SECTION EC

ENGINE CONTROL SYSTEM

CONTENTS

VQ37VHR

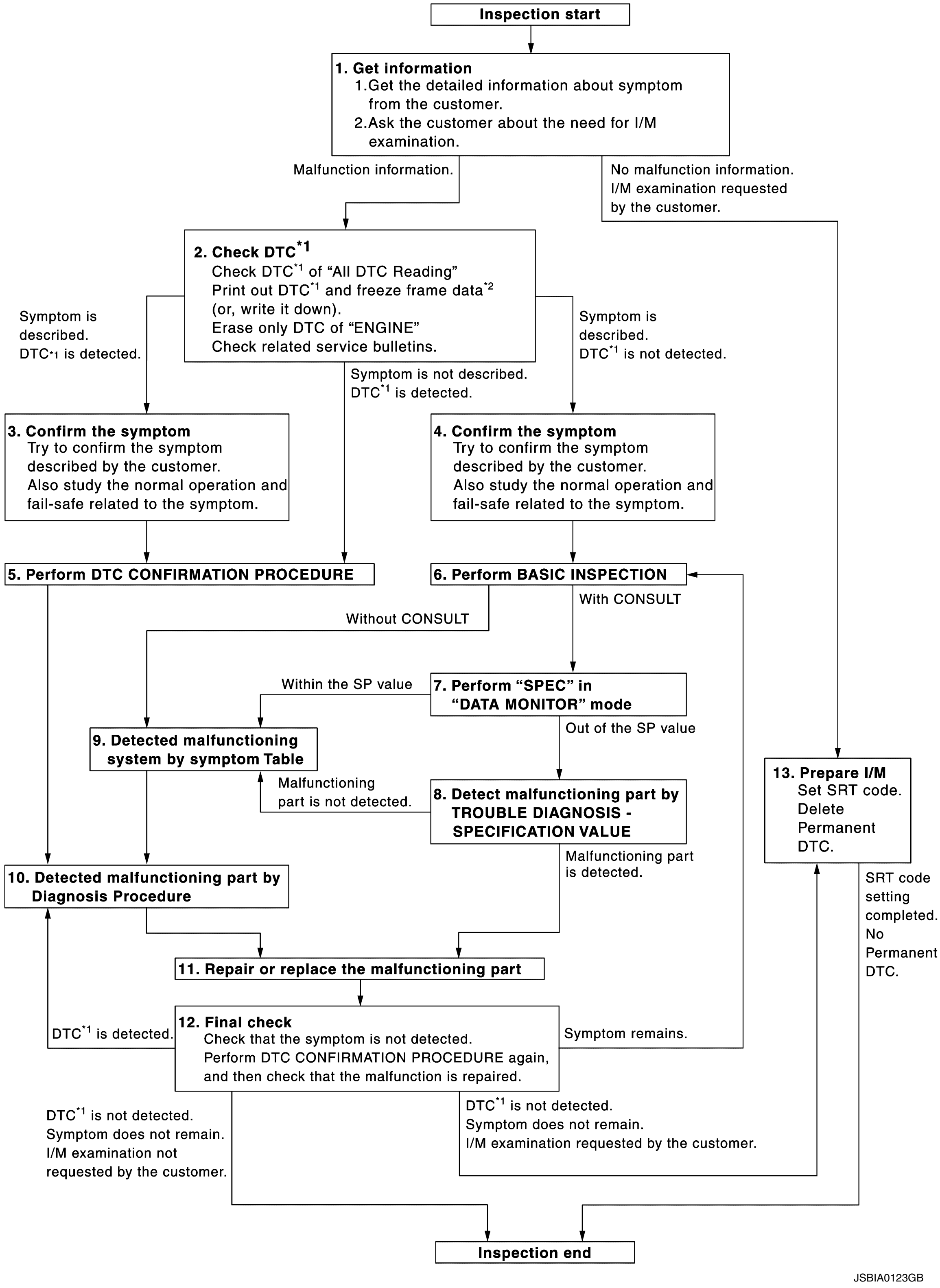
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORKFLOW

Work Flow

INFOID:0000000010596652

OVERALL SEQUENCE


Inspection start
1. Get information
1.Get the detailed information about symptom from the customer.
2.Ask the customer about the need for I/M examination.
Malfunction information.
No malfunction information. I/M examination requested by the customer.
2. Check DTC*1
Check DTC*1 of “All DTC Reading”
Print out DTC*1 and freeze frame data*2 (or, write it down).
Erase only DTC of “ENGINE”
Check related service bulletins.
Symptom is described. DTC*1 is detected.
Symptom is not described. DTC*1 is detected.
Symptom is described. DTC*1 is not detected.
3. Confirm the symptom
Try to confirm the symptom described by the customer.
Also study the normal operation and fail-safe related to the symptom.
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.
5. Perform DTC CONFIRMATION PROCEDURE
6. Perform BASIC INSPECTION
Without CONSULT
With CONSULT
Within the SP value
7. Perform “SPEC” in “DATA MONITOR” mode
Out of the SP value
9. Detected malfunctioning system by symptom Table
Malfunctioning part is not detected.
8. Detect malfunctioning part by TROUBLE DIAGNOSIS - SPECIFICATION VALUE
Malfunctioning part is detected.
13. Prepare I/M
Set SRT code.
Delete Permanent DTC.
SRT code setting completed. No Permanent DTC.
10. Detected malfunctioning part by Diagnosis Procedure
11. Repair or replace the malfunctioning part
12. Final check
Check that the symptom is not detected.
Perform DTC CONFIRMATION PROCEDURE again, and then check that the malfunction is repaired.
DTC*1 is detected.
Symptom remains.
DTC*1 is not detected. Symptom does not remain. I/M examination not requested by the customer.
DTC*1 is not detected. Symptom does not remain. I/M examination requested by the customer.
Inspection end

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*1: Include 1st trip DTC.

*2: Include 1st trip freeze frame data.

DETAILED FLOW

1.GET INFORMATION FOR SYMPTOM

1. Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the “Diagnostic Work Sheet”. (Refer to EC-12, "Diagnostic Work Sheet".)
2. Ask if the customer requests I/M examination.

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

2.CHECK DTC

1. Check DTC.
2. Perform the following procedure if DTC is displayed.
- Record DTC and freeze frame data. (Print them out with CONSULT or GST.)
- Erase DTC. (Refer to EC-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Table is useful. Refer to EC-616, "Symptom Table".)
3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

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

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).
Also study the normal operation and fail-safe related to the symptom. Refer to EC-620, "Description" and EC-572, "Fail safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 5.

4.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer.
Also study the normal operation and fail-safe related to the symptom. Refer to EC-620, "Description" and EC-572, "Fail safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then make sure that DTC is detected again.
If two or more DTCs are detected, refer to EC-574, "DTC Inspection Priority Chart" and determine trouble diagnosis order.

NOTE:

- Freeze frame data is useful if the DTC is not detected.
- Perform Component Function Check if DTC CONFIRMATION PROCEDURE is not included on Service Manual. This simplified check procedure is an effective alternative though DTC cannot be detected during this check.
  If the result of Component Function Check is NG, it is the same as the detection of DTC by DTC CONFIRMATION PROCEDURE.

Is DTC detected?

YES >> GO TO 10.
NO >> Check according to GI-45, "Intermittent Incident".

6.PERFORM BASIC INSPECTION

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

Do you have CONSULT?

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

7.PERFORM SPEC IN DATA MONITOR MODE

With CONSULT
Make sure that “MAS A/F SE-B1”, “MAS A/F SE-B2”, “B/FUEL SCHDL”, “A/F ALPHA-B1” and “A/F ALPHA-B2” are within the SP value using CONSULT “SPEC” in “DATA MONITOR” mode. Refer to EC-156, "Component Function Check".

Is the measurement value within the SP value?

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

8.DETECT MALFUNCTIONING PART BY TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Detect malfunctioning part according to EC-157, "Diagnosis Procedure".

Is a malfunctioning part detected?

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

9.DETECT MALFUNCTIONING SYSTEM BY SYMPTOM TABLE

Detect malfunctioning system according to EC-616, "Symptom Table" based on the confirmed symptom in step 4, and determine the trouble diagnosis order based on possible causes and symptoms.

>> GO TO 10.

10.DETECT MALFUNCTIONING PART BY DIAGNOSIS PROCEDURE

Inspect according to Diagnosis Procedure of the system.
NOTE:
The Diagnosis Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnosis Procedure. For details, refer to GI-48, "Circuit Inspection".

Is a malfunctioning part detected?

YES >> GO TO 11.
NO >> Monitor input data from related sensors or check voltage of related ECM terminals using CONSULT. Refer to EC-534, "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 EC-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function".

>> GO TO 12.

12.FINAL CHECK

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

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.
YES-2 >> Symptom remains: GO TO 6.

NO-1 >> No request for I/M examination from the customer: Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). Refer to EC-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function".

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

13.PREPARE FOR I/M EXAMINATION

1. Set SRT codes. Refer to EC-27, "SRT Set Driving Pattern".
2. Erase permanent DTCs. Refer to EC-32, "Description".

>> INSPECTION END.

Diagnostic Work Sheet

INFOID:0000000010596653

DESCRIPTION

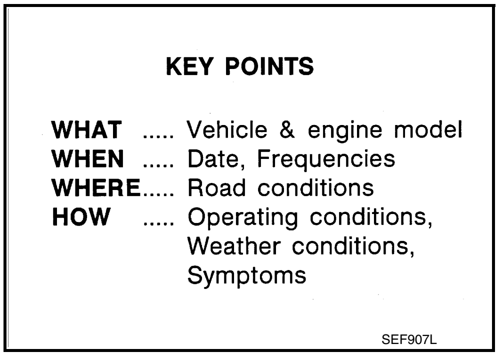
There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.

