric throttle control actuator	ECH-488, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
Fuel injector	ECH-553, "Description"
Fuel pump	ECH-556, "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Heated oxygen sensor 1 heater	ECH-564, "Description"
Heated oxygen sensor 2	ECH-464, "Description"
Heated oxygen sensor 2 heater	ECH-571, "Description"
Ignition signal	ECH-576, "Description"
Intake air temperature sensor	ECH-574, "Description"
Intake valve timing control solenoid valve	ECH-486, "Description"
Knock sensor	ECH-472, "Description"
Mass air flow sensor	ECH-445, "Description"
Park/neutral position switch	ECH-522, "Description"
PCV valve	ECH-582, "Description"
Refrigerant pressure sensor	ECH-583, "Description"
Stop lamp switch	ECH-525, "Description"
Throttle control motor	ECH-497, "Description"
Throttle control motor relay	ECH-494, "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585, "Description"

MULTIPORT FUEL INJECTION SYSTEM

System Diagram

INFOID:0000000001179682



System Description

INFOID:0000000001179683

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*3 Piston position	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor (PHASE)			
Mass air flow sensor	Amount of intake air		
Intake air temperature sensor	Intake air temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Heated oxygen 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	Gear position		
Battery	Battery voltage*3		
Knock sensor	Engine knocking condition		
EPS control unit	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
BCM*2	Air conditioner operation		
Combination meter*2	Vehicle speed		

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

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

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

SYSTEM DESCRIPTION

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

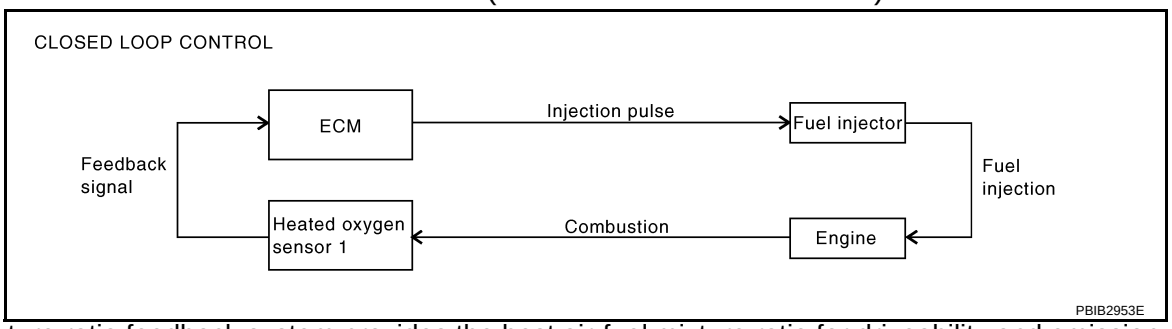
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

<Fuel increase>
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- High-load, high-speed operation

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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can then better reduce CO, HC and NOx emissions. This system uses heated oxygen 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 heated oxygen sensor 1, refer to ECH-130, "DTC Logic". 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 heated oxygen 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 heated oxygen sensor 1 or its circuit
- Insufficient activation of heated sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

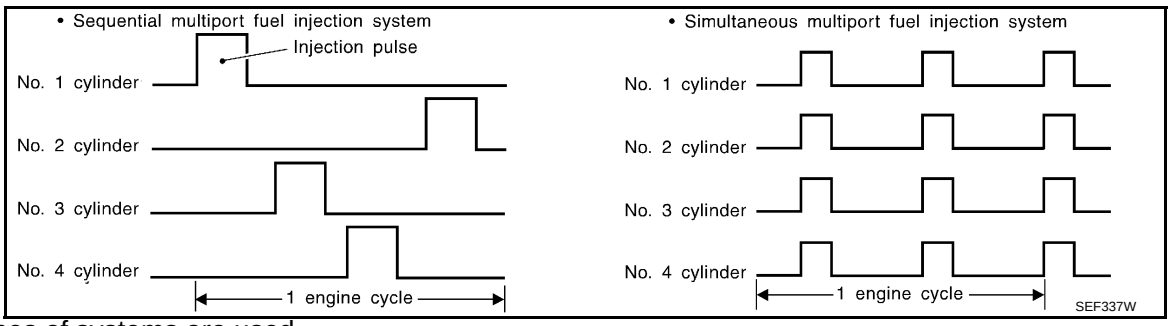
The mixture ratio feedback control system monitors the mixture ratio signal transmitted from heated oxygen sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.

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

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

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

FUEL INJECTION TIMING



Two types of systems are used.

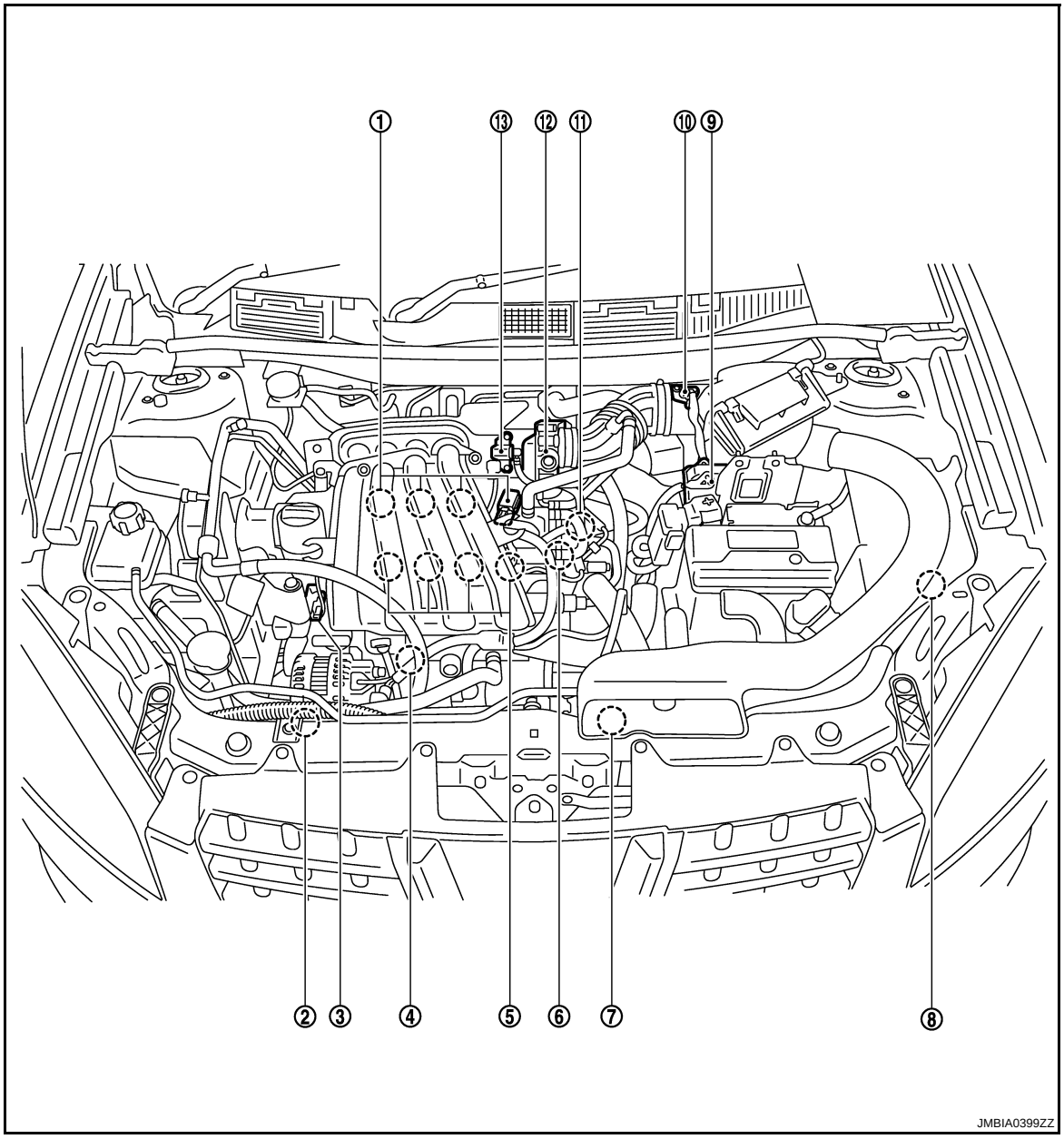
- Sequential Multiport Fuel Injection System
  Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
  Fuel is injected simultaneously into all four cylinders twice each 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

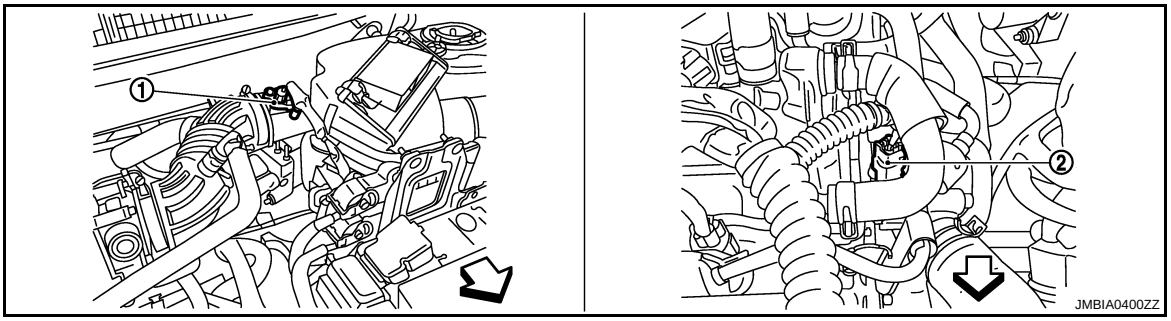
Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

Component Parts Location

INFOID:0000000001179684

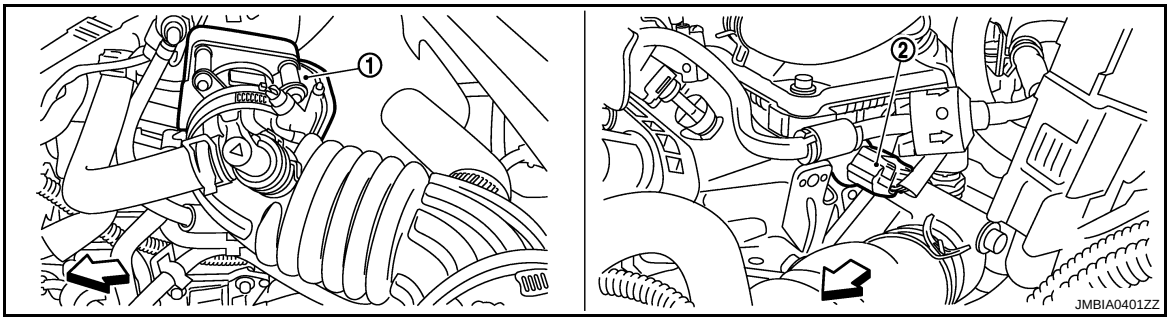


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



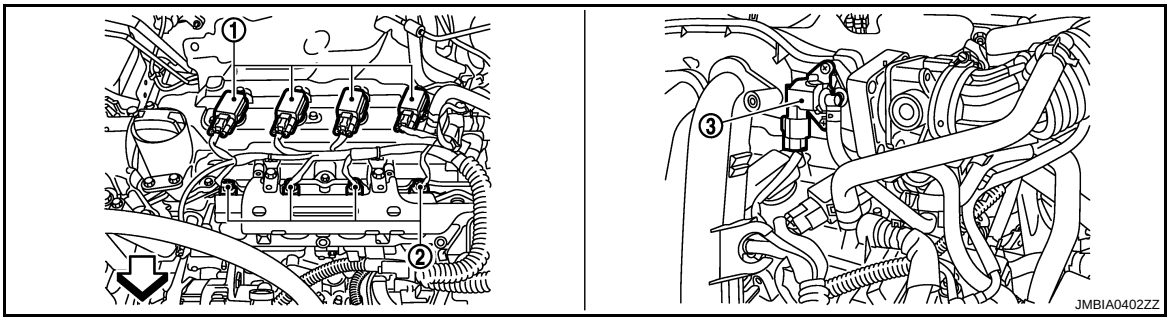
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



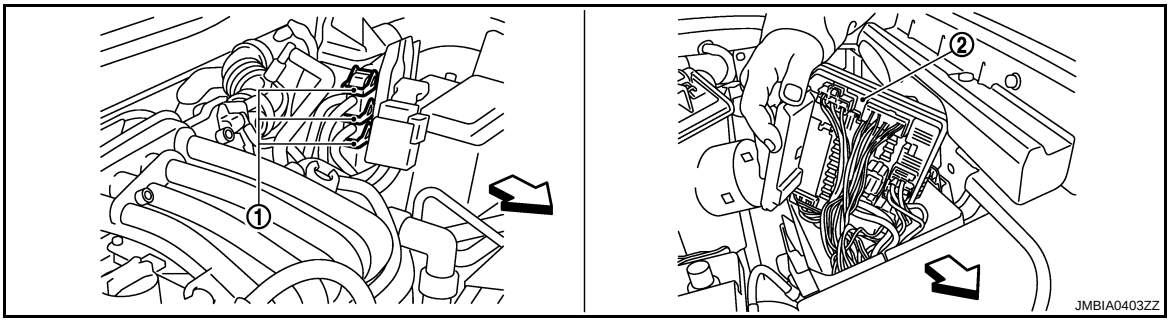
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



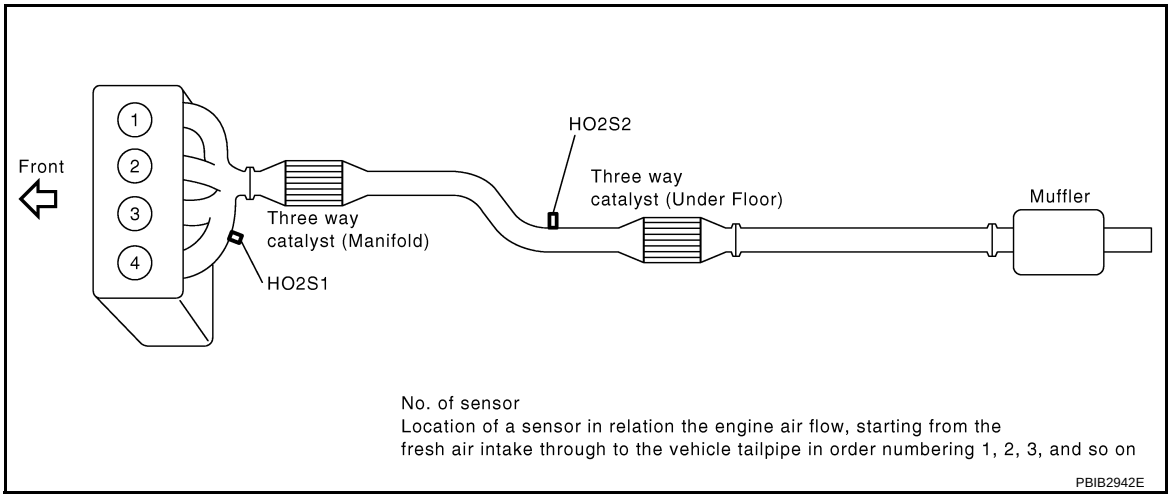
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

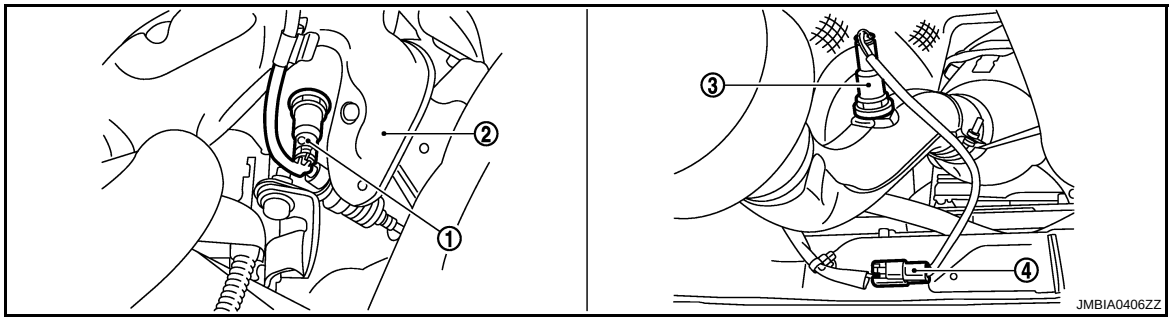
⇦ Vehicle front



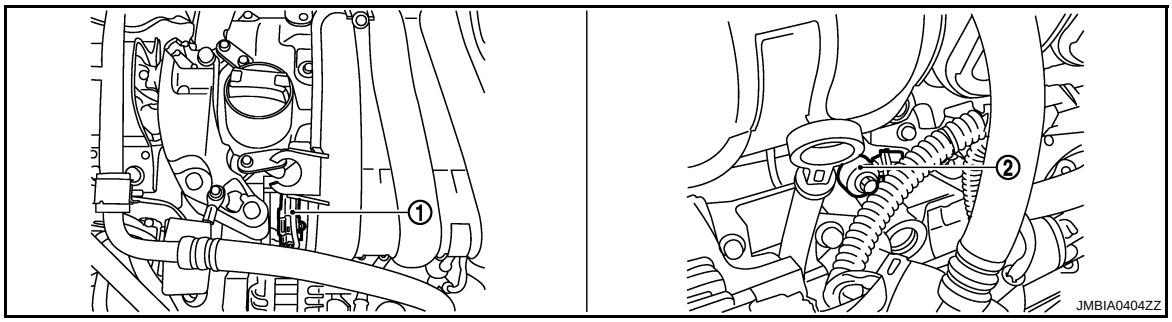
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

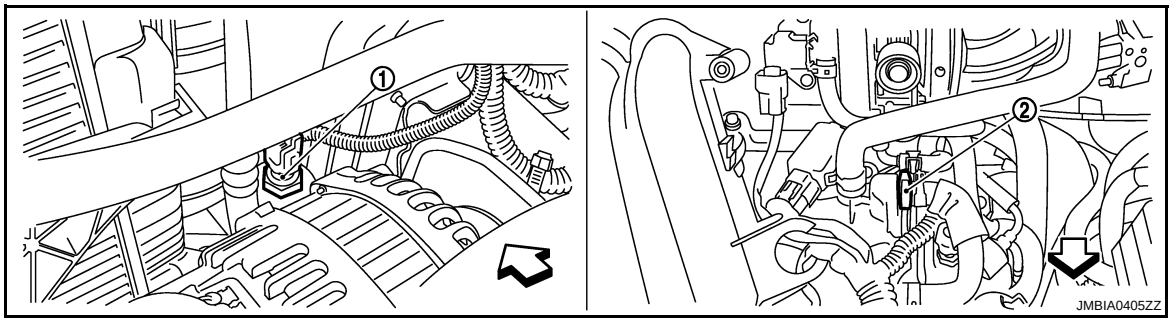




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

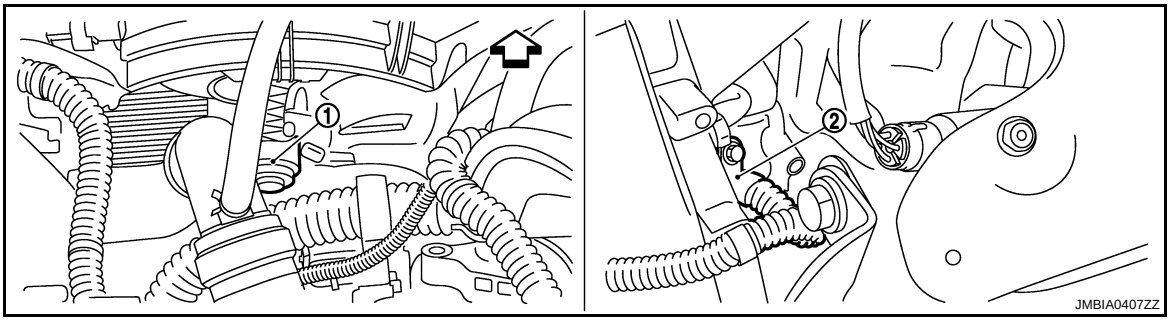


1. Intake valve timing control solenoid valve
2. Knock sensor



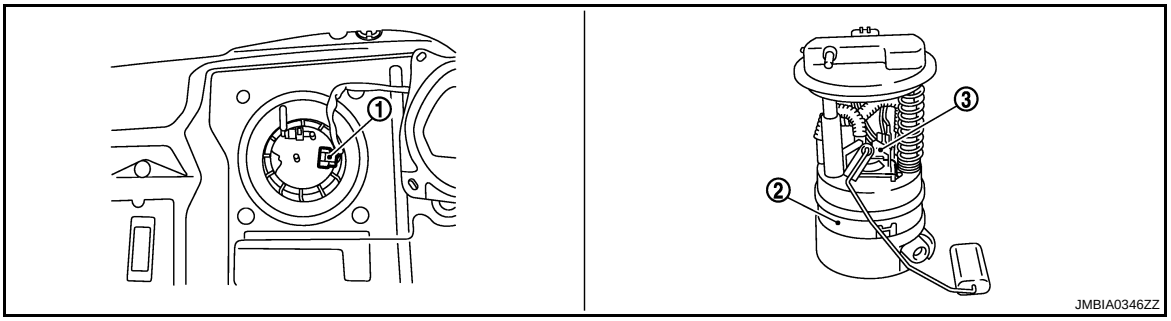
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

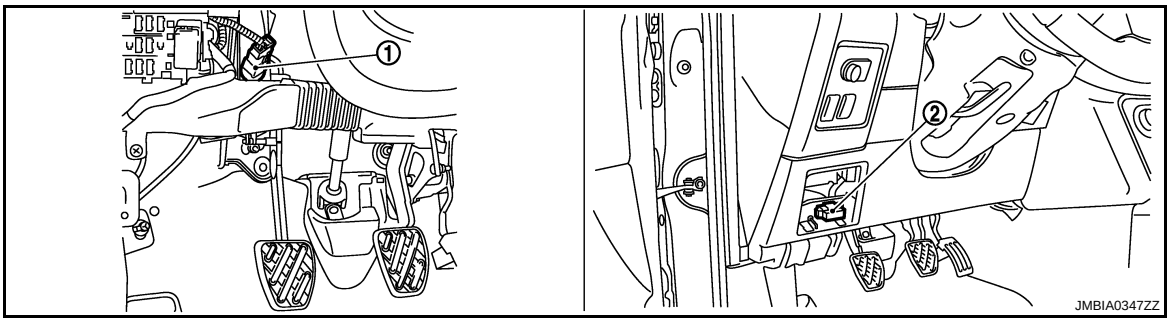


1. Cooling fan motor
2. Crankshaft position sensor (POS)

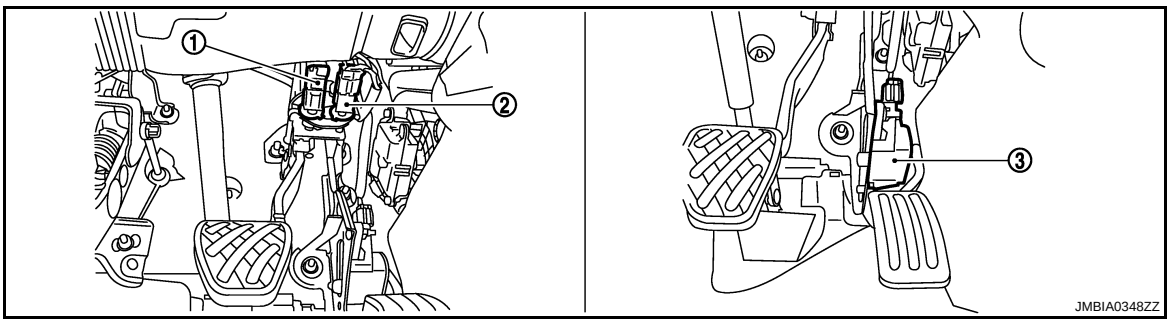
⇦ Vehicle front



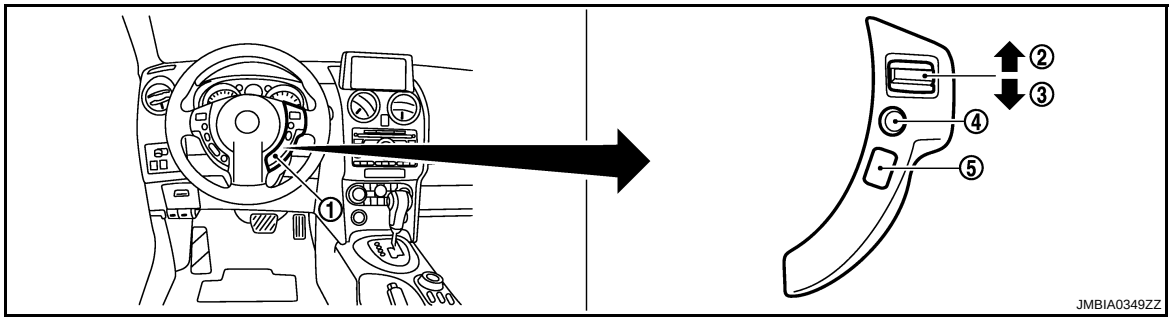
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

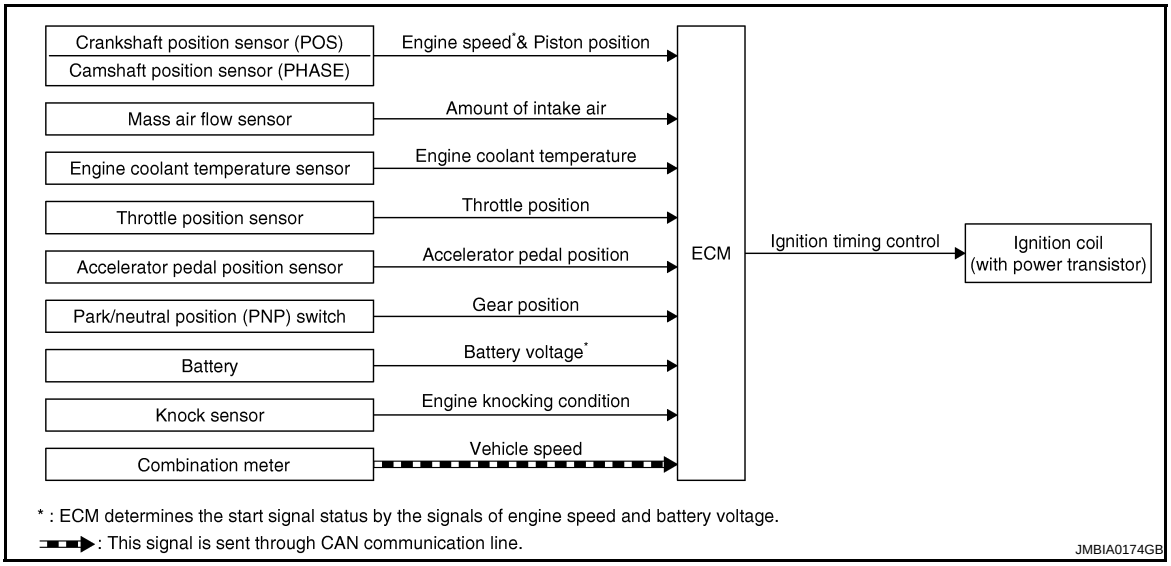
INFOID:0000000001179685

Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
Fuel injector	ECH-553, "Description"
Heated oxygen sensor 1	ECH-130, "Description"
Heated oxygen sensor 2	ECH-571, "Description"
Intake air temperature sensor	ECH-574, "Description"
Knock sensor	ECH-472, "Description"
Mass air flow sensor	ECH-445, "Description"
Park/neutral position (PNP) switch	ECH-522, "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585, "Description"

ELECTRIC IGNITION SYSTEM

System Diagram

INFOID:0000000001179686



System Description

INFOID:0000000001179687

INPUT/OUTPUT SIGNAL CHART

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

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

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

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 (PHASE) signal. Computing this information, ignition signals are transmitted to the power transistor.

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

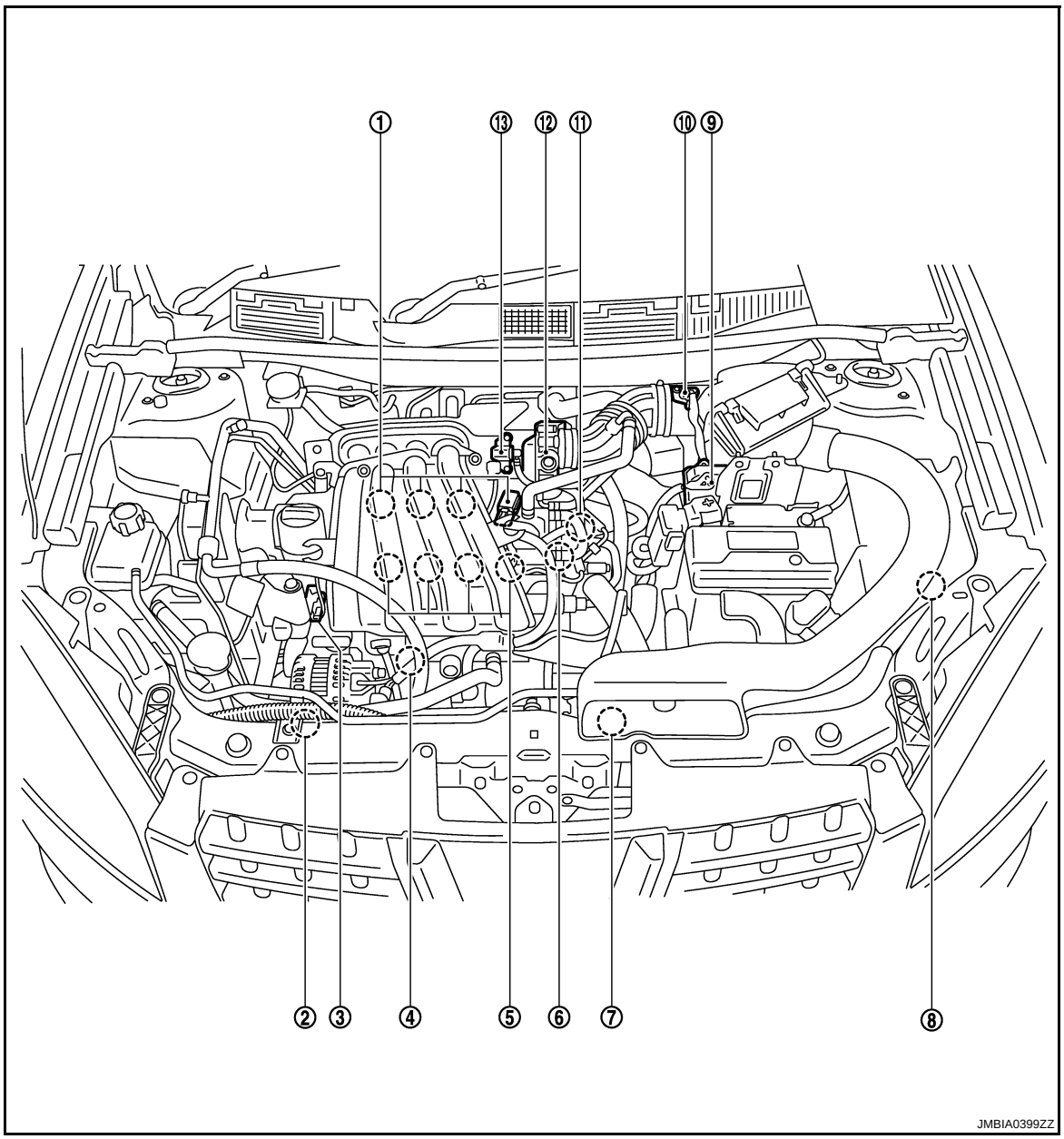
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

The knock sensor retard system is designed only for emergencies. The basic ignition timing is programmed within the anti-knocking zone, if recommended fuel is used under dry conditions. The retard system does not

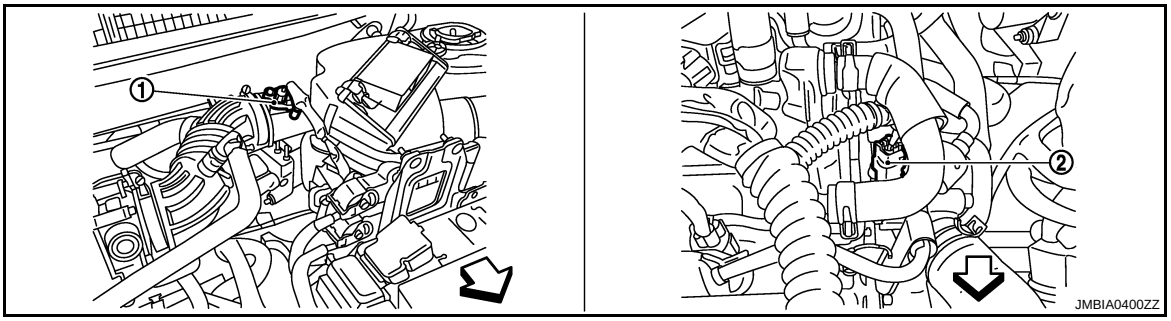
operate under normal driving conditions. If engine knocking occurs, the knock sensor monitors the condition. The signal is transmitted to the ECM. The ECM retards the ignition timing to eliminate the knocking condition.

Component Parts Location

INFOID:0000000001179688

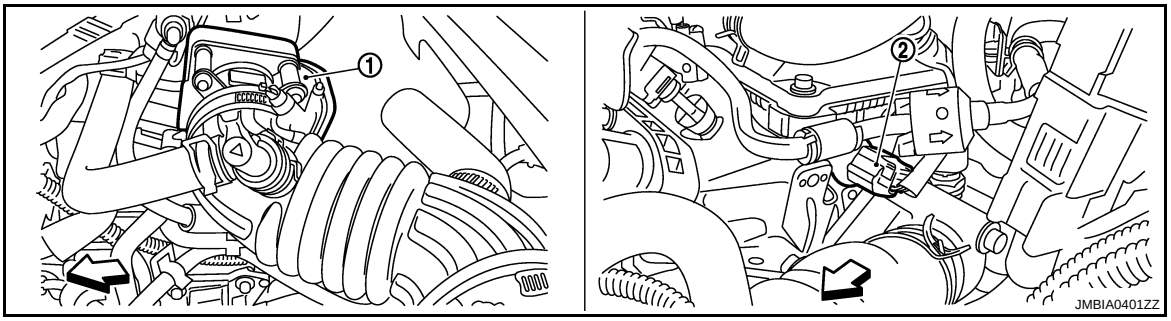


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



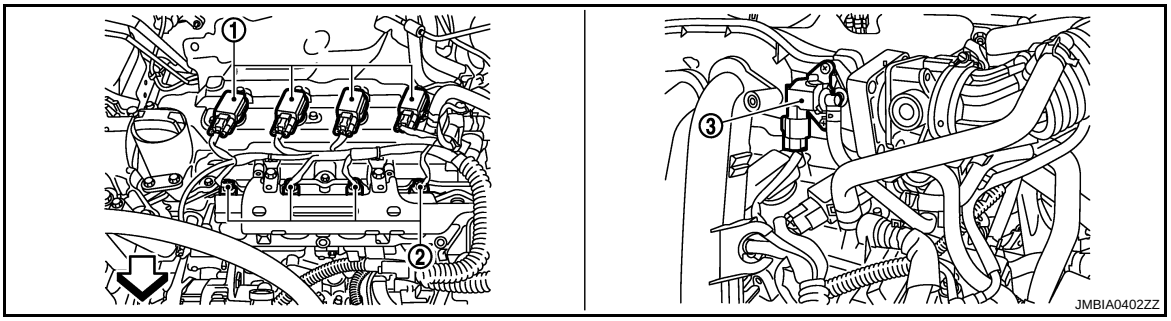
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



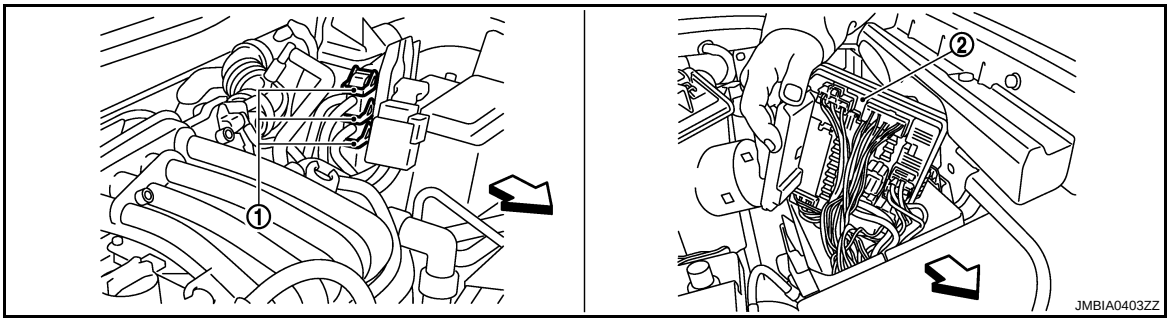
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



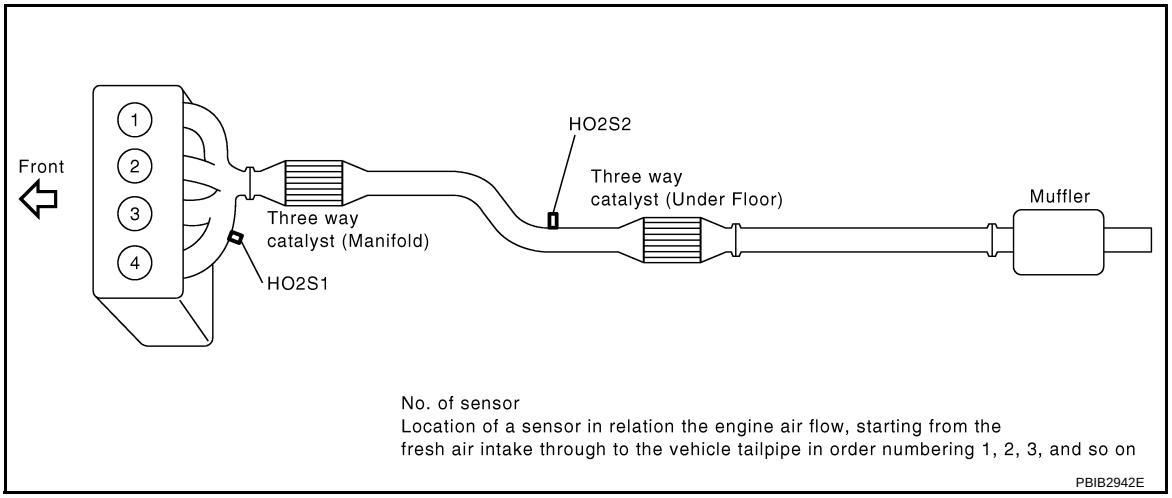
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

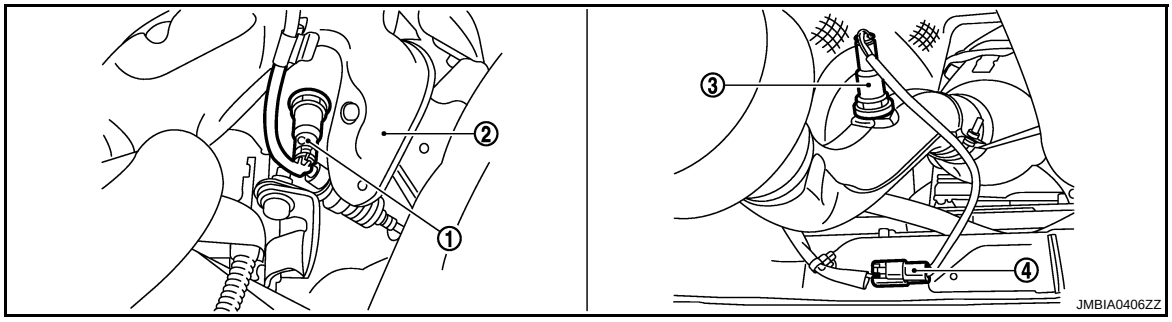
⇦ Vehicle front



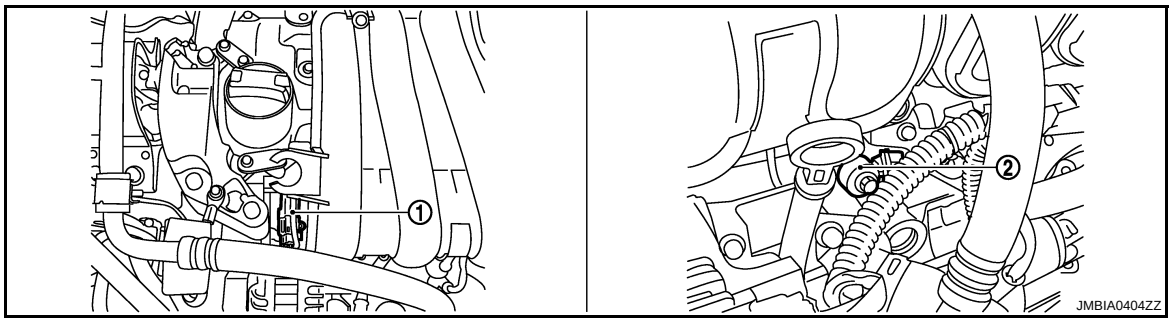
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

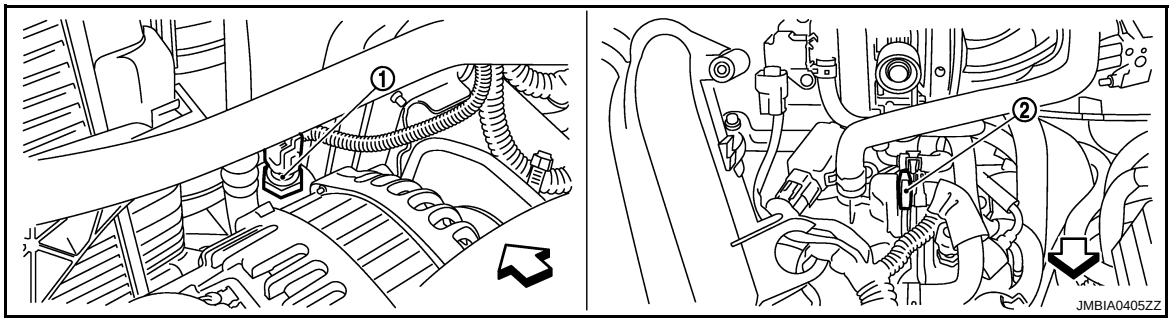




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

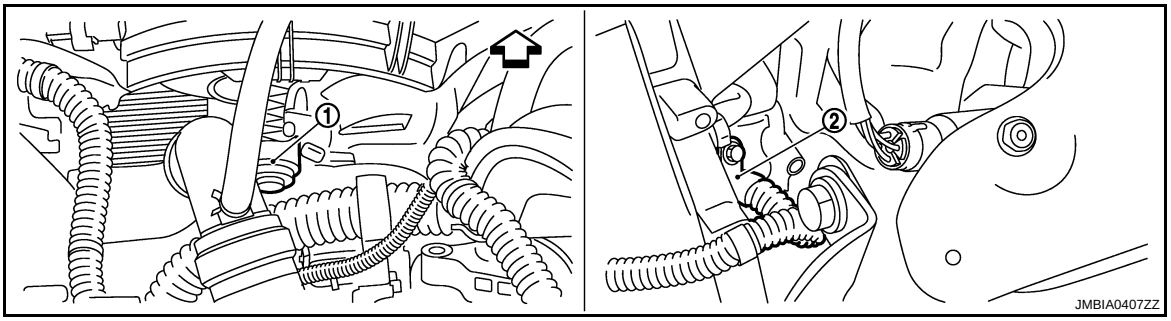


1. Intake valve timing control solenoid valve
2. Knock sensor



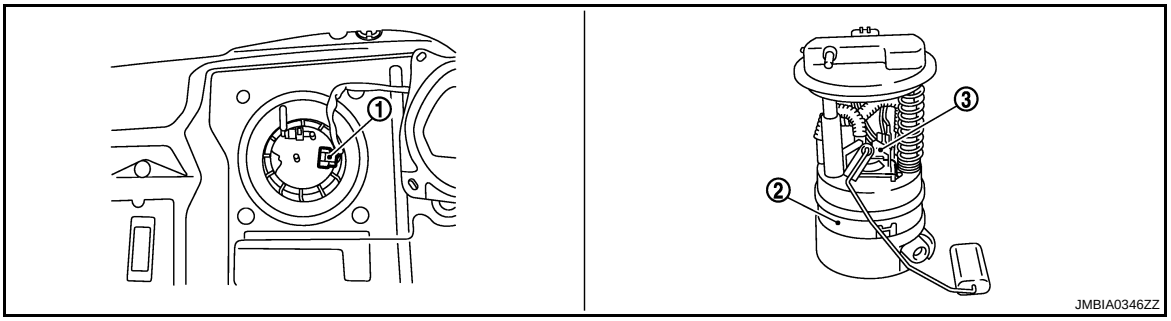
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

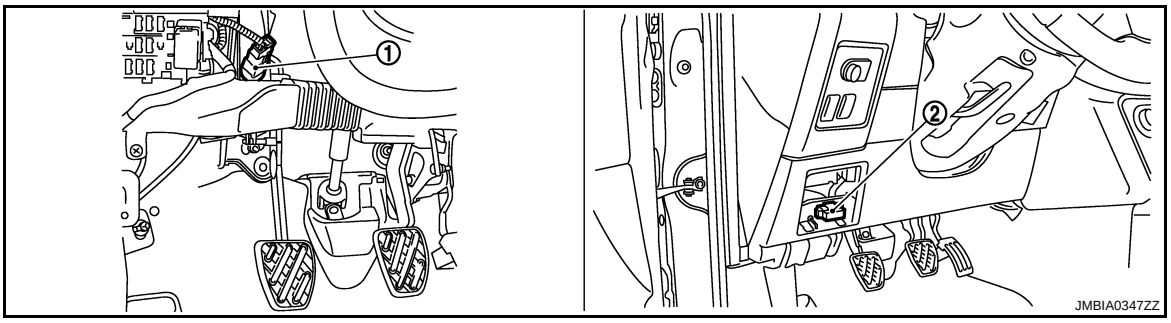


1. Cooling fan motor
2. Crankshaft position sensor (POS)

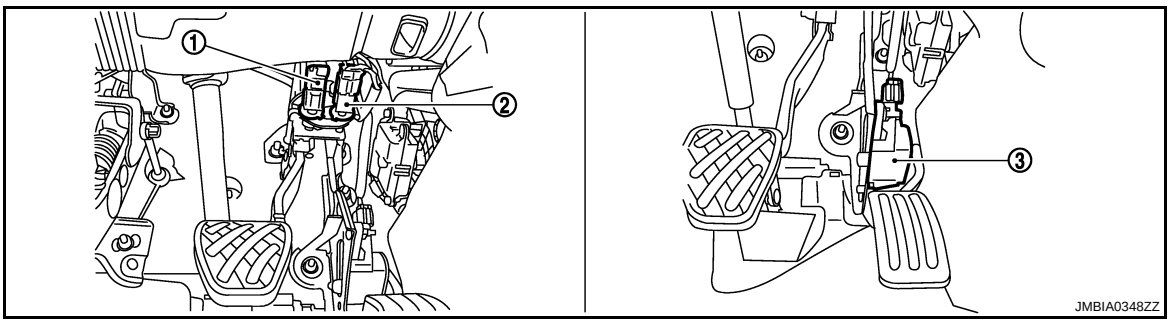
⇦ Vehicle front



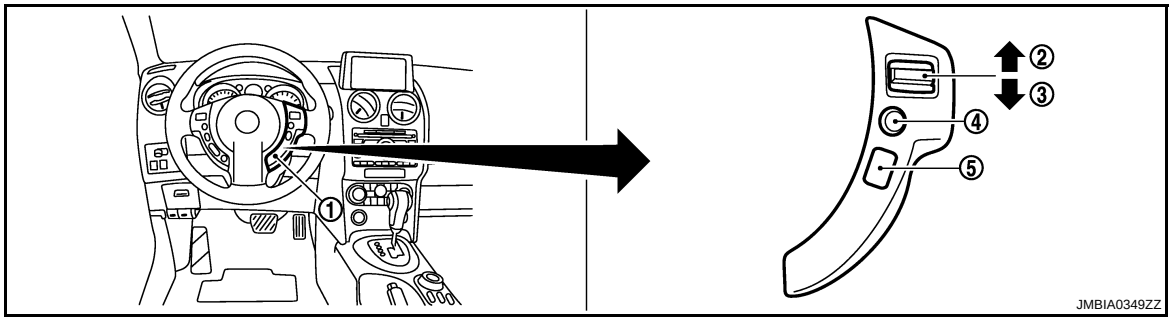
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