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

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

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

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



KEY POINTS

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

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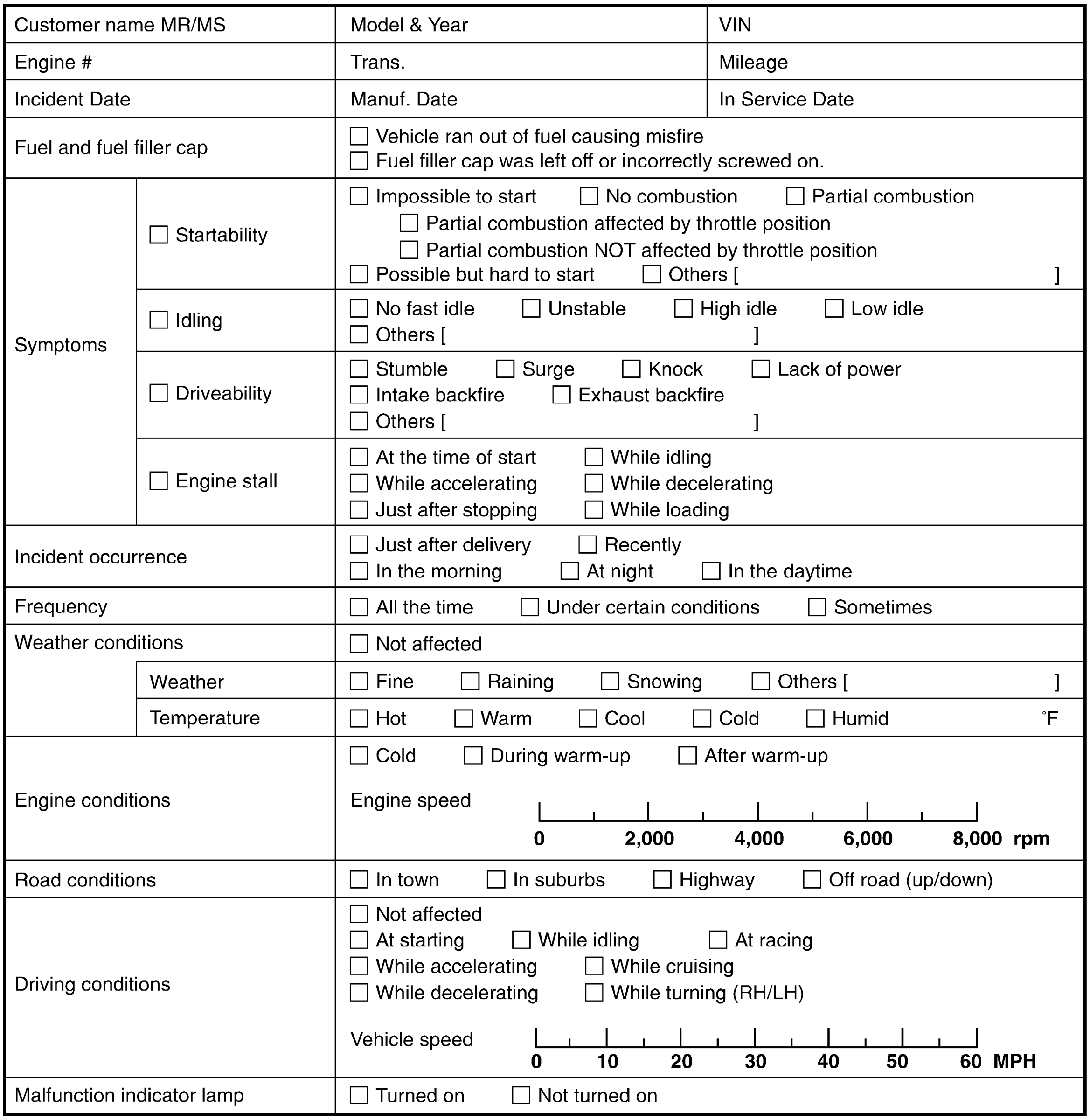
WORKSHEET SAMPLE



Customer name MR/MS		Model & Year	VIN
Engine #		Trans.	Mileage
Incident Date		Manuf. Date	In Service Date
Fuel and fuel filler cap		☐ Vehicle ran out of fuel causing misfire ☐ Fuel filler cap was left off or incorrectly screwed on.	
Symptoms	☐ Startability	☐ Impossible to start ☐ No combustion ☐ Partial combustion ☐ Partial combustion affected by throttle position ☐ Partial combustion NOT affected by throttle position ☐ Possible but hard to start ☐ Others [ ]	
	☐ Idling	☐ No fast idle ☐ Unstable ☐ High idle ☐ Low idle ☐ Others [ ]	
	☐ Driveability	☐ Stumble ☐ Surge ☐ Knock ☐ Lack of power ☐ Intake backfire ☐ Exhaust backfire ☐ Others [ ]	
	☐ Engine stall	☐ At the time of start ☐ While idling ☐ While accelerating ☐ While decelerating ☐ Just after stopping ☐ While loading	
Incident occurrence		☐ Just after delivery ☐ Recently ☐ In the morning ☐ At night ☐ In the daytime	
Frequency		☐ All the time ☐ Under certain conditions ☐ Sometimes	
Weather conditions		☐ Not affected	
	Weather	☐ Fine ☐ Raining ☐ Snowing ☐ Others [ ]	
	Temperature	☐ Hot ☐ Warm ☐ Cool ☐ Cold ☐ Humid ˚F	
Engine conditions		☐ Cold ☐ During warm-up ☐ After warm-up Engine speed 0 2,000 4,000 6,000 8,000 rpm	
Road conditions		☐ In town ☐ In suburbs ☐ Highway ☐ Off road (up/down)	
Driving conditions		☐ Not affected ☐ At starting ☐ While idling ☐ At racing ☐ While accelerating ☐ While cruising ☐ While decelerating ☐ While turning (RH/LH) Vehicle speed 0 10 20 30 40 50 60 MPH	
Malfunction indicator lamp		☐ Turned on ☐ Not turned on	

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INSPECTION AND ADJUSTMENT

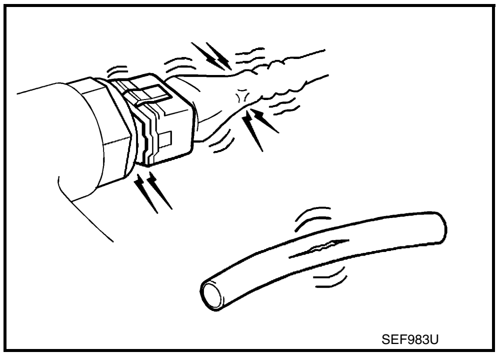
BASIC INSPECTION

BASIC INSPECTION : Special Repair Requirement

INFOID:0000000010596654

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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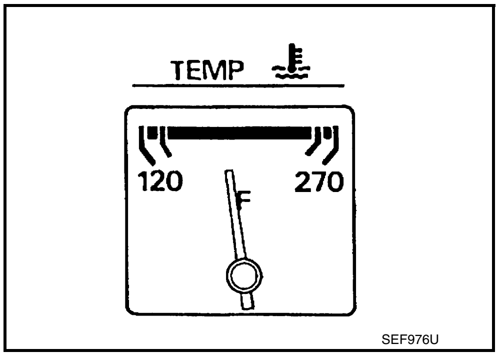
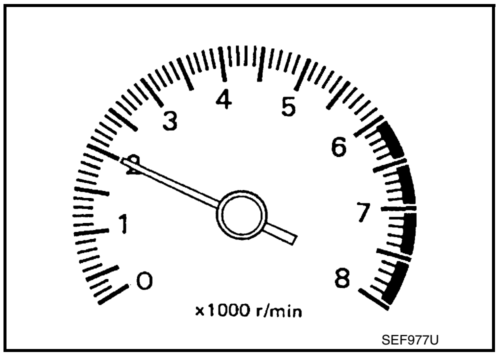


SEF976U

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 or GST.

Are any DTCs detected?

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



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2.REPAIR OR REPLACE

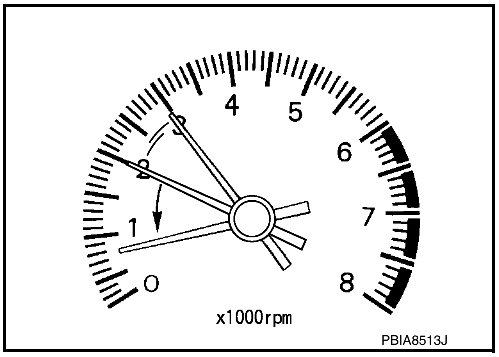
Repair or replace components as necessary according to corresponding Diagnosis Procedure.

>> GO TO 3

3.CHECK IDLE SPEED

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

2. Rev engine (2,000 to 3,000 rpm) two or three times under no load, then run engine at idle speed for about 1 minute.
3. Check idle speed.
   For procedure, refer to EC-19, "IDLE SPEED : Description".
   For specification, refer to EC-631, "Idle Speed".



Is the inspection result normal?

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

4.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 5.

5.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

>> GO TO 6.

6.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-21, "IDLE AIR VOLUME LEARNING : Description".

Is Idle Air Volume Learning carried out successfully?

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

7.CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-19, "IDLE SPEED : Description".
   For specification, refer to EC-631, "Idle Speed".

Is the inspection result normal?

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

8.DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-304, "Component Inspection".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-300, "Component Inspection".

Is the inspection result normal?

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

9.CHECK ECM FUNCTION

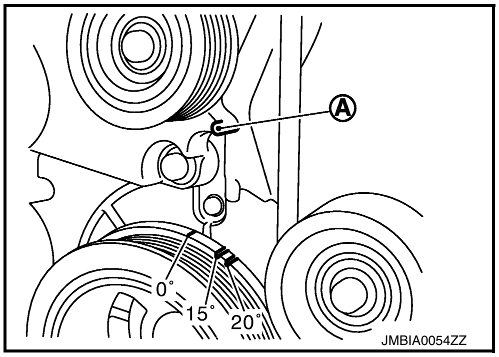
1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> GO TO 4.

10.CHECK IGNITION TIMING

1. Run engine at idle.

2. Check ignition timing with a timing light.



A :Timing indicator

For procedure, refer to EC-19, "IGNITION TIMING : Description".
For specification, refer to EC-631, "Ignition Timing".

Is the inspection result normal?

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

11.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 12.

12.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

>> GO TO 13.

13.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-21, "IDLE AIR VOLUME LEARNING : Description".

Is Idle Air Volume Learning carried out successfully?

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

14.CHECK IDLE SPEED AGAIN

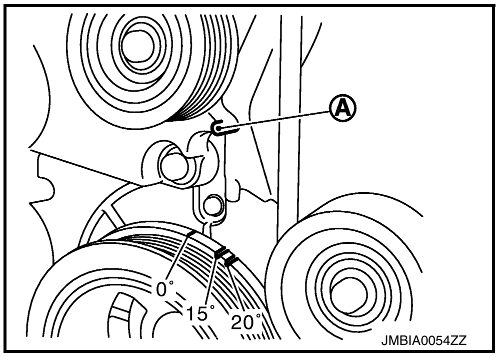
1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-19, "IDLE SPEED : Description".
   For specification, refer to EC-631, "Idle Speed".