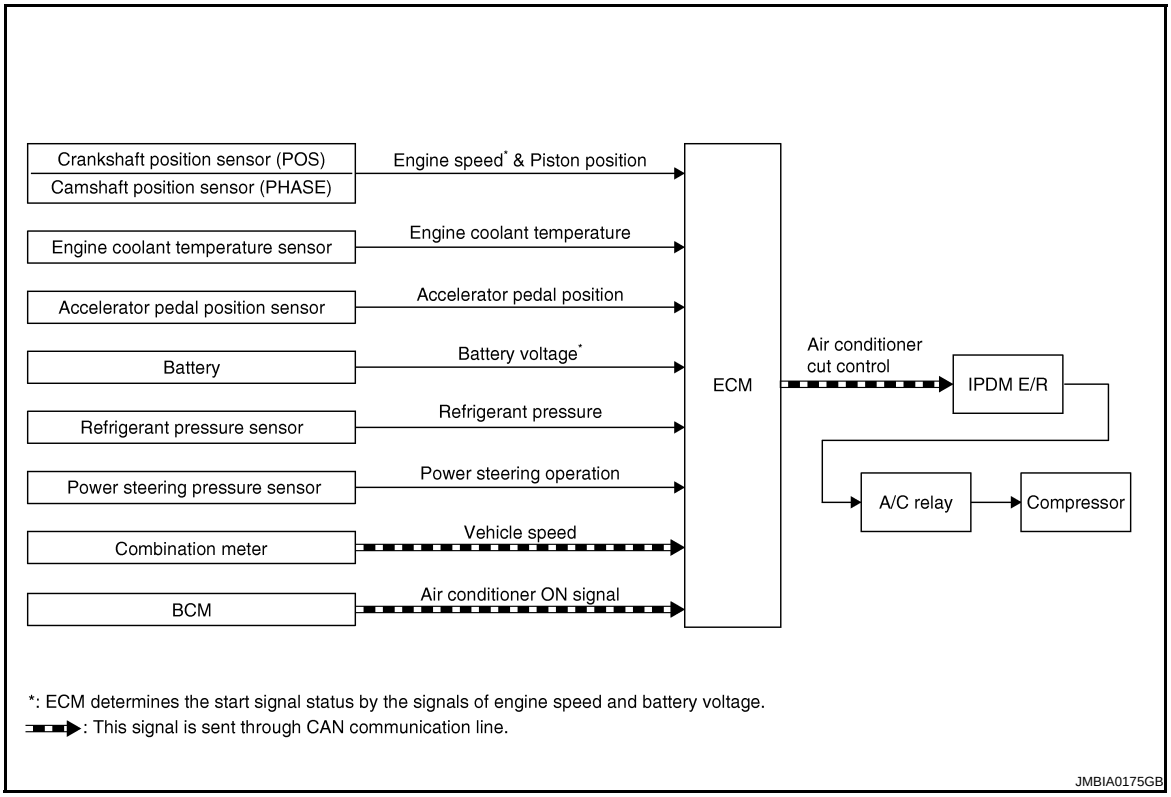
INFOID:0000000001179689

Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
Ignition signal	ECH-576, "Description"
Knock sensor	ECH-472, "Description"
Mass air flow sensor	ECH-116, "Description"
Park/neutral position (PNP) switch	ECH-263, "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585, "Description"

AIR CONDITIONING CUT CONTROL

System Diagram

INFOID:0000000001179690



System Description

INFOID:0000000001179691

INPUT/OUTPUT SIGNAL CHART

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

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

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

SYSTEM DESCRIPTION

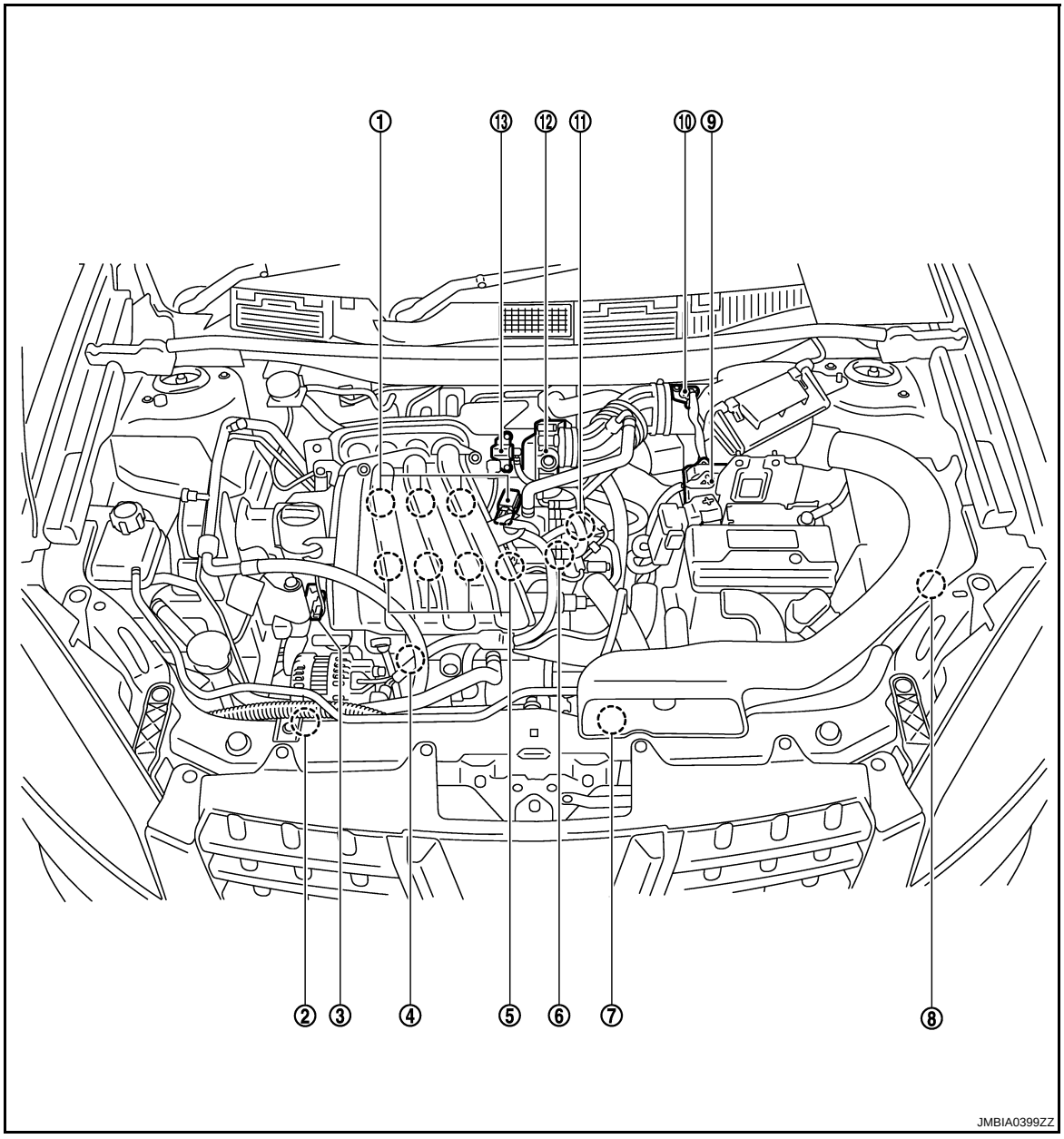
This system improves engine operation when the air conditioner is used.
Under the following conditions, the air conditioner is turned off.

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

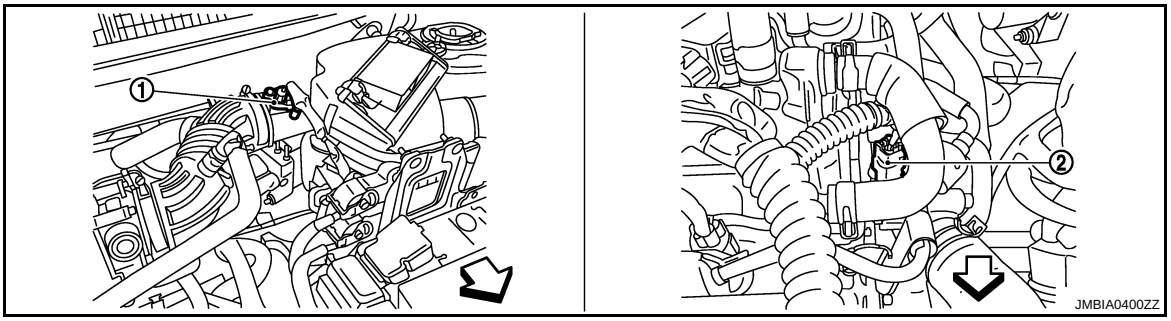
• When refrigerant pressure is excessively low or high.

Component Parts Location

INFOID:0000000001179692

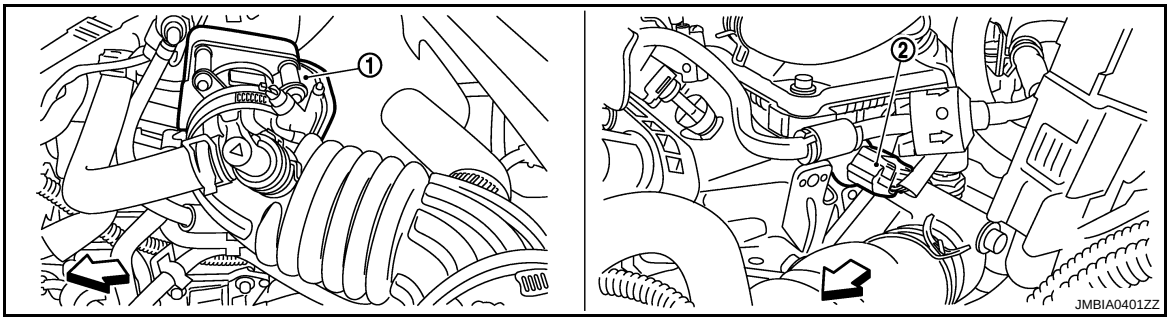


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



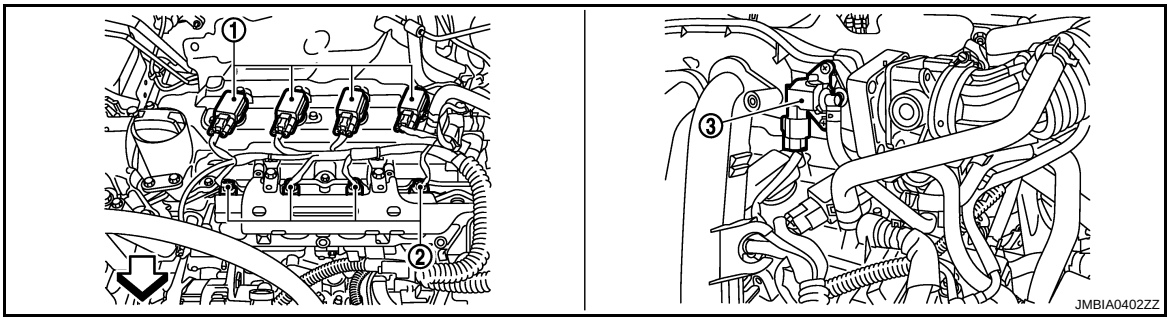
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



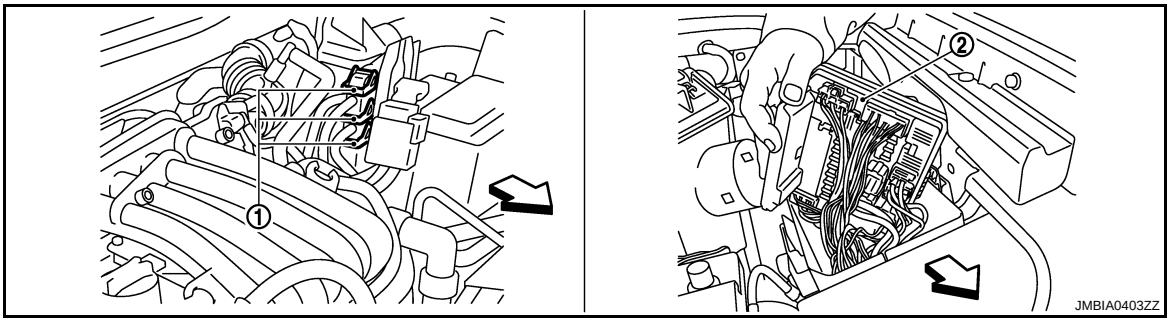
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



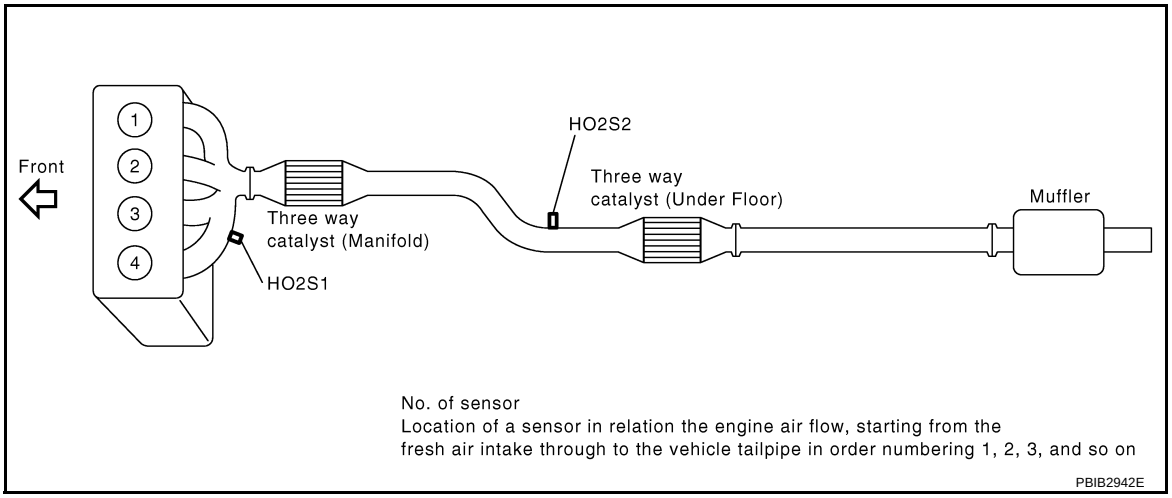
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

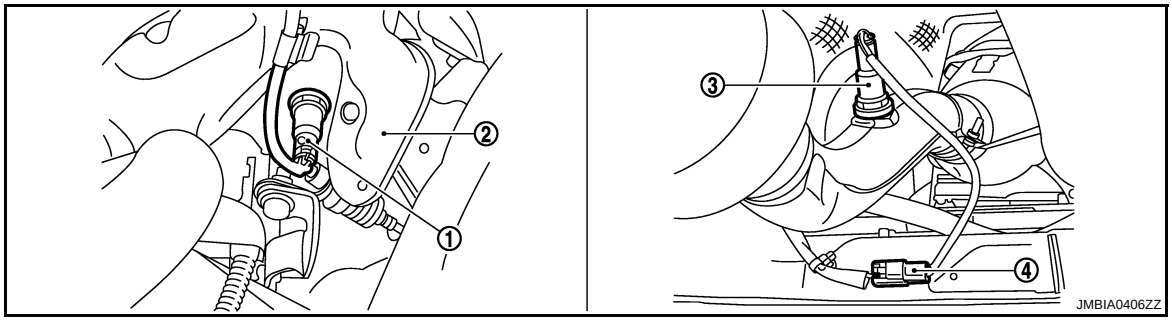
⇦ Vehicle front



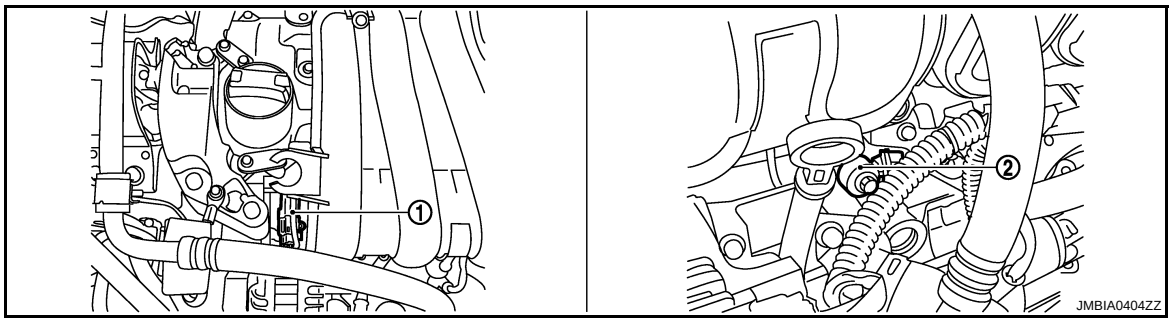
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

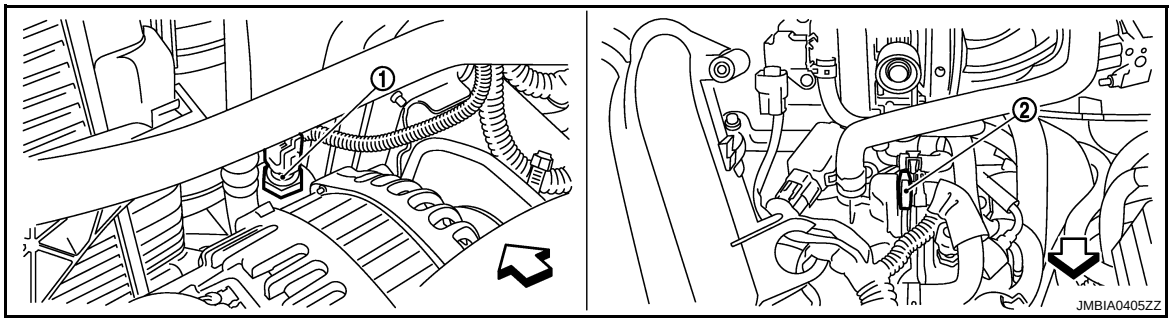




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

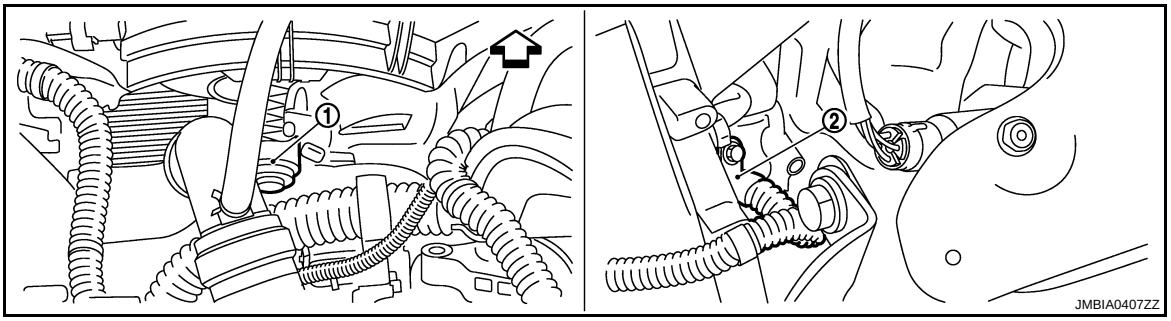


1. Intake valve timing control solenoid valve
2. Knock sensor



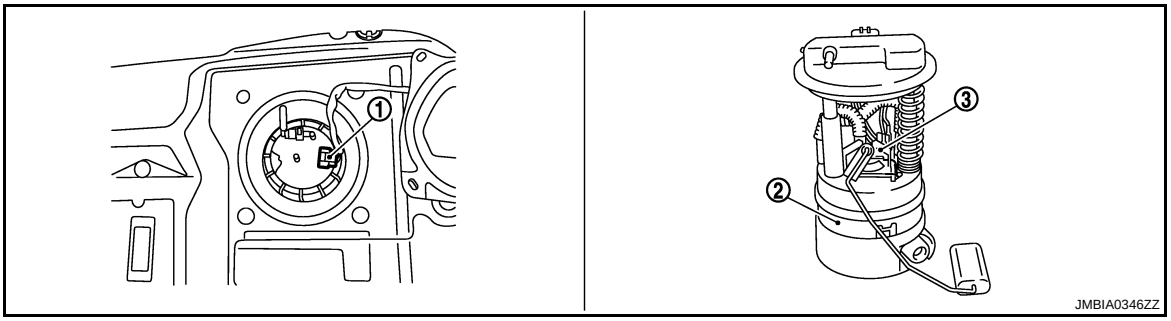
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

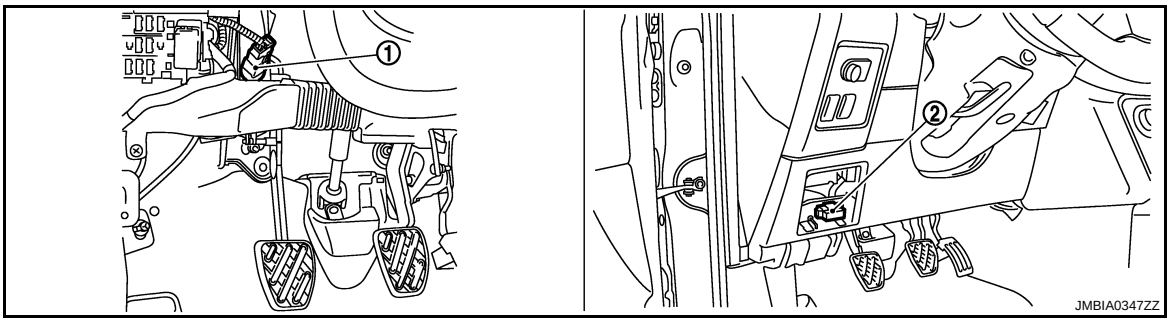


1. Cooling fan motor
2. Crankshaft position sensor (POS)

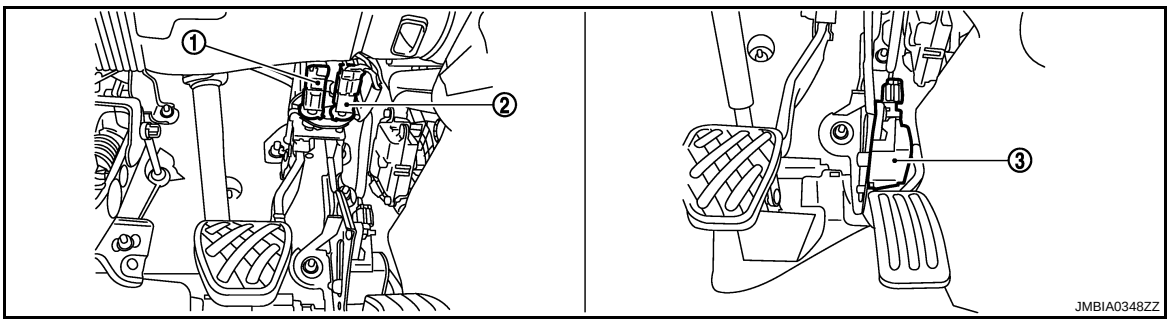
⇦ Vehicle front



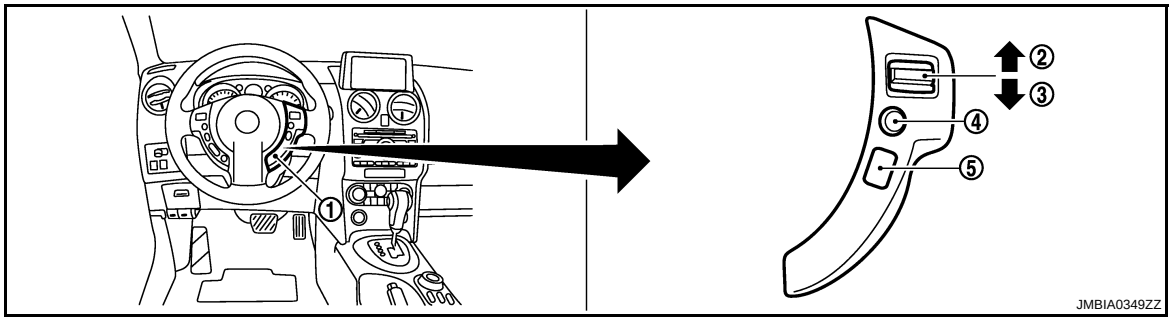
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

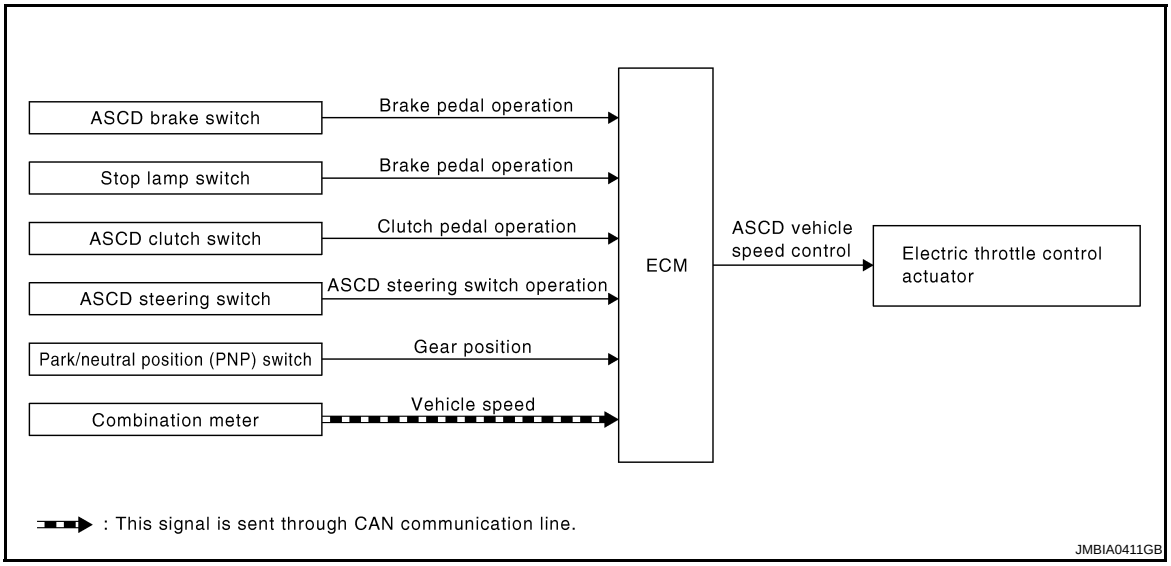
INFOID:0000000001179693

Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
EPS contro unit	STC-4, "System Description"
Refrigerant pressure sensor	ECH-583, "Description"
Vehicle speed sensor	ECH-585, "Description"

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram

INFOID:0000000001179694



System Description

INFOID:0000000001179695

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
ASCD brake switch	Brake pedal operation	ASCD vehicle speed control	Electric throttle control actuator
Stop lamp switch			
ASCD clutch switch	Clutch pedal operation		
ASCD steering switch	ASCD steering switch operation		
Park/neutral position switch	Gear position		
Combination meter*	Vehicle speed		

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

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.
Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 180 km/h (112 MPH).
ECM controls throttle angle of electric throttle control actuator to regulate engine speed.
Operation status of ASCD is indicated by CRUISE lamp and SET lamp in combination meter. If any malfunction occurs in ASCD system, it automatically deactivates control.
NOTE:
Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws.

SET OPERATION

Press MAIN switch. (The CRUISE lamp in combination meter illuminates.)
When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 180 km/h (112 MPH), press SET/COAST switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

If the RESUME/ACCELERATE switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.
And then ASCD will keep the new set speed.

CANCEL OPERATION

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

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed
- Clutch pedal is depressed or gear position is changed to neutral position.
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

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

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

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

COAST OPERATION

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

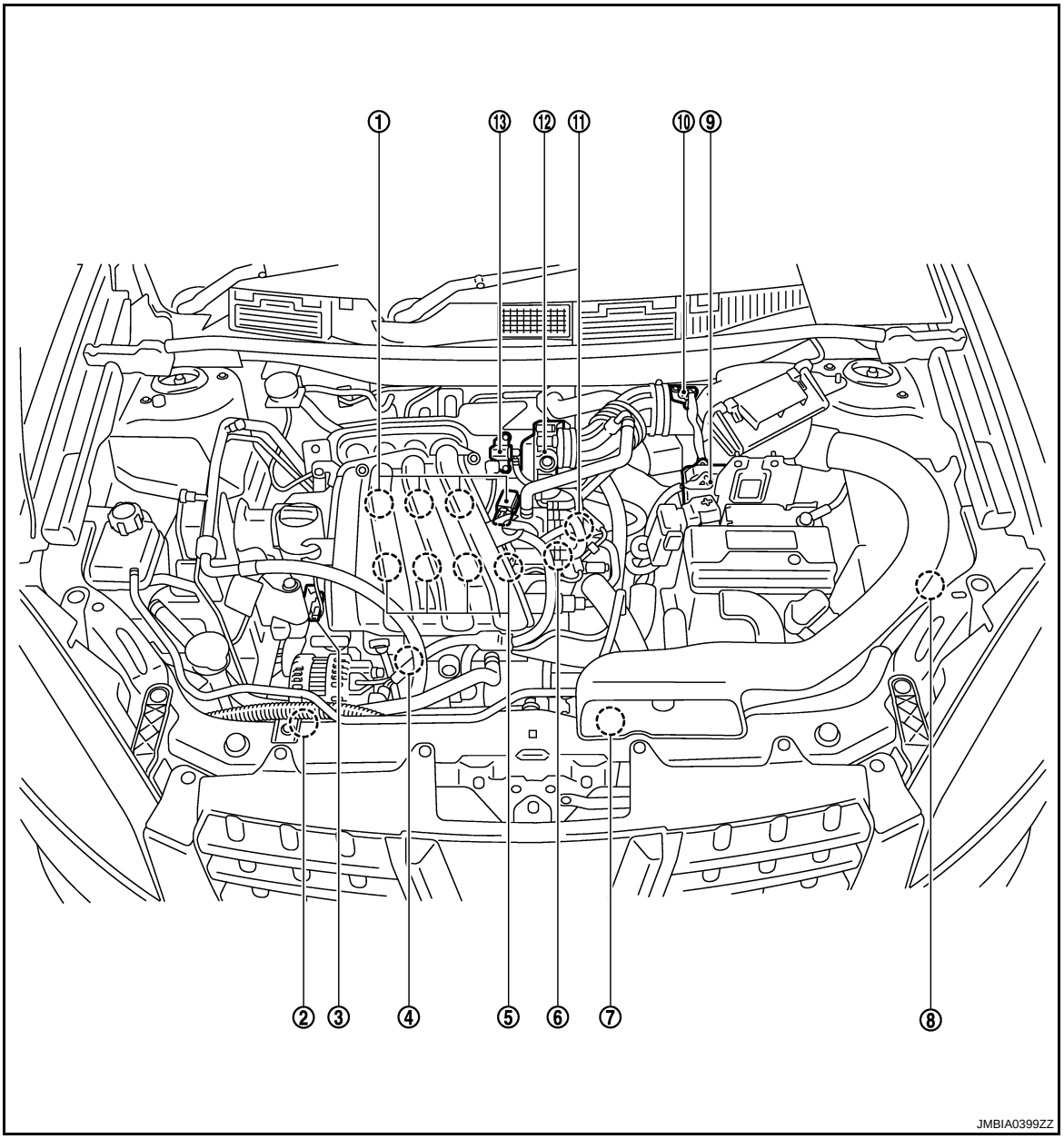
RESUME OPERATION

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

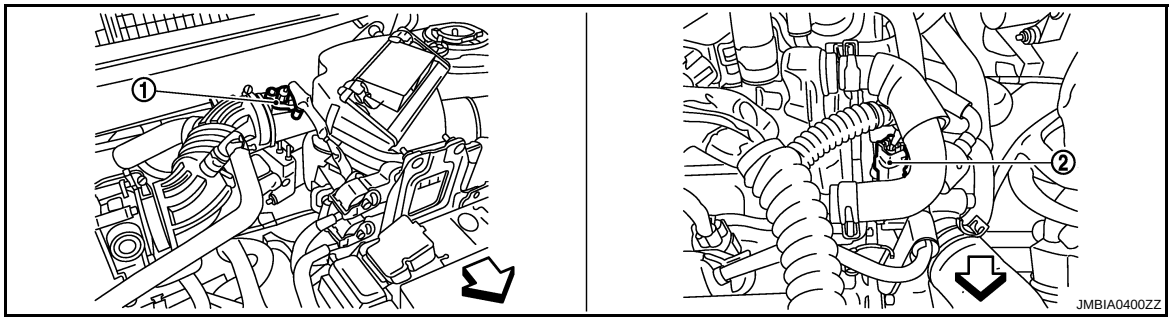
- Brake pedal is released
- Clutch pedal is released
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 180km/h (112 MPH)

Component Parts Location

INFOID:0000000001179696

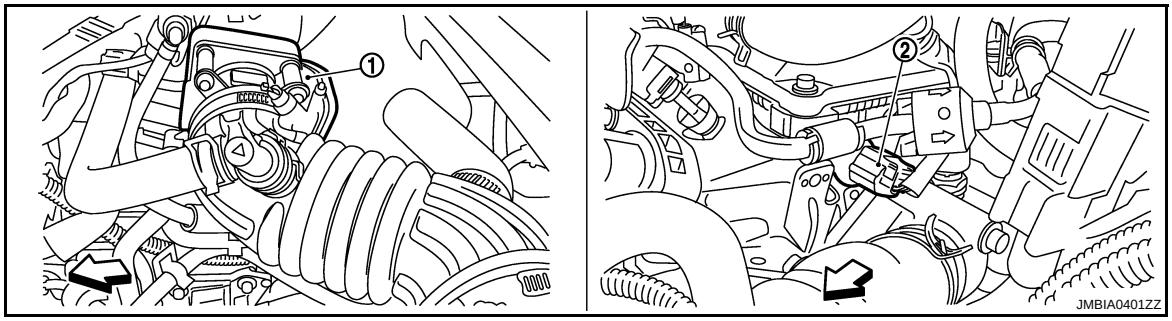


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



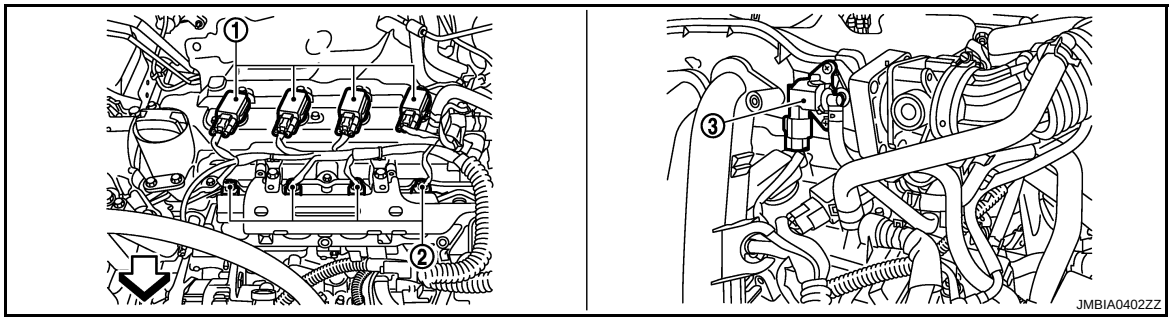
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



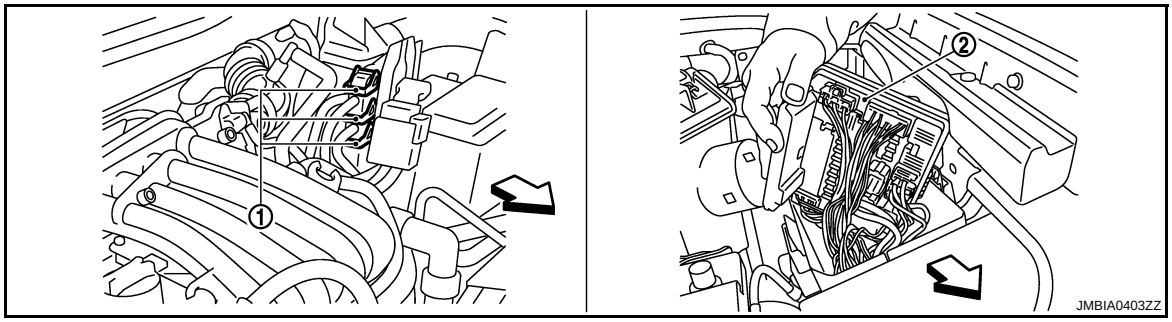
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



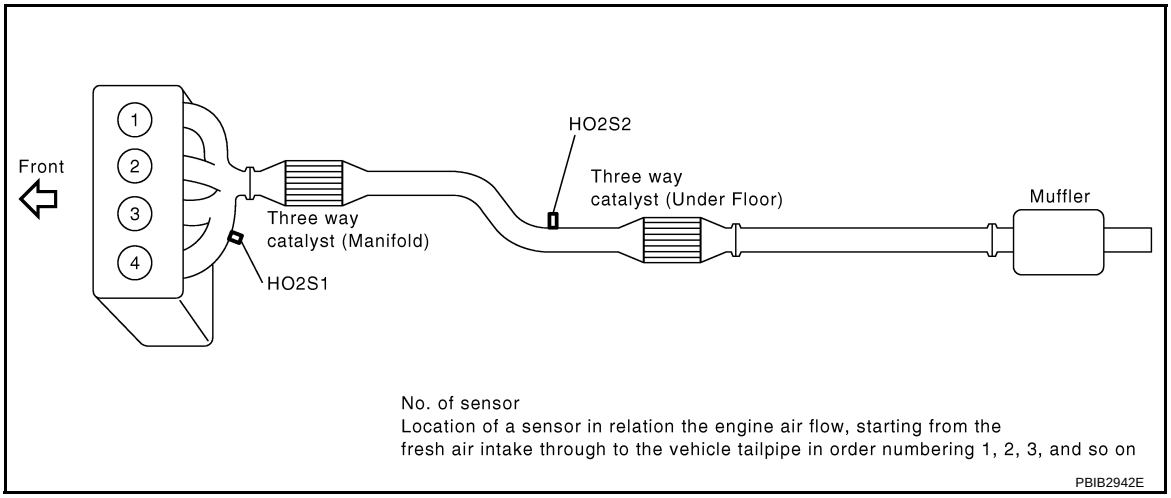
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

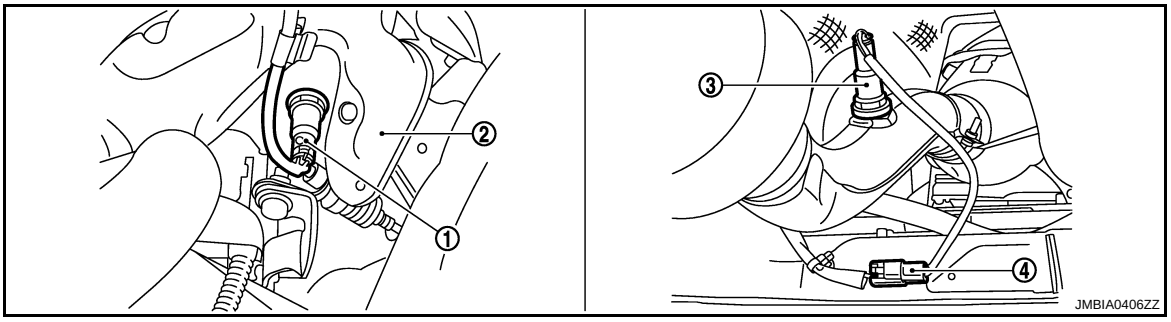
⇦ Vehicle front



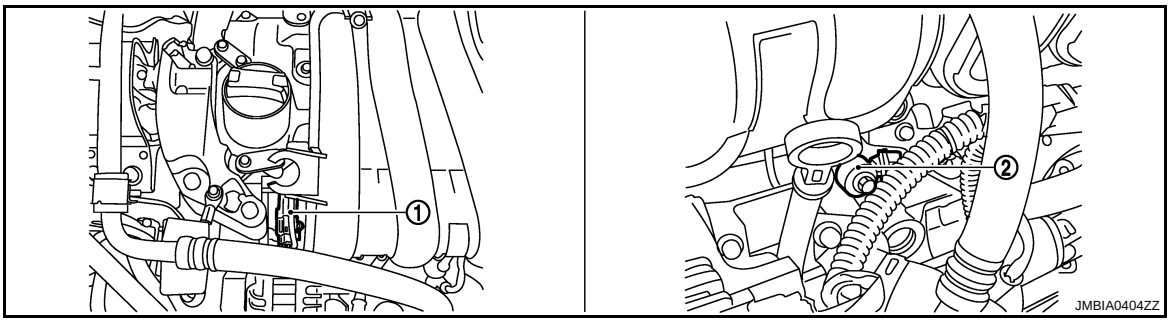
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

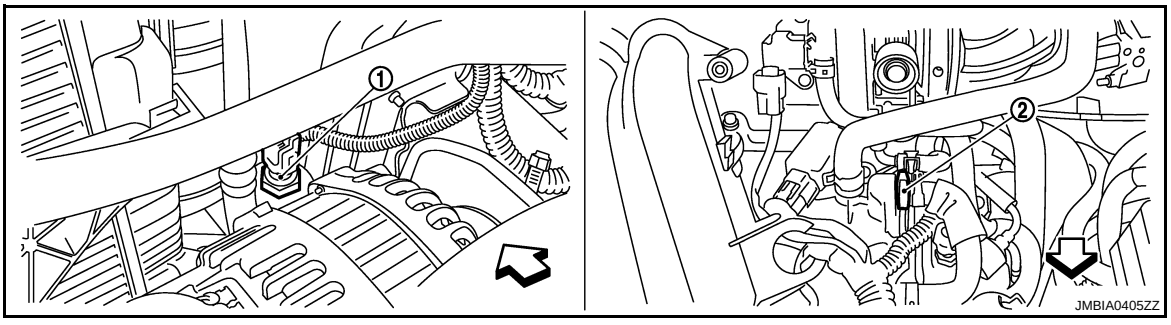




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

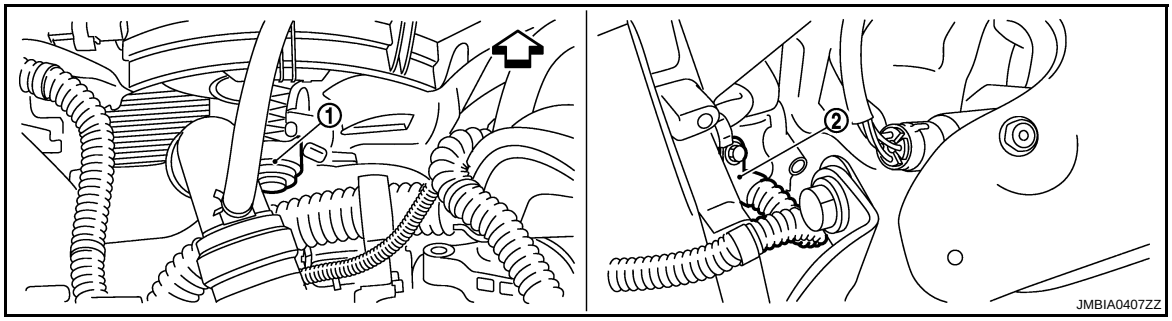


1. Intake valve timing control solenoid valve
2. Knock sensor



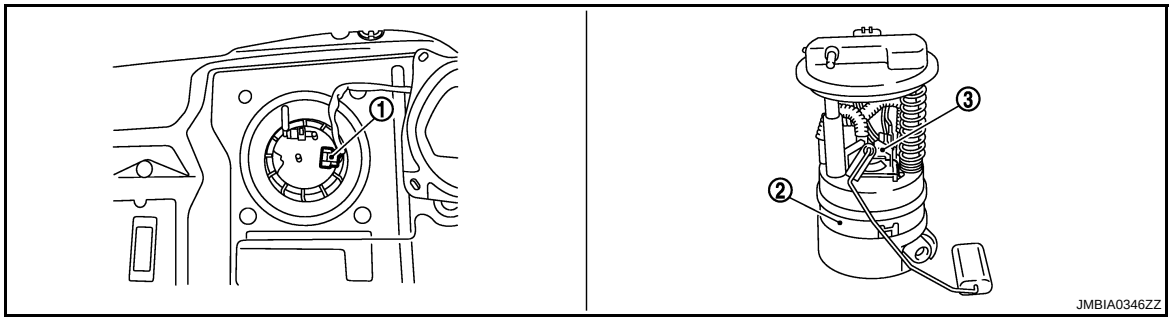
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

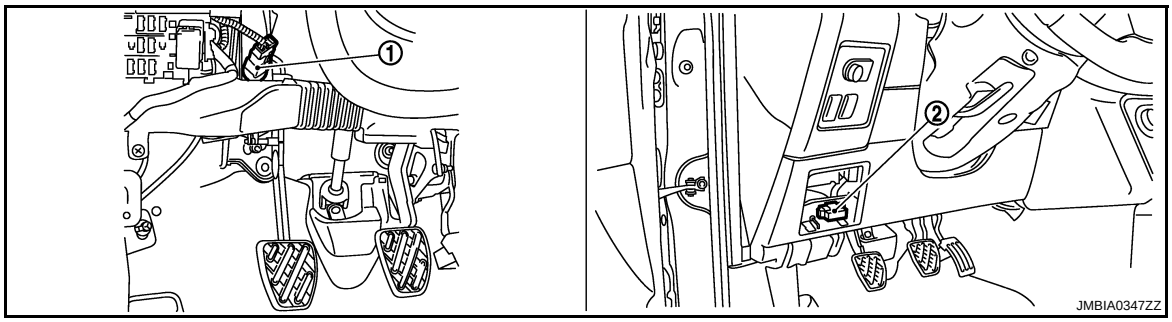


1. Cooling fan motor
2. Crankshaft position sensor (POS)

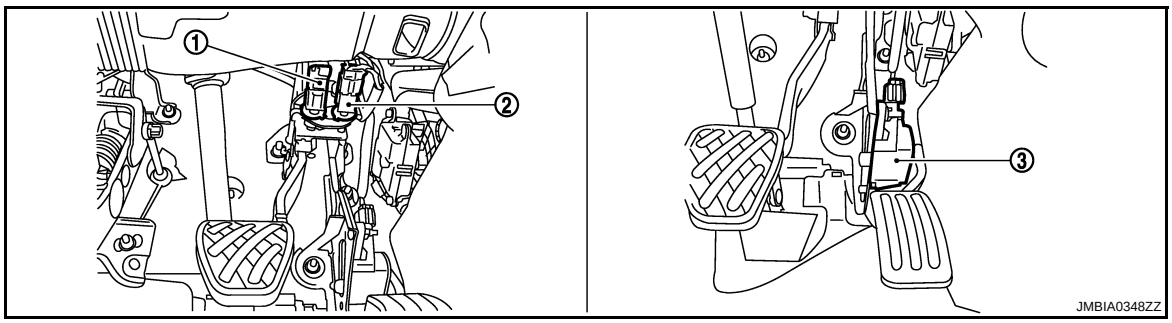
⇦ Vehicle front



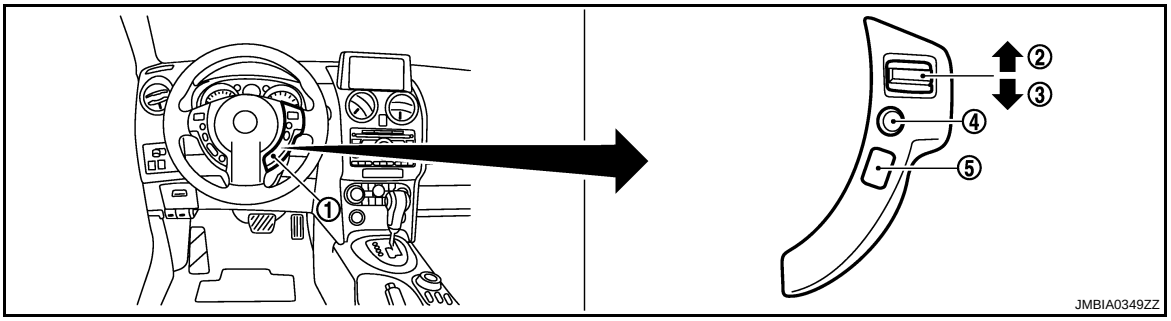
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

INFOID:0000000001179697

Component	Reference
ASCD steering switch	ECH-252, "Description"
ASCD clutch switch	ECH-541, "Description"
ASCD brake switch	ECH-282, "Description"
ASCD indicator	ECH-545, "Description"
Stop lamp switch	ECH-525, "Description"
Electric throttle control actuator	ECH-488, "Description"

CAN COMMUNICATION

System Description

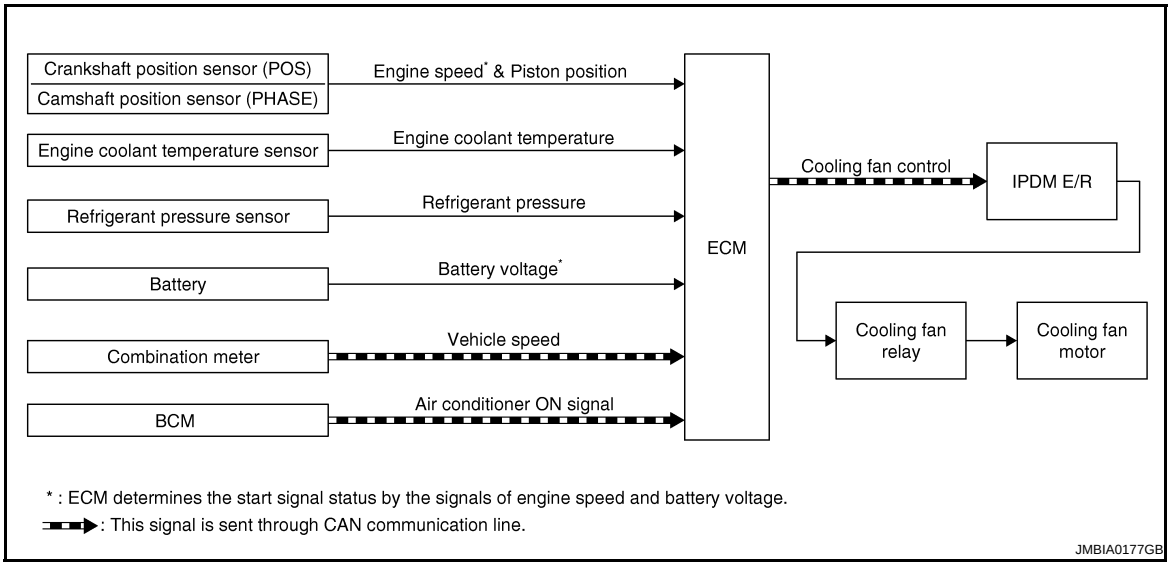
INFOID:0000000001179698

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information and links with other control units during operation (not independent). In CAN communication, control units are connected with 2 communication lines (CAN H line, CAN L line) allowing a high rate of information transmission with less wiring. Each control unit transmits/receives data but selectively reads required data only.
Refer to LAN-28, "CAN Communication Signal Chart", about CAN communication for detail.