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.



A :Timing indicator

For procedure, refer to EC-19, "IGNITION TIMING : Description".
For specification, refer to EC-631, "Ignition Timing".

Is the inspection result normal?

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

16.CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-52, "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 EC-304, "Component Inspection".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-300, "Component Inspection".

Is the inspection result normal?

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

18.CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> GO TO 4.

19.INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM)

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description

INFOID:0000000010596655

When replacing ECM, the following procedure must be performed. (For details, refer to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement".)

PROGRAMMING OPERATION

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

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Special Repair Requirement

INFOID:0000000010596656

1.CHECK ECM PART NUMBER

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

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

Is the ECM a blank ECM?

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

2.SAVE ECM PART NUMBER

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

NOTE:
- The ECM part number is saved in CONSULT.
- Even when ECM part number is not saved in CONSULT, go to 3.

>> GO TO 3.

3.PERFORM ECM PROGRAMMING

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

NOTE:

During programming, maintain the following conditions:

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

>> GO TO 5.

4.REPLACE ECM

Replace ECM.

>> GO TO 5.

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

Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to SEC-8, "ECM RE-COMMUNICATING FUNCTION : Description".

>> GO TO 6.

6.PERFORM VIN REGISTRATION

Perform VIN registration. Refer to EC-19, "VIN REGISTRATION : Description".

>> GO TO 7.

7.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Perform accelerator pedal released position learning. Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 8.

8.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

>> GO TO 9.

9.PERFORM IDLE AIR VOLUME LEARNING

Perform idle air volume learning. Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE)

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description

INFOID:0000000010596657

When replacing VVEL control module, the following procedure must be performed. Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Special Repair Requirement".

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL

MODULE) : Special Repair Requirement

INFOID:0000000010596658

1.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

IDLE SPEED

IDLE SPEED : Description

INFOID:0000000010596659

This describes how to check the idle speed. For the actual procedure, follow the instructions in “BASIC INSPECTION”. Refer to EC-19, "IDLE SPEED : Special Repair Requirement".

IDLE SPEED : Special Repair Requirement

INFOID:0000000010596660

1.CHECK IDLE SPEED

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

>> INSPECTION END

IGNITION TIMING

IGNITION TIMING : Description

INFOID:0000000010596661

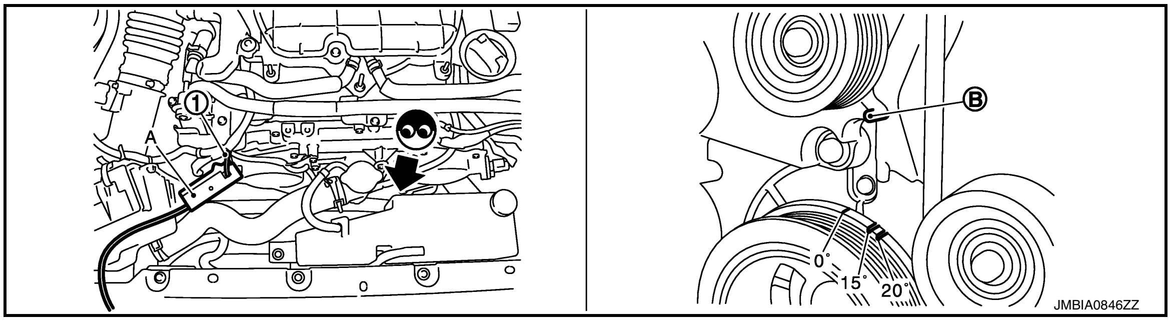
This describes how to check the ignition timing. For the actual procedure, follow the instructions in “BASIC INSPECTION”. Refer to EC-19, "IGNITION TIMING : Special Repair Requirement".

IGNITION TIMING : Special Repair Requirement

INFOID:0000000010596662

1.CHECK IGNITION TIMING

1. Attach timing light to loop wire as shown.



1. Loop wire
A. Timing light
B. Timing indicator

2. Check ignition timing.

>> INSPECTION END

VIN REGISTRATION

VIN REGISTRATION : Description

INFOID:0000000010596663

VIN Registration is an operation to registering VIN in ECM. It must be performed each time ECM is replaced. Refer to EC-20, "VIN REGISTRATION : Special Repair Requirement".

NOTE:
Accurate VIN which is registered in ECM may be required for Inspection & Maintenance (I/M).

VIN REGISTRATION : Special Repair Requirement

INFOID:0000000010596664

1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to GI-25, "Information About Identification or Model Code".

>> GO TO 2.

2.PERFORM VIN REGISTRATION

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

>> END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description

INFOID:0000000010596665

Accelerator Pedal Released Position Learning is a function of ECM to learn the fully released position of the accelerator pedal by monitoring the accelerator pedal position sensor output signal. It must be performed each time the harness connector of the accelerator pedal position sensor or ECM is disconnected. Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement

INFOID:0000000010596666

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:0000000010596667

Throttle Valve Closed Position Learning is a function of ECM to learn the fully closed position of the throttle valve by monitoring the throttle position sensor output signal. It must be performed each time harness connector of electric throttle control actuator or ECM is disconnected or electric throttle control actuator inside is cleaned. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:0000000010596668

1.START

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

WITHOUT CONSULT

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

>> END

IDLE AIR VOLUME LEARNING

IDLE AIR VOLUME LEARNING : Description

INFOID:0000000010596669

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps engine idle speed within the specific range. Refer to EC-21, "IDLE AIR VOLUME LEARNING : Special Repair Requirement". It must be performed under the following conditions:

- Each time electric throttle control actuator or ECM is replaced.
- Each time VVEL actuator sub assembly or VVEL control module is replaced.
- Idle speed or ignition timing is out of specification.

IDLE AIR VOLUME LEARNING : Special Repair Requirement

INFOID:0000000010596670

1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.

- Battery voltage: More than 12.9 V (At idle)
- Engine coolant temperature: 70 - 105°C (158 - 221°F)
- Selector lever: P or N
- Electric load switch: OFF
  (Air conditioner, headlamp, rear window defogger)
  On vehicles equipped with daytime light systems, if the parking brake is applied before the engine is started the headlamp will not be illuminated.
- Steering wheel: Neutral (Straight-ahead position)
- Vehicle speed: Stopped
- Transmission: Warmed-up
- With CONSULT: Drive vehicle until “ATF TEMP SE 1” in “DATA MONITOR” mode of “A/T” system indicates less than 0.9V.
- Without CONSULT: Drive vehicle for 10 minutes.

Do you have CONSULT?

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

2.PERFORM IDLE AIR VOLUME LEARNING

With CONSULT

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

Is “CMPLT” displayed on CONSULT screen?

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

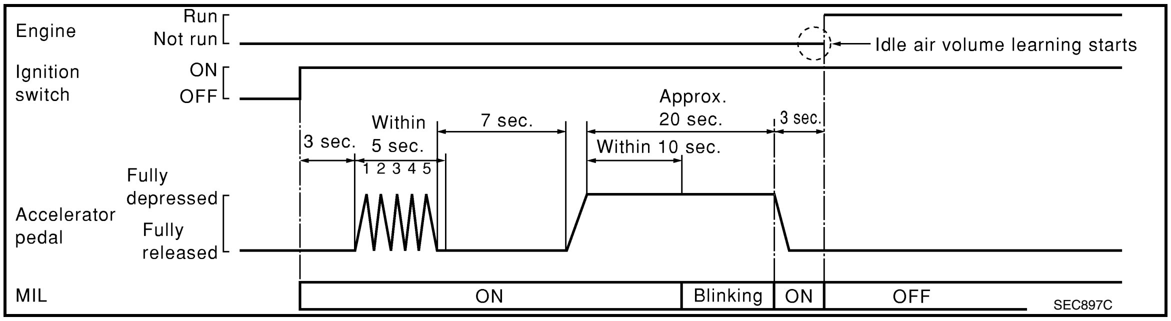
3.PERFORM IDLE AIR VOLUME LEARNING

Without CONSULT

NOTE:

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

1. Perform Accelerator Pedal Released Position Learning. Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".
2. Perform Throttle Valve Closed Position Learning. EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly five times within 5 seconds.
   - Fully depress the accelerator pedal.
   - Fully release the accelerator pedal.
7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and illuminates.
8. Fully release the accelerator pedal within 3 seconds after the MIL illuminates.
9. Start engine and let it idle.
10. Wait 20 seconds.



>> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

1. Start engine and warm it up to normal operating temperature.
2. Let it idle for 20 seconds.
3. Rev up the engine two or three times and make sure that idle speed and ignition timing are within the specifications. Refer to EC-631, "Idle Speed" and EC-631, "Ignition Timing".

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART-I

Check the following

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

Is the inspection result normal?

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

6.DETECT MALFUNCTIONING PART-II

Engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.

It is useful to perform “TROUBLE DIAGNOSIS - SPECIFICATION VALUE”. Refer to EC-156, "Description".

If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:

- Engine stalls.
- Erroneous idle.

>> INSPECTION END

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description

INFOID:0000000010596671

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

It must be performed each time VVEL actuator sub assembly is replaced. Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement".

CAUTION:

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

VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Special Repair Requirement

INFOID:0000000010596672

1.START

Do you have CONSULT?

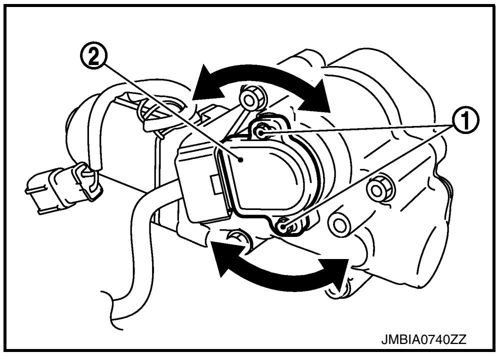
Do you have CONSULT?