COOLING FAN CONTROL

System Diagram

INFOID:0000000001179699



System Description

INFOID:0000000001179700

INPUT/OUTPUT SIGNAL CHART

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

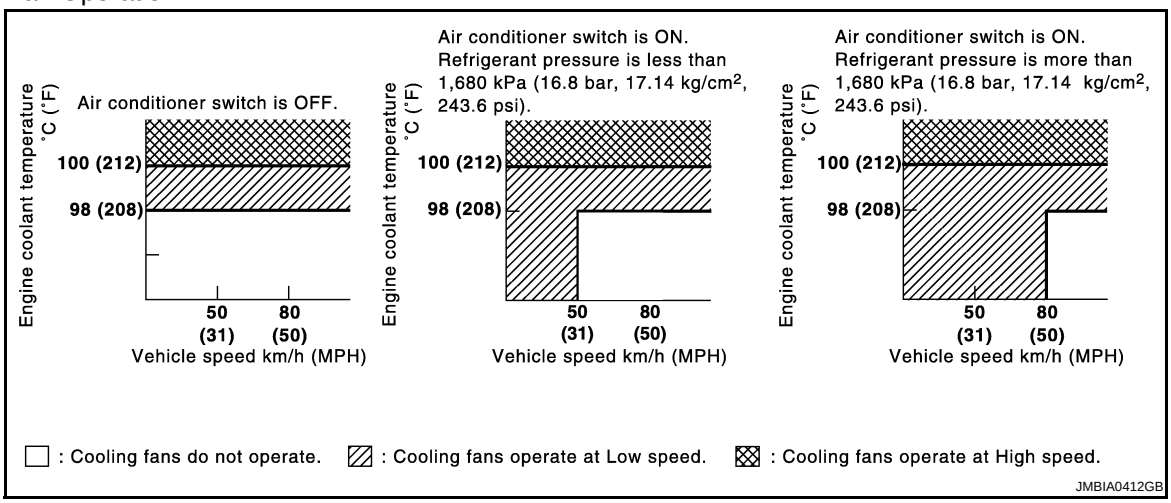
*1: The ECM determines the start signal status by the signals of engine speed and battery voltage.

*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



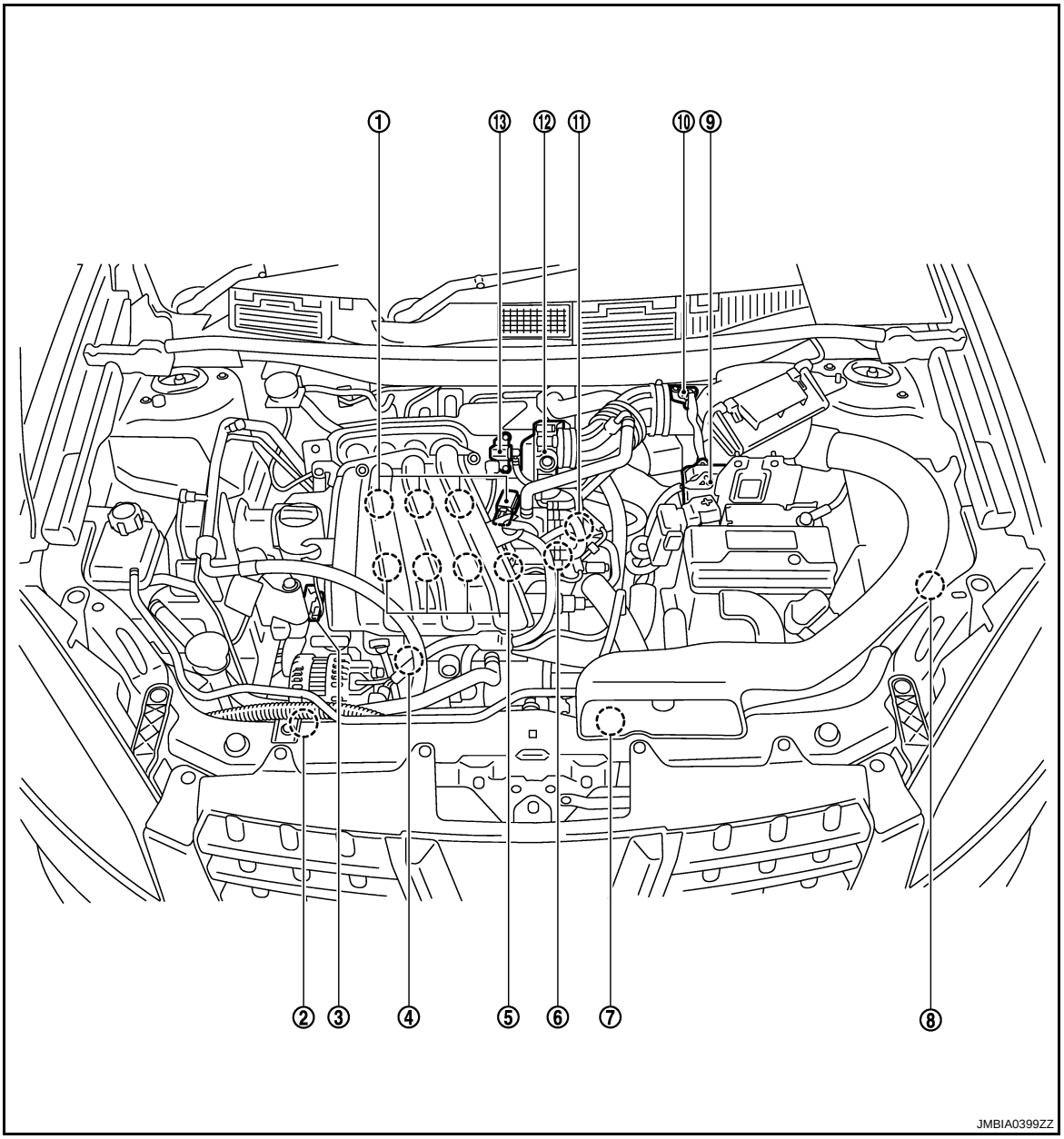
Cooling Fan Relay Operation

The ECM controls cooling fan relays through CAN communication line.

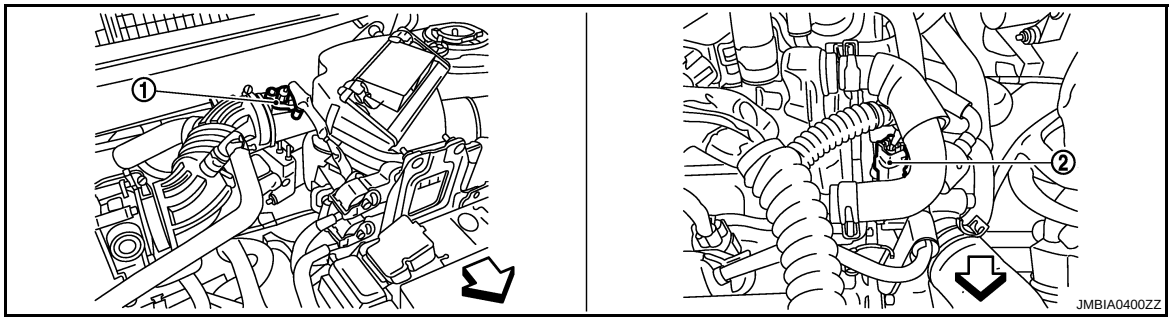
Cooling fan speed	Cooling fan relay	
	1	2
Stop (OFF)	OFF	OFF
Low (LOW)	ON	OFF
High (HI)	OFF	ON

Component Parts Location

INFOID:0000000001179701

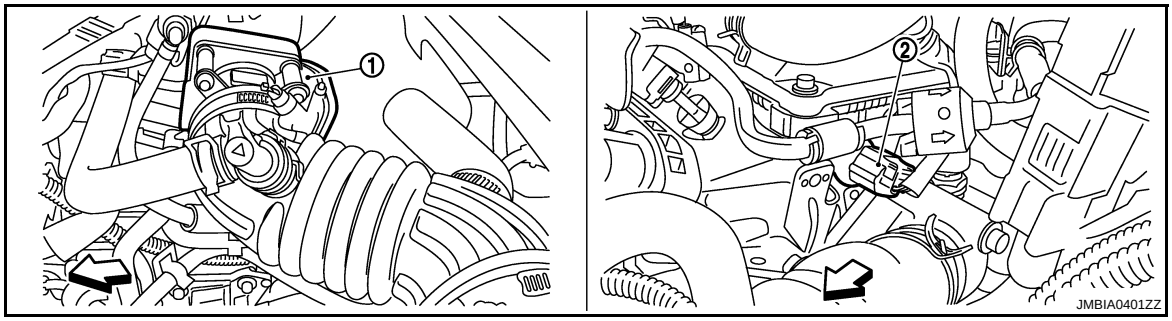


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



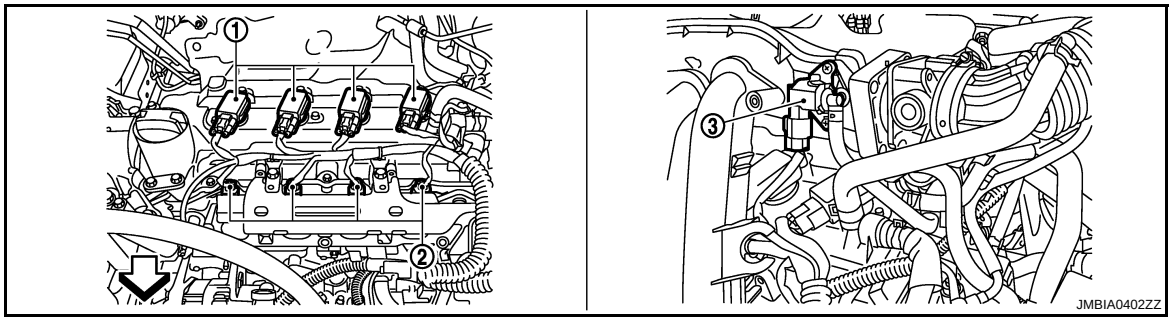
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



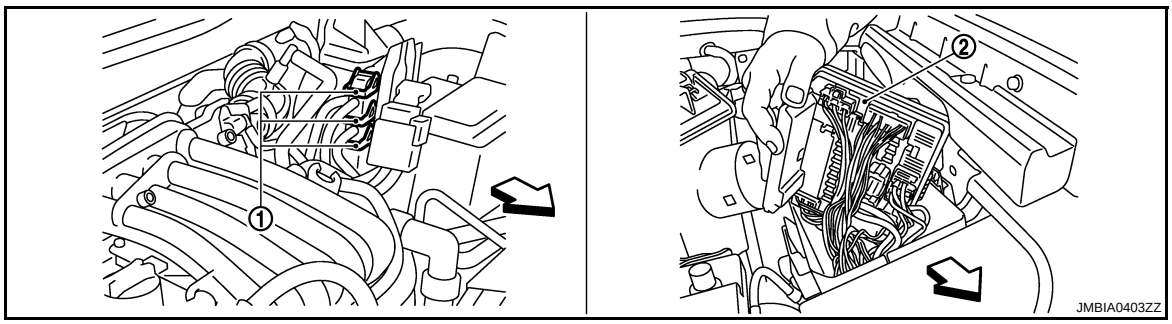
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



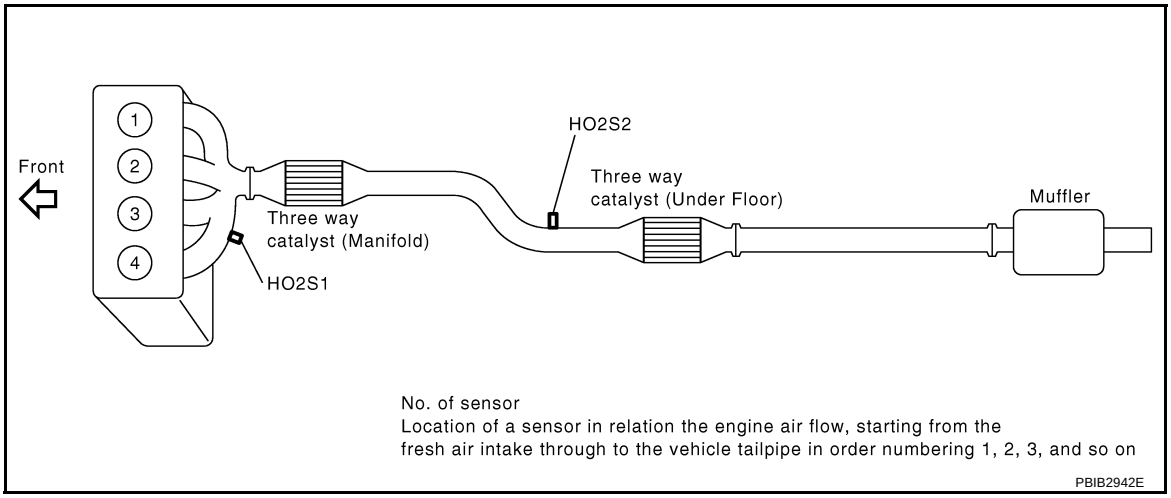
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

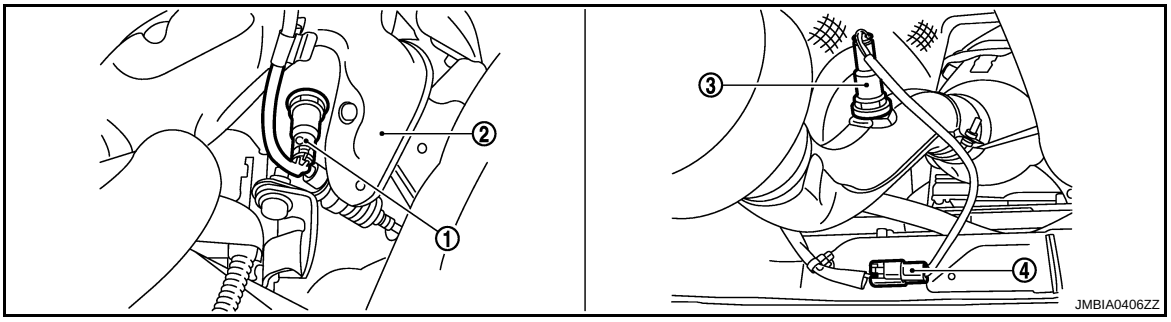
⇦ Vehicle front



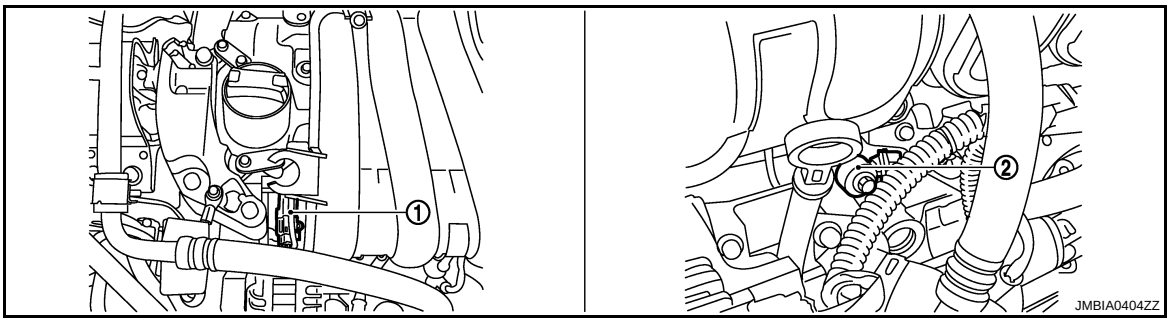
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

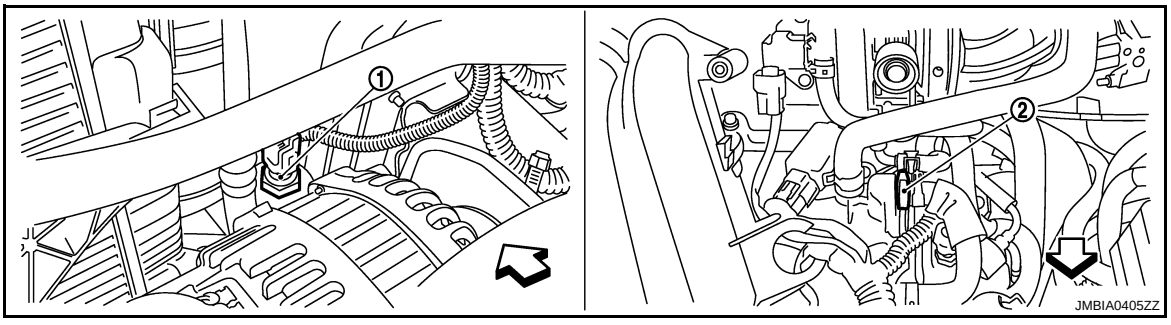




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

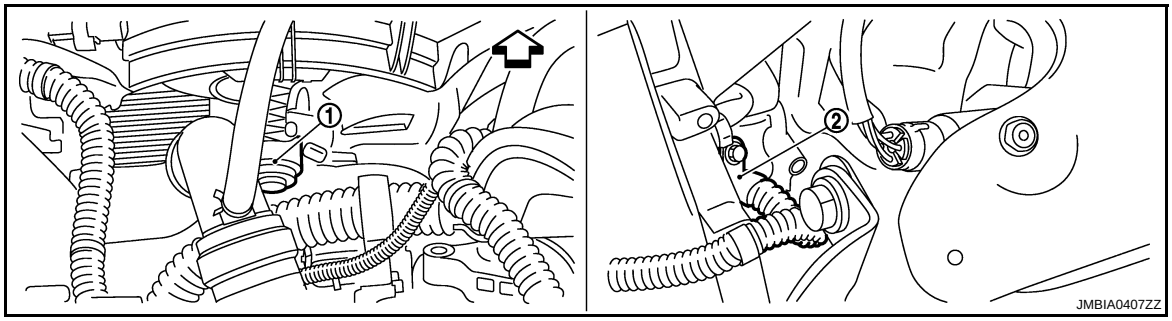


1. Intake valve timing control solenoid valve
2. Knock sensor



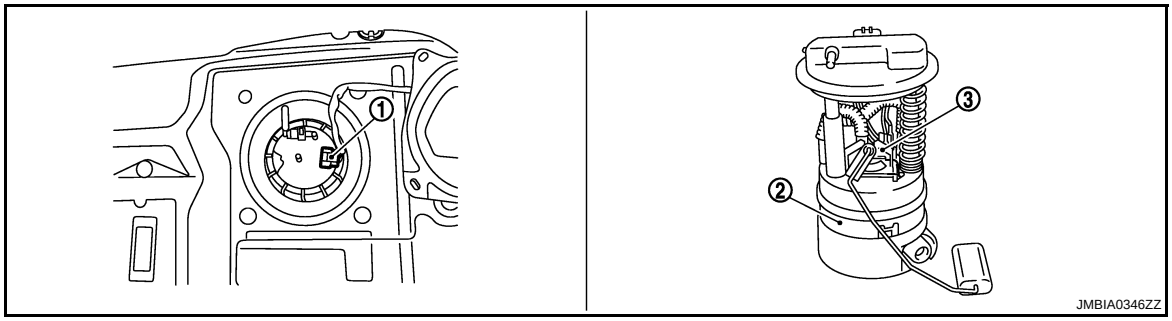
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

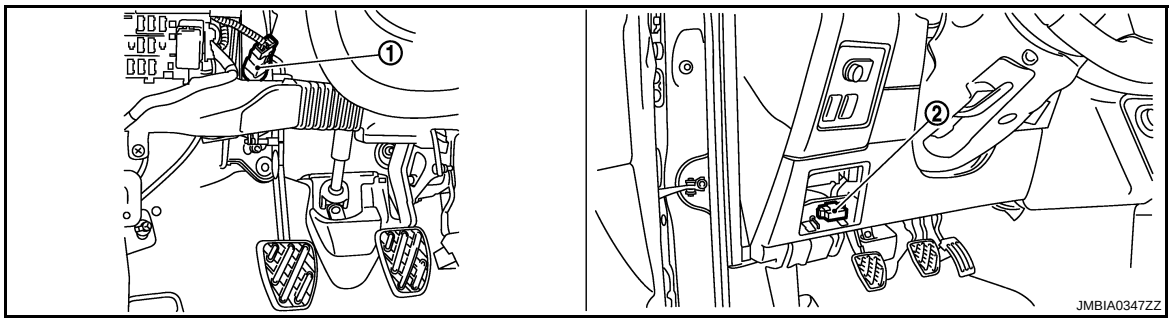


1. Cooling fan motor
2. Crankshaft position sensor (POS)

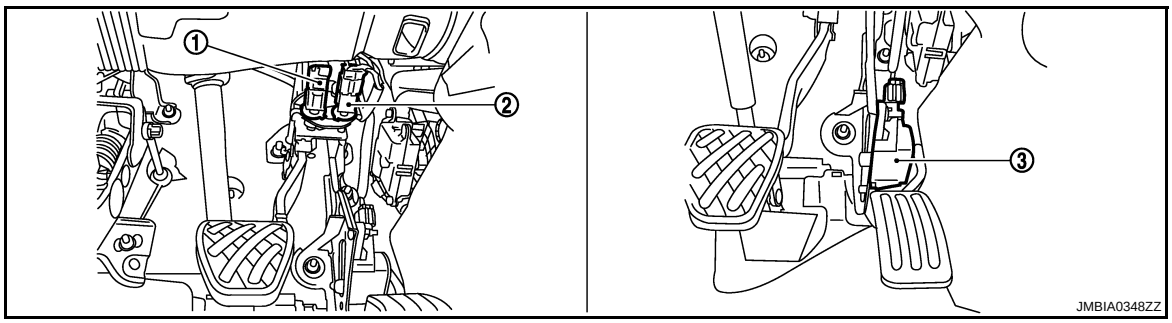
⇦ Vehicle front



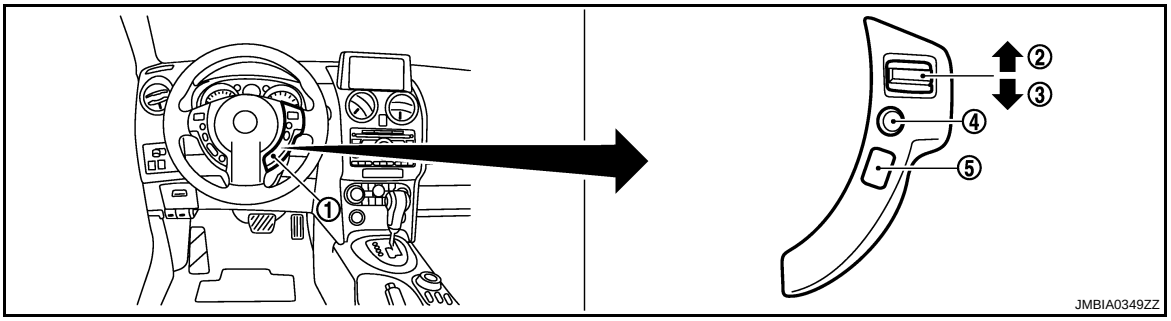
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

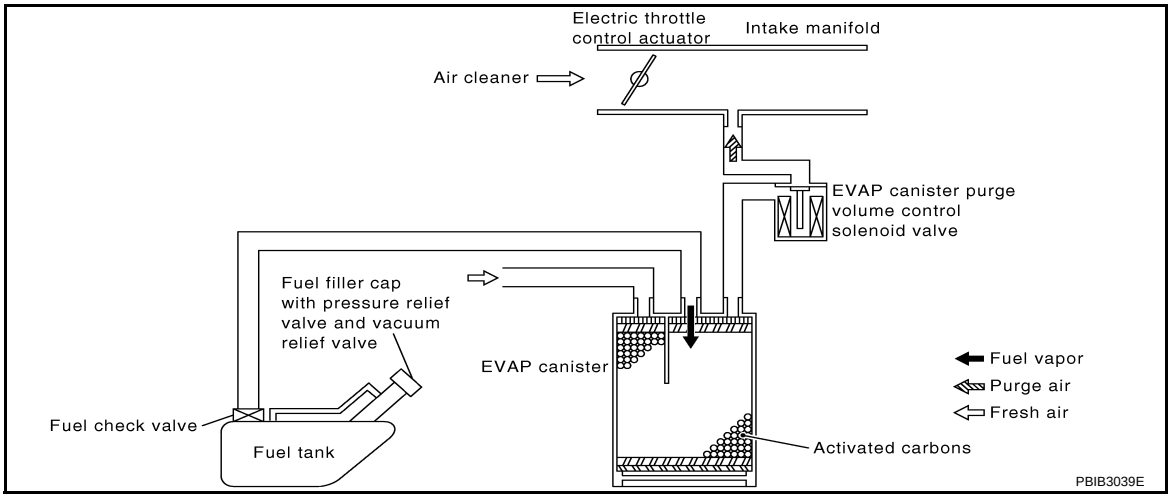
INFOID:0000000001179702

Component	Reference
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Cooling fan motor	ECH-395, "System Description"
Engine coolant temperature sensor	ECH-450, "Description"
Refrigerant pressure sensor	ECH-583, "Description"

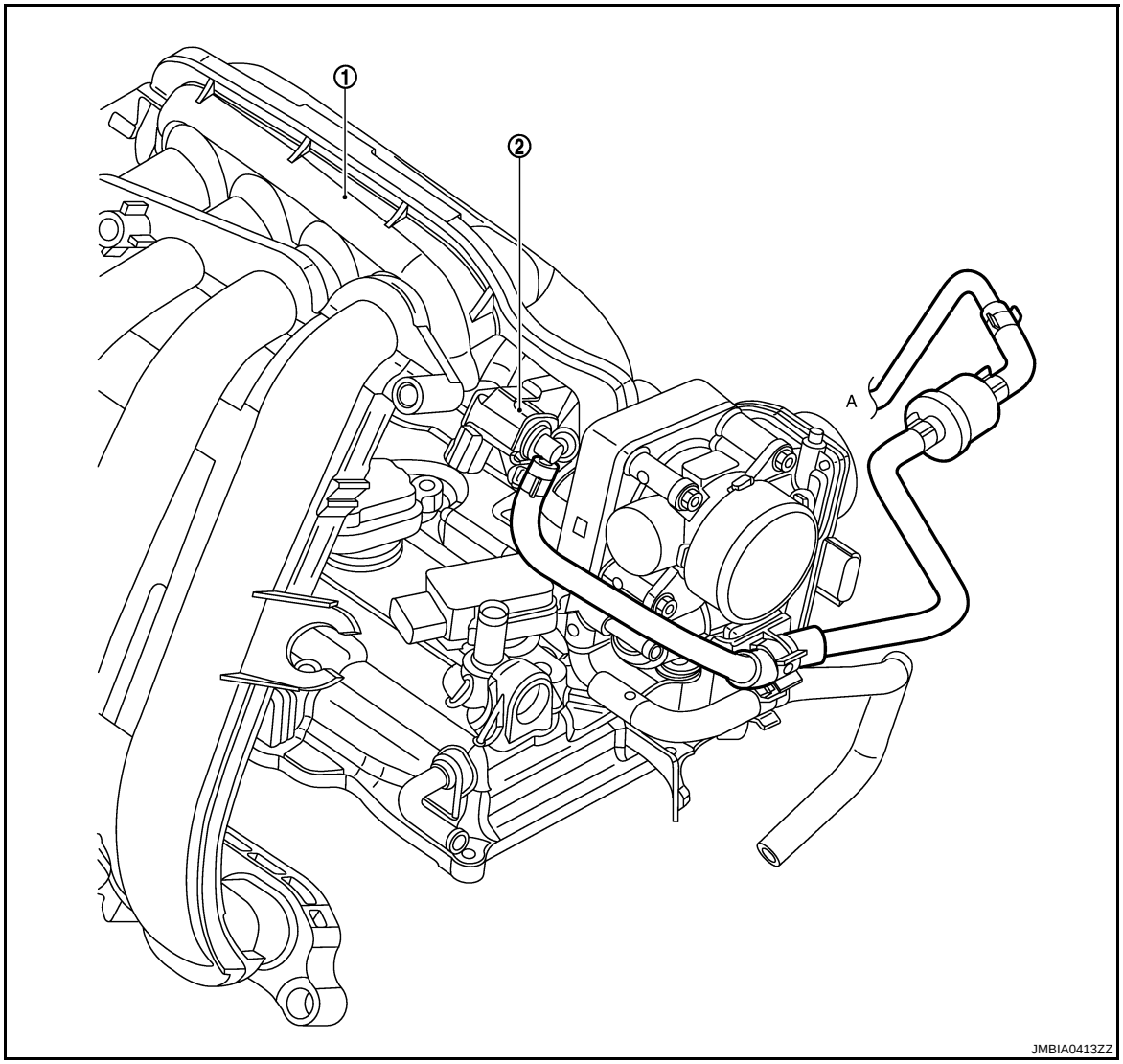
EVAPORATIVE EMISSION SYSTEM

System Diagram

INFOID:0000000001179703



EVAPORATIVE EMISSION LINE DRAWING



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

A. To EVAP canister

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

System Description

INFOID:0000000001179704

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*1		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Heated oxygen sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)		
Combination meter*2	Vehicle speed		

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

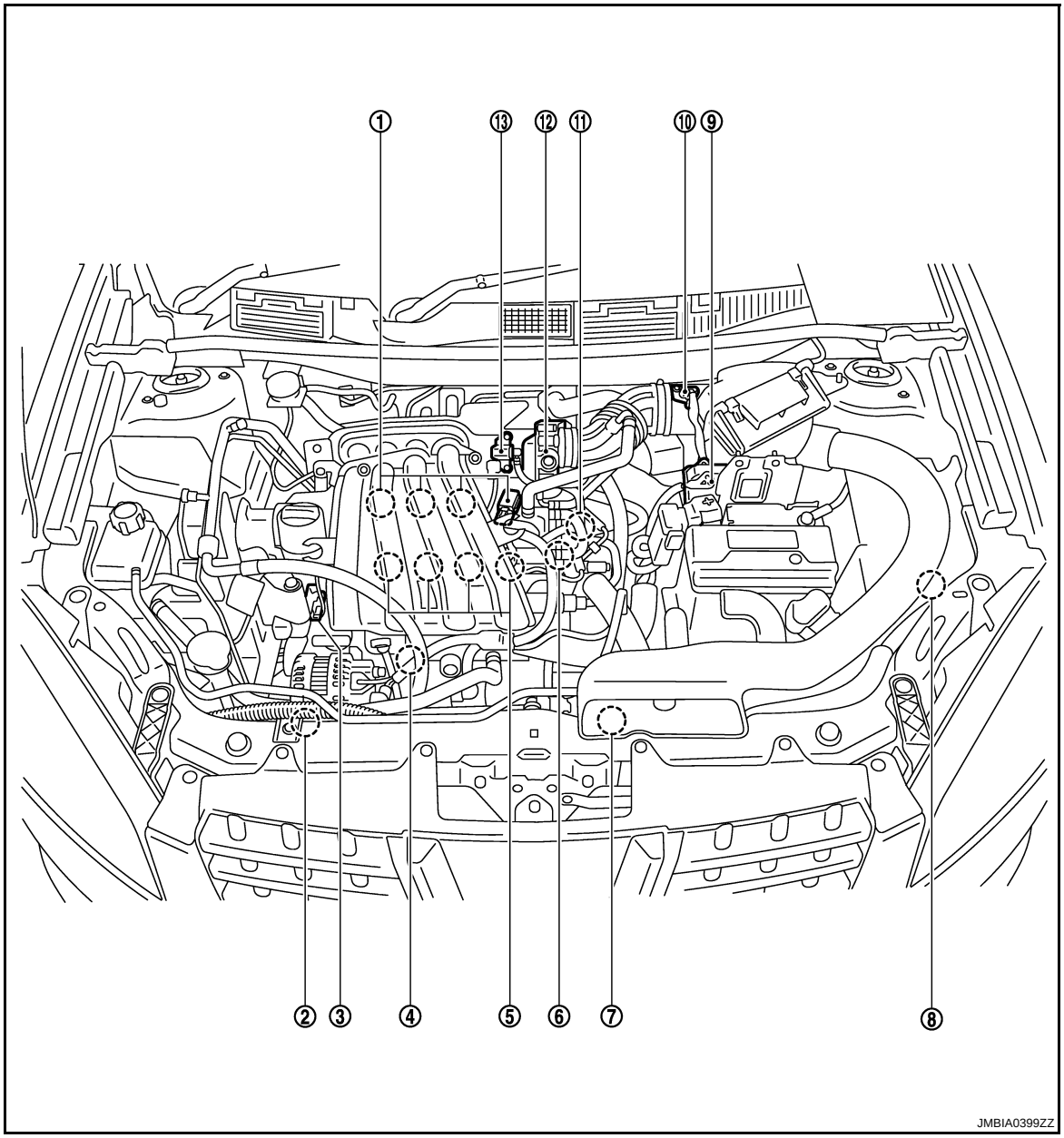
*2: This signal is sent to the ECM through CAN communication line.

SYSTEM DESCRIPTION

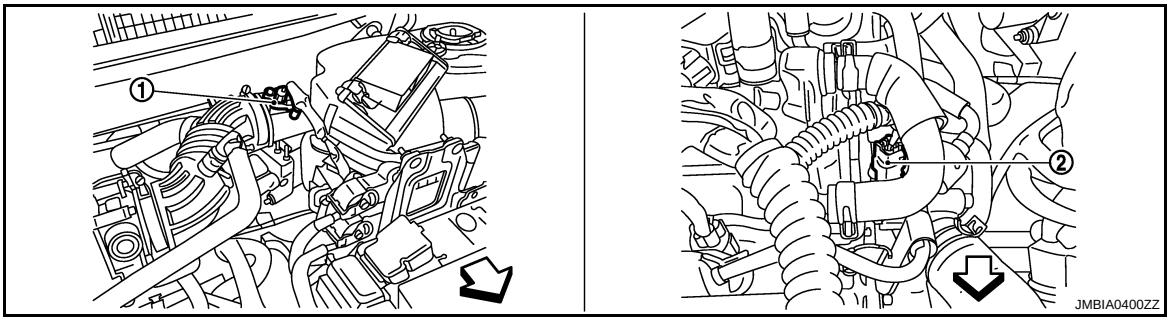
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon 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.

Component Parts Location

INFOID:0000000001179705

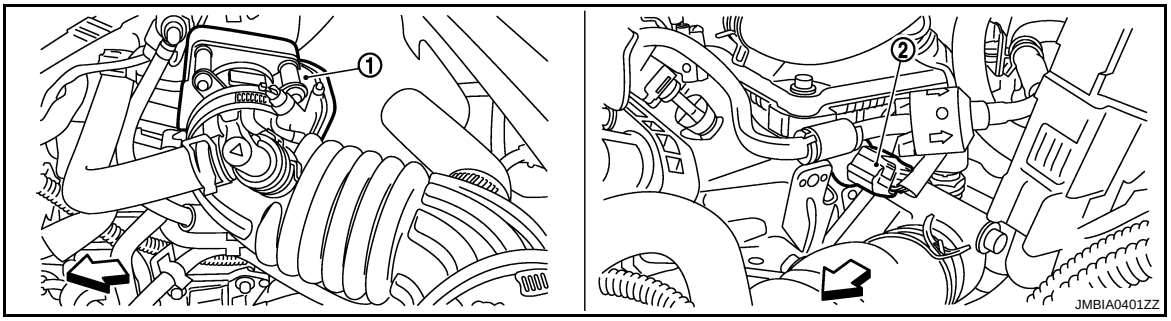


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



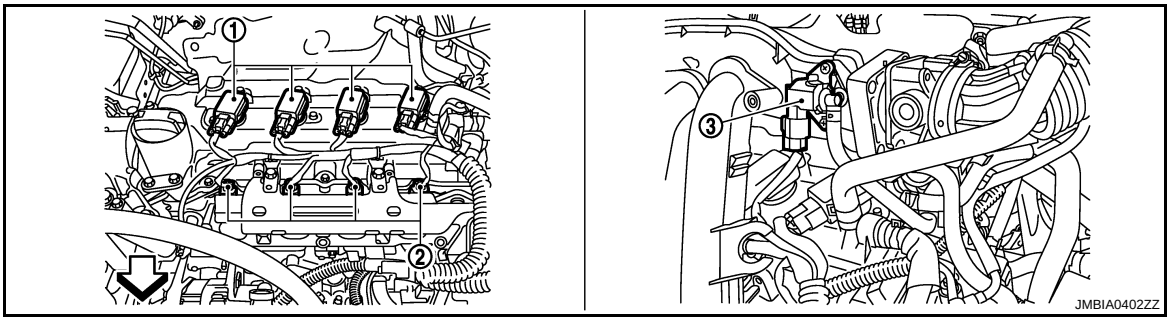
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



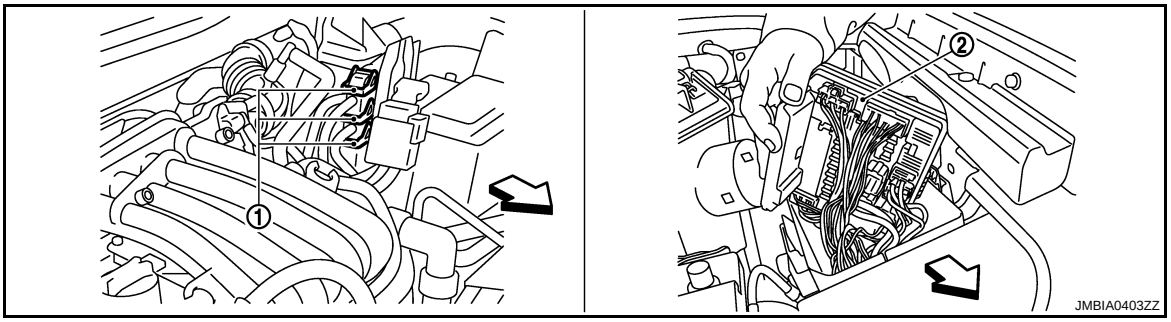
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



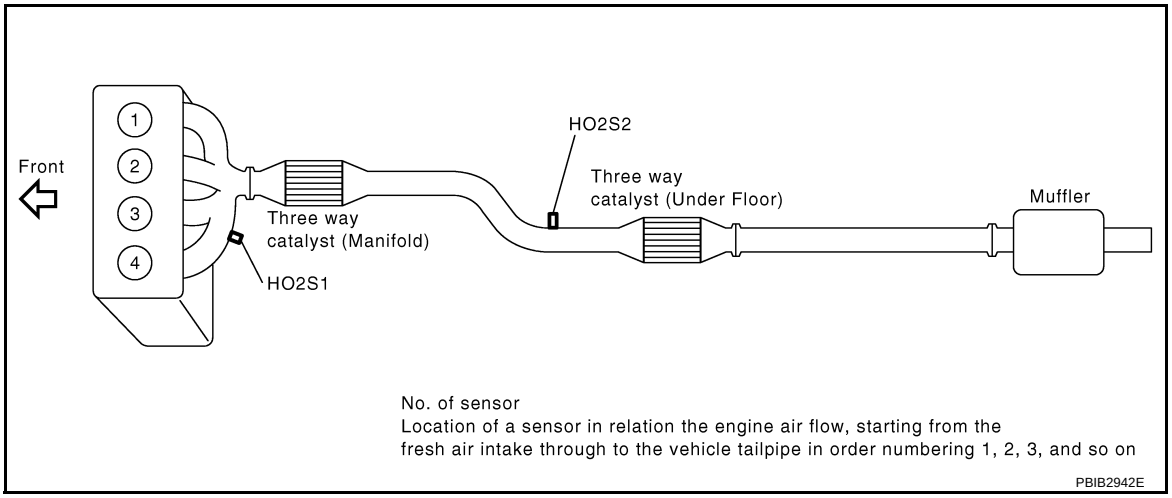
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

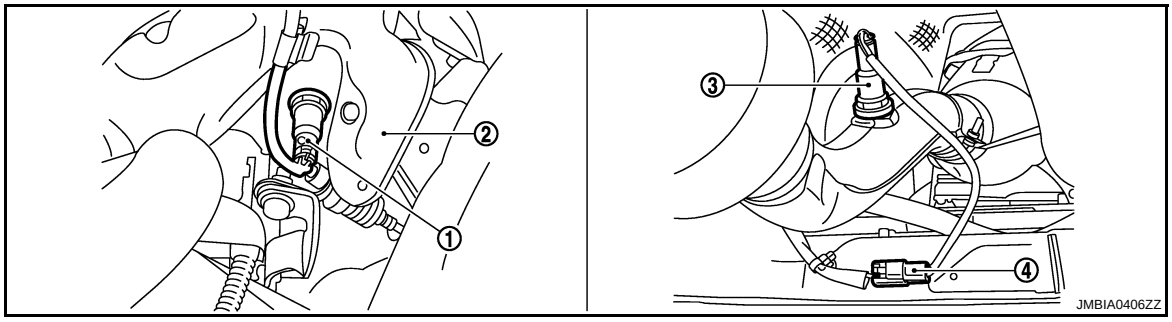
⇦ Vehicle front



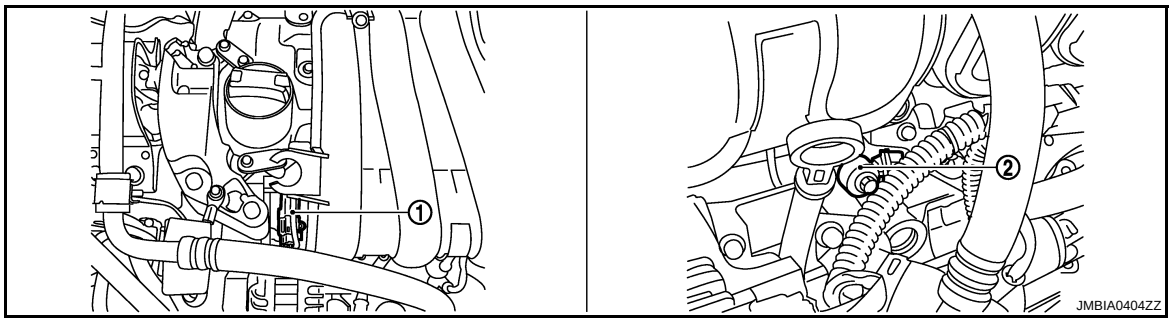
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

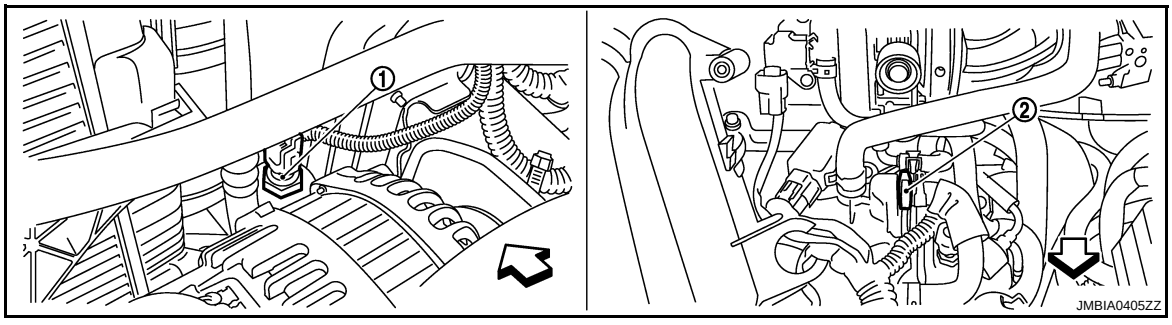




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

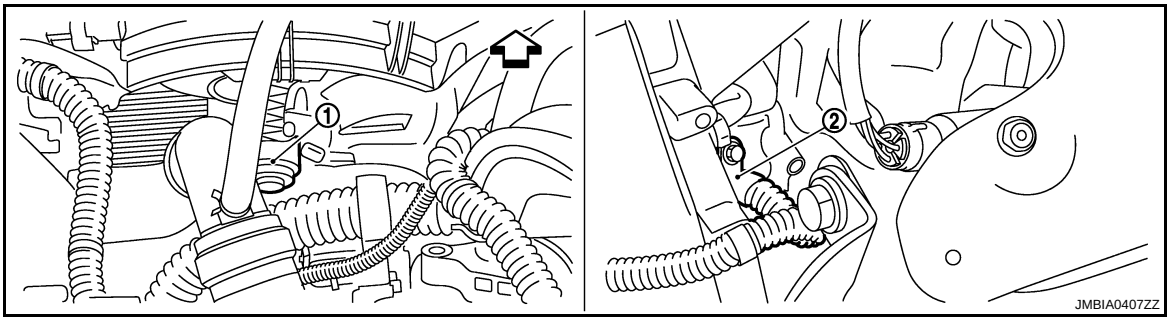


1. Intake valve timing control solenoid valve
2. Knock sensor



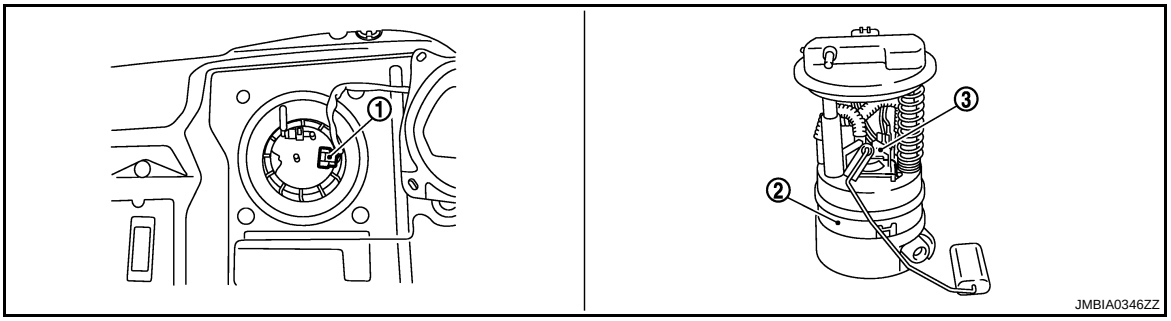
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

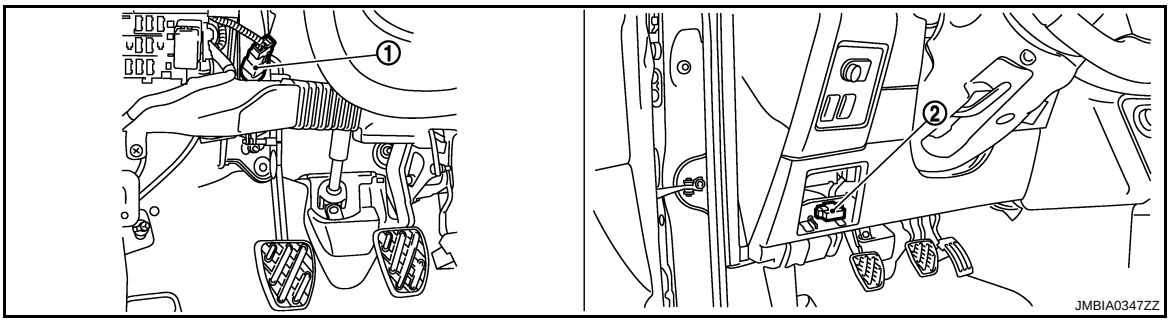


1. Cooling fan motor
2. Crankshaft position sensor (POS)

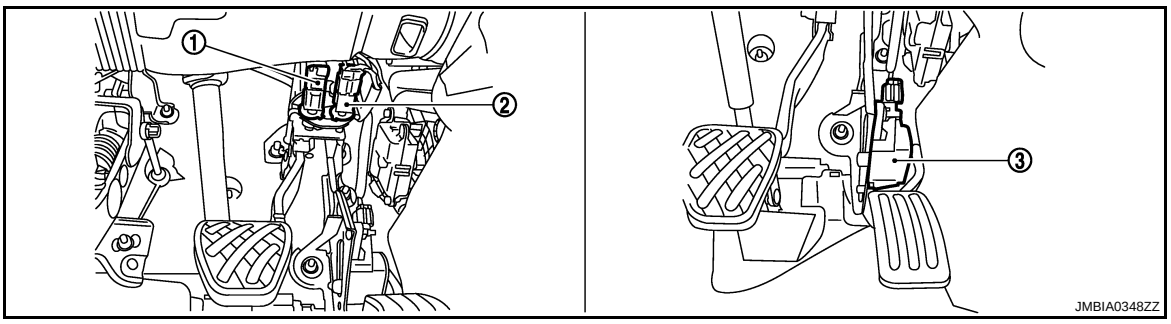
⇦ Vehicle front



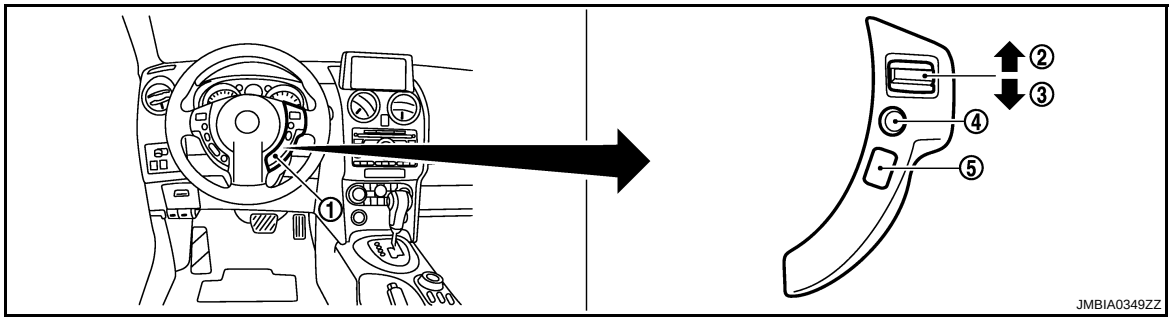
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

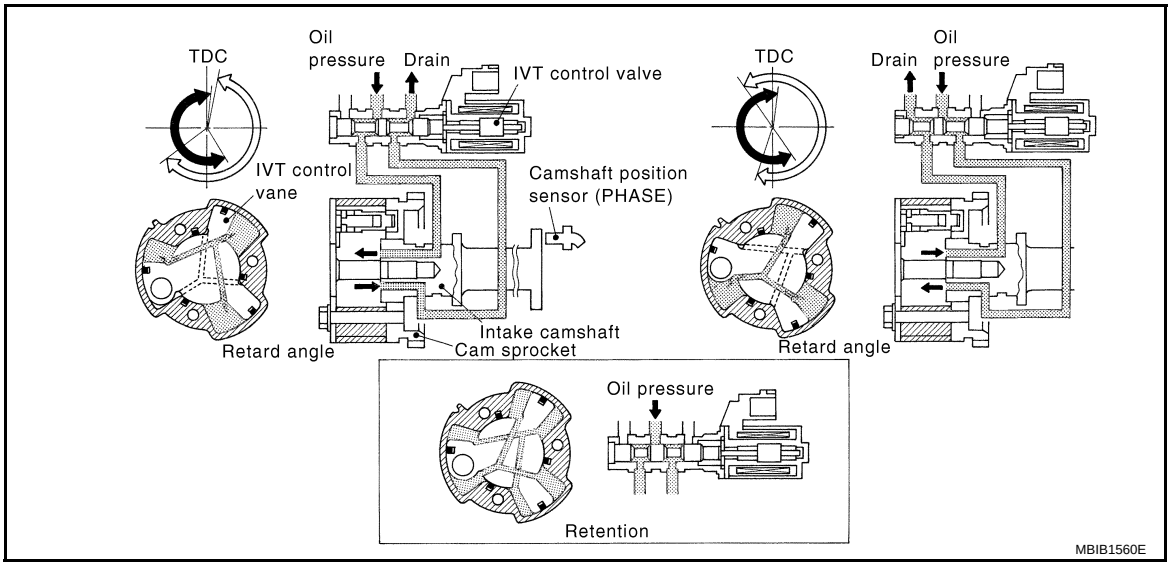
INFOID:0000000001179706

Component	Reference
Accelerator pedal position sensor	ECH-527, "Description"
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
EVAP canister purge volume control solenoid valve	ECH-550, "Description"
Heated oxygen sensor 1	ECH-456, "Description"
Mass air flow sensor	ECH-445, "Description"
Throttle position sensor	ECH-453, "Description"
Vehicle speed sensor	ECH-585, "Description"

INTAKE VALVE TIMING CONTROL

System Diagram

INFOID:0000000001179707



System Description

INFOID:0000000001179708

INPUT/OUTPUT SIGNAL CHART

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

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

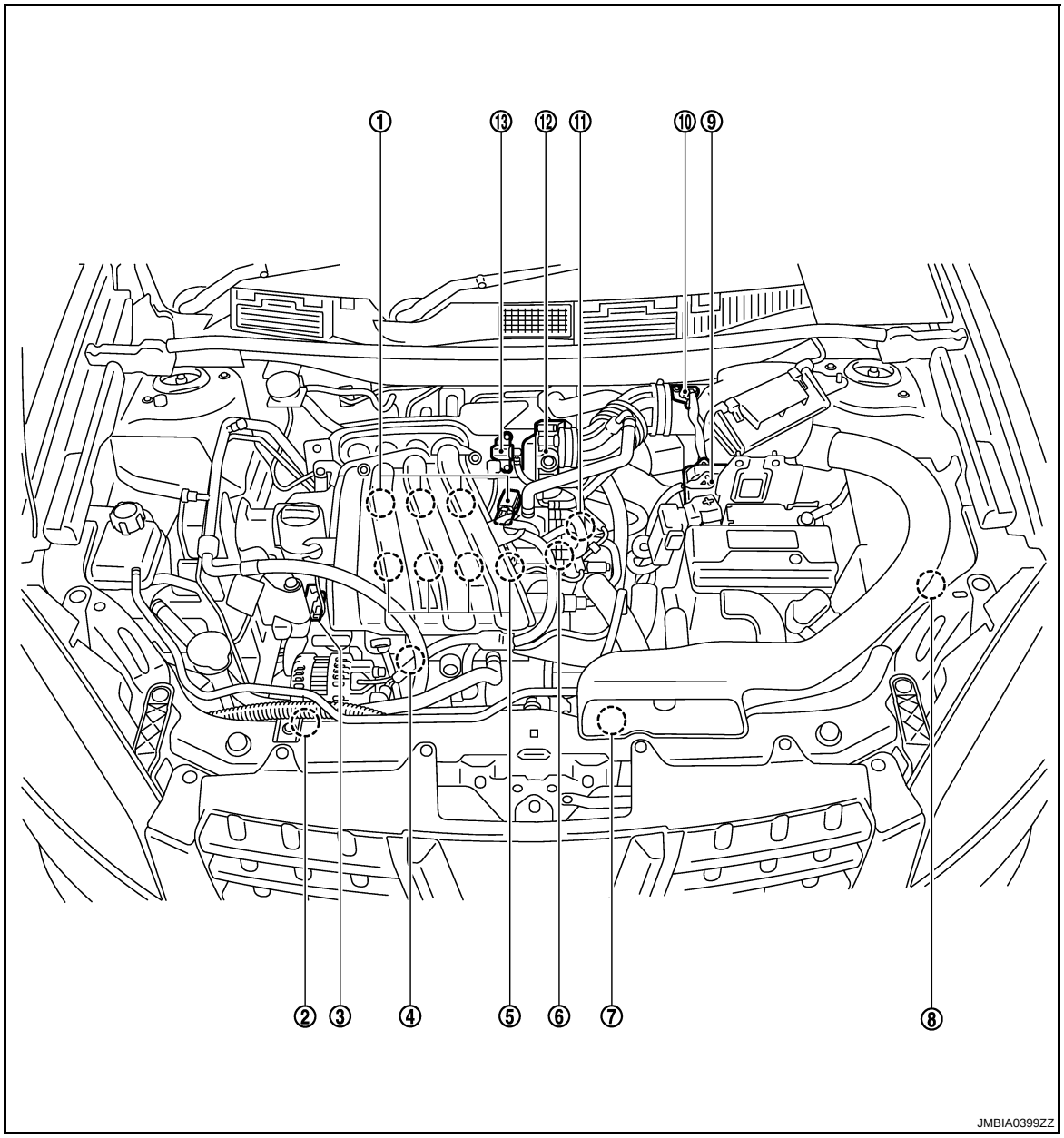
SYSTEM DESCRIPTION

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

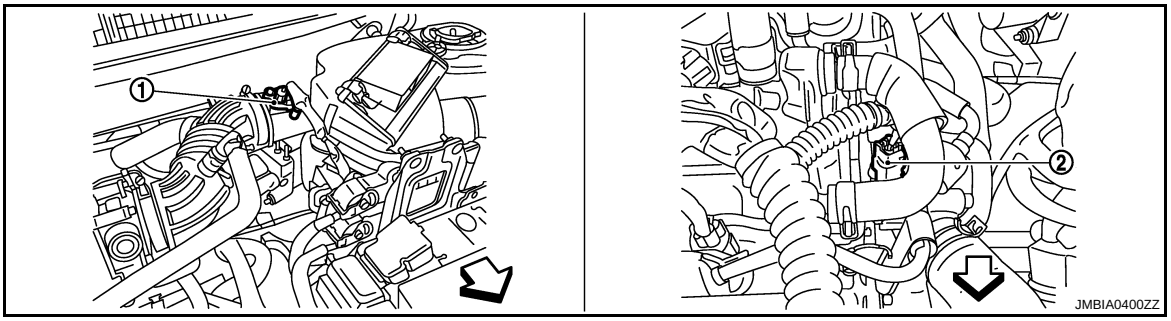
The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing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

Component Parts Location

INFOID:0000000001179709

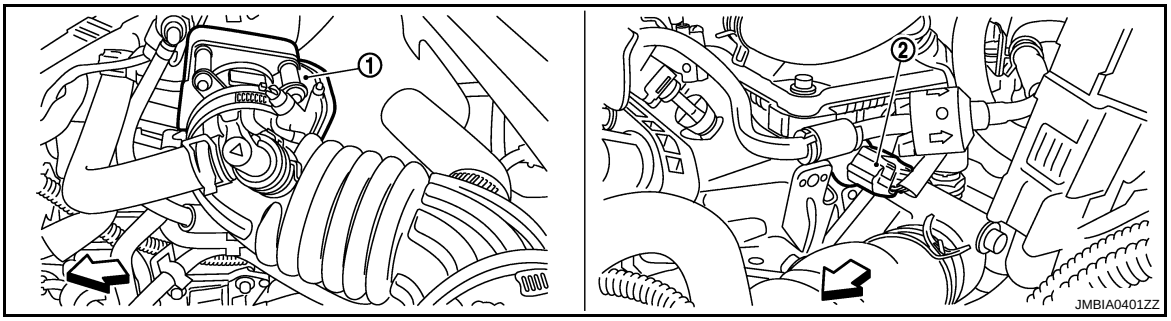


1. Ignition coil (with power transistor) and spark plug
2. Refrigerant pressure sensor
3. Intake valve timing control solenoid valve
4. Knock sensor, Crankshaft position sensor (POS)
5. Fuel injector
6. Camshaft position sensor (PHASE)
7. Cooling fan motor
8. IPDM E/R
9. ECM
10. Mass air flow sensor (with intake temperature sensor)
11. Engine coolant temperature sensor
12. Electric throttle control actuator (with built in throttle position sensor and throttle control motor)
13. EVAP canister purge volume control solenoid valve



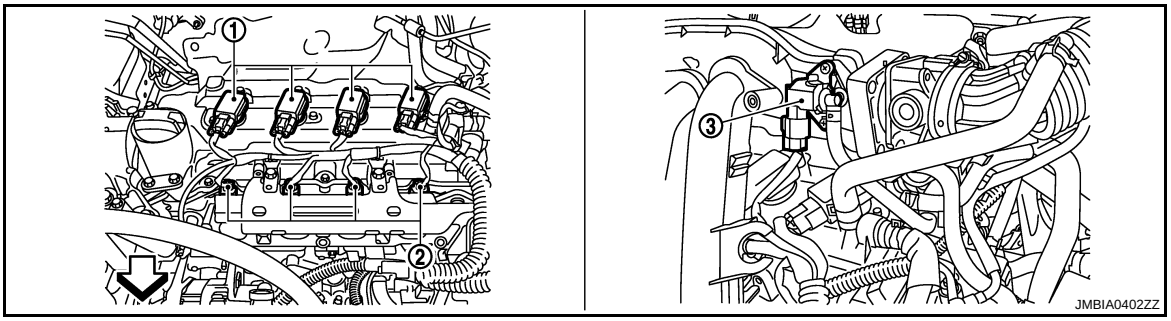
1. Mass air flow sensor
2. Engine coolant temperature sensor

⇦ Vehicle front



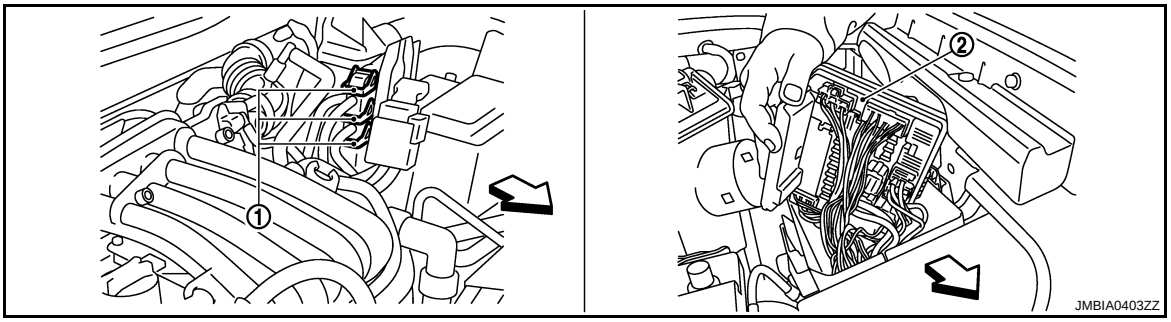
1. Electric throttle control actuator
2. Camshaft position sensor (PHASE)

⇦ Vehicle front



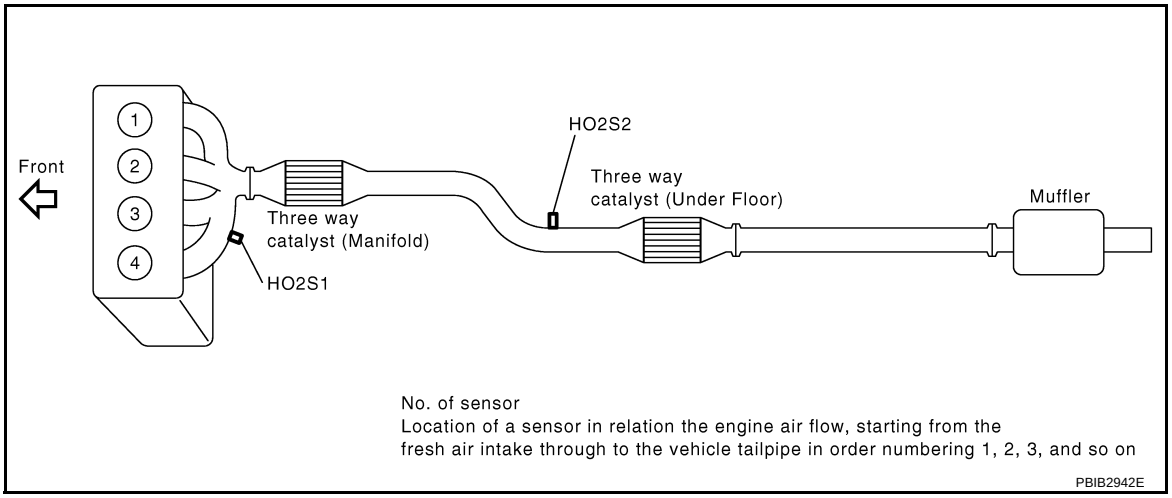
1. Ignition coil (with power transistor) and spark plug
2. Fuel injector
3. EVAP canister purge volume control solenoid valve

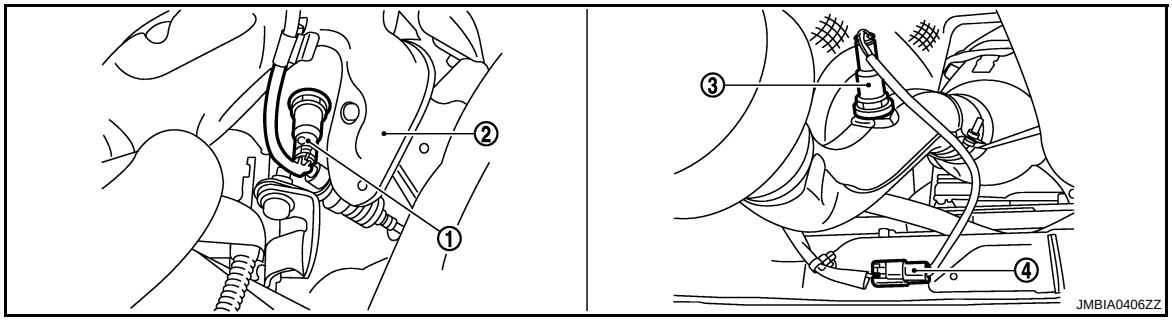
⇦ Vehicle front



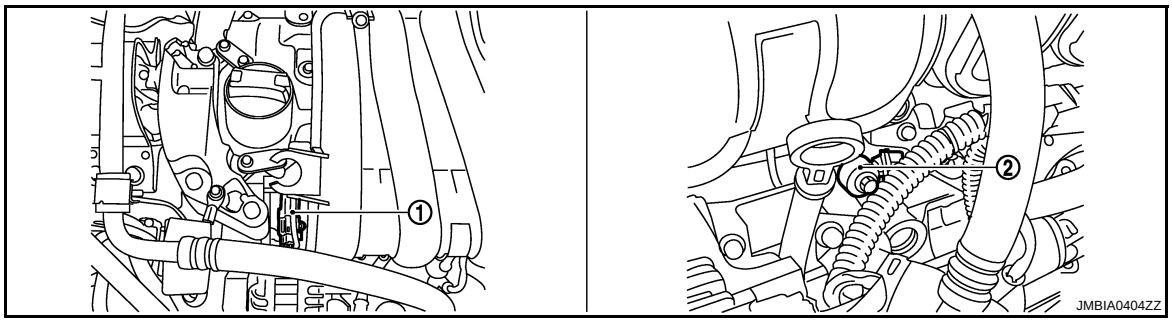
1. ECM harness connector
2. IPDM E/R

⇦ Vehicle front

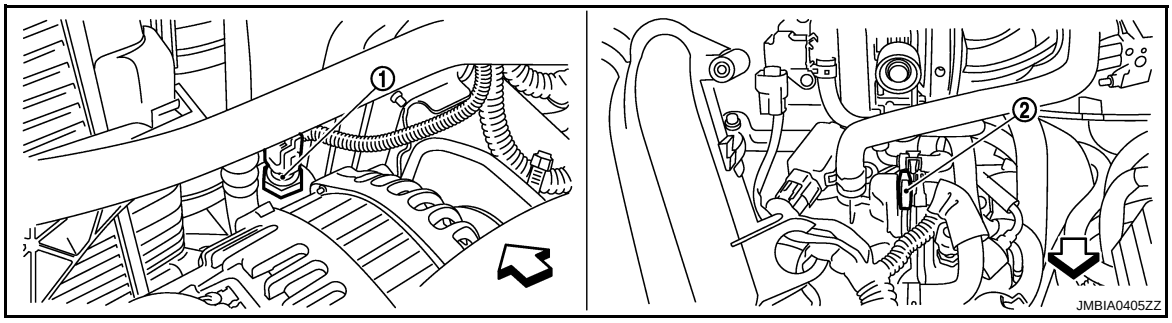




1. Heated oxygen sensor 1
2. Exhaust manifold cover
3. Heated oxygen sensor 2
4. Heated oxygen sensor 2 harness connector

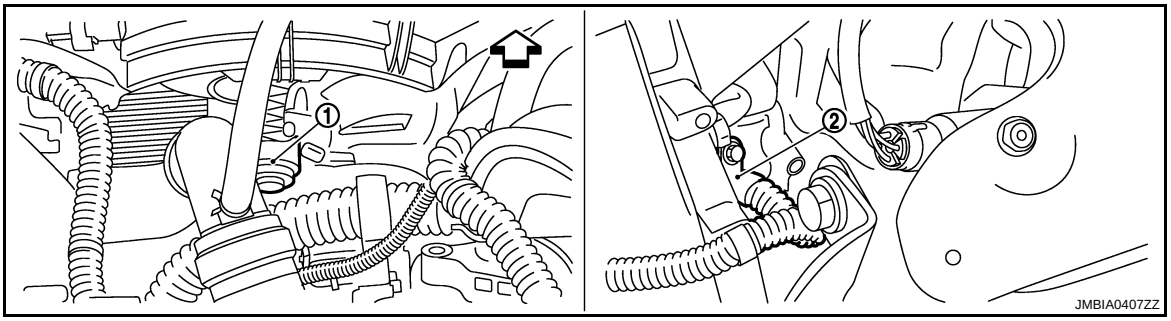


1. Intake valve timing control solenoid valve
2. Knock sensor



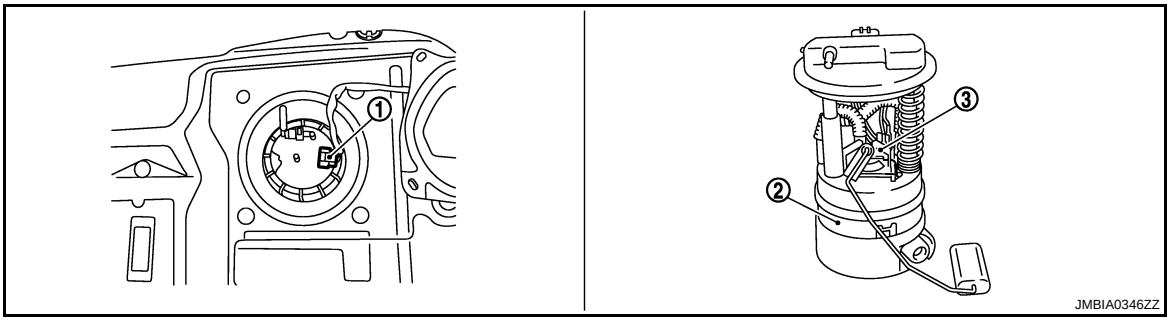
1. Refrigerant pressure sensor
2. PCV valve

⇦ Vehicle front

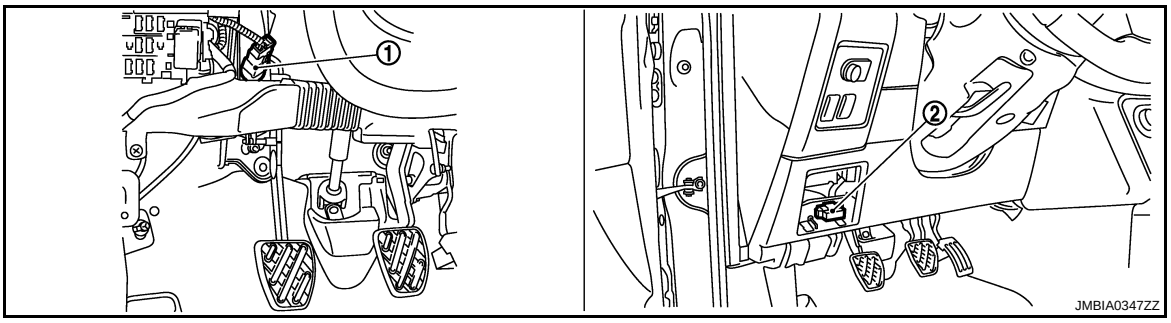


1. Cooling fan motor
2. Crankshaft position sensor (POS)

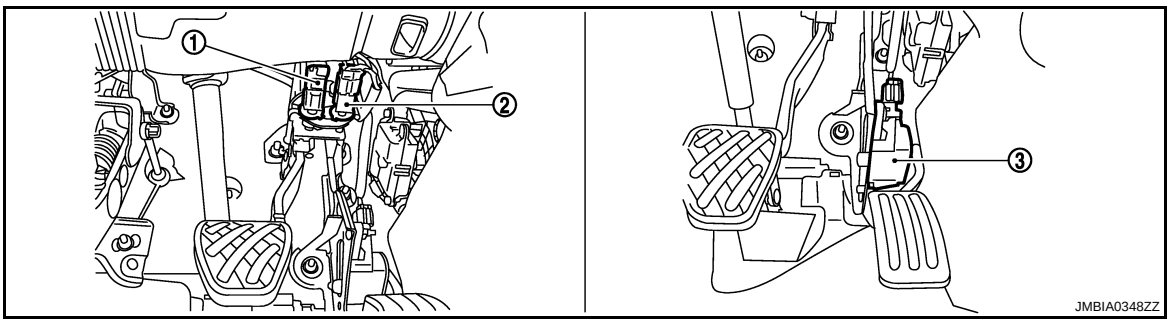
⇦ Vehicle front



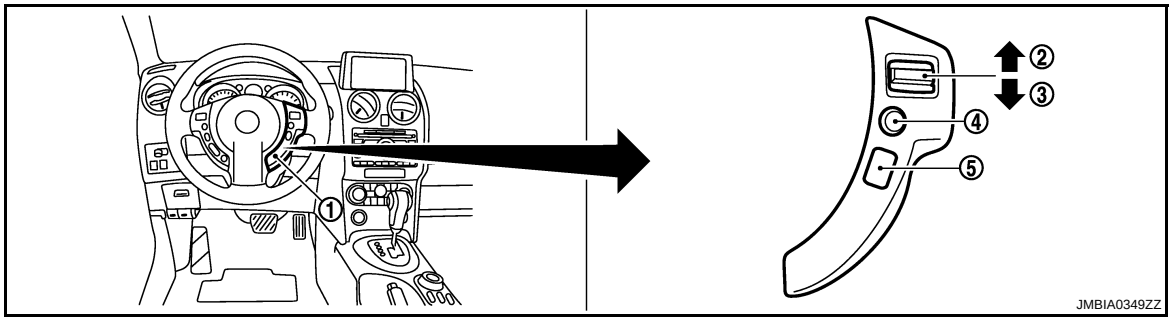
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator



1. ASCD clutch switch
2. Data link connector



1. Stop lamp switch
2. ASCD brake pedal
3. Accelerator pedal position sensor



1. ASCD steering switch
2. CANSEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. MAIN switch

Component Description

INFOID:0000000001179710

Component	Reference
Camshaft position sensor (PHASE)	ECH-478, "Description"
Crankshaft position sensor (POS)	ECH-474, "Description"
Engine coolant temperature sensor	ECH-450, "Description"
Intake valve timing control solenoid valve	ECH-486, "Description"
Vehicle speed sensor	ECH-585, "Description"

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000001179711

INTRODUCTION

The ECM has an on board diagnostic system, which detects malfunctions related to engine sensors or actuators. The ECM also records various emission-related diagnostic information including:

Emission-related diagnostic information
Diagnostic Trouble Code (DTC)
Freeze Frame data
1st Trip Diagnostic Trouble Code (1st Trip DTC)
1st Trip Freeze Frame data

The above information can be checked using procedures listed in the table below.

×: Applicable —: Not applicable

	DTC	1st trip DTC	Freeze Frame data	1st trip Freeze Frame data
CONSULT-III	×	×	×	×
ECM	×	×*	—	—

*: When DTC and 1st trip DTC simultaneously appear on the display, they cannot be clearly distinguished from each other.

The malfunction indicator (MI) on the instrument panel lights up when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to ECM-330, "Fail Safe".)

TWO TRIP DETECTION LOGIC

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 light up 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 lights up. The MI lights up 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.

DTC AND FREEZE FRAME DATA

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 reoccur, the 1st trip DTC will not be displayed.

If a malfunction is detected during the 1st trip, the 1st trip DTC is stored 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 stored 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.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”.

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 ECM-10, "Work Flow". Then perform DTC CONFIRMATION PROCEDURE or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

Freeze Frame Data and 1st Trip Freeze Frame Data

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

Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-III. The 1st trip freeze frame data can only be displayed on the CONSULT-III 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.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in “HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION”.

How to Read DTC and 1st Trip DTC

With CONSULT-III
CONSULT-III displays the DTC in ″SELF-DIAG RESULTS″ mode. Examples: P0340, P1148, P1706, etc.
(CONSULT-III also displays the malfunctioning component or system.)

Without CONSULT-III
The number of blinks of the MI in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: P0340, P1148, P1706, etc.
These DTCs are controlled by NISSAN.

- **1st trip DTC No. is the same as DTC No.**
- **Output of a DTC indicates a malfunction. However, the Diagnostic Test Mode II do not indicate whether the malfunction is still occurring or has occurred in the past and has returned to normal. CONSULT-III can identify malfunction status as shown below. Therefore, using CONSULT-III (if available) is recommended.**

DTC or 1st trip DTC of a malfunction is displayed in “SELF-DIAGNOSTIC RESULTS” mode of CONSULT-III. Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be [0].
If a 1st trip DTC is stored in the ECM, the time data will be [1t].

How to Erase DTC and 1st Trip DTC

With CONSULT-III
The emission related diagnostic information in the ECM can be erased by selecting “All Erase” in the “Description” of “FINAL CHECK” mode with CONSULT-III.

Without CONSULT-III
1. 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.
2. Perform ECH-415, "Diagnosis Description".
3. Change the diagnostic test mode from Mode II to Mode I by depressing the accelerator pedal.

- **If the battery is disconnected, the emission-related diagnostic information will be lost within 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

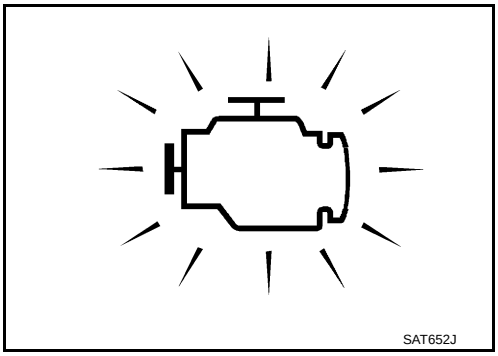
- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data

Actual work procedures are explained using a DTC as an example. Be careful so that not only the DTC, but all of the data listed above, are cleared from the ECM memory during work procedures.

MALFUNCTION INDICATOR (MI)

Description
The MI is located on the instrument panel.

1. The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MI does not light up, check MI circuit. Refer to ECH-581, or see MWI-20.
2. When the engine is started, the MI should go off.
   If the MI remains on, the on board diagnostic system has detected an engine system malfunction.



On Board Diagnostic System Function

The on board diagnostic system has the following four functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MI bulb for damage (blown, open circuit, etc.). If the MI does not come on, check MI circuit.
	Engine running 	MALFUNCTION WARNING	This is a usual driving condition. When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MI will light up to inform the driver that a malfunction has been detected. One trip detection diagnoses will light up the MI in the 1st trip.
Mode II	Ignition switch in ON position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.
	Engine running 	HEATED OXYGEN SENSOR 1 MONITOR	This function allows the fuel mixture condition (lean or rich), monitored by heated oxygen sensor 1, to be read.

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.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

MI FLASHING WITHOUT DTC
If the ECM is in Diagnostic Test Mode II, MI may flash when engine is running. In this case, check ECM diagnostic test mode. How to switch the diagnostic test (function) modes, and details of the above functions are described later. Refer to HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
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

How to Switch Diagnostic Test 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.**
- **Always ECM returns to Diagnostic Test Mode I after ignition switch is turned OFF.**

HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)
1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.

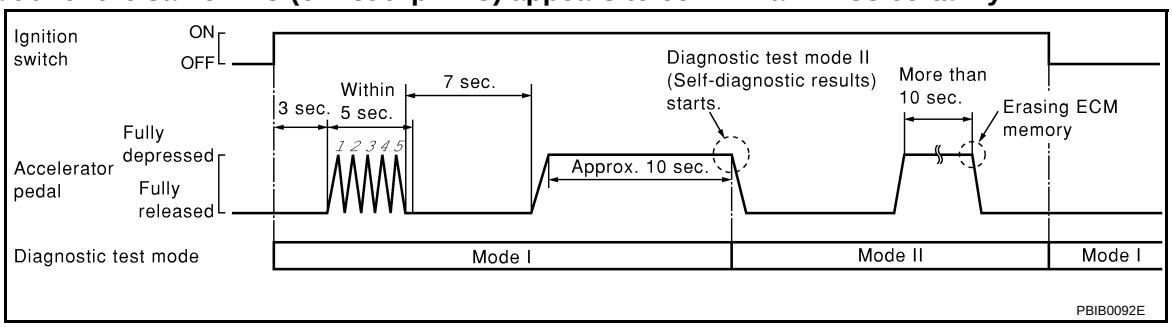
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.

b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it for approx. 10 seconds until the MI starts blinking.

4. Fully release the accelerator pedal.
ECM has entered to Diagnostic Test Mode II (Self-diagnostic results).
NOTE:
Wait until the same DTC (or 1st trip DTC) appears to confirm all DTCs certainly.



HOW to SET DIAGNOSTIC TEST MODE II (HEATED OXYGEN SENSOR 1 MONITOR)

1. Set the ECM in Diagnostic Test Mode II (Self-diagnostic results).
Refer to HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
2. Start Engine.
ECM has entered to Diagnostic Test Mode II (Heated oxygen sensor 1 monitor).

HOW to ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)

1. Set ECM in Diagnostic Test Mode II (Self-diagnostic results). Refer to HOW to SET DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
2. Fully depress the accelerator pedal and keep it for more than 10 seconds.
The emission-related diagnostic information has been erased from the backup memory in the ECM.
3. Fully release the accelerator pedal, and confirm the DTC 0000 is displayed.

Diagnostic Test Mode I — Bulb Check

In this mode, the MI on the instrument panel should stay ON. If it remains OFF, check MI circuit. Refer to ECH-581 or see MWI-20.

Diagnostic Test Mode I — Malfunction Warning

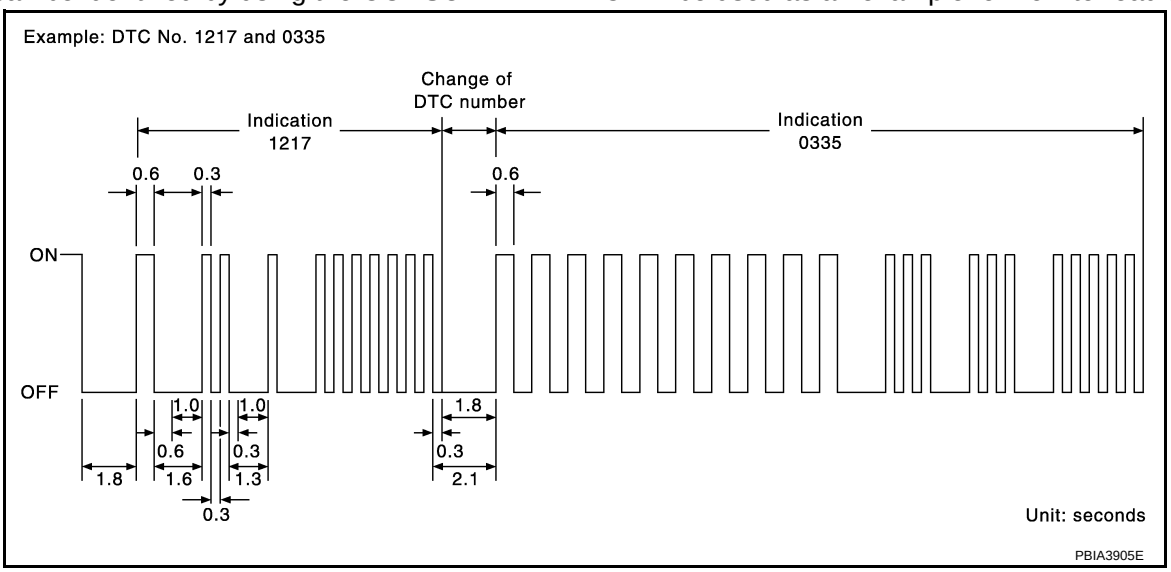
MI	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

This DTC number is clarified in Diagnostic Test Mode II (SELF-DIAGNOSTIC RESULTS)

Diagnostic Test Mode II — Self-diagnostic Results

In this mode, 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 diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are dis-

played, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These unidentified codes can be identified by using the CONSULT-III. 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. The “zero” is indicated by the number of ten flashes. The length of time the 1,000th-digit numeral flashes on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-second ON and 0.3-second 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-second OFF.
In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. (See ECH-608.)
HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS)
The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to HOW to ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).
- **If the battery is disconnected, the DTC will be lost from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

Diagnostic Test Mode II — Heated Oxygen Sensor 1 Monitor
In this mode, the MI displays the condition of the fuel mixture (lean or rich) which is monitored by the heated oxygen sensor 1.

MI	Fuel mixture condition in the exhaust gas	Air fuel ratio feedback control condition
ON	Lean	Closed loop system
OFF	Rich	
*Remains ON or OFF	Any condition	Open loop system

*: Maintains conditions just before switching to open loop.
To check the heated oxygen sensor 1 function, start engine in the Diagnostic Test Mode II and warm it up until engine coolant temperature indicator points to the middle of the gauge.
Next run engine at about 2,000 rpm for about 2 minutes under no load conditions. Then make sure that the MI comes ON more than 5 times within 10 seconds with engine running at 2,000 rpm under no load.

CONSULT-III Function

INFOID:0000000001179712

FUNCTION

Diagnostic test mode	Function
Work support	This mode enables a technician to adjust some devices faster and more accurately by following the indications on the CONSULT-III unit.
Self-diagnostic results	Self-diagnostic results such as 1st trip DTC, DTCs and 1st trip freeze frame data or freeze frame data can be read and erased quickly.*

Diagnostic test mode	Function
Data monitor	Input/Output data in the ECM can be read.
Active test	Diagnostic Test Mode in which CONSULT-III drives some actuators apart from the ECMs and also shifts some parameters in a specified range.
Function test	This mode is used to inform customers when their vehicle condition requires periodic maintenance.
ECU part number	ECM part number can be read.

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

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data
- 1st trip freeze frame data

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE				
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST
				DTC*1	FREEZE FRAME DATA*2		
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×	
		Camshaft position sensor (PHASE)		×	×	×	
		Mass air flow sensor		×		×	
		Engine coolant temperature sensor		×	×	×	×
		Heated oxygen sensor 1		×		×	
		Heated oxygen sensor 2		×		×	
		Vehicle speed sensor		×	×	×	
		Accelerator pedal position sensor		×		×	
		Throttle position sensor		×	×	×	
		Intake air temperature sensor		×	×	×	
		Knock sensor		×			
		Refrigerant pressure sensor				×	
		Closed throttle position switch (accelerator pedal position sensor signal)				×	
		Air conditioner switch				×	
		Park/neutral position (PNP) switch		×		×	
		Stop lamp switch		×		×	
		EPS control unit				×	
		Battery voltage				×	
		Load signal				×	
		ASCD steering switch		×		×	
		ASCD brake switch		×		×	

Item			DIAGNOSTIC TEST MODE				
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST
				DTC*1	FREEZE FRAME DATA*2		
ENGINE COTNROL COMPONENT PARTS	OUTPUT	Fuel injector				×	×
		Power transistor (Ignition timing)				×	×
		Throttle control motor relay		×		×	
		Throttle control motor		×			
		EVAP canister purge volume control solenoid valve		×		×	×
		Air conditioner relay				×	
		Fuel pump relay	×			×	×
		Cooling fan relay		×		×	×
		Heated oxygen sensor 1 heater		×		×	
		Heated oxygen sensor 2 heater		×		×	
		Intake valve timing control solenoid valve		×		×	×

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-III screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to ECH-415, "Diagnosis Description".

INSPECTION PROCEDURE

Refer to CONSULT-III Operators Manual.

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

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to ECH-608, "DTC Index".)

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	• The engine control component part/control system has a trouble code, it is displayed as PXXXX. (Refer to ECH-608, "DTC Index".)
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
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.
INT MANI PRES [kPa]	• Always a certain value is displayed. • This item is not efficient for J10 models.

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

DATA MONITOR MODE

Monitored Item

×: Applicable

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor (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	msec	• “Base fuel schedule” indicates the fuel injection pulse width programmed into ECM, prior to any learned on board correction.	• When engine is running specification range is indicated in “SPEC”.
A/F ALPHA-B1	%	• 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.

Monitored item	Unit	Description	Remarks
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.
HO2 SEN1 (B1)	V	• The A/F signal computed from the input signal of the heated oxygen sensor 1 is displayed.	
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S1 MNTR(B1)	RICH/LEAN	• Display of heated oxygen sensor 1 signal during air-fuel ratio feedback control: RICH: means the mixture became ″rich″, and control is being affected toward a leaner mixture. LEAN: means the mixture became ″″lean″, and control is being affected toward a rich mixture.	• After turning ON the ignition switch, ″RICH″ is displayed until air-fuel mixture ratio feedback control begins. • When the air-fuel ratio feedback is clamped, the value just before the clamping is displayed continuously.
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 1-B2			
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
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.	
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) switch 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 from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
CLUTCH P/P SW	ON/OFF	• Indicates [ON/OFF] condition from the clutch switch signal.	

Monitored item	Unit	Description	Remarks
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.
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·m/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.	
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	
HO2S1 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 1 heater determined by ECM according to the input signals.	
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
IDL A/V LEARN	YET/CMPLT	• Display 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.	
O2 SEN HTR DTY	%	• Heated oxygen 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.	