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

2.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

With CONSULT

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



Voltage : 500 ± 48 mV

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

: 7.0 N•m (0.71 kg-m, 62 in-lb)

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

Voltage : 500 ± 48 mV

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

10. Turn ignition switch OFF and wait at least 10 seconds.
11. Start engine and warm it up to normal operating temperature.
12. Turn ignition switch OFF and wait at least 10 seconds.
13. Perform idle air volume learning. Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

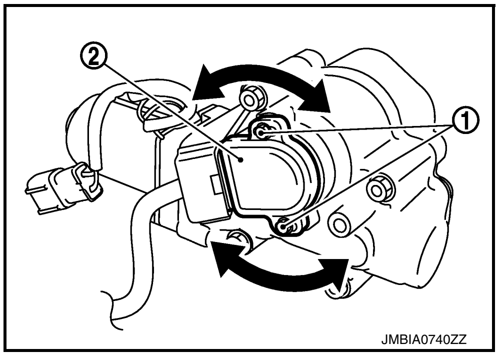
>> INSPECTION END

3.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Without CONSULT

1. Disconnect VVEL control shaft position sensor harness connector.

2. Remove VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".
3. Turn ignition switch ON, wait at least 5 seconds and then turn OFF.
4. Reconnect all harness connectors disconnected.
5. Install VVEL actuator motor relay.
6. Turn ignition switch ON and wait at least 5 seconds.
7. Loosen the VVEL control shaft position sensor mounting bolt (1).
8. Turn the VVEL control shaft position sensor (2) right and left while monitoring the output voltage between the VVEL control module terminals with a tester and adjust the output voltage to be within the standard value.



VVEL control module				Voltage
Bank	Connector	+	–	
		Terminal	Terminal	
1	E14	3	4	500 ± 48 mV
2		5	6	

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

: 7.0 N•m (0.71 kg-m, 62 in-lb)

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

VVEL control module				Voltage
Bank	Connector	+	–	
		Terminal	Terminal	
1	E14	3	4	500 ± 48 mV
2		5	6	

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

11. Turn ignition switch OFF and wait at least 10 seconds.
12. Start engine and warm it up to normal operating temperature.
13. Turn ignition switch OFF and wait at least 10 seconds.
14. Perform idle air volume learning. Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> INSPECTION END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:0000000010596673

This describes how to erase the mixture ratio self-learning value. For the actual procedure, follow the instructions in “Diagnosis Procedure”. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:0000000010596674

1.START

With CONSULT

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

GST With GST

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

>> END

HOW TO SET SRT CODE

Description

INFOID:0000000010596675

OUTLINE

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

SRT ITEM

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

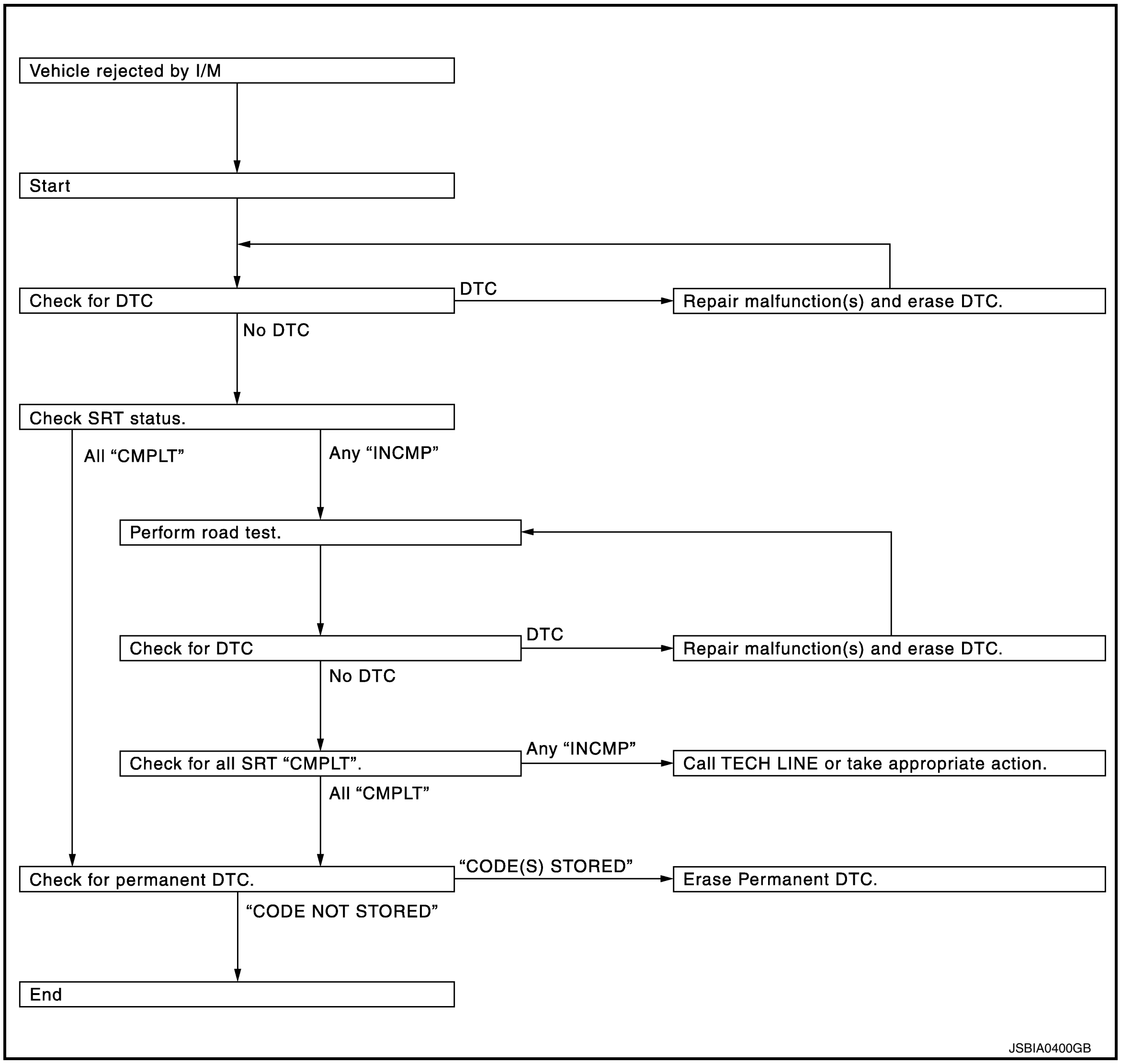
SRT item[*1] (CONSULT indication)	Performance Priority[*2]	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	1	Three way catalyst function	P0420, P0430
EVAP SYSTEM	1	EVAP control system purge flow monitoring	P0441
	1	EVAP control system	P0456
HO2S	1	Air fuel ratio (A/F) sensor 1	P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D
		Heated oxygen sensor 2	P0137, P0157
		Heated oxygen sensor 2	P0138, P0158
		Heated oxygen sensor 2	P0139, P0159
EGR/VVT SYSTEM	2	Intake value timing control function	P0011, P0021

*1: Though displayed on the CONSULT screen, “HO2S HTR” is not SRT item.

*2: If completion of several SRTs is required, perform driving patterns (DTC confirmation procedure), one by one based on the priority for models with CONSULT.

SRT SERVICE PROCEDURE

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

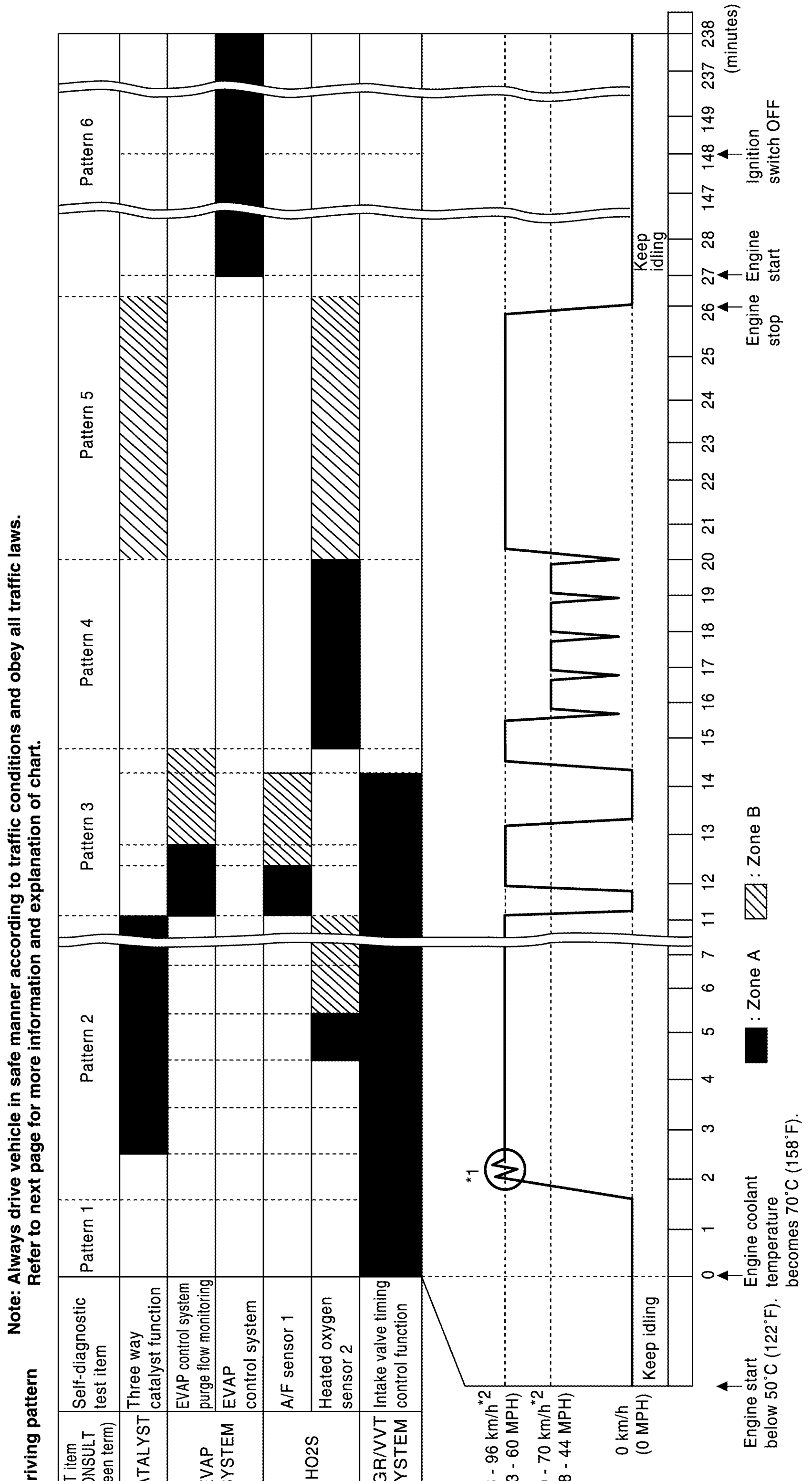


SRT Set Driving Pattern

INFOID:0000000010596676

CAUTION:

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



JPBIA5320GB

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

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

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

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

NOTE:

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

Work Procedure

INFOID:0000000010596677

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-576, "DTC Index".
NO >> GO TO 2.

2.CHECK SRT STATUS

With CONSULT

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

Without CONSULT

Perform “SRT status” mode with EC-143, "On Board Diagnosis Function".

With GST

Select Service $01 with GST.

Is SRT code(s) set?

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

3.DTC CONFIRMATION PROCEDURE

1. Select “SRT WORK SUPPORT” in “DTC & SRT CONFIRMATION” mode with CONSULT.
2. For SRT(s) that is not set, perform the corresponding “DTC CONFIRMATION PROCEDURE” according to the “Performance Priority” in the “SRT ITEM” table. Refer to EC-26, "Description".
3. Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-576, "DTC Index".
NO >> GO TO 11.

4.PERFORM ROAD TEST

- Check the “Performance Priority” in the “SRT ITEM” table. Refer to EC-26, "Description".
- Perform the most efficient SRT set driving pattern to set the SRT properly. Refer to EC-27, "SRT Set Driving Pattern".
  In order to set all SRTs, the SRT set driving pattern must be performed at least once.

>> GO TO 5.

5.PATTERN 1

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

NOTE:

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

Refer to EC-534, "Reference Value".

>> GO TO 6.

6.PATTERN 2

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

NOTE:

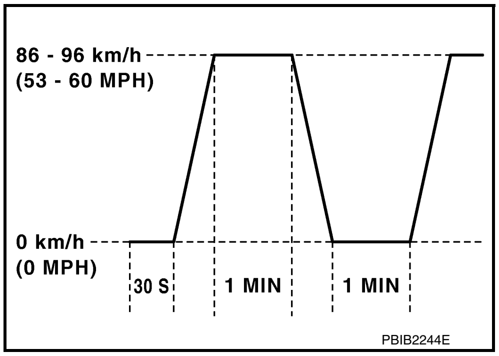
- Checking the vehicle speed with GST is advised.
- When steady-state driving is performed again even after it is interrupted, each diagnosis can be conducted. In this case, the time required for diagnosis may be extended.

>> GO TO 7.

7.PATTERN 3

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

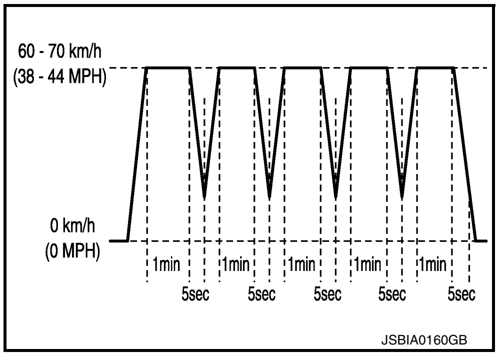
>> GO TO 8.



8.PATTERN 4

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

>> GO TO 9.



9.PATTERN 5

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

>> GO TO 10.

10.PATTERN 6

1. Start the engine and wait at least 2 hours.
2. Turn ignition OFF and wait at least 90 minutes.

>> GO TO 11.

11.CHECK SRT STATUS

With CONSULT

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

Without CONSULT

Perform “SRT status” mode with EC-143, "On Board Diagnosis Function".

With GST

Select Service $01 with GST.

Is SRT(s) set?

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

12.CHECK PERMANENT DTC

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

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

With GST
Select Service $0A with GST.

Is permanent DTC(s) detected?

YES >> Go to EC-26, "Description".
NO >> END

A
EC
C
D
E
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G
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O
P

HOW TO ERASE PERMANENT DTC

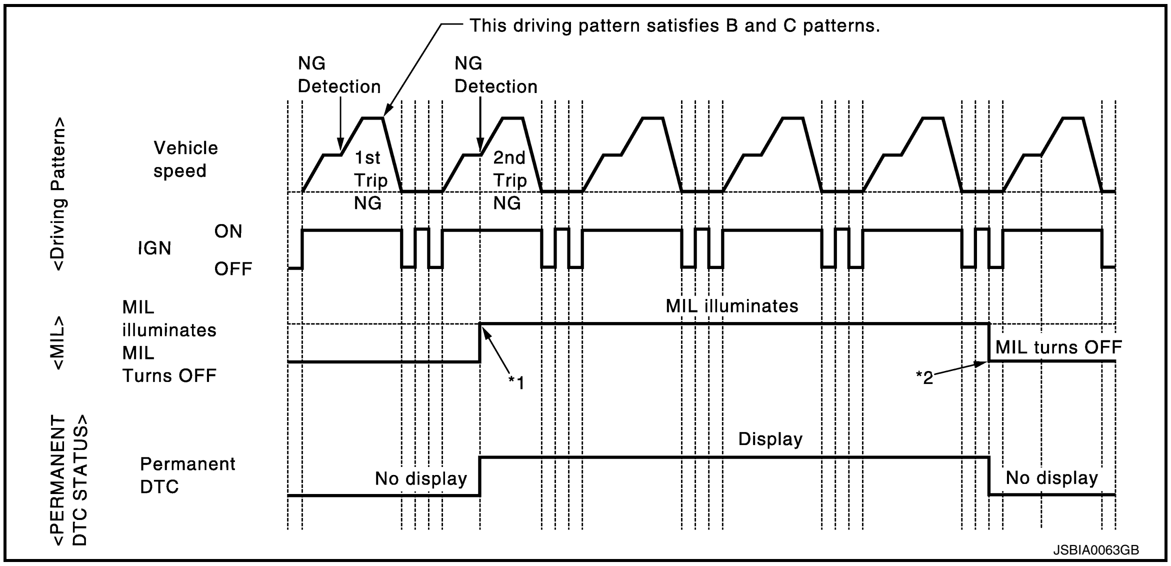
Description

INFOID:0000000010596678

OUTLINE

When a DTC is stored in ECM

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



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

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

When a DTC is not stored in ECM

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

NOTE:

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

×: Applicable —: Not applicable

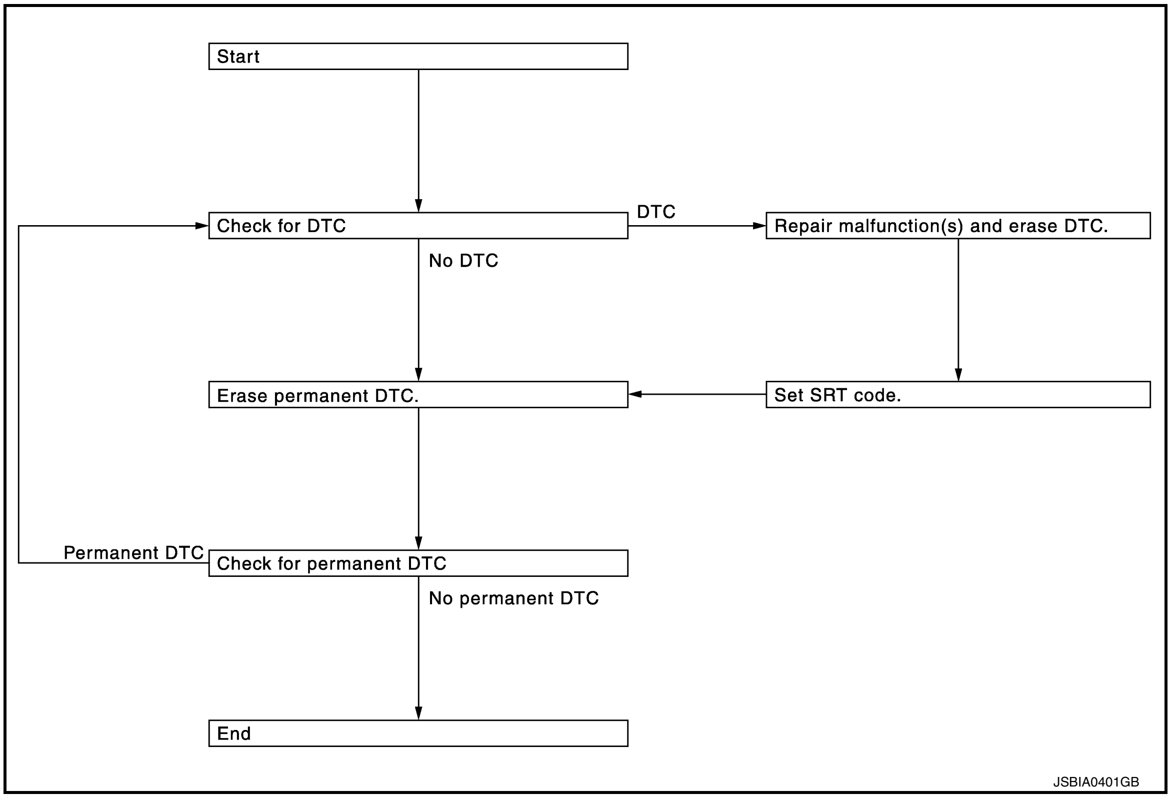
Group*	Perform “DTC CONFIRMATION PROCEDURE” for applicable DTCs.	Driving pattern	
		B	D
A	×	—	—
B	—	×	×

*: For group, refer to EC-576, "DTC Index".