Monitored item	Unit	Description	Remarks
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter is displayed.	
SET VHCL SPD	km/h or mph	• The preset vehicle speed is displayed.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	• Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW	ON/OFF	• Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	• Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2	ON/OFF	• Indicates [ON/OFF] condition of stop lamp switch signal.	
VHCL SPD CUT	NON/CUT	• Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT	NON/CUT	• Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low, and ASCD operation is cut off.	
CRUISE LAMP	ON/OFF	• Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
SET LAMP	ON/OFF	• Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	
Voltage	V	• Voltage, frequency, duty cycle or pulse width measured by the probe.	• Only “#” is displayed if item is unable to be measured. • Figures with “#”s are temporary ones. They are the same figures as an actual piece of data which was just previously measured.
Frequency	msec, Hz or %		
DUTY-HI	—		
DUTY-LOW			
PLS WIDTH-HI			
PLS WIDTH-LOW			

NOTE:

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Heated oxygen sensor 1
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.
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-III.	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-III.	Cooling fan moves and stops.	• Harness and connectors • IPDM E/R (Cooling fan relay) • Cooling fan motor
ENG COOLANT TEMP	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector
FUEL PUMP RELAY	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay “ON” and “OFF” using CONSULT-III and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connectors • Fuel pump relay
PURG VOL CONT/V	• Engine: After warming up, run engine at 1,500 rpm. • Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.	Engine speed changes according to the opening percent.	• Harness and connectors • Solenoid valve
V/T ASSIGN ANGLE	• Engine: Return to the original trouble condition • Change intake valve timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve

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

COMPONENT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000001179713

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” of “DATA MONITOR” mode of CONSULT-III 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:0000000001179714

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
- After the engine is warmed up to normal operating temperature, drive vehicle for 5 minutes.
- Electrical load: Not applied*
- Engine speed: Idle

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

>> GO TO 2.

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

With CONSULT-III
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform ECH-353, "BASIC INSPECTION : Special Repair Requirement".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1” and “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode with CONSULT-III.
3. Make sure that monitor items are within the SP value.

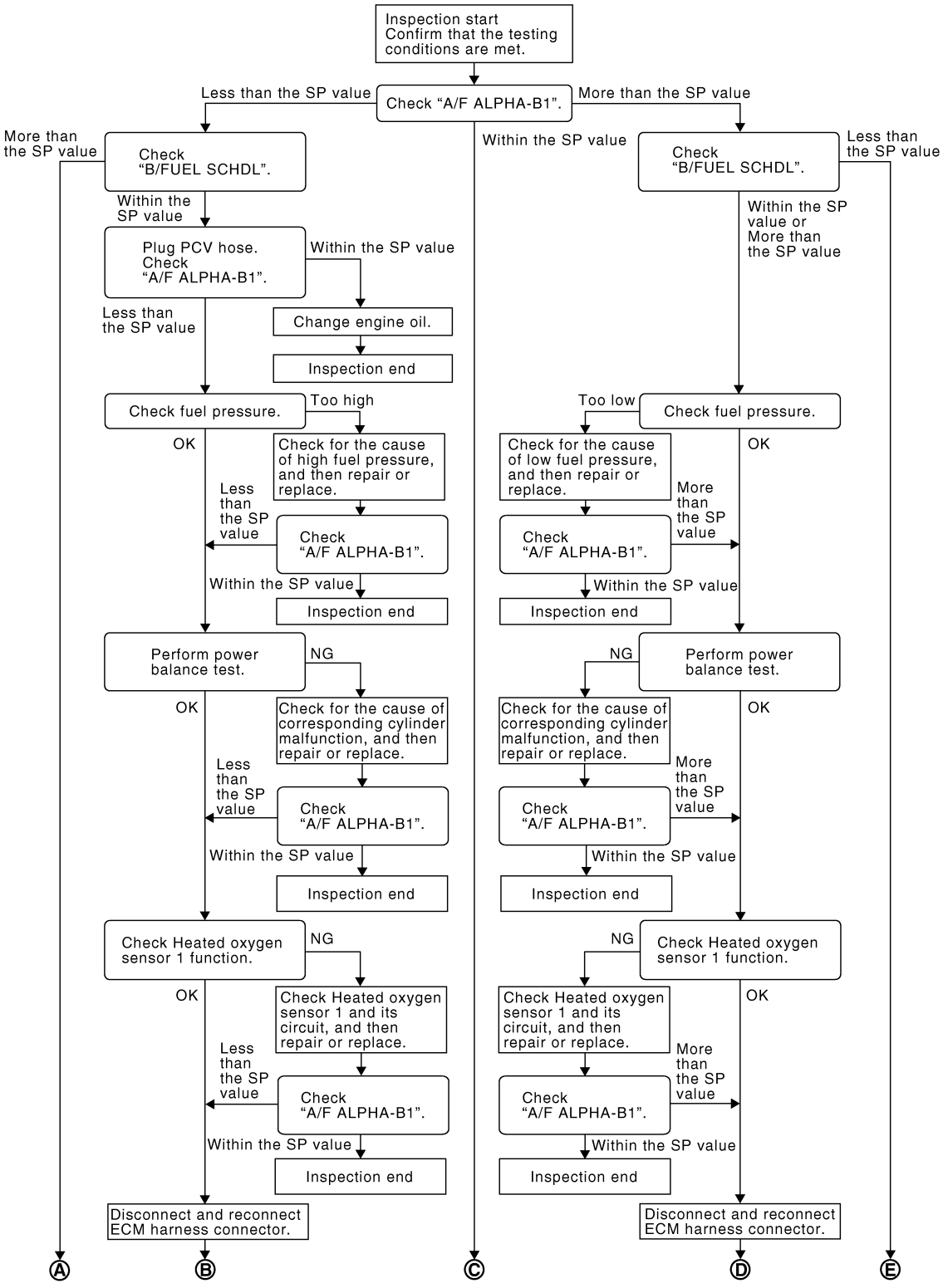
Is the inspection result normal?

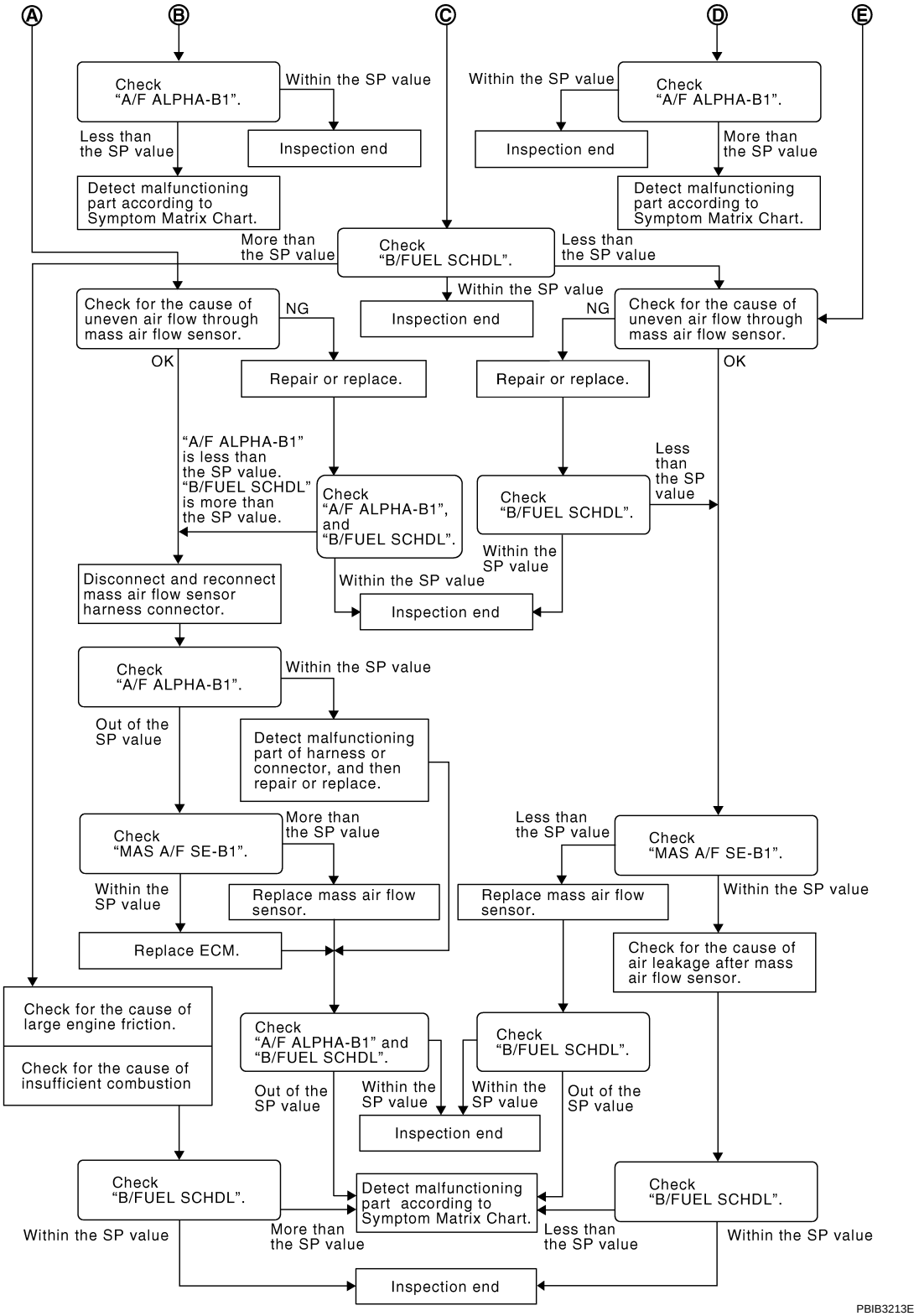
YES >> END
NO >> Go to ECH-428, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179715

OVERALL SEQUENCE





DETAILED PROCEDURE

1. CHECK "A/F ALPHA-B1"

With CONSULT-III

1. Start engine.
2. Confirm that the testing conditions are met. Refer to ECH-427, "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 they may fluctuate. It is NG if the indication is out of the SP value even a little.

Is the measurement value within the SP value?

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

2. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

3. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

4. CHECK “A/F ALPHA-B1”

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 ECH-622, "Inspection".)

Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> Fuel pressure is too high: Replace “fuel filter and fuel pump assembly” and then GO TO 8.
NO-2 >> Fuel pressure is too low: GO TO 7.

7. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly” and then GO TO 8.
NO >> Repair or replace and then GO TO 8.

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 ECH-576, "Component Function Check".)
2. Fuel injector and its circuit (Refer to ECH-553, "Component Function Check".)
3. Intake air leakage
4. Low compression pressure (Refer to EM-25, "Inspection".)

Is the inspection result normal?

YES >> Replace fuel injector and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.

11. CHECK “A/F ALPHA-B1”

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 HEATED OXYGEN SENSOR 1 FUNCTION

1. Run engine at about 2,000 rpm for about 2minutes under no load.
2. Select “HO2S1 MNTR (B1)”, in “DATA MONITOR” mode.
3. Running engine at 2,000 rpm under no load (The engine is warmed up to normal operating temperature.), check that the monitor fluctuates between LEAN and RICH more than 5 times during 10 seconds.

1 time : RICH → LEAN → RICH
2 times : RICH → LEAN → RICH → LEAN → RICH

Is the inspection result more than 5 times during 10 seconds?

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

13. CHECK HEATED OXYGEN SENSOR 1 CIRCUIT

Check heated oxygen sensor 1 and its circuit. Refer to ECH-456, "DTC Logic".

>> 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 each indication is within the SP value.

Is the measurement value within the SP value?

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

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

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

>> GO TO 16.

16. CHECK “A/F ALPHA-B1”

1. 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 ECH-611, "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 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 the each indication is within the SP value.

Is the measurement value within the SP value?

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

21. DISCONNECT AND RECONNECT MASS AIR FLOW SENSOR HARNESS CONNECTOR

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

>> GO TO 22.

22. CHECK “A/F ALPHA-B1”

1. 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 ECH-445, "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, and then GO TO 29.

24. REPLACE ECM

1. Replace ECM.
2. Go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> 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, 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 the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to ECH-611, "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 ECH-611, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000001179716

1.INSPECTION START

Start engine.

Is engine running?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK ECM POWER SUPPLY CIRCUIT-I

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

ECM		Ground	Voltage
Connector	Terminal		
E16	93	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E105, M77
- 10A fuse (No. 4)
- Harness for open or short between ECM and fuse

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

4.CHECK GROUND CONNECTION-I

1. Turn ignition switch OFF.
2. Check ground connection E21. Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

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

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		
E16	108		

3. Also check harness for short to power.

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between ECM and ground

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

7.CHECK ECM POWER SUPPLY CIRCUIT-II

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

IPDM E/R		Ground	Voltage
Connector	Terminal		
E11	15	Ground	Battery voltage

Is the inspection result normal?

YES >> Go to ECH-576, "Diagnosis Procedure".
NO >> GO TO 8.

8.CHECK ECM POWER SUPPLY CIRCUIT-III

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		
E16	105	Ground	After turning ignition switch OFF, battery voltage will exist for more than a few seconds, then drop approximately 0V.

Is the inspection result normal?

YES >> GO TO 15.
NO-1 >> Battery voltage does not exist: GO TO 9.
NO-2 >> Battery voltage exists for more than a few seconds: GO TO 12.

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 10.
NO >> GO TO 12.

10.CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E11.
3. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E16	105	E11	9	Existed

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

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair open circuit or short to ground or short power in harness or connectors.

11.CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E11.
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	E11	15	Existed

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

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 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.

13. CHECK 20A FUSE

1. Disconnect 20A fuse (No. 51) from IPDM E/R.
2. Check 20A fuse.

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace 20A fuse.

14. CHECK GROUND CONNECTION-II

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Repair or replace ground connection.

15. CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT-II

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

ECM		Ground	Continuity
Connector	Terminal		
F7	10	Ground	Existed
	11		
E16	108		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 17.
NO >> GO TO 16.

16. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors F121, E7
- Harness for open or short between ECM and ground

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

17. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair open circuit or short to power in harness or connectors.

U1001 CAN COMM CIRCUIT

Description

INFOID:0000000001179717

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:0000000001179718

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> ECH-439, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179719

Go toLAN-13, "Trouble Diagnosis Flow Chart".

U1010 CONTROL UNIT (CAN)

Description

INFOID:0000000001179720

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:0000000001179721

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1010	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check DTC.

Is DTC detected?

YES >> Go to ECH-440, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179722

1.INSPECTION START

With CONSULT-III

1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode with CONSULT-III.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-440, "DTC Logic".
5. Check DTC.

Without CONSULT-III

1. Turn ignition switch ON.
2. Erase the Diagnostic Test Mode II Self-diagnostic results) memory.
3. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-440, "DTC Logic".
4. Check DTC.

Is the DTC U1010 displayed again?

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

2.REPLACE ECM

1. Replace ECM.
2. Go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P0011 IVT CONTROL

DTC Logic

INFOID:0000000001179723

DTC DETECTION LOGIC

NOTE:

- **If DTC P0011 is displayed with DTC P1111, first perform the trouble diagnosis for DTC P1111, refer to ECH-486, "Description".**
- **The MI will not light up for this self-diagnosis.**

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 (POS) • Camshaft position sensor (PHASE) • Intake valve control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.PRECONDITIONING

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

TESTING CONDITION:

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

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

ENG SPEED	1,200 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 3.5 msec
Shift lever	Neutral position

CAUTION:

Always drive at a safe speed.

4. Stop vehicle with engine running and let engine idle for 10 seconds.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-442, "Diagnosis Procedure"
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

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 70°C (221°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.

Is 1st trip DTC detected?

YES >> Go to ECH-442, "Diagnosis Procedure"
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to.

NOTE:
Use component function check to check the overall function of intake valve timing control system. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-442, "Diagnosis Procedure"

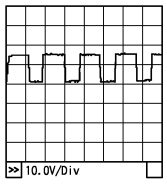
Component Function Check

INFOID:0000000001179724

1.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and let it idle.
4. Check the voltage between ECM harness connector and ground under the following condition.

Connector	ECM Terminal	Ground	Condition	Voltage signal
F8	73 IVT control solenoid valve	Ground	At idle	BATTERY VOLTAGE (11 - 14V)
			Engine speed: 2,000 rpm	7-12V*  PBIA4937J

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-291, "Diagnosis Procedure".

Diagnosis Procedure

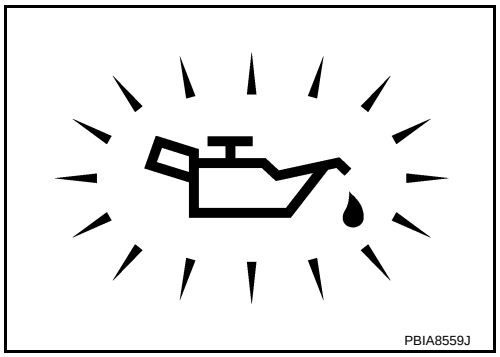
INFOID:0000000001179725

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 MWI-32, "Description".
NO >> GO TO 2.



2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to ECH-444, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace intake valve timing control solenoid valve.

3. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to ECH-477, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor (POS).

4. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to ECH-480, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace camshaft position sensor (PHASE).

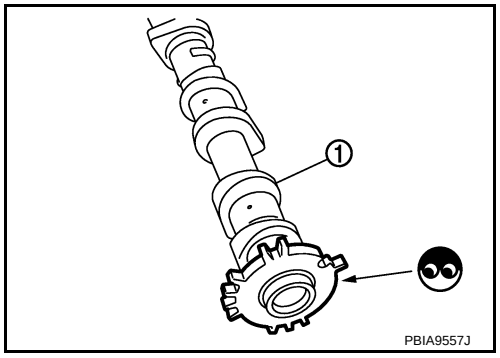
5. CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft (1) 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.



6. CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-47, "Removal and Installation".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Refer to LU-3, "Engine Lubrication System".

Is the inspection result normal?

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

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179726

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.

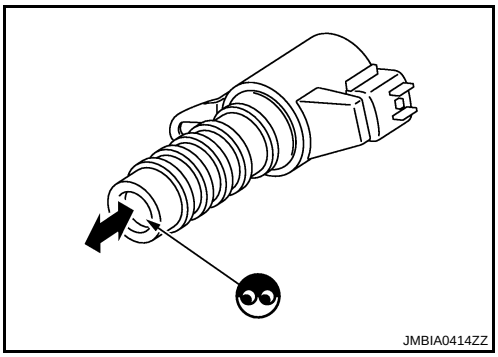
Terminals	Resistance [at 20°C (68°F)]
1 and 2	6.7 - 7.7 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve.

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Provide 12V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.
   CAUTION:
   Do not apply 12V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
   NOTE:
   Always replace O-ring when intake valve timing control solenoid valve is removed.


JMBIA0414ZZ

Is the inspection result normal?

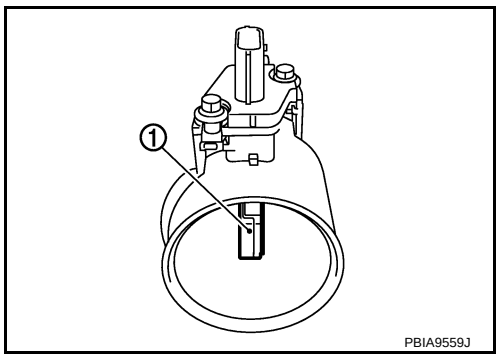
YES >> INSPECTION END
NO >> Replace intake valve timing control solenoid valve.

P0102, P0103 MAF SENSOR

Description

INFOID:0000000001179727

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.



DTC Logic

INFOID:0000000001179728

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 leaks • 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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

Which DTC is detected?

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102

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

Is DTC detected?

YES >> Go to ECH-446, "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 ECH-446, "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 ECH-446, "Diagnosis Procedure".

NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179729

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 E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

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		
E18	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	
E18	4	F8	52	Existed

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between mass air flow sensor and ECM

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

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

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

MAF sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E18	3	F8	45	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 MASS AIR FLOW SENSOR

Refer to ECH-447, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179730

1. CHECK MASS AIR FLOW SENSOR-I

With CONSULT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
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. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. 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		Ground	Condition	Voltage
Connector	Terminal			
F8	45 (MAF sensor signal)	Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V
			Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK FOR THE CAUSE OF UNEVEN AIR FLOW THROUGH 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 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-III

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

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	45 (MAF sensor signal)	Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V
			Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

*: 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-III

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and check indication.

Monitor item	Condition	MAS A/F SE-B1
MAS A/F SE-B1	Ignition switch ON (Engine stopped.)	Approx. 0.4V
	Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
	Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	45 (MAF sensor signal)	Ground	Ignition switch ON (Engine stopped.)	Approx. 0.4V
			Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3V
			Idle to about 4,000 rpm	1.0 - 1.3V to Approx. 2.4V*

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

Is the inspection result normal?

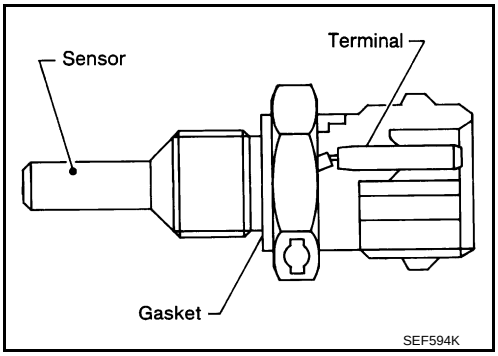
YES >> INSPECTION END
NO >> Clean or replace mass air flow sensor.

P0117, P0118 ECT SENSOR

Description

INFOID:0000000001179731

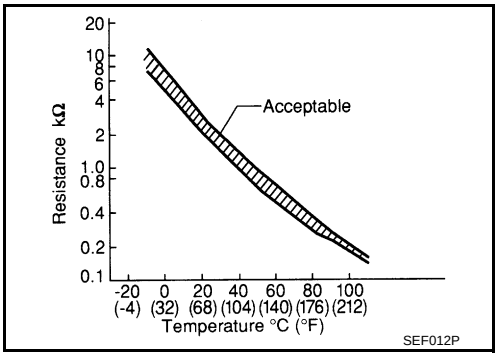
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



<Reference data>

Engine coolant temperature °C (°F)	Voltage* V	Resistance kΩ
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: These data are reference values and are measured between ECM terminal 38 (Engine coolant temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

DTC Logic

INFOID:0000000001179732

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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to ECH-451, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179733

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ECT SENSOR POWER SUPPLY CIRCUIT

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. 5V

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	F8	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 ECH-451, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace engine coolant temperature sensor.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

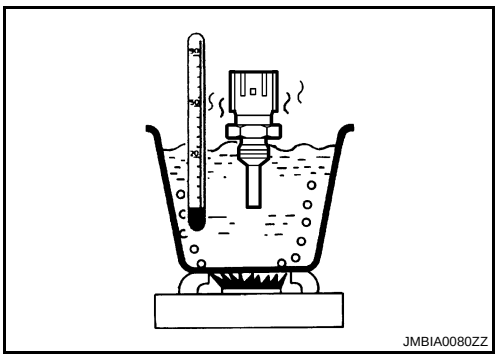
Component Inspection

INFOID:0000000001179734

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor.

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



Terminals	Condition		Resistance
1 and 2	Temperature °C (°F)	20 (68)	2.1 - 2.9 kΩ
		50 (122)	0.68 - 1.00 kΩ
		90 (194)	0.236 - 0.260 kΩ

Is the inspection result normal?

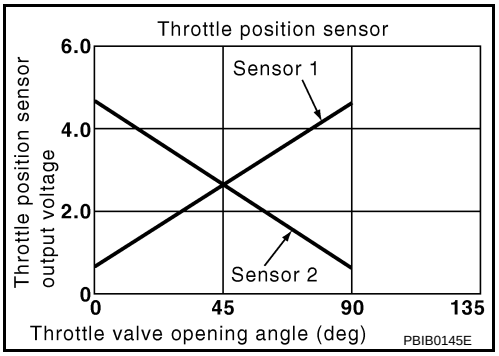
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

P0122, P0123 TP SENSOR

Description

INFOID:0000000001179735

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



DTC Logic

INFOID:0000000001179736

DTC DETECTION LOGIC

NOTE:
If DTC P0122 or P0123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 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 10V 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 ECH-453, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179737

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE POSITION SENSOR 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		
F29	1	Ground	Approx. 5V

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	
F29	4	F8	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	
F29	3	F8	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 ECH-455, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-455, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179738

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to 1st position.
6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	33 (TP sensor 1 signal)	Ground	Accelerator pedal	Fully released	More than 0.36V
				Fully depressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully depressed	More than 0.36V

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-455, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179739

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

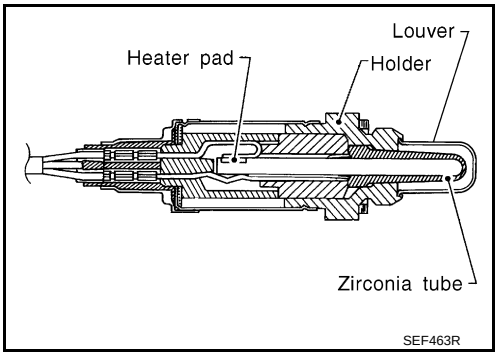
>> END

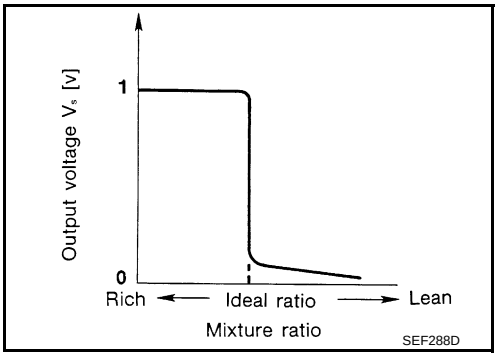
P0132 HO2S1

Description

INFOID:0000000001179740

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



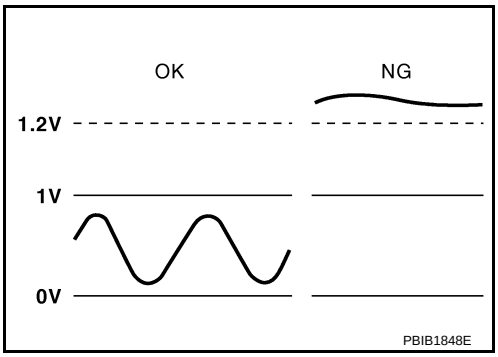


DTC Logic

INFOID:0000000001179741

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the heated oxygen sensor 1 is not inordinately high.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Heated oxygen sensor 1 circuit high voltage	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. 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 2 minutes.
4. Check 1st trip DTC.

Is 1st trip DTC is detected?

YES >> Go to ECM-462, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179742

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.RETIGHTEN HEATED OXYGEN SENSOR 1

Loosen and retighten heated oxygen sensor 1.

Tightening torque: 50 N·m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	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 HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	existed

2. Check harness continuity between HO2S1 harness connector or ECM harness connector.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	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 HO2S1 CONNECTOR FOR WATER

Check heated oxygen sensor 1 connector for water.

Is the inspection result normal?

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

6.CHECK HEATED OXYGEN SENSOR 1

Refer to ECH-458, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace heated oxygen sensor 1.

7.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> **INSPECTION END**

Component Inspection

INFOID:0000000001179743

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

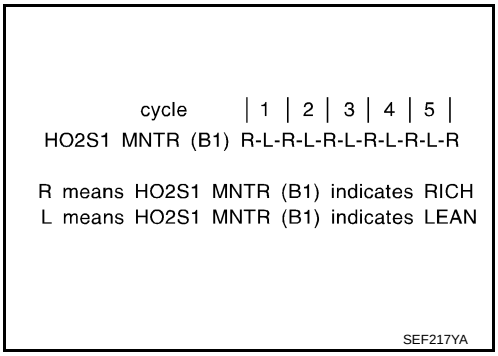
YES >> GO TO 2.
NO >> GO TO 3.

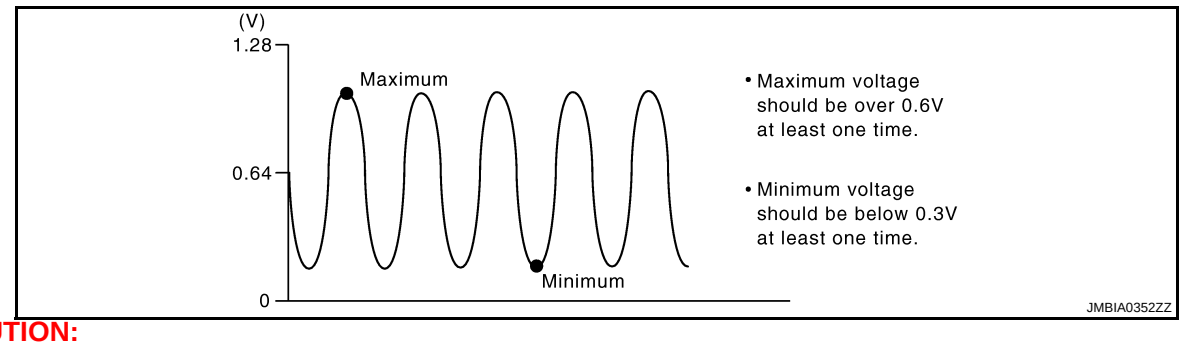
2.CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.
6. Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 tool and approved anti-seize lubricant.**

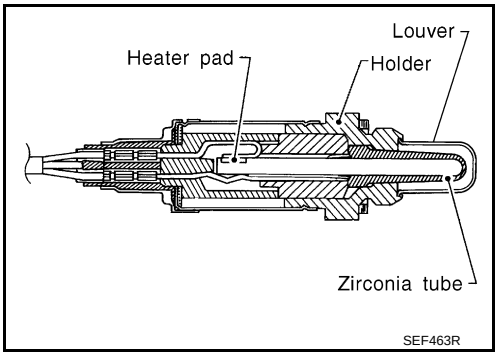
>> INSPECTION END

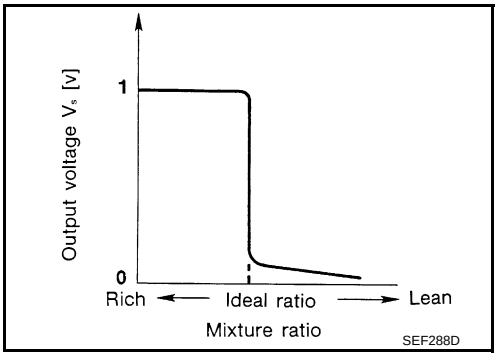
P0134 HO2S1

Description

INFOID:0000000001179744

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.



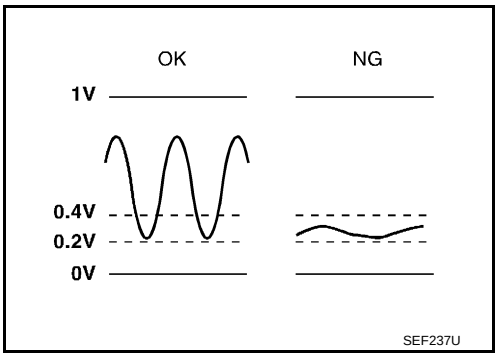


DTC Logic

INFOID:0000000001179745

DTC DETECTION LOGIC

Under the condition in which the heated oxygen sensor 1 signal is not input, the ECM circuits will read a continuous approximately 0.3V. Therefore, for this diagnosis, the time that output voltage is within 200 to 400 mV range is monitored, and the diagnosis checks that this time is not inordinately long.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0134 0134	Heated oxygen sensor 1 circuit no activity detected	The voltage from the sensor is constantly approx. 0.3V.	• Harness or connectors (The sensor circuit is open or shorted.) • Heated oxygen sensor 1

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

TESTING CONDITION:

Always perform at a temperature above -10°C (14°F).

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

Do you have CONSULT-III?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Select "MANU TRIG" in "DATA MONITOR" mode with CONSULT-III, and select "HO2S1 (B1)".
3. Hold engine speed at 2,000 rpm under no load.
4. Make sure that the indications do not remain in the range between 0.2V to 0.4V.

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECM-137, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set volmeter probes between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage dose not remain in the range of 0.2 to 0.4.

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECM-137, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179746

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 1 harness connector.
2. Disconnect ECM harness connector.
3. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	Existed

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

Is inspection result normal?

YES >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK HO2S1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between HO2S1 harness connector and ECM harness connector 49.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	4	F8	49	Existed

2. Check harness continuity between ECM harness connector 49 or HO2S1 harness connector and ground.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not existed

3. Also check harness for short to power.

Is 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 HEATED OXYGEN SENSOR 1

Refer to ECH-462, "Component Inspection".

Is inspection result normal?

YES >> GO TO 5.
NO >> Replace heated oxygen sensor 1.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> **INSPECTION END**

Component Inspection

INFOID:0000000001179747

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

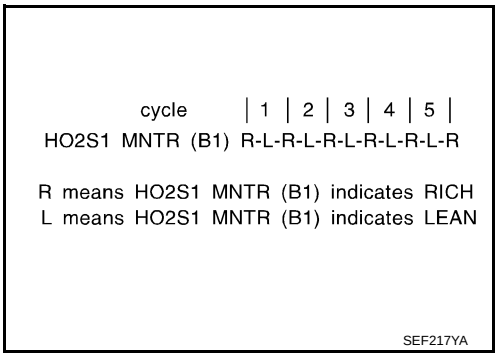
YES >> GO TO 2.
NO >> GO TO 3.

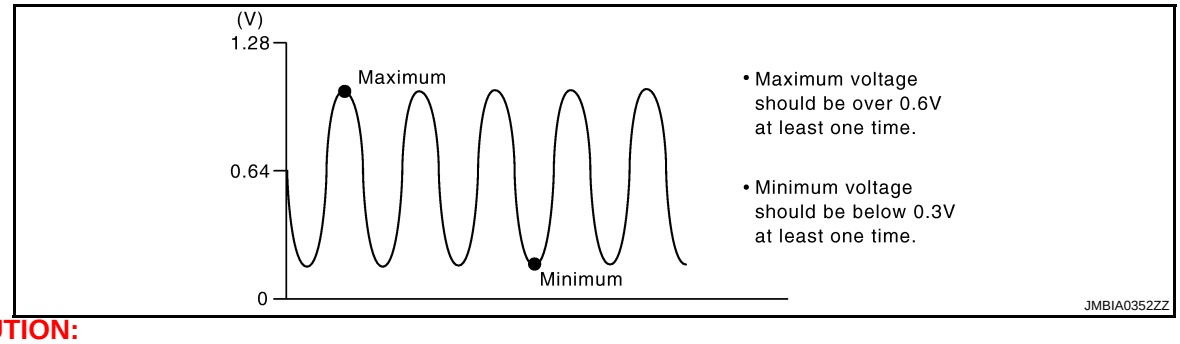
2.CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.
6. Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III
1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 tool and approved anti-seize lubricant.**

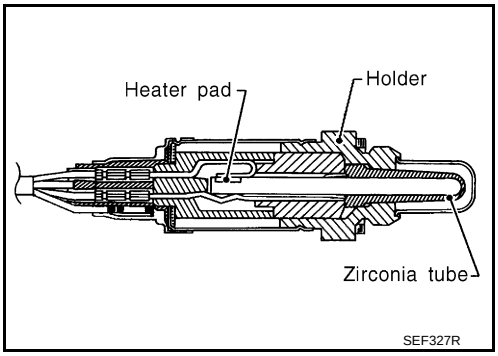
>> INSPECTION END

P0138 HO2S2

Description

INFOID:0000000001179748

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen 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 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

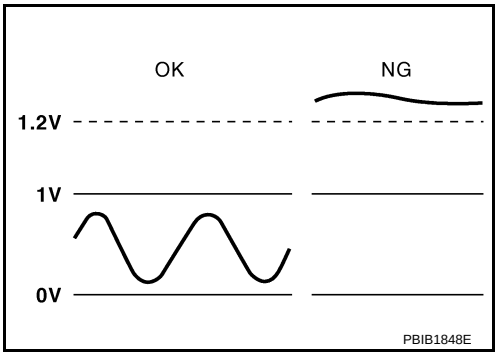


DTC Logic

INFOID:0000000001179749

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the heated oxygen 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 voltage is unusually high during the various driving condition such as fuel-cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0138	Heated oxygen sensor 2 circuit high voltage	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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. 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 2 minutes.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-465, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179750

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK 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	
E58	1	F8	59	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.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

>> 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	
E58	4	F8	50	Existed

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

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E58	4	F8	50	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F121, E7
- Harness for open or short between HO2S2 and ECM

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

6.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace harness or connectors.

7.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-466, "Component Inspection".

Is the inspection result normal?

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

8.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179751

1.INSPECTION START

Do you have CONSULT-III?

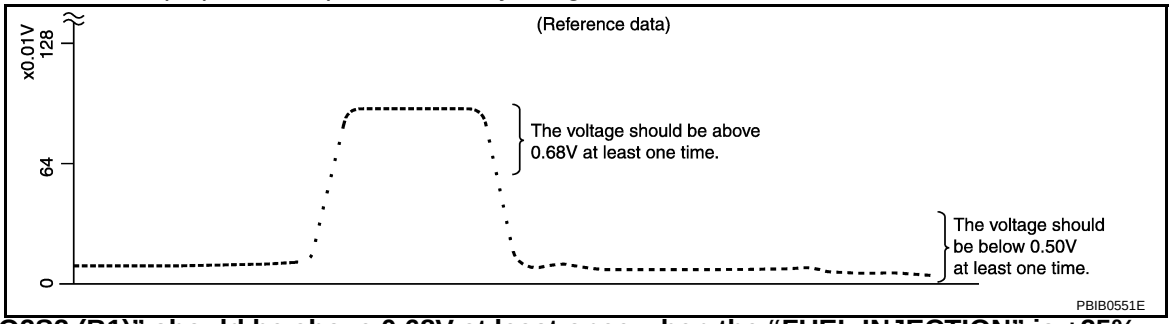
Do you have CONSULT-III?

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

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 heated oxygen sensor 2.

CAUTION:

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

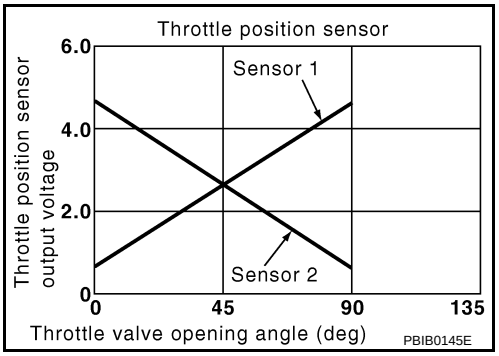
>> INSPECTION END

P0222, P0223 TP SENSOR

Description

INFOID:0000000001179752

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



DTC Logic

INFOID:0000000001179753

DTC DETECTION LOGIC

NOTE:
If DTC P0222 or P0223 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-508, "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 10V 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 ECH-469, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179754

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT

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		
F29	1	Ground	Approx. 5V

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	
F29	4	F8	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	
F29	2	F8	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 ECH-471, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-471, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179755

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to 1st position.
6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	33 (TP sensor 1 signal)	Ground	Accelerator pedal	Fully released	More than 0.36V
				Fully depressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully depressed	More than 0.36V

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-471, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179756

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P0327, P0328 KS

Description

INFOID:0000000001179757

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.

DTC Logic

INFOID:0000000001179758

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 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 10V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-472, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179759

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK KNOCK SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector and disconnect ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

Knock sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F12	2	F8	40	Existed

3. 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	
F12	1	F8	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 ECH-473, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace knock sensor.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179760

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?

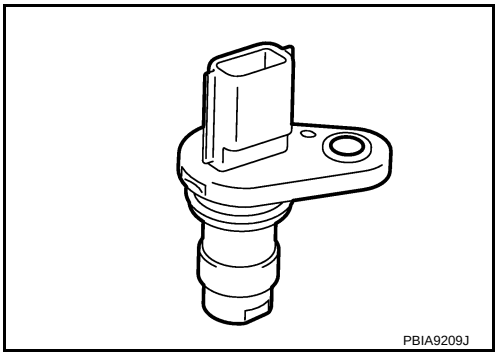
YES >> INSPECTION END
NO >> Replace knock sensor.

P0335 CKP SENSOR (POS)

Description

INFOID:0000000001179761

The crankshaft position sensor (POS) 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.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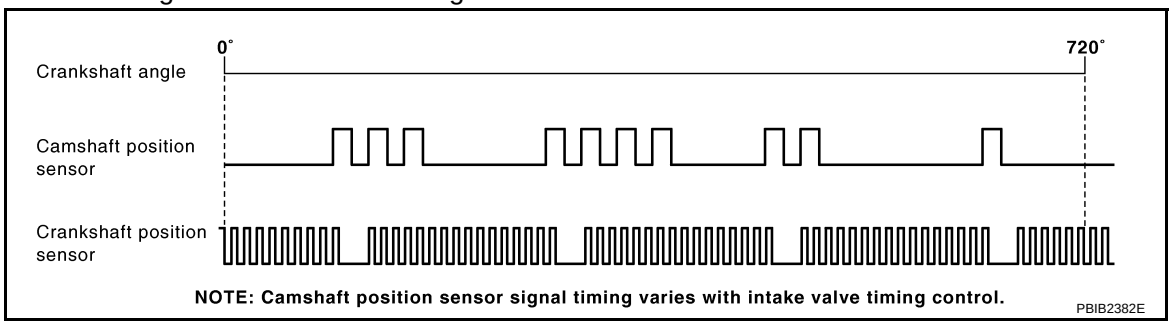


DTC Logic

INFOID:0000000001179762

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.] (Refrigerant pressure sensor circuit is shorted.) (Accelerator pedal position sensor circuit is shorted.) • Crankshaft position sensor (POS) • Refrigerant pressure sensor • Accelerator pedal position sensor • Signal plate

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 10.5V 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 ECH-475, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179763

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-I

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. 5V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II

1. Turn ignition switch 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	F8	75	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	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.

- Refrigerant pressure sensor (Refer to HAC-172, "Component Inspection")

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning components.

6.CHECK APP SENSOR

Refer to ECH-532, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-533, "Special Repair Requirement".

>> INSPECTION END

8.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	F8	62	Existed

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

Is the inspection result normal?

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

9.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	F8	61	Existed

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 CRANKSHAFT POSITION SENSOR (POS)

Refer to ECH-477, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace crankshaft position sensor (POS).

11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace the signal plate.

12.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

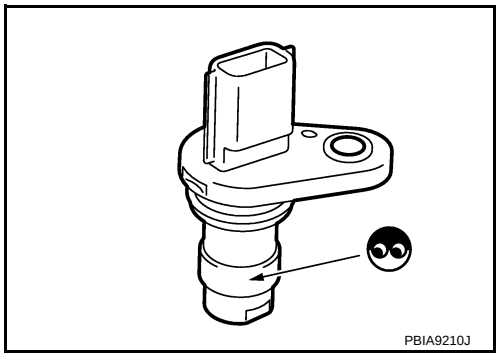
INFOID:0000000001179764

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.
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor (POS).



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?

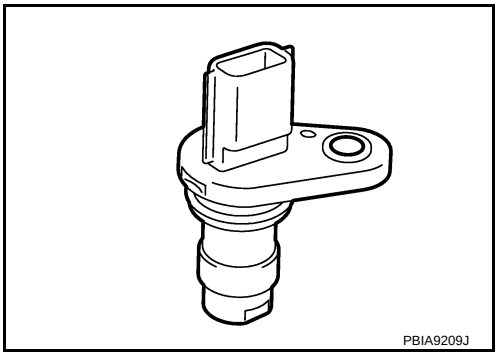
YES >> INSPECTION END
NO >> Replace crankshaft position sensor (POS).

P0340 CMP SENSOR (PHASE)

Description

INFOID:0000000001179765

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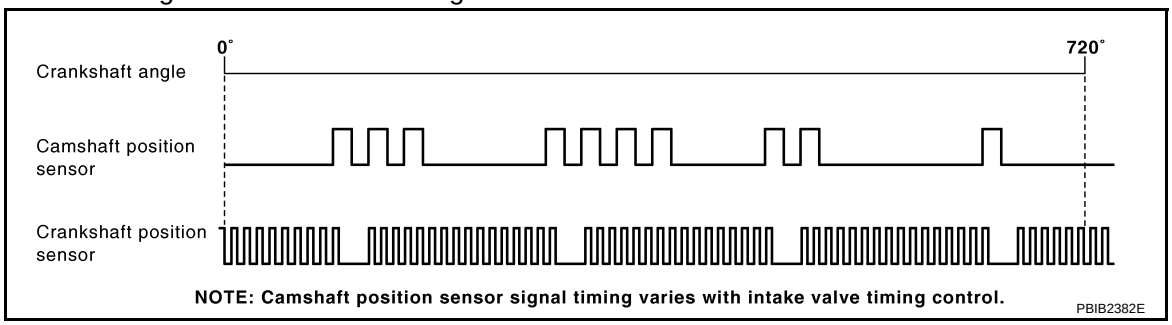
Due to the changing magnetic field, the voltage from the sensor changes.
ECM receives the signals as shown in the figure.



DTC Logic

INFOID:0000000001179766

DTC DETECTION LOGIC

NOTE:
If DTC P0340 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 (The sensor circuit is open or shorted) • Camshaft position sensor (PHASE) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery

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 10.5V 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 ECH-479, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-I

1. Maintaining engine speed at more than 800 rpm for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-479, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179767

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 E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

3. CHECK 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
Connector	Terminal		
F26	1	Ground	Approx. 5V

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. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F26	2	F8	63	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 CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

CMP sensor (PHASE)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F26	3	F8	65	Existed

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

Is the inspection result normal?

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

6.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to ECH-480, "Component Inspection".

Is the inspection result normal?

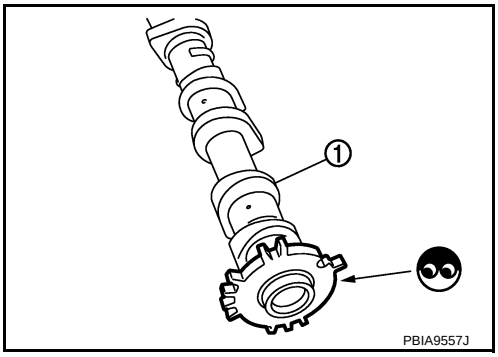
YES >> GO TO 7.
NO >> Replace camshaft position sensor (PHASE).

7.CHECK CAMSHAFT (INT)

Check the following.
- Accumulation of debris to the signal plate of camshaft (1) 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.



8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

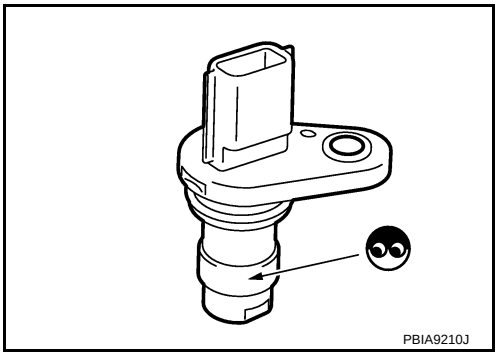
INFOID:0000000001179768

1.CHECK CAMSHAFT POSITION SENSOR (PHASE)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect camshaft position sensor (PHASE) harness connector.
4. Remove the sensor.
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace camshaft position sensor (PHASE).



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) 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?

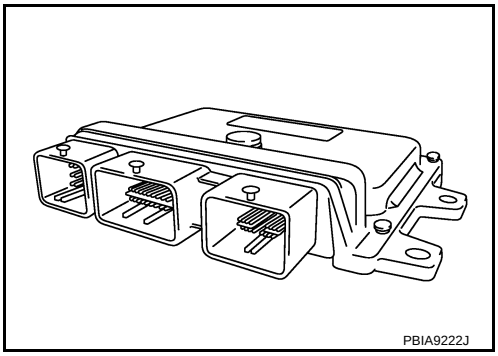
YES >> INSPECTION END
NO >> Replace camshaft position sensor (PHASE).

P0605 ECM

Description

INFOID:0000000001179769

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

INFOID:0000000001179770

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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-483, "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 ECH-483, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and waitait 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 ECH-483, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179771

1.INSPECTION START

With CONSULT-III

1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode with CONSULT-III.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-482, "DTC Logic".