PERMANENT DTC ITEM

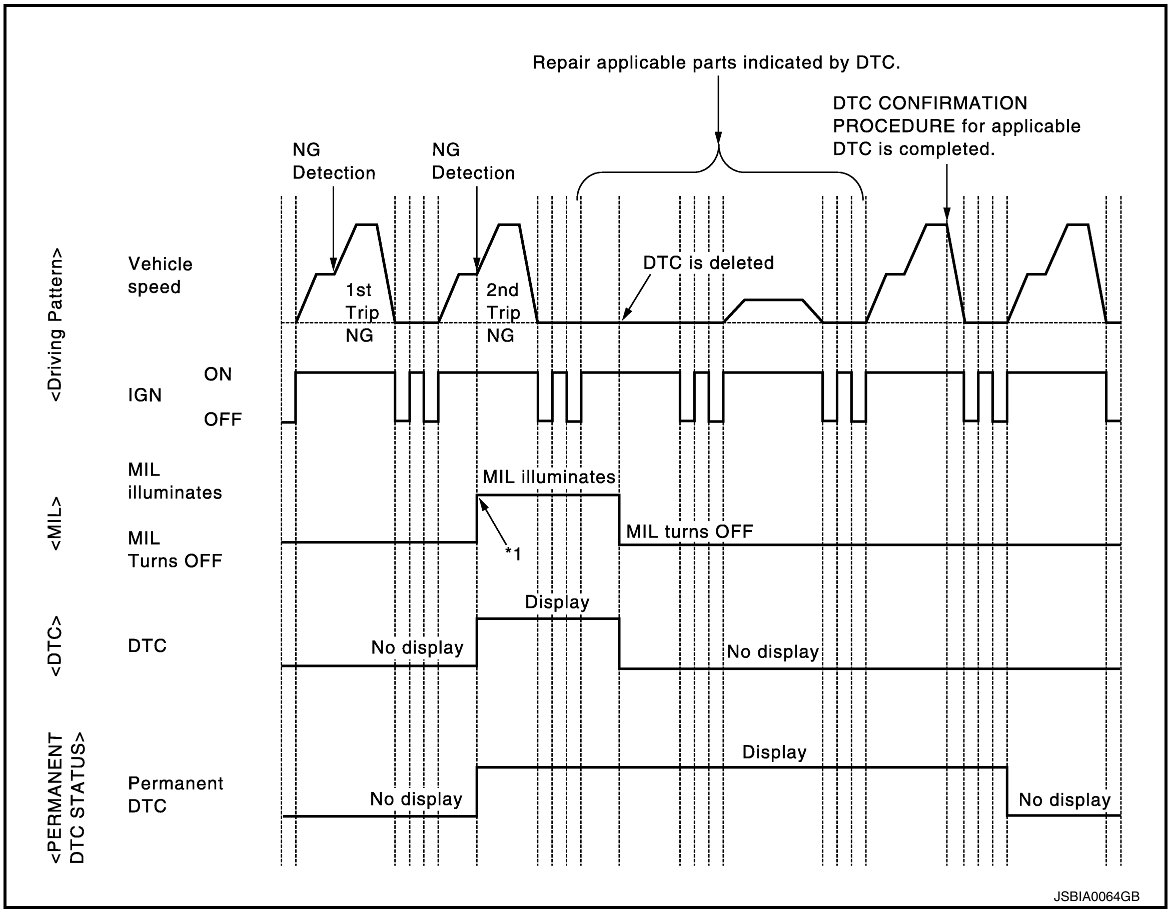
For permanent DTC items, MIL turns ON. Refer to EC-576, "DTC Index".

PERMANENT DTC SERVICE PROCEDURE



Work Procedure (Group A)

INFOID:0000000010596679



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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-143, "On Board Diagnosis Function", EC-146, "CONSULT Function".
NO >> GO TO 2.

2.CHECK PERMANENT DTC

With CONSULT

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

With GST

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

Is any permanent DTC detected?

YES >> GO TO 3.
NO >> END

3.PERFORM DTC CONFIRMATION PROCEDURE

Perform “DTC CONFIRMATION PROCEDURE” for DTCs which are the same as permanent DTCs stored in ECM. Refer to EC-576, "DTC Index".

>> GO TO 4.

4.CHECK PERMANENT DTC

With CONSULT

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

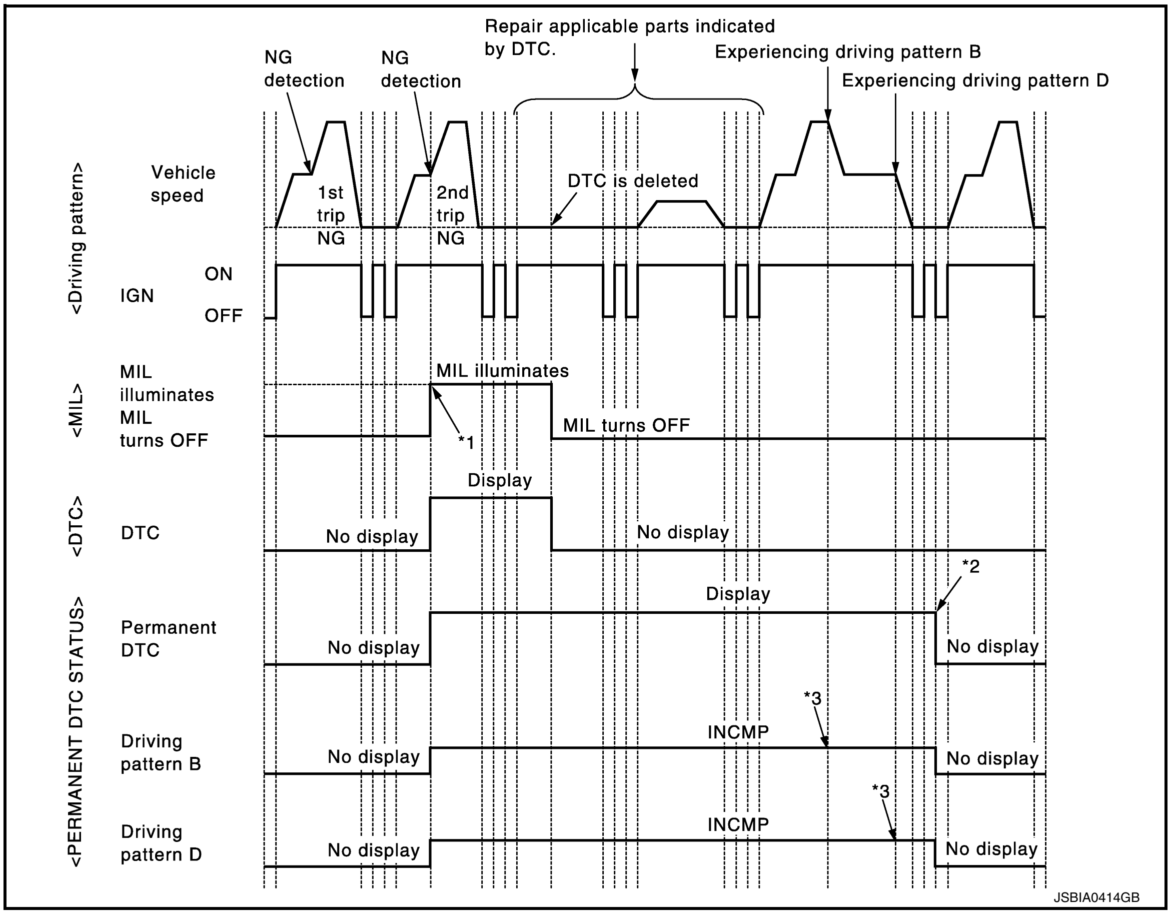
With GST

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

Is any permanent DTC detected?

YES >> GO TO 1.
NO >> END

Work Procedure (Group B)



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

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

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

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

1.CHECK DTC

Check DTC.

Is any DTC detected?

YES >> Repair malfunction(s) and erase DTC. Refer to EC-143, "On Board Diagnosis Function", EC-146, "CONSULT Function".

NO >> GO TO 2.

2.CHECK PERMANENT DTC

With CONSULT

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

With GST

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

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

Is any permanent DTC detected?

YES >> GO TO 3.
NO >> END

3.DRIVE DRIVING PATTERN B

CAUTION:

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

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Use “PERMANENT DTC WORK SUPPORT” mode with CONSULT to drive the vehicle according to driving pattern B. Refer to EC-146, "CONSULT Function", EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle according to driving pattern B. Refer to EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

>> GO TO 4.

4.CHECK PERMANENT DTC

With CONSULT

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

With GST

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

Is any permanent DTC detected?

YES >> GO TO 5.
NO >> END

5.DRIVE DRIVING PATTERN D

CAUTION:

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

1. Drive the vehicle according to driving pattern D. Refer to EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

>> GO TO 6.

6.CHECK PERMANENT DTC

With CONSULT

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

5. Select “PERMANENT DTC STATUS” mode with CONSULT.

GST With GST

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

Is any permanent DTC detected?