Without CONSULT-III

1. Turn ignition switch ON.
2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.
3. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-482, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

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

2.REPLACE ECM

1. Replace ECM.
2. Go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

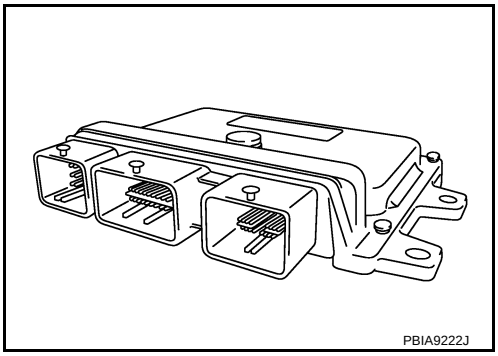
>> INSPECTION END

P1065 ECM

Description

INFOID:0000000001179772

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.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DTC Logic

INFOID:0000000001179773

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1065	Engine control module	ECM back-up RAM system does not function properly.	• 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Start engine and let it idle for 1 second.
3. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
4. Repeat steps 2 and 3 for four times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-484, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179774

1.INSPECTION START

With CONSULT-III
1. Turn ignition switch ON.
2. Select “SELF-DIAG RESULTS” mode with CONSULT-III.
3. Touch “ERASE”.
4. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-484, "DTC Logic".

Without CONSULT-III
1. Turn ignition switch ON.
2. Erase the Diagnostic Test Mode II (Self-diagnostic results) memory.
3. Perform DTC CONFIRMATION PROCEDURE.
   See ECH-484, "DTC Logic".

Is the 1st trip DTC P1065 displayed again?

YES >> GO TO 2.

NO >> INSPECTION END

2.REPLACE ECM

1. Replace ECM.
2. Go to ECH-356, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

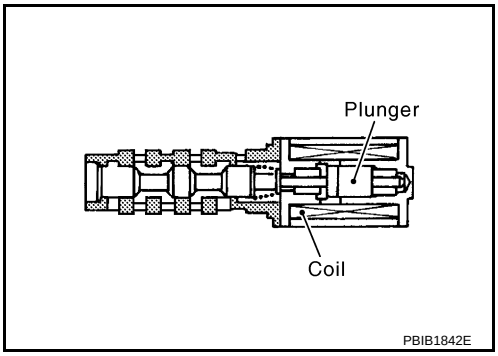
>> INSPECTION END

P1111 IVT CONTROL SOLENOID VALVE

Description

INFOID:0000000001179775

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.



DTC Logic

INFOID:0000000001179776

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1111	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> 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 ECH-486, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179777

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

1. Turn ignition switch OFF.
2. Disconnect intake valve timing 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	2	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN

AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	1	F8	73	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 INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to ECH-487, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace intake valve timing control solenoid valve.

4.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179778

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	6.7 - 7.7 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

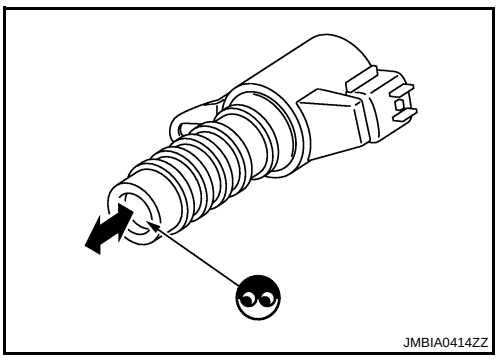
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace intake valve timing control solenoid valve.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.
2. Provide 12V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

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



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace intake valve timing control solenoid valve.

P1121 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

INFOID:0000000001179779

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

DTC Logic

INFOID:0000000001179780

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1121	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 turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Set shift lever to 1st position and wait at least 3 seconds.
3. Set shift lever to Neutral 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 shift lever to 1st position and wait at least 3 seconds.
7. Set shift lever to Neutral position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to ECH-488, "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 shift lever to 1st position and wait at least 3 seconds.
3. Set shift lever to Neutral position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

YES >> Go to ECH-488, "Diagnosis Procedure".
NO >> INSPECTION END

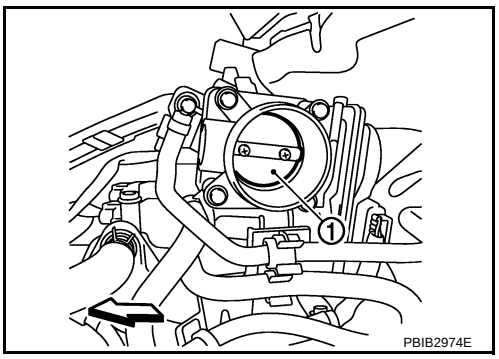
Diagnosis Procedure

INFOID:0000000001179781

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

⇦ : Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-489, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179782

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1122 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000001179783

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 control motor to make the throttle valve opening angle properly in response to driving condition.

DTC Logic

INFOID:0000000001179784

DTC DETECTION LOGIC

NOTE:
If DTC P1122 is displayed with DTC P1121 or P1126, first perform the trouble diagnosis for DTC P1121 or P1126. Refer to ECH-494, "DTC Logic" or ECH-488, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1122	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 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 11V 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 ECH-490, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179785

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F7	2	Ground	Ignition switch OFF	Approx. 0V
			Ignition switch ON	Battery voltage

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

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

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E12	32	F7	2	Existed

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

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F12, E9
- Harness for open or short between throttle motor relay and ECM

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

5.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Check voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal		
F7	15	Ground	Battery voltage

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between throttle motor relay and ECM

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

7.CHECK FUSE

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace 15A fuse.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

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	
F29	5	F7	1	Not existed
			4	Existed
	6		1	Existed
			4	Not existed

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

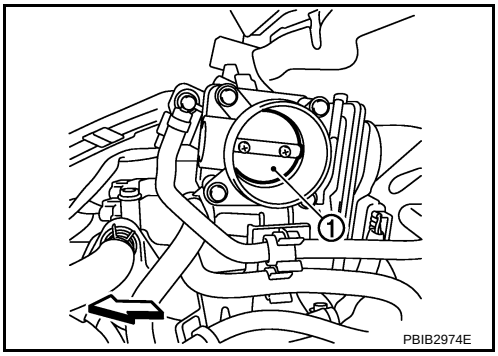
Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
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 11.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

11. CHECK THROTTLE CONTROL MOTOR

Refer to ECH-493, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 13.

12. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

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

13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunction electric throttle control actuator.
2. Go to ECH-493, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000001179786

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

1. Replace electric throttle control actuator.
2. Go to ECH-493, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179787

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1124, P1126 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:0000000001179788

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.

DTC Logic

INFOID:0000000001179789

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1124	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
P1126	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

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 8V.

Witch DTC is detected?

P1124 >> GO TO 2.
P1126 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1124

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

Is DTC detected?

YES >> Go to ECH-494, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1126

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 ECH-494, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179790

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		Ground	Voltage
Connector	Terminal		
F7	15	Ground	Battery voltage

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between throttle motor relay and ECM

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

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E12.
4. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	15	E12	25	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- Harness for open or short between throttle motor relay and ECM

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

5. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Reconnect ECM and IPDM E/R harness connectors.
2. Turn ignition switch ON.
3. Check voltage between ECM harness connector and ground.

ECM		Ground	Voltage
Connector	Terminal		
F7	2	Ground	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. Check the continuity between ECM harness connector and IPDM E/R harness connector.

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	E12	32	Existed

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

Is the inspection result normal?

YES >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F12, E9
- Harness for open or short between throttle motor relay and ECM

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

8. CHECK FUSE

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

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace 15A fuse.

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

P1128 THROTTLE CONTROL MOTOR

Description

INFOID:0000000001179791

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

DTC Logic

INFOID:0000000001179792

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1128	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	• Harness or connectors (Throttle control motor circuit is shorted.) • Electric throttle control actuator (Throttle control motor)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to ECH-497, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179793

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator harness connector.
2. Disconnect ECM harness connector.
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	
F29	5	F7	1	Not existed
			4	Existed
	6		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.

3.CHECK THROTTLE CONTROL MOTOR

Refer to ECH-498, "Component Inspection".

Is the inspection result normal?

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

4.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

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

5.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-498, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000001179794

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

1. Replace electric throttle control actuator.
2. Go to ECH-498, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179795

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000001179796

This CAN communication line is used to control the smooth engine operation during the TCS operation. Pulse signals are exchanged between ECM and “ABS actuator and electric unit (control unit)”.
Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000001179797

DTC DETECTION LOGIC

NOTE:
- **If DTC P1212 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-439, "DTC Logic".**
- **If DTC P1212 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-439, "DTC Logic".**

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1212	TCS communication line	ECM can not receive the information from “ABS actuator and electric unit (control unit)” continuously.	• Harness or connectors (The CAN communication line is open or short-ed.) • ABS actuator and electric unit (control unit) • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-499, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179798

Go to BRC-6, "Work Flow".

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000001179799

DTC DETECTION LOGIC

NOTE:

- **If DTC P1217 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-439, "DTC Logic".**
- **If DTC P1217 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-440, "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 relays -1 and -2) • 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 CO-9, "Inspection". Also, replace the engine oil. Refer to LU-6, "Inspection".

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 LU-6, "Inspection".**
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 ECH-500, "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 ECH-501, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179800

1.PERFORM COMPONENT FUNCTION CHECK-I

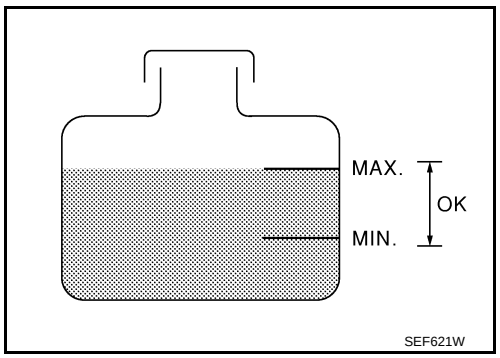
WARNING:

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 ECH-501, "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 ECH-501, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

With CONSULT-III
1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that cooling fan motor operate at each speed (LOW/HI).

Without CONSULT-III
Perform IPDM E/R auto active test and check cooling fan motor operation, refer to PCS-9, "Diagnosis Description".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to PCS-9, "Diagnosis Description".

Diagnosis Procedure

INFOID:0000000001179801

1.CHECK COOLING FAN OPERATION

With CONSULT-III
1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that cooling fan motor operate at each speed (LOW/HI).

Without CONSULT-III
1. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to PCS-9, "Diagnosis Description".
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 ECH-546, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-9, "Inspection".

Is leakage detected?

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

3.CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak. Refer to CO-9, "Inspection".
- Hose
- Radiator
- Water pump

>> Repair or replace malfunctioning part.

4. CHECK RADIATOR CAP

Check radiator cap. Refer to CO-13, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace radiator cap.

5. CHECK THERMOSTAT

Check thermostat. Refer to CO-19, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat.

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to ECH-451, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor.

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	50 - 50% coolant mixture	CO-9, "Inspection"
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-9, "Inspection"
	4	• Radiator cap	• Pressure tester	59 - 98 kPa (0.6 - 1.0 bar, 0.6 - 1.0 kg/cm^2, 9 - 14 psi) (Limit)	CO-14, "Inspection"
ON*2	5	• Coolant leaks	• Visual	No leaks	CO-9, "Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-20, "Inspection"
ON*1	7	• Cooling fan motor	• CONSULT-III	Operating	ECH-547, "Component Inspection (Cooling Fan Motor)"
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	CO-9, "Inspection"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-9, "Inspection"
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-81, "Inspection"
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-102, "Inspection"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (55 MPH) for 30 minutes and then let idle for 10 minutes.

*4: After 60 minutes of cool down time.

For more information, refer to CO-5, "Troubleshooting Chart".

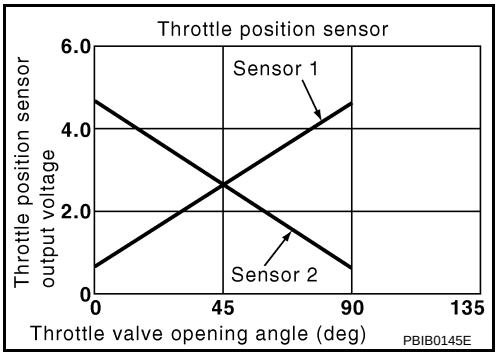
>> INSPECTION END

P1225 TP SENSOR

Description

INFOID:0000000001179802

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



DTC Logic

INFOID:0000000001179803

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 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 10V 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 ECH-504, "Diagnosis Procedure".
NO >> INSPECTION END

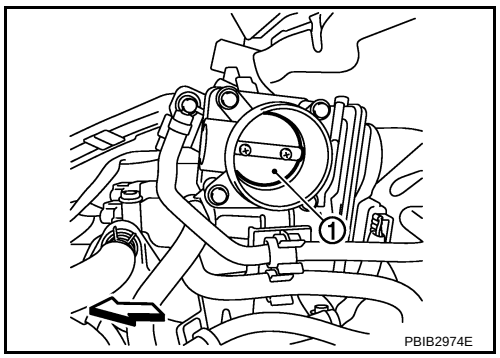
Diagnosis Procedure

INFOID:0000000001179804

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.



⇦ : Vehicle front

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-505, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179805

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

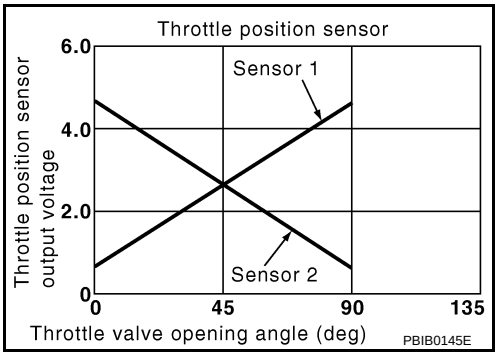
>> END

P1226 TP SENSOR

Description

INFOID:0000000001179806

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



DTC Logic

INFOID:0000000001179807

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 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 10V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF, 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 ECH-506, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

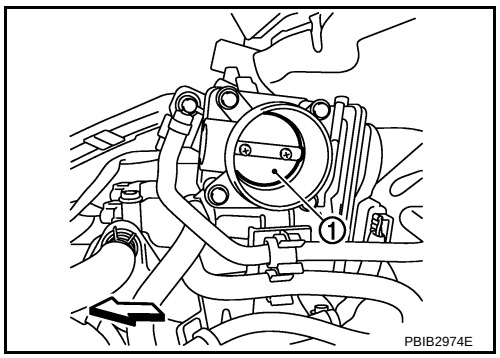
INFOID:0000000001179808

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.

⇦ : Vehicle front



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-505, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179809

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1229 SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000001179810

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1229	Sensor power supply circuit short	ECM detects a voltage of power source for sensor is excessively low or high.	• Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [Camshaft position sensor (PHASE) circuit is shorted.] • Accelerator pedal position sensor • Throttle position sensor • Camshaft position sensor (PHASE)

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 10V 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 ECH-508, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179811

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage
Connector	Terminal		
E110	4	Ground	Approx. 5V

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	72	Electric throttle control actuator	F29	1
	78	CMP sensor (PHASE)	F26	1
E16	106	APP sensor	E110	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.
• Camshaft position sensor (PHASE) (Refer to ECH-480, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5. CHECK TP SENSOR

Refer to ECH-471, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> INSPECTION END

7. CHECK APP SENSOR

Refer to ECH-529, "Component Inspection".

Is the inspection result normal?

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

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P1564 ASCD STEERING SWITCH

Description

INFOID:0000000001179812

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to ECH-387, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000001179813

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to ECM-199, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ASCD steering switch	• An excessively high voltage signal from the ASCD steering switch is sent to ECM. • ECM detects that input signal from the ASCD steering switch is out of the specified range. • ECM detects that the ASCD steering switch is stuck ON.	• Harness or connectors (The switch circuit is open or shorted.) • ASCD steering switch • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Wait at least 10 seconds.
3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Check DTC.

Is DTC detected?

YES >> Go to ECH-510, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179814

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-III
1. Turn ignition switch ON.

2. Select “MAIN SW”, “CANCEL SW”, “RESUME/ACC SW” and “SET SW” in “DATA MONITOR” mode with CONSULT-III.
3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
		Released	OFF
RESUME/ACC SW	RESUME/ACCELERATE switch	Pressed	ON
		Released	OFF
SET SW	SET/COAST switch	Pressed	ON
		Released	OFF

Without CONSULT-III
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition	Voltage
Connector	Terminal			
E16	94 (ASCD steering switch signal)	Ground	MAIN switch: Pressed	Approx. 0V
			CANSEL switch: Pressed	Approx. 1V
			SET/COAST switch: Pressed	Approx. 2V
			RESUME/ACCELERATE switch: Pressed	Approx. 3V
			All ASCD steering switches: Released	Approx. 4V

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3. CHECK ASCD STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector M352.
4. Check the continuity between ASCD steering switch and ECM harness connector.

ASCD steering switch	ECM		Continuity
Terminal	Connector	Terminal	
15	E16	95	Existed

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

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M77, E105
- Combination switch (spiral cable)
- Harness for open and short between ECM and ASCE steering switch

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

5. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM harness connector and ASCD steering switch.

ASCD steering switch	ECM		Continuity
Terminal	Connector	Terminal	
14	E16	94	Existed

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M77, E105
- Combination switch (spiral cable)
- Harness for open and short between ECM and ASCE steering switch

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

7. CHECK ASCD STEERING SWITCH

Refer to ECH-512, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179815

1. CHECK ASCD STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector.
2. Check the continuity between combination switch harness connector terminals under following conditions.

Combination meter		Condition	Resistance
Connector	Terminals		
M325	14 and 15	MAIN switch: Pressed	Approx. 0 Ω
		CANCEL switch: Pressed	Approx. 250 Ω
		SET/COAST switch: Pressed	Approx. 660 Ω
		RESUME/ACCELERATE switch: Pressed	Approx. 1,480 Ω
		All ASCD steering switches: Released	Approx. 4,000 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD steering switch

P1572 ASCD BRAKE SWITCH

Description

INFOID:0000000001179816

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to ECH-48, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000001179817

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to ECM-199, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1572	ASCD brake switch	A)	When the vehicle speed is above 30 km/h (19 MPH), ON signals from the stop lamp switch and the ASCD brake switch are sent to the ECM at the same time.	• Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ASCD brake switch circuit is shorted.) • Harness or connectors (The ASCD clutch switch circuit is shorted.) • Stop lamp switch • ASCD brake switch • ASCD clutch switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • Incorrect ASCD clutch switch installation • ECM
		B)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is driving.	

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?.

Do you have CONSULT-III?

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

2.PRECONDITIONING

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

NOTE:
Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

With CONSULT-III

1. Start engine.
2. Select “DATA MONITOR” mode with CONSULT-III.
3. Press MAIN switch and make sure that CRUISE indicator is displayed in combination meter.
4. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:
Always drive vehicle at a safe speed.

NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Shift lever	Suitable position

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-515, "Diagnosis Procedure".
NO >> GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT-III

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than five seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-515, "Diagnosis Procedure".
NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

Perform component check. Refer to
Use component function check to check the overall function of the ASCD brake circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-515, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179818

1. PERFORM COMPONENT FUNCTION CHECK-I

Without CONSSULT-III

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

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	100 (ASCD brake switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to ECM-198, "Diagnosis Procedure".

2. PERFORM COMPONENT FUNCTION CHECK-II

Without CONSSULT-III
Check voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	99 (Stop lamp switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECM-198, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179819

1. CHECK OVERALL FUNCTION-I

With CONSULT-III
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal and clutch pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III
1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	100 (ASCD brake switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

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

2. CHECK OVERALL FUNCTION-II

With CONSULT-III
Select “BRAKE SW2” and check indication in “DATA MONITOR” mode.

Monitor item	Condition		Indication
BRAKE SW2	Brake pedal and clutch pedal	Slightly depressed	ON
		Fully released	OFF

Without CONSULT-III
Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	99 (Stop lamp switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 6.

3.CHECK ASCD BRAKE SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD Clutch switch		Ground	Condition		Voltage (V)
Connector	Terminal				
E112	1	Ground	Clutch pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD clutch switch harness connector and ground.

ASCD clutch switch		Ground	Voltage
Connector	Terminal		
E111	1	Ground	Battery voltage

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Junction block connector E105, M77
- 10A fuse (No.4)
- Harness for open or short between ASCD brake switch and fuse

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

6.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ASCD brake switch harness connector and ASCD clutch switch harness connector.

ASCD brake switch		ASCD clutch switch		Continuity
Connector	Terminal	Connector	Terminal	
E112	1	E111	2	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 ASCD BRAKE SWITCH

Refer to ECH-518, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace ASCD brake switch.

8. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

ECM		ASCD brake switch		Continuity
Connector	Terminal	Connector	Terminal	
E16	100	E112	2	Existed

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

Is the inspection result normal?

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

9. CHECK ASCD CLUTCH SWITCH

Refer to ECH-518, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace ASCD clutch switch.

10. 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	1	Ground	Battery voltage

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.
- 10A fuse (No.11)
- 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.

12. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

ECM		Stop lamp switch		Continuity
Connector	Terminal	Connector	Terminal	
E10	106	E114	2	Existed

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

Is the inspection result normal?

YES >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.
• Harness for open or short between ECM and stop lamp switch

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

14. CHECK STOP LAMP SWITCH

Refer to ECH-519, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace stop lamp switch.

15. CHECK INTERMITTENT INCIDENT

Refer to .

>> INSPECTION ENDGI-39, "Intermittent Incident"

Component Inspection (ASCD Brake Switch)

INFOID:0000000001179820

1. CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2. CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-8, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

Component Inspection (ASCD Clutch Switch)

INFOID:0000000001179821

1. CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to CL-6, "Inspection and Adjustment".
2. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD clutch switch.

Component Inspection (Stop Lamp Switch)

INFOID:0000000001179822

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

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

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-18, "Inspection and Adjustment"
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch.

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000001179823

The ECM receives two vehicle speed sensor signals via CAN communication line. One is sent from combination meter, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to ECH-48, "System Description" for ASCD functions.

DTC Logic

INFOID:0000000001179824

DTC DETECTION LOGIC

NOTE:

- **If DTC P1574 is displayed with DTC U1001, first perform the trouble diagnosis for DTC U1001. Refer to ECH-439, "DTC Logic".**
- **If DTC P1574 is displayed with DTC U1010, first perform the trouble diagnosis for DTC U1010. Refer to ECH-440, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to ECH-482, "DTC Logic"**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ASCD vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) (Combination meter circuit is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
3. Check DTC.

Is DTC detected?

YES >> Go to ECH-520, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179825

1.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-57, "DTC No. Index".

Is the inspection result normal?

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

2.CHECK COMBINATION METER

Check combination meter function.
Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

>> INSPECTION END

P1706 PNP SWITCH

Description

INFOID:0000000001179826

When the shift lever position is in the neutral position, ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:0000000001179827

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1706	Park/neutral position switch	The signal of the park/neutral position (PNP) switch is not changed in the process of engine starting and driving.	• Harness or connectors [The park/neutral position (PNP) switch circuit is open or shorted.] • Park/neutral position (PNP) switch

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.PRECONDITIONING

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

>> GO TO 3.

3.CHECK PNP SWITCH FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-III. Then check the “P/N POSI SW” signal under the following conditions.

Position (Shift lever)	Known-good signal
Neutral position	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to ECH-523, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT-III.
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	1,925 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	2.5 - 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 ECH-523, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

With CONSULT-III

Perform component function check. Refer to ECH-523, "Component Function Check".

NOTE:

Use component function check the overall function of the park/neutral position (PNP) switch circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-523, "Diagnosis Procedure".

Component Function Check

INFOID:0000000001179828

1.PERFORM COMPONENT FUNCTION CHECK

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

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	69 (PNP switch signal)	Ground	Shift lever	Neutral position	Approx. 0V
				Except above	BATTERY VOLTAGE

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-523, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179829

1.CHECK PNP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect Park/neutral position (PNP) switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between PNP switch harness connector and ground.

PNP switch		Ground	Voltage
Connector	Terminal		
F46	2	Ground	Battery voltage

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following

- Harness connectors E6, F123
- Harness for open or short between neutral position switch and IPDM E/R

>> 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 PNP switch harness connector and ECM harness connector.

PNP switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F46	3	F8	69	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 PNP SWITCH

Refer to TM-13, "PARK/NEUTRAL POSITION (PNP) SWITCH : Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace PNP switch.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

P1805 BRAKE SWITCH

Description

INFOID:0000000001179830

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 driving.

DTC Logic

INFOID:0000000001179831

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 the DTC with CONSULT-III.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to ECH-525, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179832

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 1st trip DTC detected?

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	1	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
• Harness connectors E105, M77

- 10A fuse (No. 11)
- 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 ECM harness connector.
2. Check the continuity between ECM harness connector and stop lamp switch harness connector.

ECM		Stop lamp switch		Continuity
Connector	Terminal	Connector	Terminal	
E16	99	E114	2	Existed

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

Is the inspection result normal?

YES >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK STOP LAMP SWITCH

Refer to ECH-526, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace stop lamp switch.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000001179833

1. CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

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

2. CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-18, "Inspection and Adjustment"(LHD) or BR-65, "Inspection and Adjustment"(LHD).
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

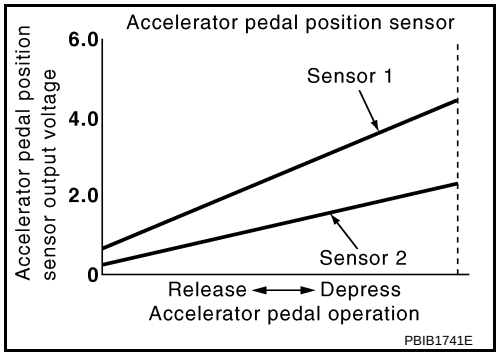
YES >> INSPECTION END
NO >> Replace stop lamp switch.

P2122, P2123 APP SENSOR

Description

INFOID:0000000001179834

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 potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic

INFOID:0000000001179835

DTC DETECTION LOGIC

NOTE:
If DTC P2122 or P2123 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-508, "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 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 10V 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 ECH-527, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179836

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

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		
E110	4	Ground	Approx. 5V

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	
E110	2	E16	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	
E110	3	E16	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 ECH-529, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-529, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179837

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		Ground	Condition		Voltage
Connector	Terminal				
E16	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-529, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179838

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

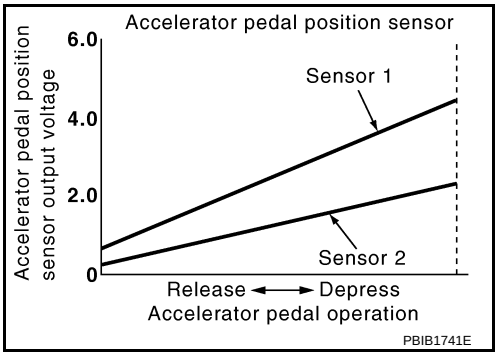
>> END

P2127, P2128 APP SENSOR

Description

INFOID:0000000001179839

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 potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



DTC Logic

INFOID:0000000001179840

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.) [Crankshaft position sensor (POS) circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • 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 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 10V 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 ECH-530, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179841

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

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		
E110	5	Ground	Approx. 5V

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	
E110	5	E16	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 APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	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.
- Crankshaft position sensor (POS) (Refer to ECH-477, "Component Inspection".)
- Refrigerant pressure sensor (Refer to HAC-70, "Component Inspection".)

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	
E110	1	E16	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	
E110	6	E16	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 ECH-532, "Component Inspection".

Is the inspection result normal?

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

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-533, "Special Repair Requirement".

>> INSPECTION END

10.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179842

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		Ground	Condition		Voltage
Connector	Terminal				
E16	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-533, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179843

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

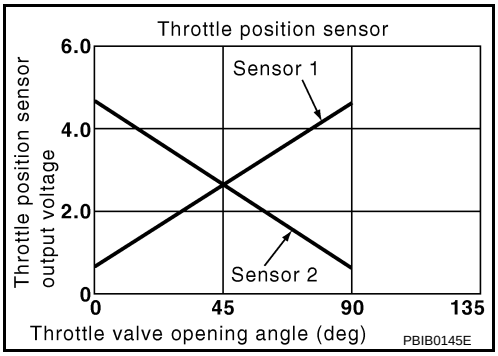
>> END

P2135 TP SENSOR

Description

INFOID:0000000001179844

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



DTC Logic

INFOID:0000000001179845

DTC DETECTION LOGIC

NOTE:
If DTC P2135 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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 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 10V 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 ECH-534, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179846

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator harness connector.

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

Electric throttle control actuator		Ground	Voltage
Connector	Terminal		
F29	1	Ground	Approx. 5V

Is the inspection result normal?

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

3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

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	
F29	1	F8	72	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4. 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	
F29	4	F8	36	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 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	
F29	2	F8	33	Existed
	3		34	

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 THROTTLE POSITION SENSOR

Refer to ECH-536, "Component Inspection".

Is the inspection result normal?

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

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. ECH-536, "Special Repair Requirement"

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179847

1. CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform ECH-536, "Special Repair Requirement".
4. Turn ignition switch ON.
5. Set shift lever to 1st position.
6. Check the voltage between ECM harness connector and ground.

ECM		Ground	Condition		Voltage
Connector	Terminal				
F8	33 (TP sensor 1 signal)	Ground	Accelerator pedal	Fully released	More than 0.36V
				Fully depressed	Less than 4.75V
	34 (TP sensor 2 signal)			Fully released	Less than 4.75V
				Fully depressed	More than 0.36V

Is the inspection result normal?

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

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.
2. Go to ECH-536, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179848

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

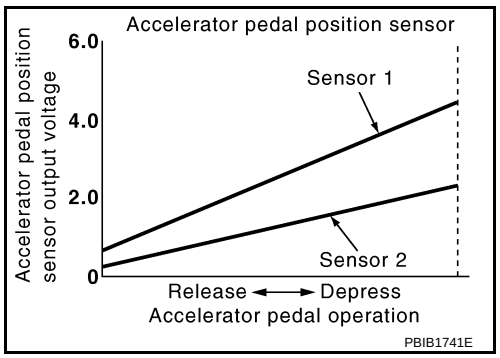
>> END

P2138 APP SENSOR

Description

INFOID:0000000001179849

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 potentiometers which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. In addition, these sensors detect the opening and closing speed of the accelerator pedal and feed the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.



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

DTC Logic

INFOID:0000000001179850

DTC DETECTION LOGIC

NOTE:
If DTC P2138 is displayed with DTC P1229, first perform the trouble diagnosis for DTC P1229. Refer to ECH-250, "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.) [Crankshaft position sensor (POS) circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 and 2) • Crankshaft position sensor (POS) • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10V 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 ECH-537, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000001179851

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

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		
E110	4	Ground	Approx. 5V

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

1. Turn ignition switch ON.
2. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage
Connector	Terminal		
E110	5	Ground	Approx. 5V

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	
E110	5	E16	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 APP SENSOR 2 POWER SUPPLY CIRCUIT-III

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Item	Connector	Terminal
F8	74	Refrigerant pressure sensor	E49	3
	75	CKP sensor (POS)	F20	1
E16	102	APP sensor	E110	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.
- Crankshaft position sensor (POS) (Refer to ECH-477, "Component Inspection".)
- Refrigerant pressure sensor (Refer to HAC-70, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 11.
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	
E110	1	E16	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	
E110	3	E16	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 ECH-539, "Component Inspection".

Is the inspection result normal?

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

10.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-540, "Special Repair Requirement".

>> INSPECTION END

11.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179852

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		Ground	Condition		Voltage
Connector	Terminal				
E110	110 (APP sensor 1 signal)	Ground	Accelerator pedal	Fully released	0.6 - 0.9V
				Fully depressed	3.9 - 4.7V
	103 (APP sensor 2 signal)			Fully released	0.3 - 0.6V
				Fully depressed	1.95 - 2.4V

Is the inspection result normal?

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

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to ECH-540, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000001179853

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to ECH-357, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to ECH-358, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to ECH-358, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

ASCD BRAKE SWITCH

Description

INFOID:0000000001179854

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by this input of two kinds (ON/OFF signal).
Refer to ECH-387, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000001179855

1.CHECK FOR ASCD BRAKE SWITCH FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal and clutch pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

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

ECM		Ground	Condition		Voltage
Connector	Terminal				
E16	100 (ASCD brake switch signal)	Ground	Brake pedal and clutch pedal	Slightly depressed	Approx. 0V
				Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-541, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179856

1.CHECK ASCD BRAKE SWITCH CIRCUIT - I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD clutch switch		Ground	Voltage (V)
Connector	Terminal		
E112	1	Ground	Battery voltage

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

Is the inspection result normal?

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

2.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT - II

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD clutch switch harness connector and ground.

ASCD clutch switch		Ground	Voltage (V)
Connector	Terminal		
E111	1	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E105, M77
- 10A fuse (No. 4)
- Harness for open or short between ASCD brake switch and fuse

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

4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Check the continuity between ASCD brake switch harness connector and ASCD clutch switch harness connector.

ASCD brake switch		ASCD clutch switch		Continuity
Connector	Terminal	Connector	Terminal	
E112	1	E111	2	Existed

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

Is the inspection result normal?

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

5. CHECK ASCD CLUTCH SWITCH

Refer to ECH-543, "Component Inspection (ASCD Clutch Switch)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace ASCD clutch switch.

6. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

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

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112	2	E16	100	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 ASCD BRAKE SWITCH

Refer to ECH-543, "Component Inspection (ASCD Brake Switch)".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD brake switch.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000001179857

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-17, "Removal and Installation" (LHD) or BR-64, "Removal and Installation" (RHD).
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

Component Inspection (ASCD Clutch Switch)

INFOID:0000000001179858

1.CHECK ASCD CLUTCH SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD clutch switch harness connector.
3. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

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

2.CHECK ASCD CLUTCH SWITCH-II

1. Adjust ASCD clutch switch installation. Refer to CL-9, "Removal and Installation".
2. Check the continuity between ASCD clutch switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Clutch pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD clutch switch.

ASCD INDICATOR

Description

INFOID:0000000001179859

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE lamp illuminates when MAIN switch on ASCD steering switch is turned ON to indicated that ASCD system is ready for operation.
SET lamp illuminates when following conditions are met.
- CRUISE lamp is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of ASCD setting.

SET lamp remains lit during ASCD control.
Refer to ECH-387, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000001179860

1.ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	• Ignition switch: ON	• MAIN switch: Pressed at the 1st time →at the 2nd time	ON → OFF
SET LAMP	• MAIN switch: ON • When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	• ASCD: Operating	ON
		• ASCD: Not operating	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-545, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179861

1.CHECK DTC

Check that DTC U1001 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC U1001. Refer to ECH-439, "DTC Logic".

2.CHECK COMBINATION METER OPERATION

Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Check combination meter circuit. Refer to MWI-49, "Wiring Diagram - METER -".

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

COOLING FAN

Description

INFOID:0000000001179862

Cooling fan operates at low and high speed when the current flows in the cooling fan motor.
Refer to ECH-395, "System Diagram" for cooling fan operation.

Component Function Check

INFOID:0000000001179863

1.CHECK COOLING FAN LOW SPEED FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “COOLING FAN” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that cooling fan operates at low and high speed.

Without CONSULT-III

1. Perform IPDM E/R auto active test and check cooling fan motor operation, refer to PCS-9, "Diagnosis Description".
2. Make sure that cooling fan operates at low and high speed.

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-546, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179864

1.CHECK IPDM E/R POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E14.
3. Check the voltage between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Voltage
Connector	Terminal		
E14	53	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair open circuit or short to ground or short to power in harness or connectors

2.CHECK COOLING FAN MOTOR CIRCUIT FOR OPEN AND SHORT

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

Cooling fan motor		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E3	1	E14	52	Existed
			54	

4. Check the continuity between cooling fan motor harness connector and ground.

Cooling fan motor		IPDM/ER		Ground	Continuity
Connector	Terminal	Connector	Terminal		
E3	2	E10	5	Ground	Existed
			6		

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Resistor E57.
- Harness for open or short between IPDM E/R and cooling fan.
- Harness for open or short between cooling fan and ground.
- Harness for open or short between IPDM E/R and ground.

>> Repair or replace malfunctioning part.

4. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

5. CHECK COOLING FAN MOTOR

Refer to ECH-547, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning cooling fan motor.

6. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connector.

Component Inspection (Cooling Fan Motor)

INFOID:0000000001179865

1. CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan motor harness connector E3.
3. Supply cooling fan motor terminals with battery voltage and check operation.

Terminals		Operation
(+)	(–)	
1	2	Cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan motor.

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000001179866

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line from BCM to ECM via IPDM E/R.

Component Function Check

INFOID:0000000001179867

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Connect CONSULT-III and select “DATA MONITOR” mode.
3. Select “LOAD SIGNAL” and check indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Rear window defogger switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to ECH-548, "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 ECH-548, "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 ECH-548, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179868

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to ECH-548, "Component Function Check".

Which circuit is related to the incident?

Rear window defogger>>GO TO 2
Headlamp>>GO TO 3.
Heater fan>>GO TO 4.

2.CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to DEF-3, "Work Flow".

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Refer to EXL-7, "Work Flow".

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to GI-39, "Intermittent Incident".

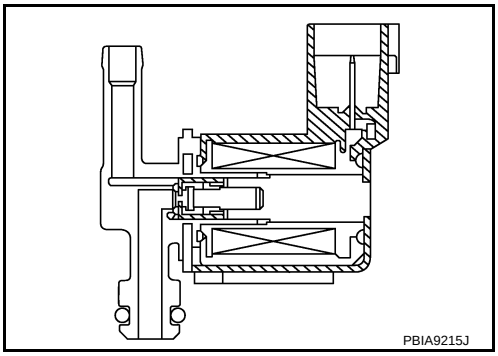
>> INSPECTION END

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000001179869

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.



Component Function Check

INFOID:0000000001179870

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE FUNCTION

With CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect the EVAP purge hose from EVAP canister purge volume control solenoid valve (EVAP canister side).
3. Start engine and let it idle.
4. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode wit CONSULT-III.
5. Touch “Qu” and “Qd” on CONSULT-III screen to adjust “PURG VOL CONT/V” and check vacuum existence under the following conditions.

PURG VOL CONT/V	Vacuum
100%	Existed
0 %	Not existed

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect the EVAP purge hose from EVAP canister purge volume control solenoid valve (EVAP canister side).
3. Start engine and let it idle for at least 100 seconds.
4. Check vacuum existence under the following conditions.

Condition	Vacuum
At idle	Not existed
About 2,000 rpm	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-550, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179871

1. CHECK EVAP CANISTER

Refer to ECH-624, "Inspection".

Is the inspection result normal?

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

2. 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 4.
NO >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E7, F121
- 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.

4. 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-III: GO TO 5.
YES-2 >> Without CONSULT-III: GO TO 6.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to ECH-552, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace EVAP canister purge volume control solenoid valve.

7. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

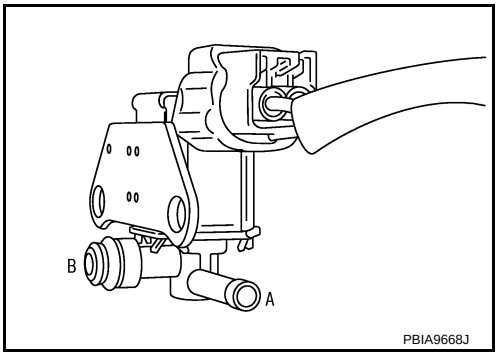
Component Inspection

INFOID:0000000001179872

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Turn ignition switch ON.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III.
6. Touch “Qd” and “Qu” on CONSULT-III screen to adjust “PURG VOL CONT/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

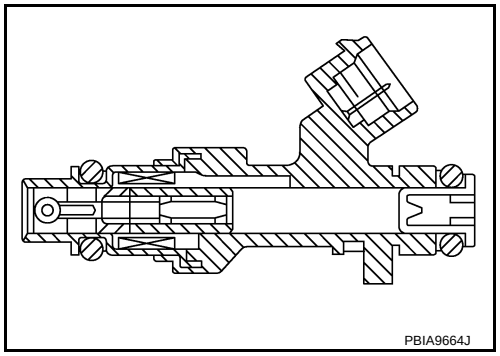
YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve

FUEL INJECTOR

Description

INFOID:0000000001179873

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.



Component Function Check

INFOID:0000000001179874

1. INSPECTION START

Turn ignition switch to START.

Is any cylinder ignited?

YES >> GO TO 2.
NO >> Go to ECH-553, "Diagnosis Procedure".

2. CHECK FUEL INJECTOR FUNCTION

With CONSULT-III

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Make sure that each circuit produces a momentary engine speed drop.

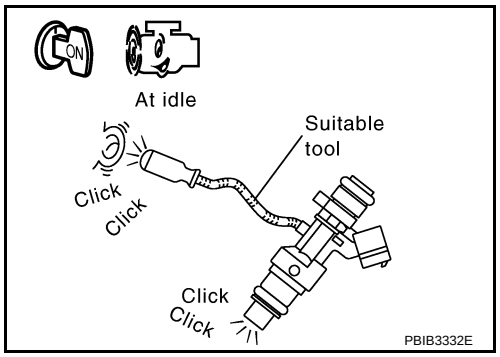
Without CONSULT-III

1. 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 ECH-553, "Diagnosis Procedure".



Diagnosis Procedure

INFOID:0000000001179875

1. CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Turn ignition switch ON.
4. Check the voltage between fuel injector harness connector and ground.

Fuel injector			Ground	Voltage
Cylinder	Connector	Terminal		
1	F37	1	Ground	Battery voltage
2	F38	1		
3	F39	1		
4	F40	1		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 10A fuse (No. 58)
- 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	Terminal	Connector	Terminal	
1	F37	2	F7	31	Existed
2	F38	2		30	
3	F39	2		29	
4	F40	2		25	

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 ECH-554, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning fuel injector.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

Component Inspection

INFOID:0000000001179876

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 [at 10 - 60°C (50 - 140°F)]
1 and 2	11.1 - 14.5 Ω

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector.

FUEL PUMP

Description

INFOID:0000000001179877

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 several seconds after the ignition switch is turned ON to improve engine startability. If the ECM receives a engine speed signal from the crankshaft position sensor 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.

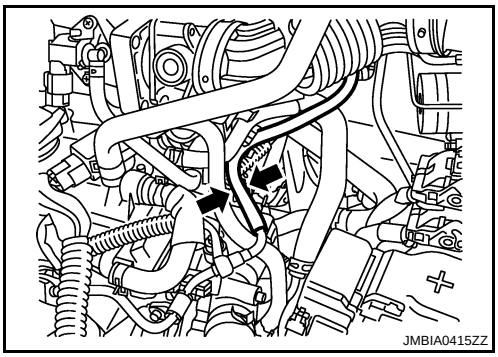
Component Function Check

INFOID:0000000001179878

1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.



Is the inspection result normal?

YES >> INSPECTION END
NO >> ECH-294, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179879

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		Ground	Voltage
Connector	Terminal		
F7	23	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F7	23	E13	33	Existed

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. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E6, F123.
- Harness for open or short to ground and short power.

>> Repair harness or connectors.

4. 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 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 exist 1 second after ignition switch is turn ON.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

5. CHECK 10A FUSE

1. Turn ignition switch OFF.
2. Disconnect 10A fuse (No. 57) from IPDM E/R.
3. Check 10A fuse.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace fuse.

6. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-IV

1. Disconnect IPDM E/R harness connector.
2. Check the continuity between IPDM E/R harness connector and “fuel level sensor unit and fuel pump” harness connector.

IPDM E/R		Fuel level sensor unit and fuel pump		Continuity
Connector	Terminal	Connector	Terminal	
F13	42	B40	1	Existed

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

Is the inspection result normal?

YES >> GO TO 10.

NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B10, E101
- Harness for open or short between IPDM E/R and “fuel level sensor unit and fuel pump”

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

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Check the continuity between “fuel level sensor unit and fuel pump” and ground.

Fuel level sensor unit and fuel pump		Ground	Continuity
Connector	Terminal		
B40	3	Ground	Existed

2. Also heck 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 FUEL PUMP

Refer to ECM-299, "Component Inspection (Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace fuel pump.

10.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

Component Inspection (Fuel Pump)

INFOID:0000000001179880

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?

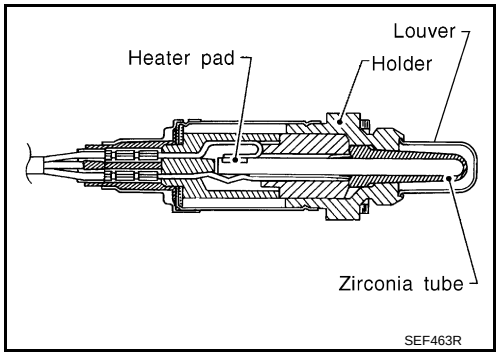
YES >> INSPECTION END
NO >> Replace “fuel level sensor unit and fuel pump”.

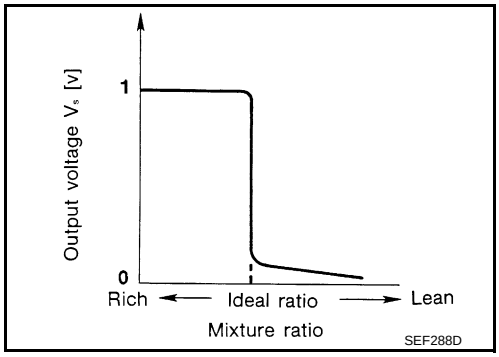
HO2S1

Description

INFOID:0000000001179881

The heated oxygen sensor 1 is placed into the exhaust manifold. It detects the amount of oxygen in the exhaust gas compared to the outside air. The heated oxygen sensor 1 has a closed-end tube made of ceramic zirconia. The zirconia generates voltage from approximately 1V in richer conditions to 0V in leaner conditions. The heated oxygen sensor 1 signal is sent to the ECM. The ECM adjusts the injection pulse duration to achieve the ideal air-fuel ratio. The ideal air-fuel ratio occurs near the radical change from 1V to 0V.





Component Function Check

INFOID:0000000001179882

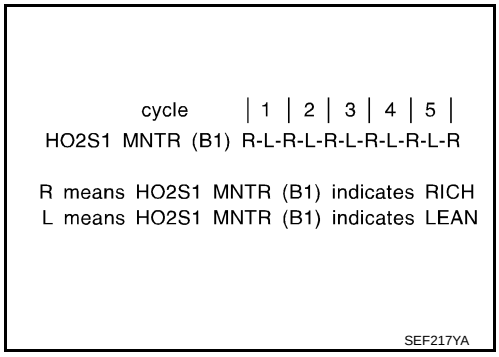
1. CHECK HEATED OXYGEN SENSOR 1 FUNCTION

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Select “HO2S1 MNITOR (B1)” in ”DATA MONITOR” mode with CONSULT-III.
3. Keep the engine speed at 2,000 rpm under no load, and make sure that the monitors fluctuates between LEAN and RICH more than five times in 10 seconds.

1 times: RICH →LEAN → RICH

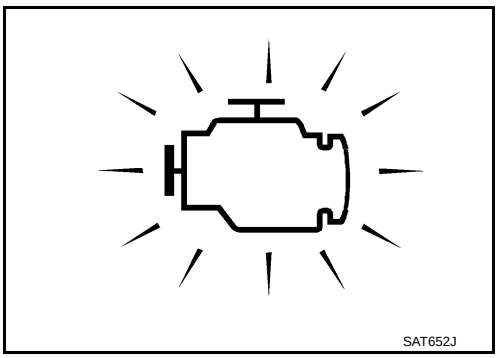
2 times: RICH → LEAN → RICH → LEAN → RICH



Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Stop engine and wait at least 10 seconds.
3. Set ECM in Diagnostic test mode - II (Heated oxygen sensor 1 monitor).

4. Keep the engine speed at 2,000 rpm under no load, and make sure that the MI comes ON more than five times in 10 seconds.



Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-135, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179883

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.RETIGHTEN HEATED OXYGEN SENSOR 1

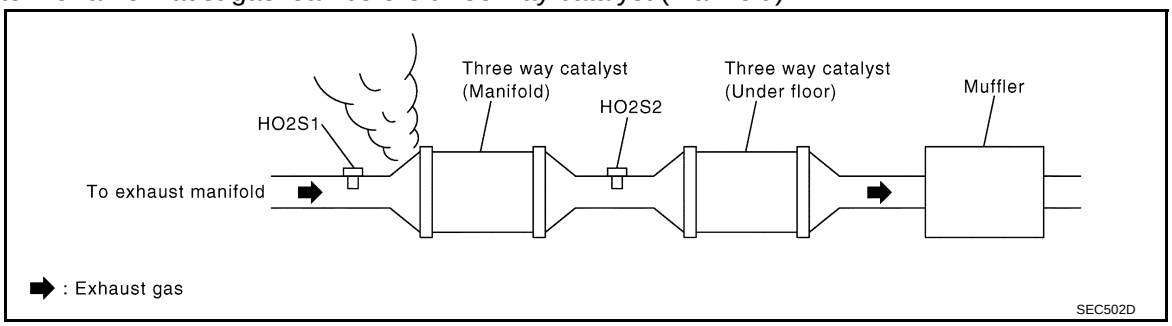
Loosen and retighten the heated oxygen sensor 1.

Tightening torque: 50 N-m (5.1 kg-m, 37 ft-lb)

>> 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 (manifold).



Is exhaust gas leak detected?

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

4.CHECK FOR INTAKE AIR LEAK

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

Is intake air leak detected?

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

5.CHECK HO2S1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.

2. Disconnect heated oxygen sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check harness continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	existed

5. 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 HEATED OXYGEN SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	1	F8	56	Existed

2. Check the continuity between HO2S1 harness connector or ECM harness connector and ground.

HO2S1		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F30	4	F8	49	Ground	Not 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 ground or short to power in harness or connectors.

7. CHECK MASS AIR FLOW SENSOR

Check mass air flow sensor.
Refer to ECH-447, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace mass air flow sensor.

8. CHECK PCV VALVE

Refer to ECM-306, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace PCV valve.

9. CHECK HEATED OXYGEN SENSOR 1

Perform ECH-562, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace heated oxygen sensor 1.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179884

1. INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

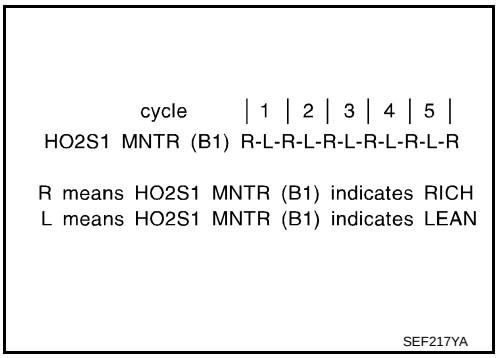
YES >> GO TO 2.
NO >> GO TO 3.

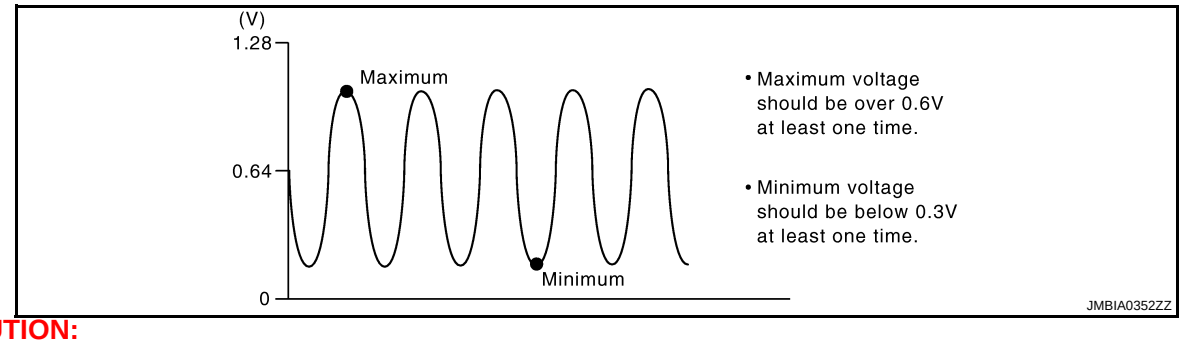
2. CHECK HEATED OXYGEN SENSOR 1

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set “POST TRIGGER” to 100% in “DATA MONITOR” mode with CONSULT-III.
3. Select “HO2S1 (B1)” and “HO2S1 MNTR (B1)”.
4. Hold engine speed at 2,000 rpm under no load during the following steps.
5. Touch “RECORD” on CONSULT-III screen.
6. Check the following.

- “HO2S1 MNTR (B1)” in “DATA MONITOR” mode changes from “RICH” to “LEAN” to “RICH” more than 5 times in 10 seconds.
  5 times (cycles) are counted as shown in the figure.
- “HO2S1 (B1)” voltage goes above 0.6V at least once.
- “HO2S1 (B1)” voltage goes below 0.3V at least once.
- “HO2S1 (B1)” voltage never exceeds 1.0V.





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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 1

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Check the voltage between ECM harness connector and ground under the following condition.

ECM		ground	Condition	Voltage
Connector	Terminal			
F8	49 (HO2S1 signal)	Ground	Engine speed held at 2,000 rpm constant under no load.	• The voltage fluctuates between 0 to 0.3V and 0.6 to 1.0V more than 5 times within 10 seconds. • The maximum voltage is over 0.6V at least 1 time. • The minimum voltage is below 0.3V at least 1 time. • The voltage never exceeds 1.0V. 1 time: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V 2 times: 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V → 0.6 - 1.0V → 0 - 0.3V

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 tool and approved anti-seize lubricant.**

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 4

4. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 tool and approved anti-seize lubricant.**

>> INSPECTION END

HO2S1 HEATER

Description

INFOID:0000000001179885

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 1 heater control	Heated oxygen sensor 1 heater
Mass air flow sensor	Amount of intake air		

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

OPERATION

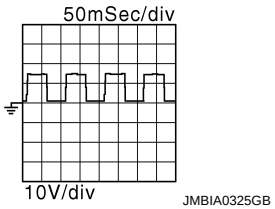
Engine speed rpm	Heated oxygen sensor 1 heater
Above 3,600	OFF
Below 3,600 rpm after the following conditions are met. • Engine: After warming up	ON

Component Function Check

INFOID:0000000001179886

1.CHECK HEATED OXYGEN SENSOR 2 HEATER FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Set tester prove between ECM harness connection and ground.
4. Start engine and let it idle.
5. Check the voltage under the following conditions.Verify that the oscilloscope screen shows the signal waves as shown below.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F7	3 (HO2S1 HEATER signal)	Ground	At idle	Approximately 7.0★  JMBIA0325GB
			Engine speed is above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)

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

Is the inspection result normal?

YES >> INSPECTION END.
NO >> Go to ECH-135, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179887

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2. CHECK HO2S1 POWER SUPPLY CIRCUIT

1. Disconnect HO2S1 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S1 harness connector and ground.

HO2S1		Ground	Voltage
Connector	Terminal		
F30	2	Ground	Battery voltage

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 10A fuse (No. 56)
- Harness for open or short between HO2S1 and fuse

>> Repair or replace harness or connectors.

4. CHECK HO2S1 HEATER OUTPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S1 harness connector and ECM harness connector.

HO2S1		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F30	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 or short to ground or short to power in harness or connectors.

5. CHECK HO2S1 HEATER

Refer to ECH-566, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE HEATED OXYGEN SENSOR 1

Replace Heated oxygen sensor 1.

CAUTION:
- **Discard any heated oxygen sensor 1 which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new heated oxygen sensor 1, clean exhaust system threads using Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.**

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Perform GI-39, "Intermittent Incident".

>> Repair or replace.

Component Inspection

INFOID:0000000001179888

1. CHECK HEATED OXYGEN SENSOR 1

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 1 harness connector.
3. Check resistance between HO2S1 terminals as follows.

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

Is the inspection result normal?

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

2. REPLACE HEATED OXYGEN SENSOR 1

Replace heated oxygen sensor 1.

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 Heated Oxygen Sensor Thread Cleaner tool and approved anti-seize lubricant.**

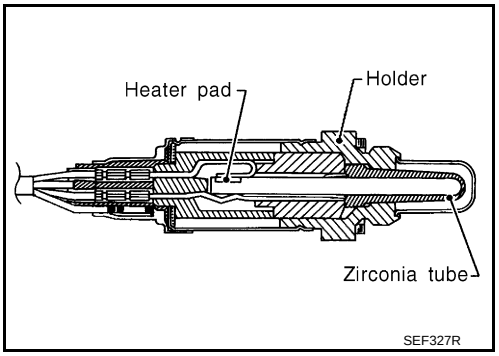
>> INSPECTION END

HO2S2

Description

INFOID:0000000001179889

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the heated oxygen 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 1V in richer conditions to 0V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



Component Function Check

INFOID:0000000001179890

1. PERFORM COMPONENT FUNCTION CHECK-I

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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage does not remain in the range of 0.2 - 0.4V.

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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage does not remain in the range of 0.2 - 0.4V.

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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 3rd gear position	The voltage does not remain in the range of 0.2 - 0.4V.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECM-570, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179891

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK 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	
F42	1	F13	35	Existed

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

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

- Harness or connectors F121, E7
- Harness for open or short between HO2S2 and ECM.

>> 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	
F42	4	F13	33	Existed

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

HO2S2		ECM		Ground	Continuity
Connector	Terminal	Connector	Terminal		
F42	4	F13	33	Ground	Not existed

3. Also check harness for short to power.

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

- Harness or connectors F121, E7
- Harness for open or short between HO2S2 and ECM.

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

6.CHECK HEATED OXYGEN SENSOR 2

Refer to ECH-569, "Component Inspection".

Is the inspection result normal?

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

7. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179892

1. INSPECTION START

Do you have CONSULT-III?

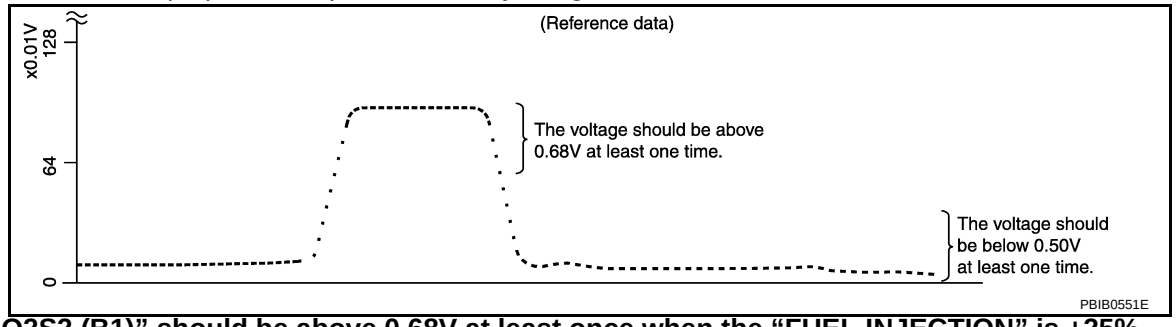
Do you have CONSULT-III?

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

2. CHECK HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)” should be above 0.68V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)” should be below 0.50V at least once when the “FUEL INJECTION” is –25%.

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
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		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Keeping engine speed at idle for 10 minutes	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 and ground under the following condition.

ECM		Ground	Condition	Voltage
Connector	Terminal			
F8	50 (HO2S2 signal)	Ground	Coasting from 80 km/h (50 MPH) in 4th gear position	The voltage should be above 0.68V at least once during this procedure. The voltage should be below 0.50V 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 heated oxygen sensor 2.

CAUTION:

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

>> INSPECTION END

HO2S2 HEATER

Description

INFOID:0000000001179893

SYSTEM DESCRIPTION

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

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

OPERATION

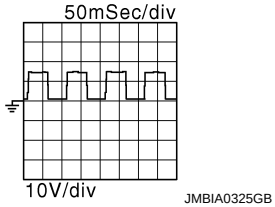
Engine speed rpm	Heated oxygen sensor 2 heater
Above 3,900	OFF
Below 3,900 rpm after the following conditions are met. • Engine: After warming up • Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	ON

Component Function Check

INFOID:0000000001179894

1. CHECK HEATED OXYGEN SENSOR 2 HRATER FUNCTION

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 let it idle.
4. Check the voltage between ECM harness connector and ground under the following condition.

ECM		Ground	Condition	Voltage signal
Connector	Terminal			
F7	5 (HO2S2 heater signal)	Ground	At idle	Approx. 10V★  JMBIA0325GB
			Engine speed: Above 3,900 rpm	BATTERY VOLTAGE (11 - 14V)

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-571, "Diagnosis Procedure"

Diagnosis Procedure

INFOID:0000000001179895

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK HO2S2 POWER SUPPLY CIRCUIT

1. Disconnect HO2S2 harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S2 harness connector and ground.

HO2S2		Ground	Voltage
Connector	Terminal		
E58	2	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 connector E11
- 10A fuse (No. 56)
- Harness for open or short between heated oxygen sensor 2 and fuse

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

4.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

HO2S2		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E58	3	F7	5	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 connectors F121, E7
- Harness for open or short between heated oxygen sensor 2 and ECM

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

6.CHECK HO2S2 HEATER

Refer to ECH-573, "Component Inspection".

Is the inspection result normal?

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

7.REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

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

>> INSPECTION END

8. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179896

1. CHECK HEATED OXYGEN SENSOR 2 HEATER

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

Terminals	Resistance [at 25°C (77°F)]
2 and 3	3.3 - 4.4 Ω
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	

Is the inspection result normal?

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

2. REPLACE HEATED OXYGEN SENSOR 2

Replace heated oxygen sensor 2.

CAUTION:

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

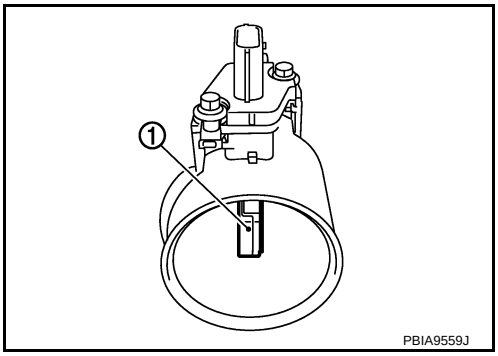
>> INSPECTION END

IAT SENSOR

Description

INFOID:0000000001179897

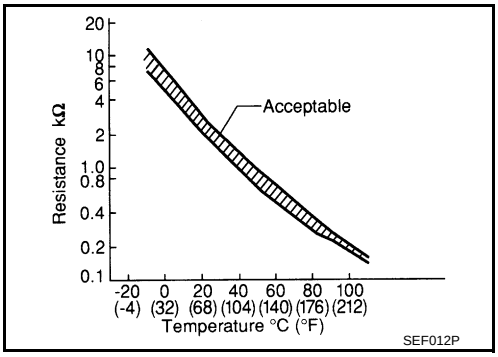
The intake air temperature sensor is built-into mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response 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 terminal 46 (Intake air temperature sensor) and ground.



CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

Component Function Check

INFOID:0000000001179898

1.CHECK INTAKE AIR TEMPERATURE SENSOR FUNCTION

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

ECM		Ground	Voltage
Connector	Terminal		
F8	46	Ground	Approx. 0 - 4.8V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-574, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179899

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor		Ground	Voltage
Connector	Terminal		
E18	2	Ground	Approx. 5V

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	
E18	1	F8	55	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 ECH-575, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace mass air flow sensor (with intake air temperature sensor).

5.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000001179900

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).

IGNITION SIGNAL

Description

INFOID:0000000001179901

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

Component Function Check

INFOID:0000000001179902

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT-III: GO TO 2.
YES-2 >> Without CONSULT-III: GO TO 3.
NO >> Go to ECH-576, "Diagnosis Procedure".

2.IGNITION SIGNAL FUNCTION

With CONSULT-III

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
2. Make sure that each circuit produces a momentary engine speed drop.

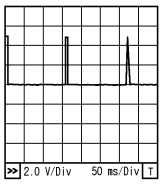
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-576, "Diagnosis Procedure".

3.IGNITION SIGNAL FUNCTION

Without CONSULT-III

1. Let engine idle.
2. Read the voltage signal between ECM harness connector and ground.

ECM		Ground	Voltage signal
Connector	Terminal		
F7	17	Ground	 PBIA9265J
	18		
	22		
	21		

NOTE:
The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-576, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179903

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		Ground	Voltage
Connector	Terminal		
E16	105	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to ECH-435, "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 4.
NO >> GO TO 3.

3. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E11.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
E11	10	F13	1	Existed

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

Is the inspection result normal?

YES >> Go to ECH-435, "Diagnosis Procedure".
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

4. 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 5.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK CONDENSER

Refer to ECH-579, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 6.
NG >> Replace condenser.

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-V

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

7. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

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 8.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

8. 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 9.
NO >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to ECH-579, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace malfunctioning ignition coil with power transistor.

10. CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000001179904

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 [at 25°C (77°F)]
1 and 2	Except 0 or ∞ Ω
1 and 3	Except 0 Ω
2 and 3	

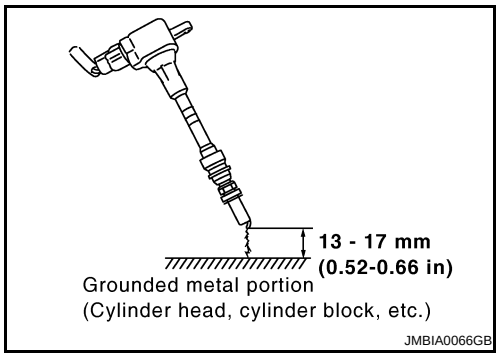
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor.

2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:
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-III to release fuel pressure, or fuel pressure applies again during the following procedure.
4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
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 20kV 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.

Component Inspection (Condenser)

INFOID:0000000001179905

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?

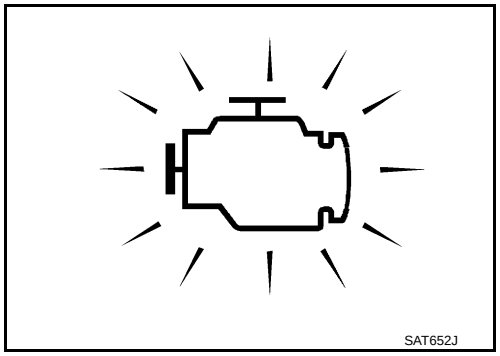
YES >> INSPECTION END
NO >> Replace condenser.

MALFUNCTION INDICATOR

Description

INFOID:0000000001179906

The Malfunction Indicator (MI) is located on the combination meter.
The MI will light up when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MI should go off. If the MI remains on, the on board diagnostic system has detected an engine system malfunction.
For details, refer to ECH-581, "Diagnosis Procedure".



Component Function Check

INFOID:0000000001179907

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 ECH-581, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179908

1.CHECK DTC

Check that DTC U1001 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC U1001. Refer to ECH-439, "Diagnosis Procedure".

2.CHECK COMBINATION METER

Refer to MWI-27, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-39, "Intermittent Incident".

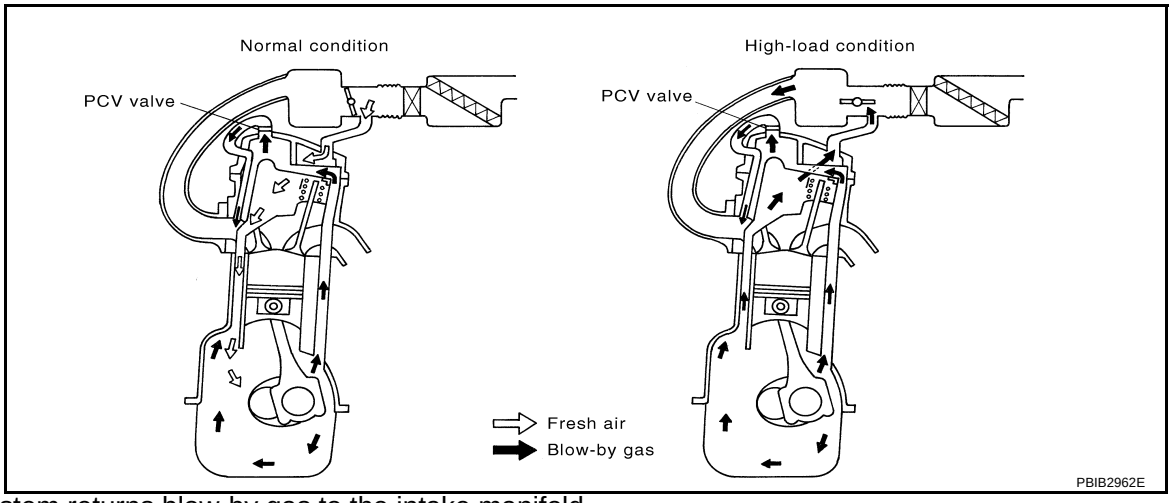
Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace.

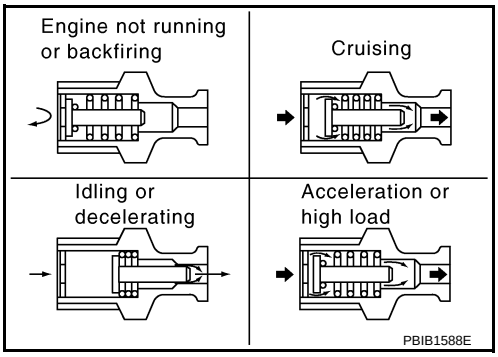
POSITIVE CRANKCASE VENTILATION

Description

INFOID:0000000001179909



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.

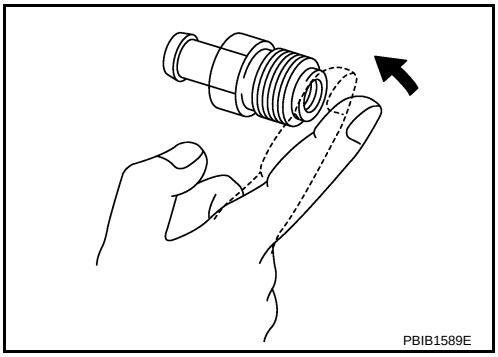


Component Inspection

INFOID:0000000001179910

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?

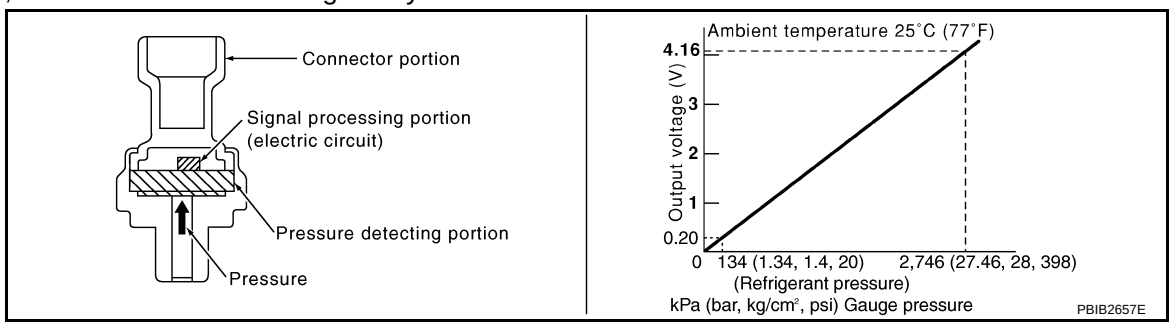
YES >> INSPECTION END
NO >> Replace PCV valve.

REFRIGERANT PRESSURE SENSOR

Description

INFOID:0000000001179911

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.



Component Function Check

INFOID:0000000001179912

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		Ground	Voltage
Connector	Terminal		
F8	41 (Refrigerant pressure sensor signal)	Ground	1.0 - 4.0V

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to ECH-583, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000001179913

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 E21. Refer to Ground Inspection in GI-41, "Circuit Inspection".

Is the inspection result normal?

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

2. CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between refrigerant pressure sensor harness connector and ground.

Refrigerant pressure sensor		Ground	Voltage
Connector	Terminal		
E49	3	Ground	Approx. 5V

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F123, E6
- 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	F8	48	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 connectors F123, E6
- 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	F8	41	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 connectors F123, E6
- 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 GI-39, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.
NO >> Repair or replace.

VSS

Description

INFOID:0000000001179914

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.

Diagnosis Procedure

INFOID:0000000001179915

1.INSPECTION START

Do you have CONSULT-III?

Do you have CONSULT-III?

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

2.PERFORM COMPONENT FUNCTION CHECK

1. Turn ignition switch OFF.
2. Lift up the vehicle.
3. Start engine and let it idle.
4. Select “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-III.
5. Select “VHCL SPEED SE” indication whe n rotating wheels with suitable gear position.

“VHCL SPEED SE” indication should exceed 10 km/h (6 MPH).

Is the inspection result normal?

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

3.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-35, "DTC Logic".

Is the inspection result normal?

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

4.CHECK COMBINATION METER FUNCTION

Refer to MWI-31, "DTC Logic".

>> INSPECTION END

ECU DIAGNOSIS

ECM

Reference Value

INFOID:0000000001179916

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.

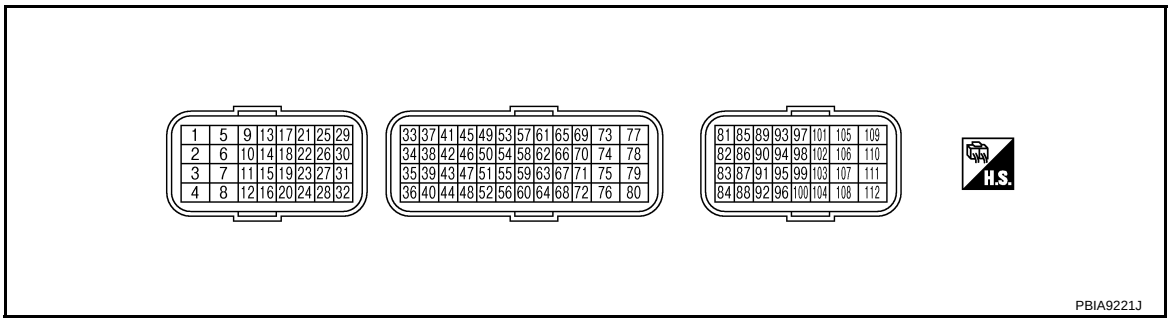
Monitor Item	Condition		Values/Status
ENG SPEED	• Run engine and compare CONSULT-III value with the tachometer indication.		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See ECH-428, "Diagnosis Procedure".		
B/FUEL SCHDL	See ECH-428, "Diagnosis Procedure".		
A/F ALPHA-B1	See ECH-428, "Diagnosis Procedure".		
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158F)
HO2S1 (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	0 - 0.3V ←→ Approx. 0.6 - 1.0V
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 - 0.3V ←→ Approx. 0.6 - 1.0V
HO2S1 MNTR (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	LEAN ←→ RICH Changes more than 5 times during 10 seconds
HO2S2 MNTR (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ←→ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9V
		Accelerator pedal: Fully depressed	4.0 - 4.8V
ACCEL SEN 2	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.6 - 0.9V
		Accelerator pedal: Fully depressed	3.9 - 4.8V
THRL SEN 1-B1	• Ignition switch: ON (Engine stopped) • Shift lever: 1st	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
THRL SEN 2-B1	• Ignition switch: ON (Engine stopped) • Shift lever:1st	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V
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

Monitor Item	Condition		Values/Status
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	• Ignition switch: ON	Shift lever: Neutral	ON
		Shift lever: Except above	OFF
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel: Not being turned	OFF
		Steering wheel: Being turned	ON
LOAD SIGNAL	• Ignition switch: ON	Rear window defogger switch: ON and/or Lighting switch: 2nd position	ON
		Rear window defogger switch and lighting switch: OFF	OFF
IGNITION SW	• Ignition switch: ON → OFF → ON		ON → OFF → ON
HEATER FAN SW	• Engine: After warming up, idle the engine	Heater fan switch: ON	ON
		Heater fan switch: OFF	OFF
BRAKE SW	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
INJ PULSE-B1	• Engine: After warming up • Shift lever: Neutral • 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 • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	10° - 20° BTDC
		2,000 rpm	25° - 45° BTDC
PURG VOL C/V	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	0%
		2,000 rpm	0% - 50%
INT/V TIM (B1)	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	–5° - 5°CA
		2,000 rpm	Approx. 0° - 40°CA
INT/V SOL (B1)	• Engine: After warming up • Shift lever: Neutral • Air conditioner switch: OFF • No load	Idle	0% - 2%
		2,000 rpm	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
THRTL RELAY	• Ignition switch: ON		ON
COOLING FAN	• Engine: After warning up, idle the engine • Air conditioner switch: OFF	Engine coolant temperature is 98°C (208F) 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
HO2S1 HTR (B1)	• Engine: After warming up • Engine speed: Below 3,600rpm		ON
	• Engine speed: Above 3,600 rpm		OFF

Monitor Item	Condition		Values/Status
HO2S2 HTR (B1)	• Engine speed: Below 3,900 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
VEHICLE SPEED	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
IDL A/V LEARN	• Engine: running	Idle air volume learning has not been performed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
TRVL AFTER MIL	• Ignition switch: ON	Vehicle has traveled after MI has turned ON.	0 - 65,535 km (0 - 40,723 miles)
O2 SEN HTR DTY	• Engine coolant temperature when engine started: More than 80°C (176 − F) • Engine speed: Below 3,600 rpm		Approx. 30%
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0V
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
SET VHCL SPD	• Engine: Running	ASCD: Operating	The preset vehicle speed is displayed
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	• Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	• Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1 (ASCD brake switch)	• Ignition switch: ON	Brake pedal and clutch pedal: Fully released	ON
		Brake pedal and/or clutch pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
VHCL SPD CUT	• Ignition switch: ON		NON
LO SPEED CUT	• Ignition switch: ON		NON
AT OD MONITOR	• Ignition switch: ON		OFF
AT OD CANCEL	• Ignition switch: ON		OFF
CRUISE LAMP	• Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
SET LAMP	• MAIN switch: ON • When vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Operating	ON
		ASCD: Not operating	OFF

*: 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.

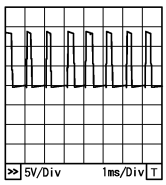
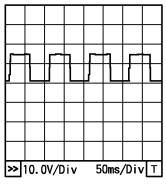
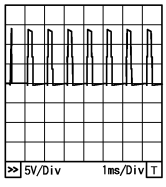
TERMINAL LAYOUT

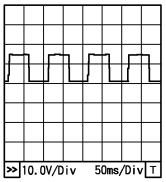
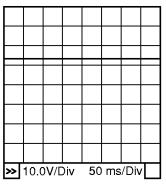
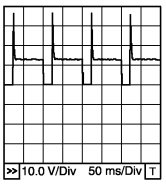
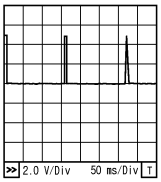
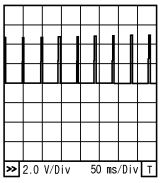


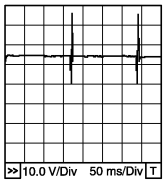
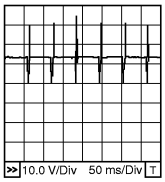
PHYSICAL VALUES

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

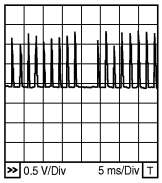
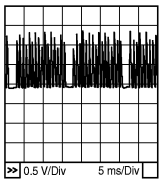
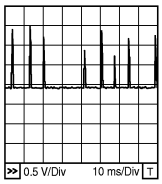
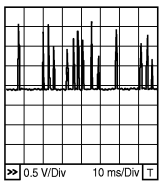
CAUTION:
Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

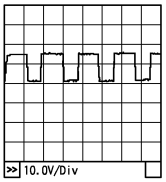
Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
1	Ground	L/W	Throttle control motor (Open)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully depressed	3.2V★  PBIA8150J
2	Ground	R/Y	Throttle control motor relay power supply	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
3	Ground	LG/R	Heated oxygen sensor 1 heater	Output	[Engine is running] • Warm up condition • Engine speed: Below 3,600 rpm	Approximately 3.2V★  PBIA8148J
					[Engine is running] • Warm-up condition • Idle speed [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14V)
4	Ground	P	Throttle control motor (Close)	Output	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully released	0 - 14V★  PBIA8149J

Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
5	Ground	R	Heated oxygen sensor 2 heater	Output	[Engine is running] • Engine speed: Below 3,900 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	10V★  PBIA8148J
					[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,900 rpm	BATTERY VOLTAGE (11 - 14V)
9	Ground	W/B	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Idle speed	BATTERY VOLTAGE (11 - 14V)★  PBIB0050E
					[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine.)	BATTERY VOLTAGE (11 - 14V)★  PBIB0520E
10 11	Ground	B B/W	ECM ground	—	[Engine is running] • Idle speed	Body ground
15	Ground	G/L	Throttle control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14V)
					[Ignition switch: ON]	0 - 1.0V
17 18 21 22	Ground	L/Y BR/Y R/G SB	Ignition signal No. 1 Ignition signal No. 2 Ignition signal No. 4 Ignition signal No. 3	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.3V★  PBIA9265J
					[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	0.2 - 0.5V★  PBIA9266J

Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
23	Ground	B/O	Fuel pump relay	Output	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.0V
					[Ignition switch: ON] • More than a few seconds after turning ignition switch ON	BATTERY VOLTAGE (11 - 14V)
25 29 30 31	Ground	R/O Y O L	Fuel injector No. 4 Fuel injector No. 3 Fuel injector No. 2 Fuel injector No. 1	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14V)★  PBIB0529E
					[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14V)★  PBIA4943J
32	Ground	Y/L	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: OFF] • A few seconds after turning ignition switch OFF	0 - 1.0V
					[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
33	Ground	L/R	Throttle position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully released	More than 0.36V
					[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully depressed	Less than 4.75V
34	Ground	L/O	Throttle position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully released	Less than 4.75V
					[Ignition switch: ON] • Engine stopped • Shift lever: 1st • Accelerator pedal: Fully depressed	More than 0.36V

Terminal No.		Wire color	Description		Condition	Value (Approx.)
+	–		Signal name	Input/ Output		
36	Ground	V/W	Sensor ground (Throttle position sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
37	Ground	W	Knock sensor	Input	[Engine is running] • Idle speed	2.5V
38	Ground	GR/B	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8V Output voltage varies with engine coolant temperature.
40	Ground	—	Sensor ground (Knock sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
41	Ground	G/P	Refrigerant pressure sensor	Input	[Engine is running] • Warm-up condition • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0V
44	Ground	B	Sensor ground (Engine coolant temperature sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
45	Ground	BR	Mass air flow sensor	Input	[Ignition switch ON] • Engine stopped	0.4V
					[Engine is running] • Warm-up condition • Idle speed	1.0 - 1.3V
					[Engine is running] • Warm-up condition • Engine is revving from idle to about 4,000 rpm	1.0 - 1.3 to 2.4V (Check for linear voltage rise in response to engine being increased to about 4,000 rpm.)
46	Ground	V	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8V Output voltage varies with intake air temperature.
48	Ground	R/L	Sensor ground (Refrigerant pressure sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
49	Ground	L/G	Heated oxygen sensor 1	—	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0 - 1.0V (Periodically change)
50	Ground	Y	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 - 1.0V
52	Ground	LG	Sensor ground (Mass air flow sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
55	Ground	O	Sensor power supply (Intake air temperature sensor)	—	[Engine is running] • Warm-up condition • Idle speed	0V
56	Ground	P	Sensor ground (Heated oxygen sensor 1)	—	[Engine is running] • Warm-up condition • Idle speed	0V

Terminal No. +	Terminal No. –	Wire color	Description Signal name	Description Input/ Output	Condition	Value (Approx.)
59	Ground	SB	Sensor ground (Heated oxygen sensor 2)	—	[Engine is running] • Warm-up condition • Idle speed	0V
61	Ground	LG/B	Crankshaft position sensor (POS)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 1.0V★  MBIB1453E
					[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0V★  MBIB1454E
62	Ground	GR/L	Sensor ground [Crankshaft position sensor (POS)]	—	[Engine is running] • Warm-up condition • Idle speed	0V
63	Ground	L	Sensor ground [Camshaft position sensor (PHASE)]	—	[Engine is running] • Warm-up condition • Idle speed	0V
65	Ground	G	Camshaft position sensor (PHASE)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 1.0V★  MBIB1455E
					[Engine is running] • Engine speed is 2,000 rpm	0 - 1.0V★  MBIB1456E
69	Ground	W/B	Neutral position switch	Input	[Ignition switch: ON] • Neutral	BATTERY VOLTAGE (11 - 14V)
					[Ignition switch: ON] • Shift lever: Except above position	0V
72	Ground	V/R	Sensor power supply (Throttle position sensor)	—	[Ignition switch: ON]	5V

Terminal No. +	Terminal No. −	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
73	Ground	Y/R	Intake valve timing control solenoid valve	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14V)
					[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 10V★  PBIA4937J
74	Ground	Y/W	Sensor power supply (Refrigerant pressure sensor)	—	[Ignition switch: ON]	5V
75	Ground	L/W	Sensor power supply [Crankshaft position sensor (POS)]	—	[Ignition switch: ON]	5V
78	Ground	Y/V	Sensor power supply [Camshaft position sensor (PHASE)]	—	[Ignition switch: ON]	5V
83	Ground	P	CAN communication line	Input/ Output	—	—
84	Ground	L	CAN communication line	Input/ Output	—	—
88	Ground	O	Data link connector	Input/ Output	[Ignition switch: ON] • CONSULT-III: Disconnected	2.7V
93	Ground	W/L	Ignition switch	Input	[Ignition switch: OFF]	0V
					[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
94	Ground	V	ASCD steering switch	Input	[Ignition switch: ON] • ASCD steering switch: OFF	4V
					[Ignition switch: ON] • CANCEL switch: Pressed	1V
					[Ignition switch: ON] • MAIN switch: Pressed	0V
					[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3V
					[Ignition switch: ON] • SET/COAST switch: Pressed	2V
95	Ground	B	Sensor ground (ASCD steering switch)	—	[Engine is running] • Warm-up condition • Idle speed	0V
99	Ground	R/W	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	0V
					[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14V)

Terminal No. +	Terminal No. –	Wire color	Description: Signal name	Description: Input/ Output	Condition	Value (Approx.)
100	Ground	R	ASCD brake switch	Input	[Ignition switch: ON] • Brake pedal and clutch pedal: Slightly depressed	0V
					[Ignition switch: ON] • Brake pedal and/or clutch pedal: Fully released	BATTERY VOLTAGE (11 - 14V)
102	Ground	BR	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5V
103	Ground	GR	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.3 - 0.6V
					[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	1.95 - 2.4V
104	Ground	Y	Sensor ground (Accelerator pedal position sensor 2)	—	[Engine is running] • Warm-up condition • Idle speed	0V
105	Ground	G	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14V)
106	Ground	V	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5V
108	Ground	B	ECM ground	—	[Engine is running] • Idle speed	Body ground
110	Ground	G	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.6 - 0.9V
					[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.9 - 4.7V
111	Ground	R	Sensor ground (Accelerator pedal position sensor 1)	—	[Engine is running] • Warm-up condition • Idle speed	0V

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

Wiring Diagram - ENGINE CONTROL SYSTEM -

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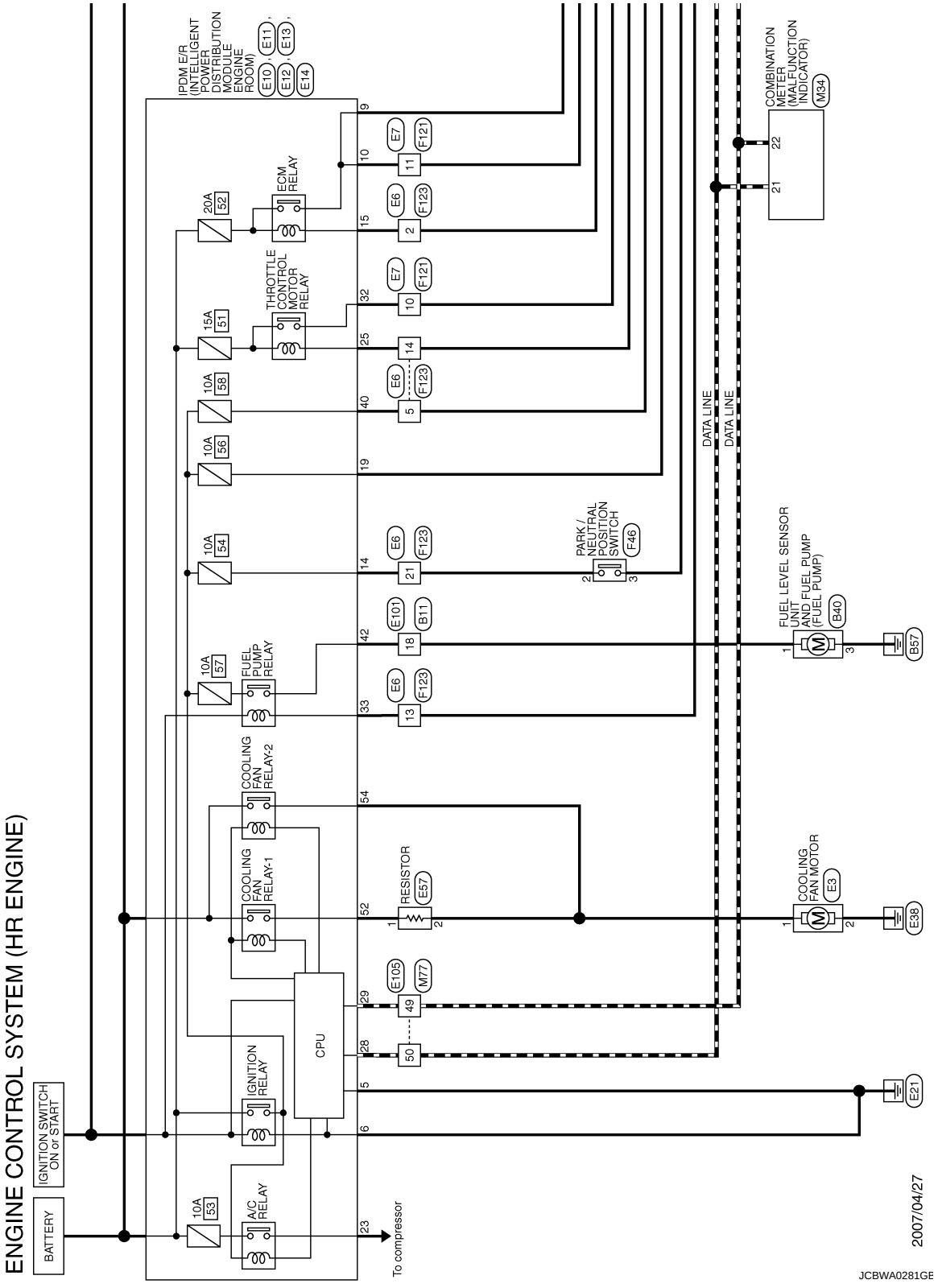
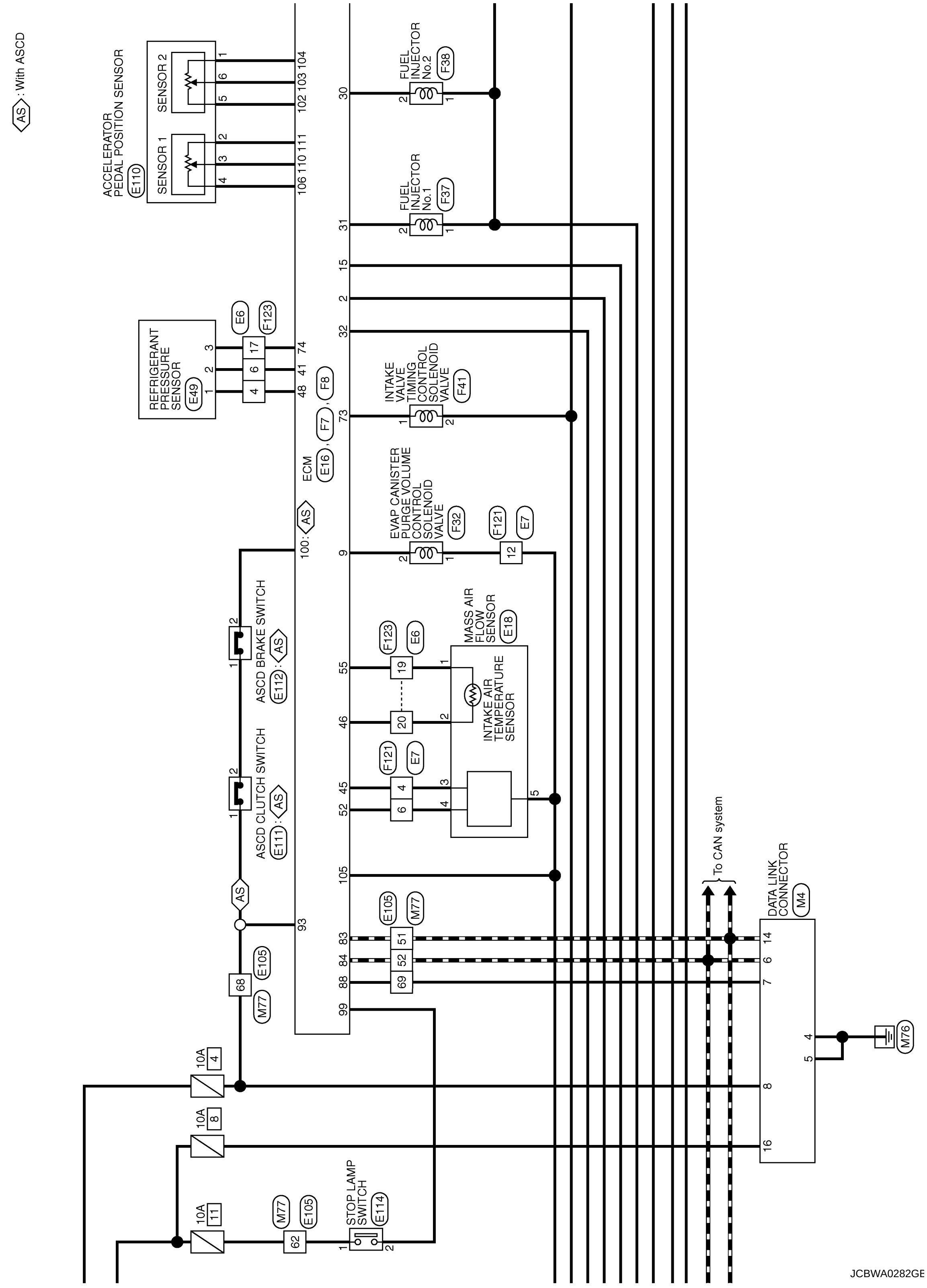
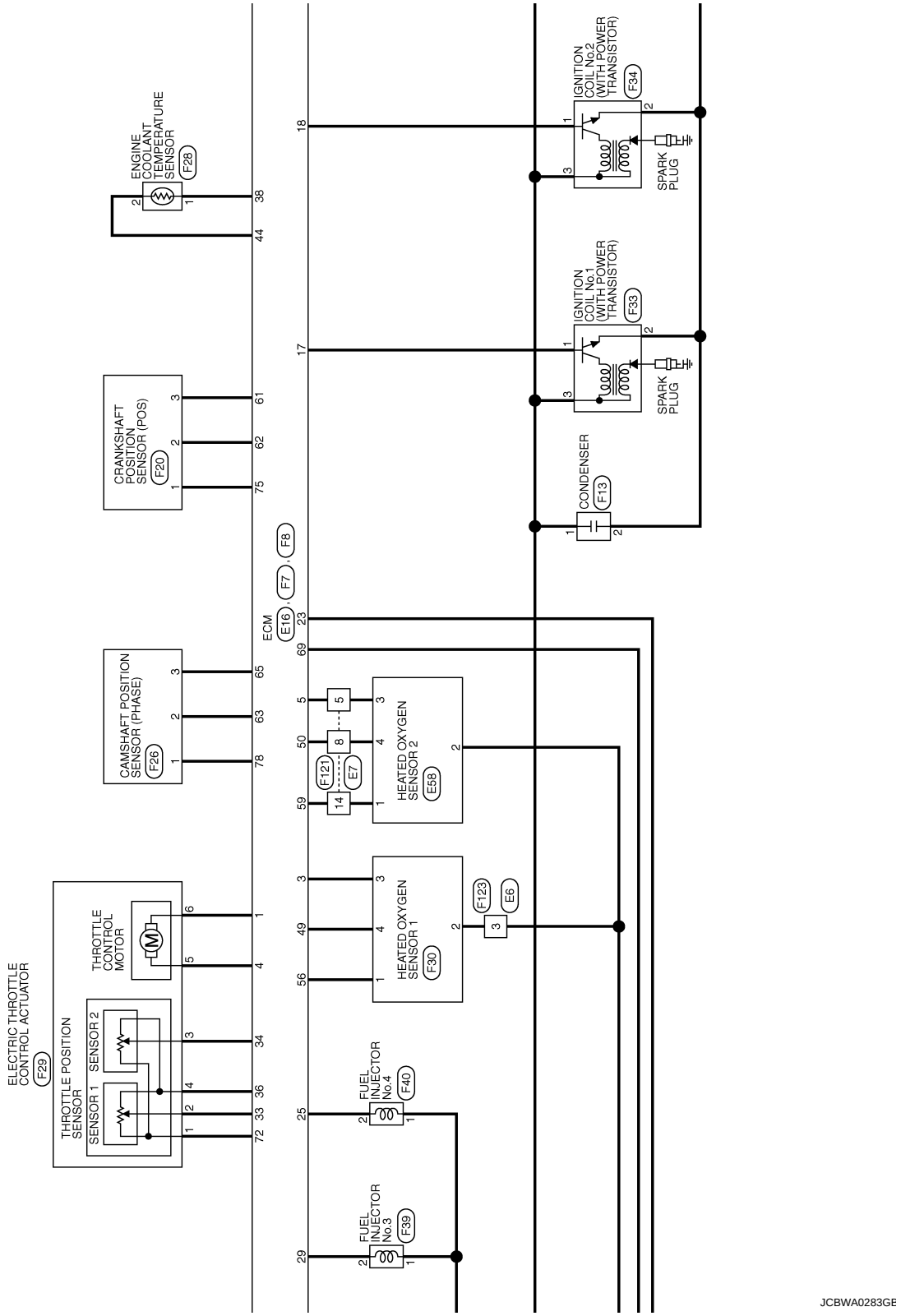
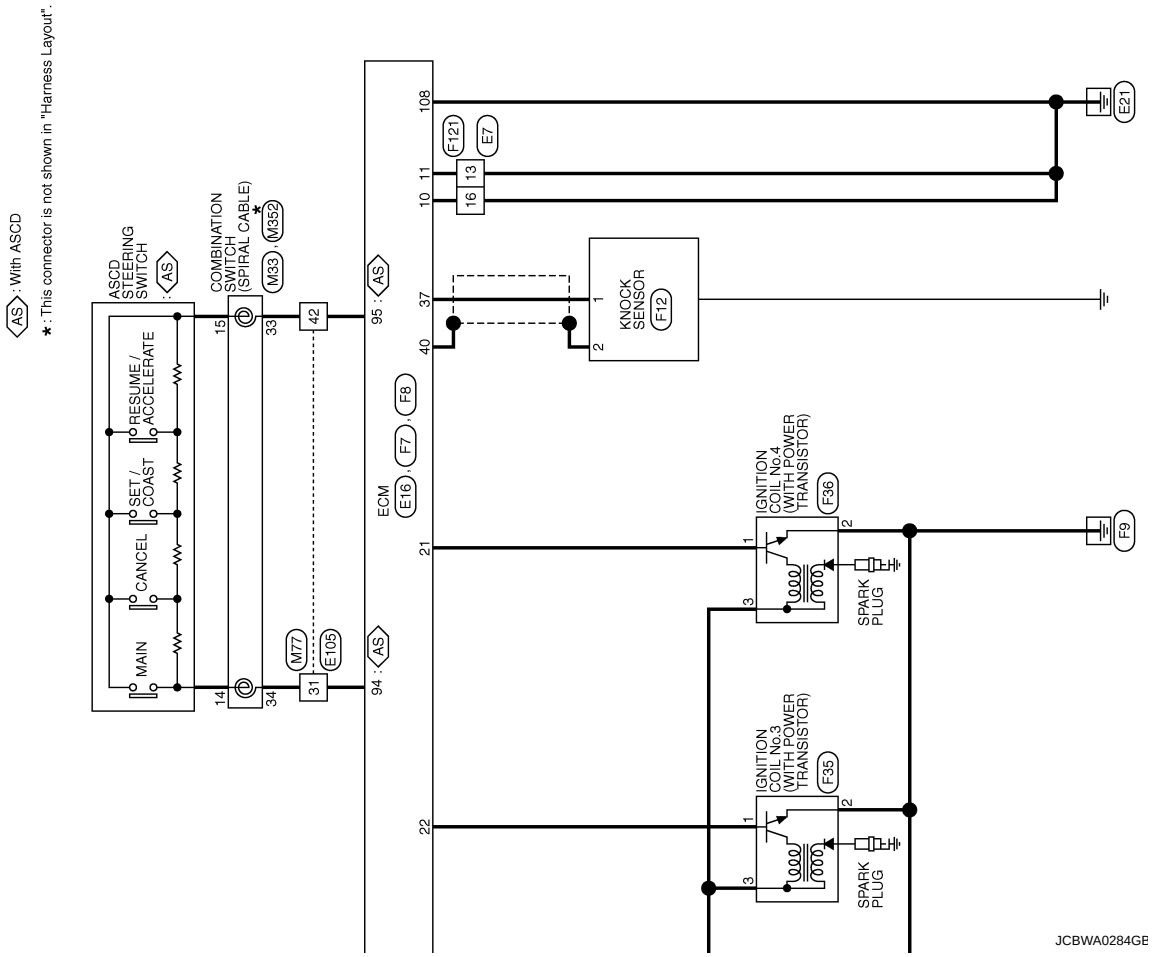