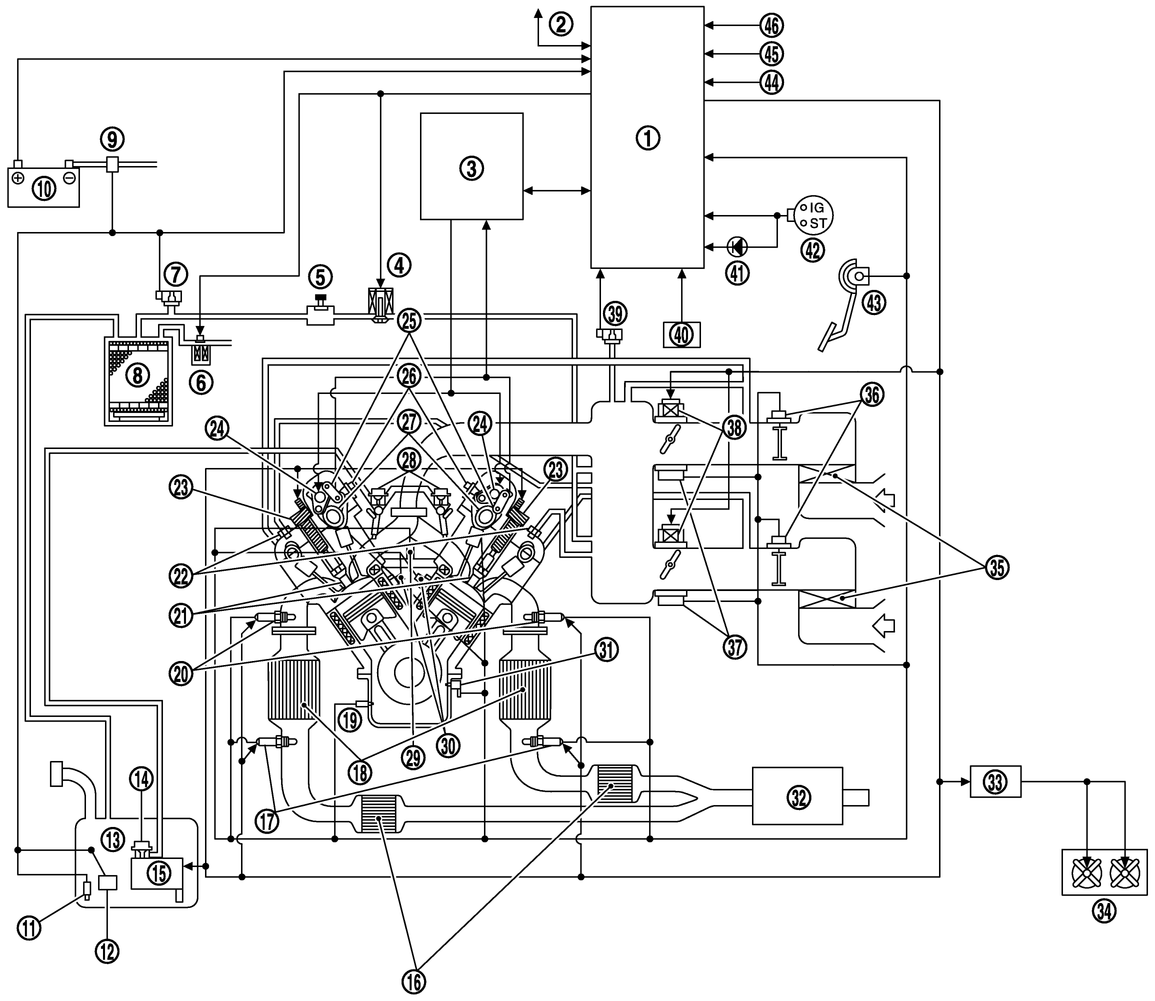
YES >> GO TO 1.
NO >> END

SYSTEM DESCRIPTION

ENGINE CONTROL SYSTEM

System Diagram

INFOID:0000000010596681



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1. ECM
2. Can communication
3. VVEL control module
4. EVAP canister purge volume control solenoid valve
5. EVAP service port
6. EVAP canister vent control valve
7. EVAP control system pressure sensor
8. EVAP canister
9. Battery current sensor
10. Battery
11. Fuel tank temperature sensor
12. Fuel level sensor
13. Fuel tank
14. Fuel pressure regulator
15. Fuel pump
16. Three way catalyst 2
17. Heated oxygen sensor 2
18. Three way catalyst 1
19. Engine oil temperature sensor
20. A/F sensor 1
21. Spark plug
22. PCV valve
23. Ignition coil (with power transistor)
24. VVEL actuator motor

25. VVEL control shaft position sensor
26. Intake valve timing control solenoid valve
27. Camshaft position sensor (PHASE)
28. Fuel damper
29. Engine coolant temperature sensor
30. Knock sensor
31. Crankshaft position sensor (POS)
32. Muffler
33. Cooling fan control module
34. Cooling fan
35. Air cleaner
36. Mass air flow sensor (with intake air temperature sensor)
37. Electric throttle control actuator
38. Throttle position sensor
39. Manifold absolute pressure (MAP) sensor
40. Brake booster pressure sensor
41. MIL
42. Ignition switch
43. Accelerator pedal position sensor
44. Power steering pressure sensor
45. Refrigerant pressure sensor
46. PNP signal

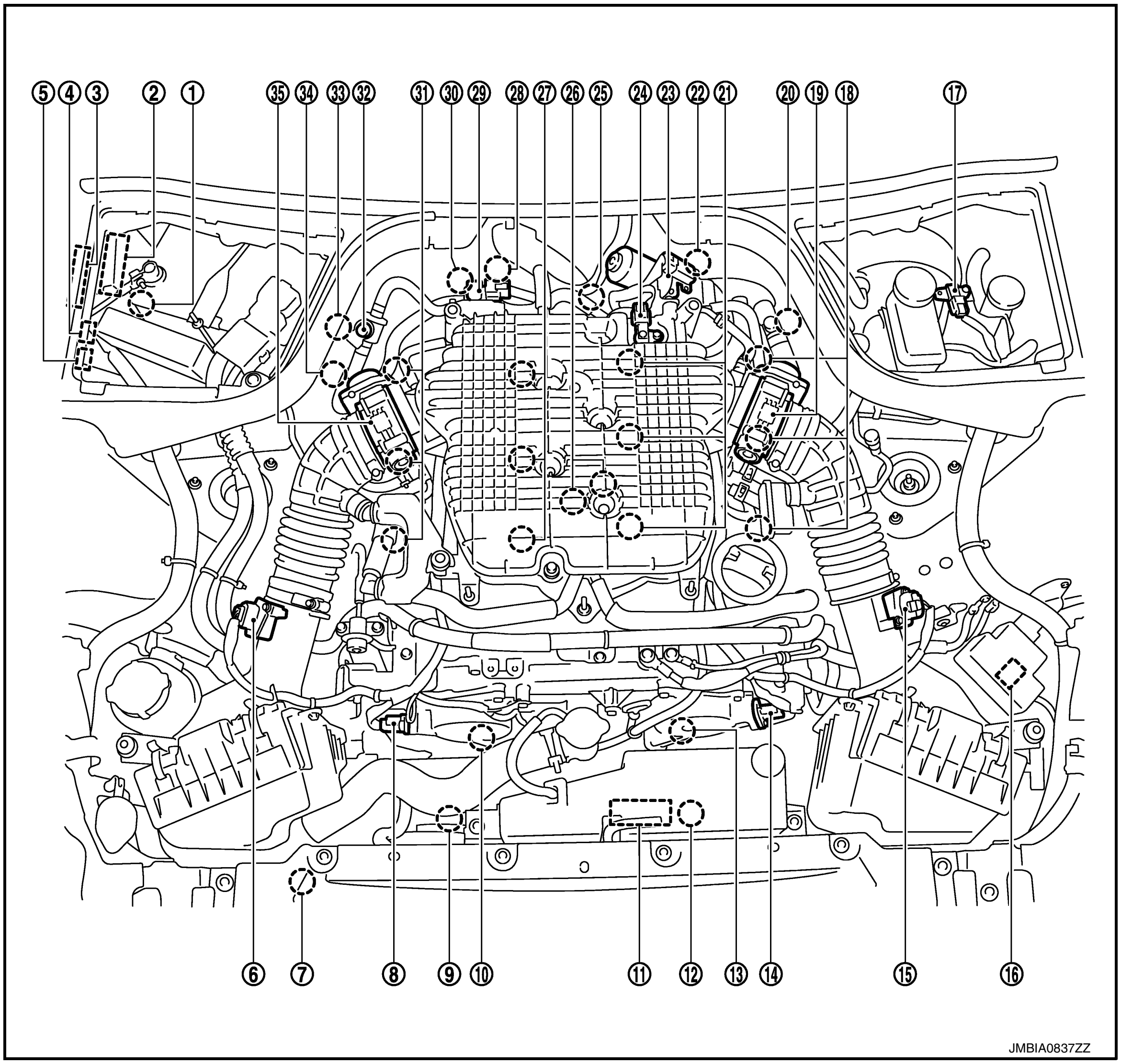
System Description

INFOID:0000000010596682

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

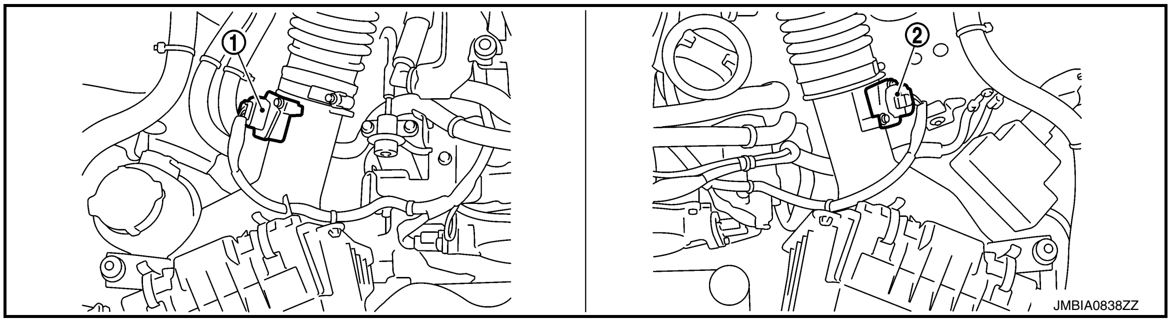
Component Parts Location

INFOID:0000000010596683

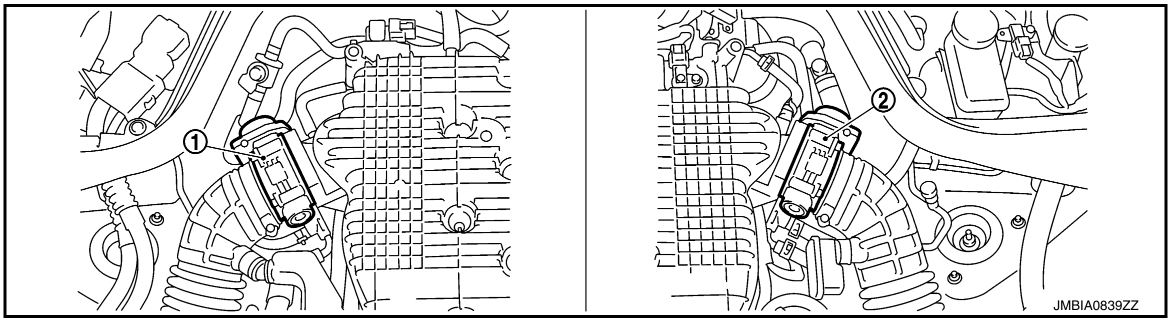


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)

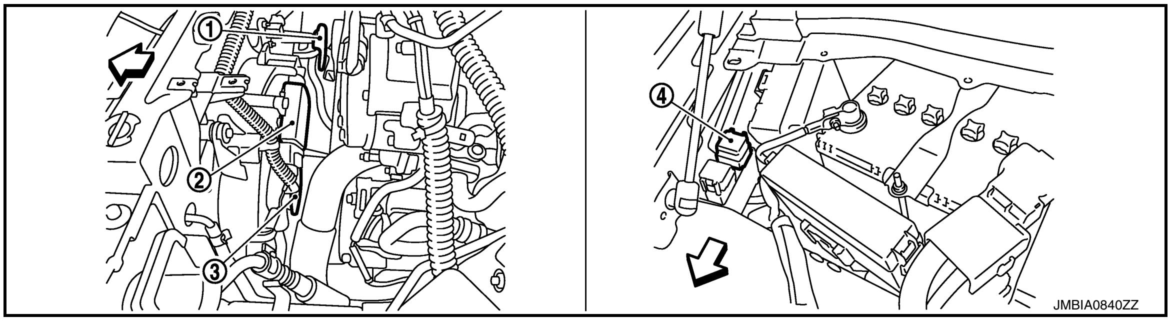
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