AS : With ASCD
ACCELERATOR PEDAL POSITION SENSOR
E110
SENSOR 2
SENSOR 1
REFRIGERANT PRESSURE SENSOR
E49
E6
F123
ECM
E16
F7
F8
100 : AS
ASCD BRAKE SWITCH
E112 : AS
ASCD CLUTCH SWITCH
E111 : AS
E105
M77
FUEL INJECTOR No.2
F38
FUEL INJECTOR No.1
F37
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
F41
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
F32
F121
E7
MASS AIR FLOW SENSOR
E18
INTAKE AIR TEMPERATURE SENSOR
To CAN system
DATA LINK CONNECTOR
M4
M76
10A
STOP LAMP SWITCH
E114
JCBWA0282GE


ELECTRIC THROTTLE CONTROL ACTUATOR F29
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
THROTTLE CONTROL MOTOR
CRANKSHAFT POSITION SENSOR (POS) F20
CAMSHAFT POSITION SENSOR (PHASE) F26
ENGINE COOLANT TEMPERATURE SENSOR F28
FUEL INJECTOR No.3 F39
FUEL INJECTOR No.4 F40
HEATED OXYGEN SENSOR 1 F30
HEATED OXYGEN SENSOR 2 E58
F123
E6
F121
E7
ECM E16, F7, F8
CONDENSER F13
IGNITION COIL No.1 (WITH POWER TRANSISTOR) F33
IGNITION COIL No.2 (WITH POWER TRANSISTOR) F34
SPARK PLUG
SPARK PLUG
JCBWA0283GE


AS : With ASCD
✱ : This connector is not shown in "Harness Layout".
ASCD STEERING SWITCH
AS
MAIN
CANCEL
SET / COAST
RESUME / ACCELERATE
COMBINATION SWITCH (SPIRAL CABLE)✱
M352
M33
15
33
42
14
34
31
M77
E105
ECM
E16
F7
F8
95 : AS
94 : AS
21
22
37
40
108
10
11
F121
E7
13
16
KNOCK SENSOR
F12
IGNITION COIL No.4 (WITH POWER TRANSISTOR)
F36
IGNITION COIL No.3 (WITH POWER TRANSISTOR)
F35
SPARK PLUG
E21
F9
JCBWA0284GE

ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	B11
Connector Name	WIRE TO WIRE
Connector Type	TK10MW-NS8

Terminal No.	Color of Wire	Signal Name [Specification]
18	B/Y	–

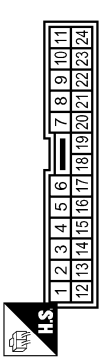
Connector No.	B40
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP
Connector Type	E04FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	B/Y	–
3	B	–

Connector No.	E3
Connector Name	COOLING FAN MOTOR
Connector Type	P8010388516O2

Terminal No.	Color of Wire	Signal Name [Specification]
1	R	–
2	B	–

Connector No.	E6
Connector Name	WIRE TO WIRE
Connector Type	TK24MW-1V



Terminal No.	Color of Wire	Signal Name [Specification]
2	Y/L	–
3	R/O	-[Except A/T]
4	R/L	–
5	SB	-[Except M9R engine]
6	G/P	–
13	B/O	–
14	G/L	-[Except M9R engine]
17	Y/W	–
19	O	-[With gasoline engine]
20	V	-[With gasoline engine]
21	R/B	–

Connector No.	E7
Connector Name	WIRE TO WIRE
Connector Type	NS16MW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
4	BR	-[With gasoline engine]
5	R	-[Except M9R engine]
6	LG	-[With gasoline engine]
8	Y	–
10	R/Y	-[With gasoline engine]
11	L/R	-[With gasoline engine]
12	G	–
13	B	–
14	SB	-[Except M9R engine]
16	B	-[Except M9R engine]

Connector No.	E10
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	M06FB-LC

Terminal No.	Color of Wire	Signal Name [Specification]
5	B	–
6	B	–

Connector No.	E11
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FBR-CS

Terminal No.	Color of Wire	Signal Name [Specification]
9	G	–
10	L/R	–
14	R/B	–
15	Y/L	-[With gasoline engine]
19	R/O	–

Connector No.	E12
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS12FW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
23	Y/B	–
25	G/L	–
28	L	–
29	P	–
32	R/Y	–

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ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	E13
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	NS16FW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
33	B/O	–
40	BR/Y	–[With HR engine]
42	B/Y	–

Connector No.	E14
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	YZK 7283-5591-40-F

Terminal No.	Color of Wire	Signal Name [Specification]
52	W	–
54	R	–

Connector No.	E16
Connector Name	ECM
Connector Type	MAA24FB-MEA8-LH

Terminal No.	Color of Wire	Signal Name [Specification]
83	P	CAN-LI
84	L	CAN-HI
88	O	K-LINE
93	W/L	IGN SW
94	V	ASCD STRG SW
95	B	GND ASCD STRG SW
99	R/W	BRAKE
100	R	BNCSW(BNC)
102	BR	AVCC-APS2[With HR engine]
103	GR	APS2
104	Y	GND-A-APS2[With HR engine]

Terminal No.	Color of Wire	Signal Name [Specification]
105	G	VBR
106	V	AVCC-APS1[With HR engine]
108	B	GND
110	G	APS1[With HR engine]
111	R	GND-A-APS1[With HR engine]

Connector No.	E18
Connector Name	MASS AIR FLOW SENSOR
Connector Type	RH06FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	O	–
2	V	–
3	BR	–
4	LG	–
5	G	–

Connector No.	E49
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	R/L	–
2	G/P	–
3	Y/W	–

Connector No.	E57
Connector Name	RESISTOR
Connector Type	P80103851602

Terminal No.	Color of Wire	Signal Name [Specification]
1	W	–
2	R	–

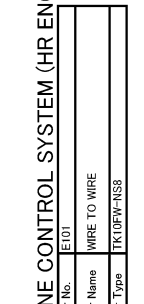
Connector No.	E58
Connector Name	HEATED OXYGEN SENSOR 2
Connector Type	AFZ04FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	R/O	–
3	R	–
4	Y	–

JCBWA0286GE

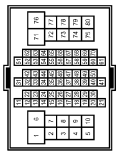
ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	E101
Connector Name	WIRE TO WIRE
Connector Type	TK10FW-NS8



Terminal No.	Color of Wire	Signal Name [Specification]
18	B/Y	–

Connector No.	E105
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-NS16-TM4



Terminal No.	Color of Wire	Signal Name [Specification]
31	V	–
42	B	–
49	P	–
50	L	–
51	P	–
52	L	–
62	V	–
68	W/L	–[Except M9R engine]
69	O	–

Connector No.	E110
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	RH06FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y	–[With HR engine]
2	R	–[With HR engine]
3	G	–[With HR engine]
4	V	–[With HR engine]
5	BR	–[With HR engine]
6	GR	–[With gasoline engine]

Connector No.	E111
Connector Name	ASCD CLUTCH SWITCH
Connector Type	M02FBR-LC

Terminal No.	Color of Wire	Signal Name [Specification]
1	W/L	–[With gasoline engine]
2	O	–[With gasoline engine]

Connector No.	F7
Connector Name	ECM
Connector Type	MA424FGY-MEA8-RH

Terminal No.	Color of Wire	Signal Name [Specification]
1	L/W	MOTOR1
2	R/Y	MOT
3	LG/R	O2HF[With HR engine]
4	P	MOTOR2
5	R	O2HR
9	W/B	EVAP
10	B	GND
11	B/W	GND
15	G/L	MOTRLY
17	L/Y	IGN COIL#1
18	BR/Y	IGN COIL#2
21	R/G	IGN COIL#4
22	Sb	IGN COIL#2[With HR engine]
23	B/O	FPR
25	R/O	INJ#4
29	Y	INJ#3[With HR engine]
30	O	INJ#2[With HR engine]
31	L	INJ#1
32	Y/L	SSOFF

Connector No.	E112
Connector Name	ASCD BRAKE SWITCH
Connector Type	M02FBR-LC

Terminal No.	Color of Wire	Signal Name [Specification]
1	O	–[With M/T]
2	R	–

Connector No.	E114
Connector Name	STOP LAMP SWITCH
Connector Type	M02FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	V	–
2	R/W	–

JCBWA0287GE

ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	F8
Connector Name	ECM
Connector Type	MAA40FBR-MEA8-LH

Terminal No.	Color of Wire	Signal Name [Specification]
33	L/R	TPS1[With HR engine]
34	L/O	TPS2[With HR engine]
36	V/W	GND-A TPS[With HR engine]
37	W	KNK
38	GR/B	TW[With HR engine]
40	SHIELD	GND-A KNK
41	G/P	PDPRESS
44	B	GND-A TW[With HR engine]
45	BR	QA+
46	V	TA
48	R/L	GND-A(PDPRES)

Connector No.	F20
Connector Name	CRANKSHAFT POSITION SENSOR (POS)
Connector Type	RH03FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	L/W	–
2	GR/L	–[With HR engine]
3	LG/B	–

49	L/G	O2SF[With HR engine]
50	Y	O2SR
52	LG	QA-
55	O	GND-TA
56	P	GND-A O2SF[With HR engine]
59	SB	O2SR-GND
61	LG/B	POS
62	GR/L	GND-POS[With HR engine]
63	L	GND-(A)-PHASE[With HR engine]
65	G	PHASE[With HR engine]
69	W/B	NEUT HIGH
72	V/R	AVCC-TPS[With HR engine]
73	Y/R	CVTC
74	Y/W	AVCC(PDPRES)
75	L/W	POS AVCC
78	Y/V	PHASE AVCC

Connector No.	F26
Connector Name	CAMSHAFT POSITION SENSOR (PHASE)
Connector Type	RH03FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/V	–
2	L	–[With HR engine]
3	G	–[With HR engine]

Connector No.	F12
Connector Name	KNOCK SENSOR
Connector Type	BS02FB-AHY-S

Terminal No.	Color of Wire	Signal Name [Specification]
1	W	–
2	B/W	–

Connector No.	F28
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	GR/B	–[With HR engine]
2	B	–[With HR engine]

Connector No.	F13
Connector Name	CONDENSER
Connector Type	M02FW-GY-LC

Terminal No.	Color of Wire	Signal Name [Specification]
1	L/R	–
2	B	–

Connector No.	F29
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR
Connector Type	RH06FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	V/R	–[With HR engine]
2	L/R	–[With HR engine]
3	L/O	–[With HR engine]
4	V/W	–[With HR engine]
5	P	–
6	L/W	–

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ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	F30
Connector Name	HEATED OXYGEN SENSOR 1
Connector Type	AFZ04FB

Terminal No.	Color of Wire	Signal Name [Specification]
1	P	–[With HR engine]
2	R/O	–
3	LG/R	–[With HR engine]
4	L/G	–[With HR engine]

Connector No.	F32
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	E02FL-RS-LGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	G	–
2	W/B	–

Connector No.	F33
Connector Name	IGNITION COIL NO.1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	L/Y	–
2	B	–
3	L/R	–

Connector No.	F34
Connector Name	IGNITION COIL NO.2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	BR/Y	–
2	B	–
3	L/R	–

Connector No.	F35
Connector Name	IGNITION COIL NO.3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–[With HR engine]
2	B	–
3	L/R	–

Connector No.	F36
Connector Name	IGNITION COIL NO.4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

Terminal No.	Color of Wire	Signal Name [Specification]
1	R/G	–
2	B	–
3	L/R	–

Connector No.	F37
Connector Name	FUEL INJECTOR NO.1
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	L	–

Connector No.	F38
Connector Name	FUEL INJECTOR NO.2
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	O	–[With HR engine]

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ENGINE CONTROL SYSTEM (HR ENGINE)

Connector No.	F39
Connector Name	FUEL INJECTOR NO.3
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	Y	–[With HR engine]

Connector No.	F40
Connector Name	FUEL INJECTOR NO.4
Connector Type	HS02FGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	SB	–
2	R/O	–

Connector No.	F41
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE
Connector Type	E02FG-RS-LGY

Terminal No.	Color of Wire	Signal Name [Specification]
1	Y/R	–
2	L/R	–

Connector No.	F46
Connector Name	PARK/NEUTRAL POSITION SWITCH
Connector Type	FEA03FG

Terminal No.	Color of Wire	Signal Name [Specification]
2	R/B	–
3	W/B	–

Connector No.	F121
Connector Name	WIRE TO WIRE
Connector Type	NS16FW-CS

Terminal No.	Color of Wire	Signal Name [Specification]
4	BR	–[With gasoline engine]
5	R	–[Except M9R engine]
6	LG	–[With gasoline engine]
8	Y	–
10	R/Y	–[With gasoline engine]
11	L/R	–[With gasoline engine]
12	G	–
13	B	–
14	SB	–[Except M9R engine]
16	B	–[Except M9R engine]

Connector No.	F123
Connector Name	WIRE TO WIRE
Connector Type	TK24FW-1V

Terminal No.	Color of Wire	Signal Name [Specification]
2	Y/L	–
3	R/O	–[Except A/T]
4	R/L	–
5	SB	–[Except M9R engine]
6	G/P	–
13	B/O	–
14	G/L	–[Except M9R engine]
17	Y/W	–
19	O	–[With gasoline engine]
20	V	–[With gasoline engine]
21	R/B	–

Connector No.	M4
Connector Name	DATA LINK CONNECTOR
Connector Type	BD16FW

Terminal No.	Color of Wire	Signal Name [Specification]
4	B	–
5	B	–
6	L	–
7	O	–
8	W	–
14	P	–
16	Y	–

Connector No.	M33
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY-1V

Terminal No.	Color of Wire	Signal Name [Specification]
33	B	–
34	V	–

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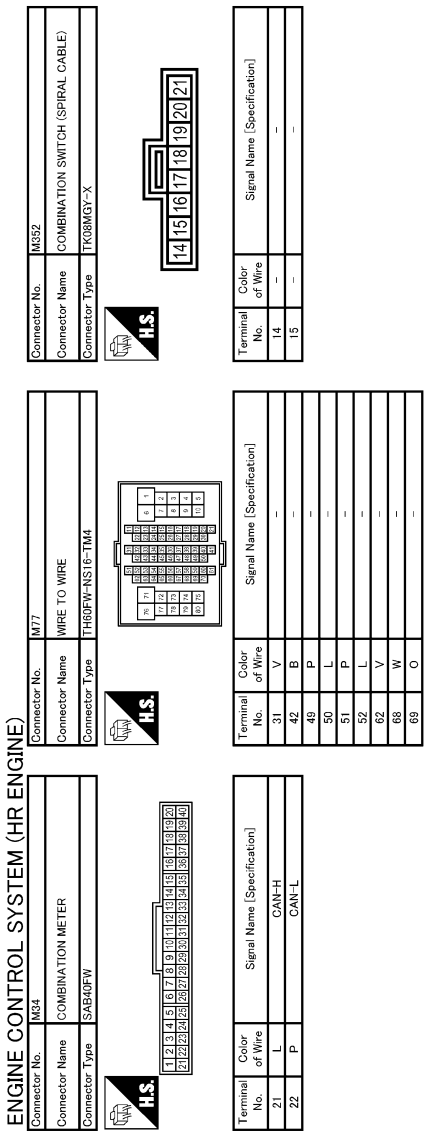

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Fail Safe

INFOID:0000000001179918

NON DTC RELATED ITEM

Engine operating condition in fail-safe mode	Detected items	Remarks	Reference page
Engine speed will not rise more than 2,500 rpm due to the fuel cut	Malfunction indicator lamp circuit	When there is an open circuit on 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.	ECH-415

DTC RELATED ITEM

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 time after turning ignition switch ON or START. CONSULT-III displays the engine coolant temperature decided by ECM.	
		Condition	Engine coolant temperature decided (CONSULT-III display)
		Just as ignition switch is turned ON or START	40°C (104°F)
		More than approx. 4 minutes after ignition ON or START	80°C (176°F)
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	
P0122 P0123 P0222 P0223 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.	
P1121	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 Neutral position, and engine speed will not exceed 1,000 rpm or more.	
P1122	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.	
P1124 P1126	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.	
P1128	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.	
P1229	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.	

DTC No.	Detected items	Engine operating condition in fail-safe mode	
P1805	Brake switch	ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
		Vehicle condition	Driving condition
		When engine is idling	Normal
		When accelerating	Poor acceleration
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:0000000001179919

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	• U1001 CAN communication line • U1010 CAN communication • P0102 P0103 Mass air flow sensor • P0117 P0118 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0327 P0328 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 Camshaft position sensor (PHASE) • P0605 ECM • P1229 Sensor power supply • P1610 - P1615 NATS • P1706 Park/neutral position (PNP) switch • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	• P0132 P0134 Heated oxygen sensor 1 • P0138 Heated oxygen sensor 2 • P1065 ECM power supply • P1111 Intake valve timing control solenoid valve • P1122 Electric throttle control function • P1124 P1126 Throttle control motor relay • P1128 Throttle control motor • P1217 Engine over temperature (OVERHEAT) • P1564 ASCD steering switch • P1572 ASCD brake switch • P1572 ASCD vehicle speed sensor • P1805 Brake switch
3	• P0011 Intake valve timing control • P1121 Electric throttle control actuator • P1212 ESP communication line

DTC Index

INFOID:0000000001179920

×:Applicable —: Not applicable

DTC*1		Items (CONSULT-III screen terms)	Trip	MI	Reference page
CONSULT-III*2	ECM*3				
U1001	1001*4	CAN COMM CIRCUIT	2	—	ECH-439
U1010	1010	CONTROL UNIT(CAN)	2	—	ECH-440
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	**Flashing**	**—**
P0011	0011	INT/V TIM CONT-B1	2	—	ECH-441

DTC*1		Items (CONSULT-III screen terms)	Trip	MI	Reference page
CONSULT-III*2	ECM*3				
P0102	0102	MAF SEN/CIRCUIT-B1	1	×	ECH-445
P0103	0103	MAF SEN/CIRCUIT-B1	1	×	ECH-445
P0117	0117	ECT SEN/CIRC	1	×	ECH-450
P0118	0118	ECT SEN/CIRC	1	×	ECH-450
P0122	0122	TP SEN 2/CIRC-B1	1	×	ECH-453
P0123	0123	TP SEN 2/CIRC-B1	1	×	ECH-453
P0132	0132	HO2S1 (B1)	2	×	ECH-456
P0134	0134	HO2S1 (B1)	2	×	ECH-460
P0138	0138	HO2S2 (B1)	2	×	ECH-464
P0222	0222	TP SEN 1/CIRC-B1	1	×	ECH-469
P0223	0223	TP SEN 1/CIRC-B1	1	×	ECH-469
P0327	0327	KNOCK SEN/CIRC-B1	2	—	ECH-472
P0328	0328	KNOCK SEN/CIRC-B1	2	—	ECH-472
P0335	0335	CKP SEN/CIRCUIT	2	×	ECH-474
P0340	0340	CMP SEN/CIRC-B1	2	×	ECH-478
P0605	0605	ECM	1 or 2	× or —	ECH-482
P1065	1065	ECM BACK UP/CIRCUIT	2	×	ECH-484
P1111	1111	INT/V TIM C/CIRC	1	×	ECH-486
P1121	1121	ETC ACTR-B1	1	×	ECH-488
P1122	1122	ETC FUNCTION/CIRC-B1	1	×	ECH-490
P1124	1124	ETC MOT PWP	1	×	ECH-494
P1126	1126	ETC MOT PWP-B1	1	×	ECH-494
P1128	1128	ETC MOT-B1	1	×	ECH-497
P1212	1212	TCS/CIRC	2	—	ECH-241
P1217	1217	ENG OVER TEMP	1	×	ECH-500
P1225	1225	CTP LEARNING-B1	2	—	ECH-504
P1226	1226	CTP LEARNING-B1	2	—	ECH-506
P1229	1129	SENSOR POWER/CIRC	1	×	ECH-508
P1564	1564	ASCD SW	1	—	ECH-252
P1572	1572	ASCD BRAKE SW	1	—	ECH-255
P1574	1574	ASCD VHL SPD SEN	1	—	ECH-261
P1610	1610	LOCK MODE	2	—	SEC-15
P1611	1611	ID DISCARD IMM-ECM	2	—	SEC-15
P1612	1612	CHAIN OF ECM-IMMU	2	—	SEC-15
P1615	1615	DIFFERENCE OF KEY	2	—	SEC-15
P1706	1706	P-N POS SW/CIRCUIT	2	×	ECH-522
P1805	1805	BRAKE SW/CIRCUIT	2	—	ECH-525
P2122	2122	APP SEN 1/CIRC	1	×	ECH-527
P2123	2123	APP SEN 1/CIRC	1	×	ECH-527
P2127	2127	APP SEN 2/CIRC	1	×	ECH-530
P2128	2128	APP SEN 2/CIRC	1	×	ECH-530
P2135	2135	TP SENSOR-B1	1	×	ECH-534
P2138	2138	APP SENSOR	1	×	ECH-537

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

*2: This number is prescribed by 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-III.

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000001179921

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	ECH-294
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			ECH-622
	Fuel injector circuit	1	1	2	3	2		2	2			2			ECH-553
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			ECH-402
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		ECH-582
	Incorrect idle speed adjustment						1	1	1	1		1			ECH-357
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	ECH-206, ECH-208, ECH-488
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			ECH-357
	Ignition circuit	1	1	2	2	2		2	2			2			ECH-576
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			ECH-435
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			ECH-445, ECH-445
Engine coolant temperature sensor circuit							3			3					ECH-450
Heated oxygen sensor 1 circuit															ECH-456, ECH-460, ECH-559, ECH-559, ECH-559
Throttle position sensor circuit							2			2					ECH-453, ECH-469, ECH-504, ECH-506, ECH-534
Accelerator pedal position sensor circuit				3	2	1									ECH-527, ECH-530, ECH-537
Knock sensor circuit				2								3			ECH-472

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Crankshaft position sensor (POS) circuit	2	2												ECH-474
Camshaft position sensor (PHASE) circuit	3	2												ECH-478
Vehicle speed signal circuit		2	3		3						3			ECH-585
ECM	2	2	3	3	3	3	3	3	3	3	3			ECH-482, ECH-484
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			ECH-486
PNP switch circuit			3		3		3	3			3			ECH-522
Refrigerant pressure sensor circuit		2				3			3		4			ECH-583
Electrical load signal circuit							3							ECH-548
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-122 ,HAC-212
ABS actuator and electric unit (control unit)			4											BRC-9

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5													FL-15 ,FL-17
	Fuel piping			5	5	5		5	5			5			FL-5
	Vapor lock		5												—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—
Air	Air duct														EM-29
	Air cleaner														EM-29
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5	5	5	5	5	5	5	5	5		5			EM-29
	Electric throttle control actuator														EM-30
	Air leakage from intake manifold/ Collector/Gasket														EM-30
Cranking	Battery	1	1	1		1		1	1			1		1	PG-2
	Generator circuit														CHG-15
	Starter circuit	3													STR-21
	Signal plate	6													EM-102
	PNP switch	4													TM-13
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-81
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-102
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-54
	Camshaft														EM-66
	Intake valve timing control														EM-54
	Intake valve												3		EM-81
	Exhaust valve														

		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	
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-76, EM-33
	Three way catalyst														
Lubrica-tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-43, EM-93, LU-9, LU-3
	Oil level (Low)/Filthy oil														LU-6
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-12
	Thermostat									5					CO-20
	Water pump														CO-18
	Water gallery														CO-22
	Cooling fan									5					CO-15
	Coolant level (Low)/Contaminat-ed coolant														CO-9
NATS (NISSAN Vehicle Immobilizer System)		1	1												SEC-15

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

Description

INFOID:0000000001179922

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,500 rpm under no load (for example, the shift lever position is neutral and engine speed is over 2,500 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, ECH-367, "System Description".

PRECAUTION

PRECAUTIONS

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

INFOID:0000000001179923

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

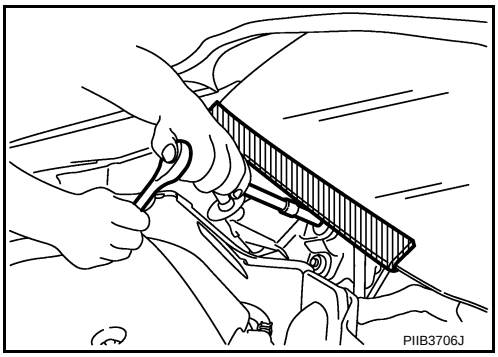
WARNING:

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

Precaution for Procedure without Cowl Top Cover

INFOID:0000000001583080

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



Precautions For Xenon Headlamp Service

INFOID:0000000001179925

WARNING:

Comply with the following warnings to prevent any serious accident.

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

CAUTION:

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

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

On Board Diagnostic (OBD) System of Engine

INFOID:0000000001179926

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

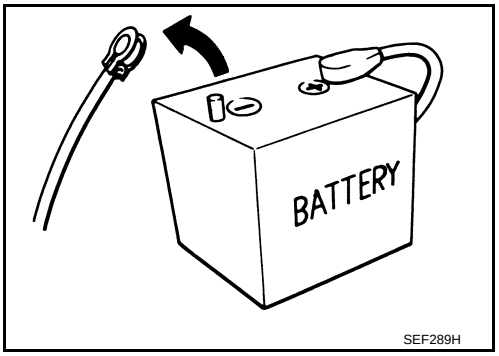
CAUTION:

- **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 PG-104, "Description".**
- **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 EVAP system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM before returning the vehicle to the customer.**

General Precautions

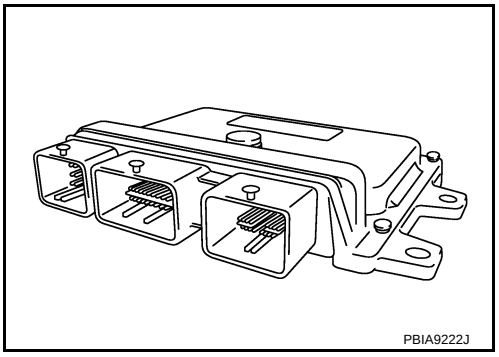
INFOID:0000000001179927

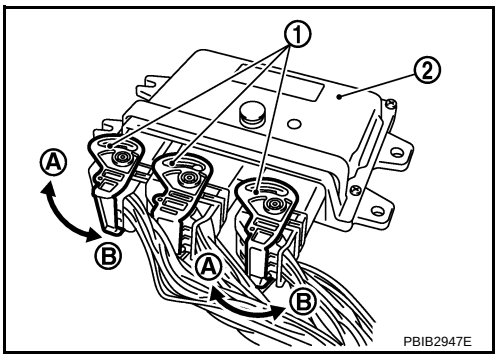
- **Always use a 12 volt battery as power source.**
- **Do not attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because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



SEF289H

- **Do not disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Engine operation can vary slightly when the terminal is disconnected. However, this is not an indication of a malfunction. Do not replace parts because of a slight variation.
- **If the battery is disconnected, the following emission-related diagnostic information will be lost within 24 hours.**
  - **Diagnostic trouble codes**
  - **1st trip diagnostic trouble codes**
  - **Freeze frame data**
  - **1st trip freeze frame data**
- **When connecting ECM harness connector (1), fasten (B) it securely with a lever as far as it will go as shown in the figure.**

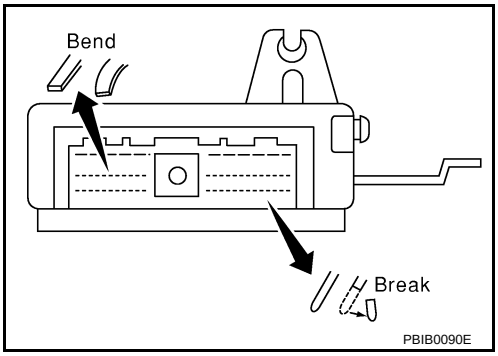

PBIA9222J

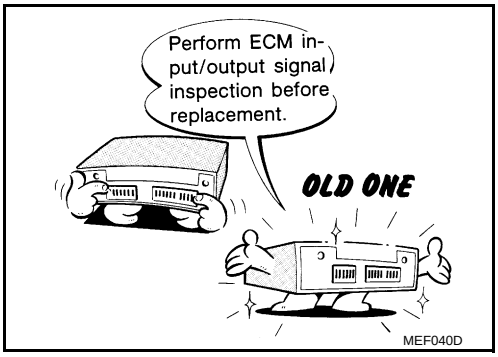


PBIB2947E

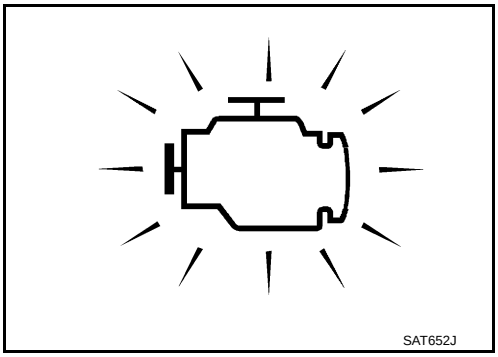
2. ECM
A. Loosen

- **When connecting or disconnecting pin connectors into or from ECM, take care not to damage pin terminals (bend or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to ECH-586, "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).**

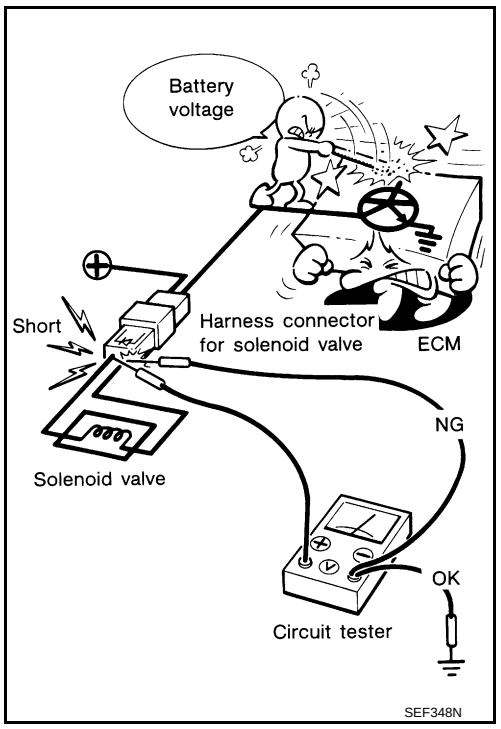




- **After performing each TROUBLE DIAGNOSIS, perform DTC CONFIRMATION PROCEDURE or Component Function Check.** The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.

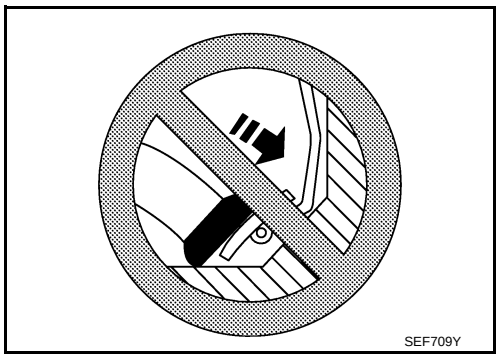


- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**

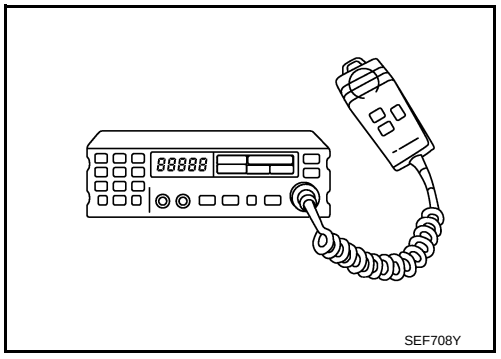


- **Do not operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**

- **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.**

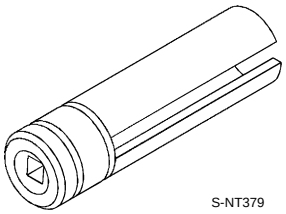
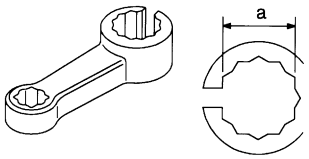
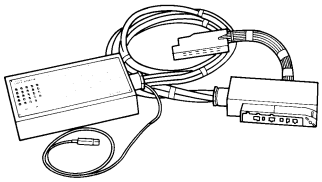
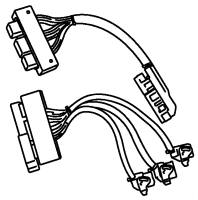
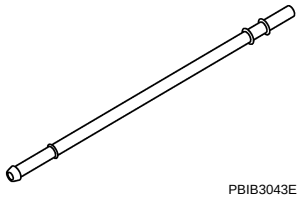


PREPARATION

PREPARATION

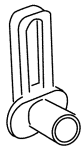
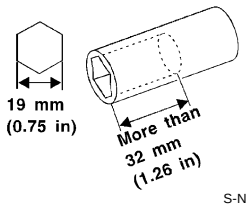
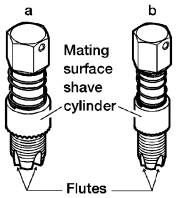
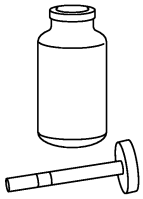
Special Service Tools

INFOID:0000000001179928

Tool number Tool name	Description
KV10117100 Heated oxygen sensor wrench  S-NT379	Loosening or tightening heated oxygen sensor with 22 mm (0.87 in) hexagon nut
KV10114400 Heated oxygen sensor wrench  S-NT636	Loosening or tightening heated oxygen sensor 2 **a: 22 mm (0.87 in)**
EG17550000 Break-out box  ZZA1194D	Measuring ECM signals with a circuit tester
EG17680000 Y-cable adapter  PBIA9379J	Measuring ECM signals with a circuit tester
KV10118400 Fuel tube adapter  PBIB3043E	Measuring fuel pressure

Commercial Service Tools

INFOID:0000000001179929

Tool name	Description
Quick connector release  PBIC0198E	Removing fuel tube quick connectors in engine room (Available in SEC. 164 of PARTS CATALOG: Par No. 16441 6N210)
Socket wrench  S-NT705	Removing and installing engine coolant temperature sensor
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.

ON-VEHICLE MAINTENANCE

FUEL PRESSURE

Inspection

INFOID:0000000001179930

FUEL PRESSURE RELEASE

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-III.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.

With CONSULT-III

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.

FUEL PRESSURE CHECK

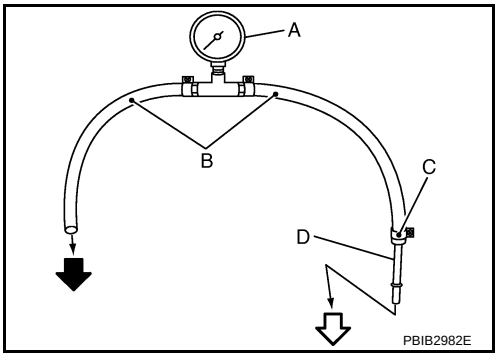
CAUTION:

- **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 sealability 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:

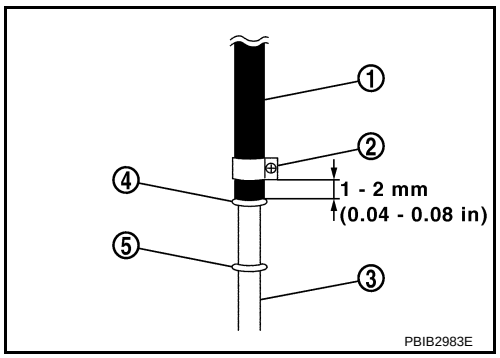
Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because J10 models do not have fuel return system.

1. Release fuel pressure to zero.
2. Prepare fuel hose for fuel pressure check B and fuel tube adapter (KV10118400) D, then connect fuel pressure gauge A.
   - ⇦: To quick connector
   - ⬅: To fuel tube (engine side)
   - C: Clamp
   - 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.
   - Do not twist or kink fuel hose because it is plastic hose.

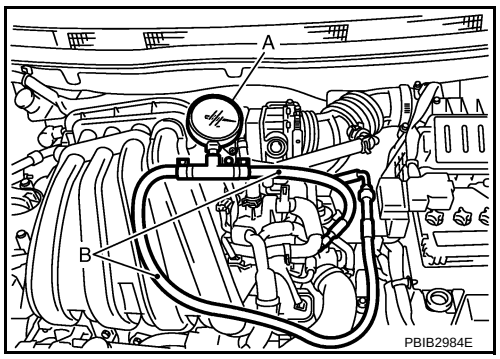
4. Connect fuel hose for fuel pressure check (1) to fuel tube (engine side) with clamp (2) as shown in the figure.
   - No.2 spool (5)
   - Wipe off oil or dirt from hose insertion part using cloth moistened with gasoline.
   - Apply proper amount of gasoline between top of the fuel tube (3) and No.1 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.
   - A: Fuel pressure gauge
   - B: Fuel hose for fuel pressure check
6. After connecting fuel hose for fuel pressure check, pull the hose with a force of approximately 98 N (10 kg, 22 lb) to confirm fuel tube does not come off.
7. 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.
   - 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)

10. If result is unsatisfactory, go to next step.
11. Check the following.
    - Fuel hoses and fuel tubes for clogging
    - Fuel filter for clogging
    - Fuel pump
    - Fuel pressure regulator for clogging

    If OK, replace fuel pressure regulator.
    If NG, repair or replace.

EVAPORATIVE EMISSION SYSTEM

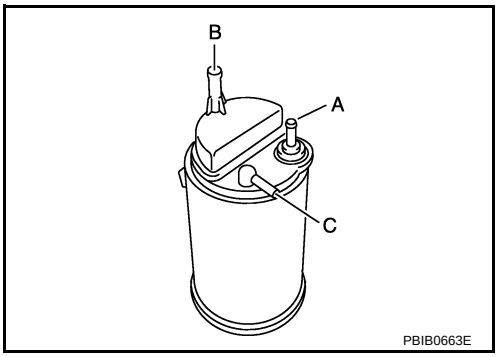
Inspection

INFOID:0000000001179931

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 (B). Orally blow air through port (A). Check that air flows freely through port (C).

b. Block port (A). Orally blow air through port (B). Check that air flows freely through port (C).

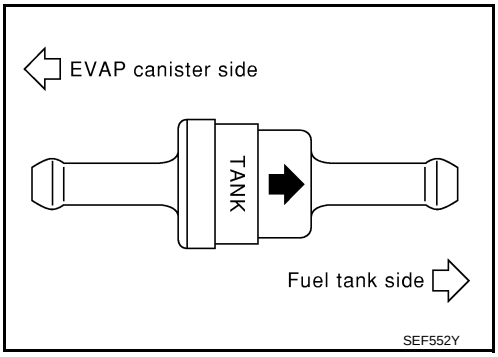


3. Visually inspect the fuel check valve for cracks, damage, loose connections chafing and deterioration.
4. Check fuel check valve as follows:

a. Blow air through connector on the fuel tank side. A considerable resistance should be felt and a portion of air flow should be directed toward the EVAP canister side.

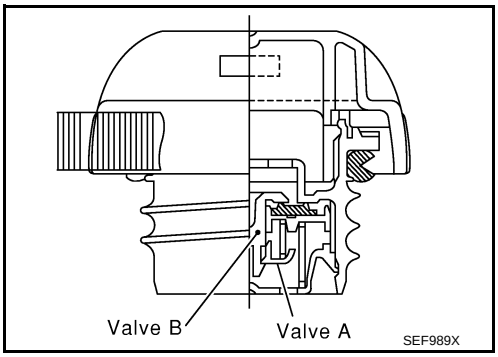
b. Blow air through connector on EVAP canister side. Air flow should be smoothly directed toward fuel tank side.

c. If fuel check valve is suspected or not properly functioning in step 1 and 2 above, replace it.



5. Inspect fuel tank filler cap vacuum relief valve for clogging, sticking, etc.

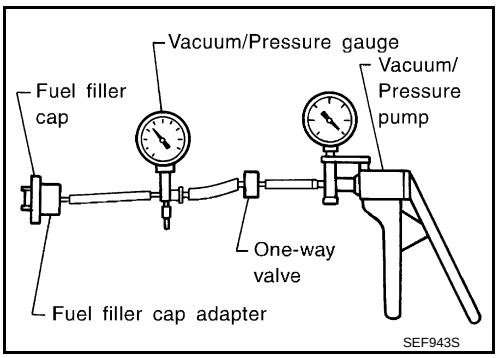
a. Wipe clean valve housing.



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.



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000001179932

Transmission	Condition	Specification
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:0000000001179933

Transmission	Condition	Specification
M/T	No load* (in Neutral position)	15 ± 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