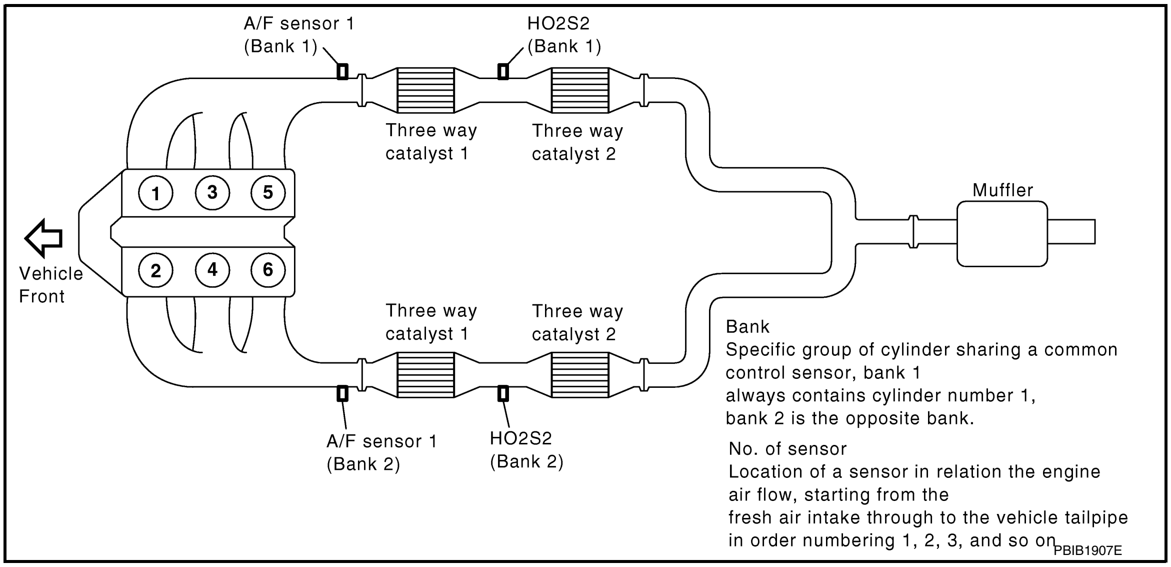


1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



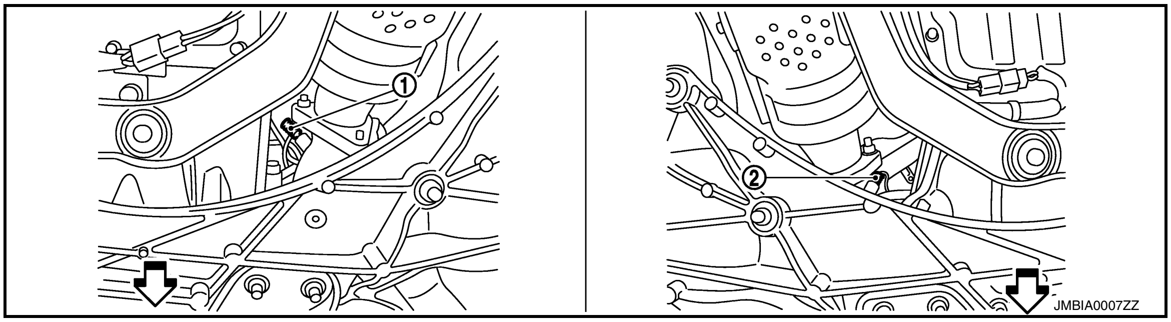
⇦ : Vehicle front

1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay



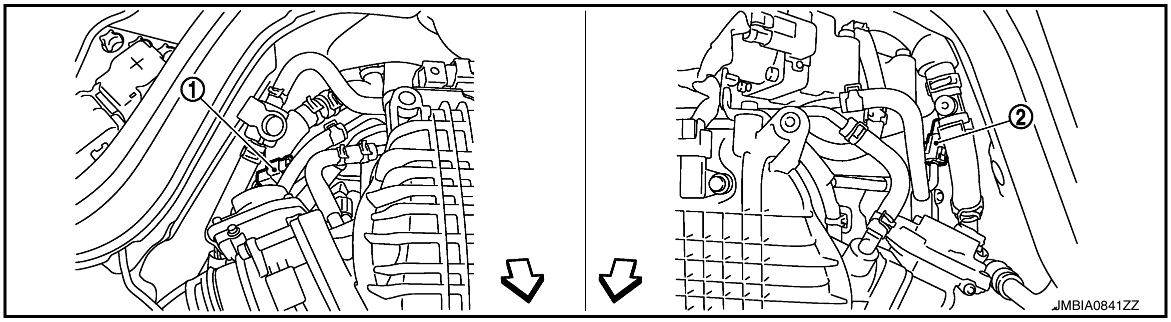
Bank
Specific group of cylinder sharing a common control sensor, bank 1 always contains cylinder number 1, bank 2 is the opposite bank.

No. of sensor
Location of a sensor in relation the engine air flow, starting from the fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on



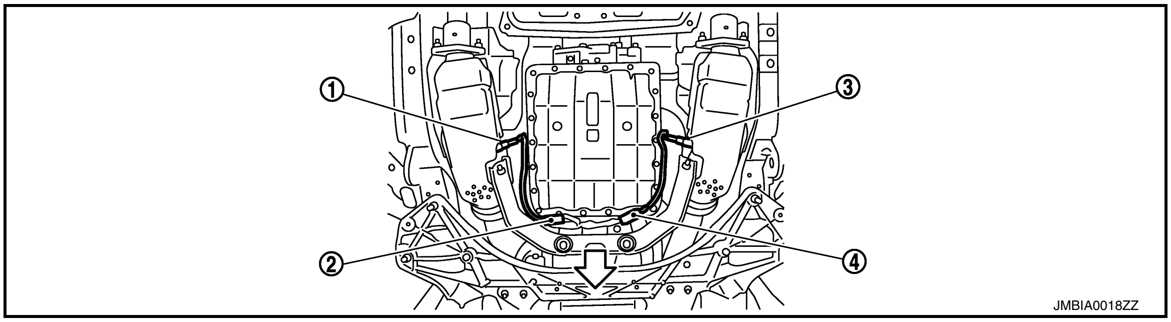
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



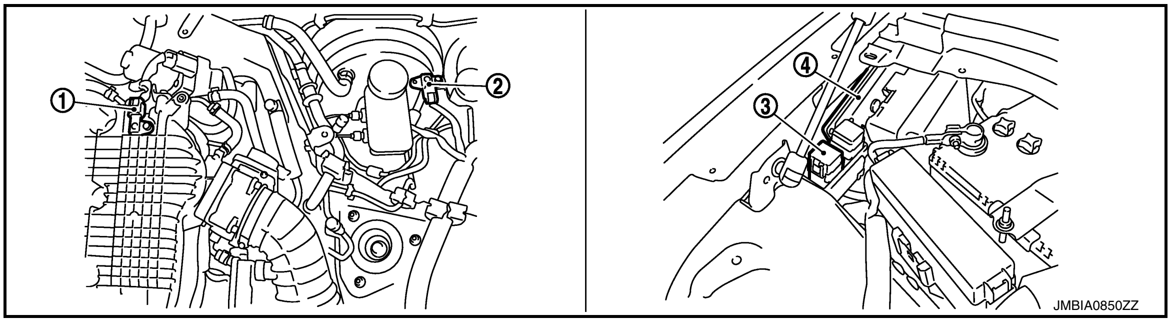
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

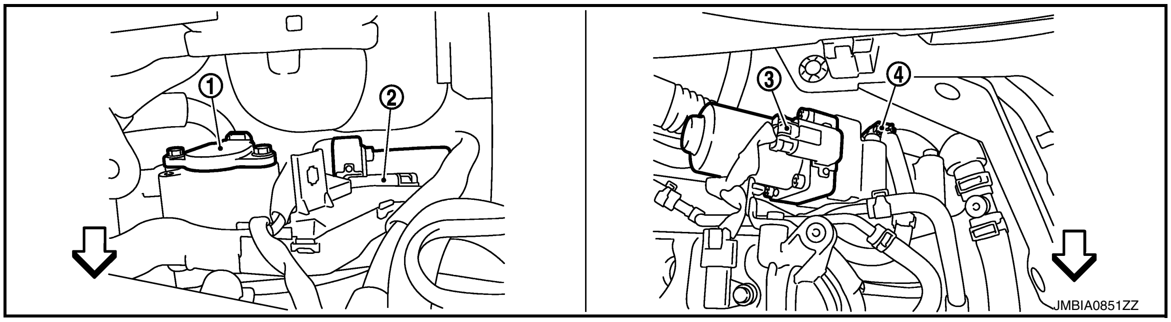


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

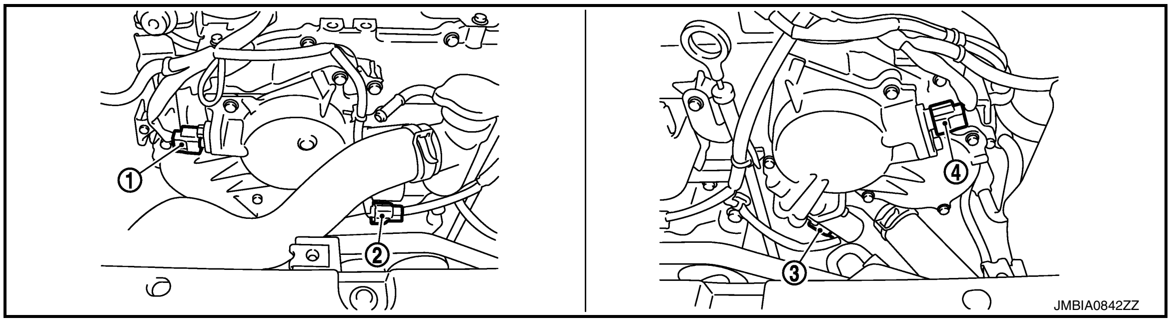


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

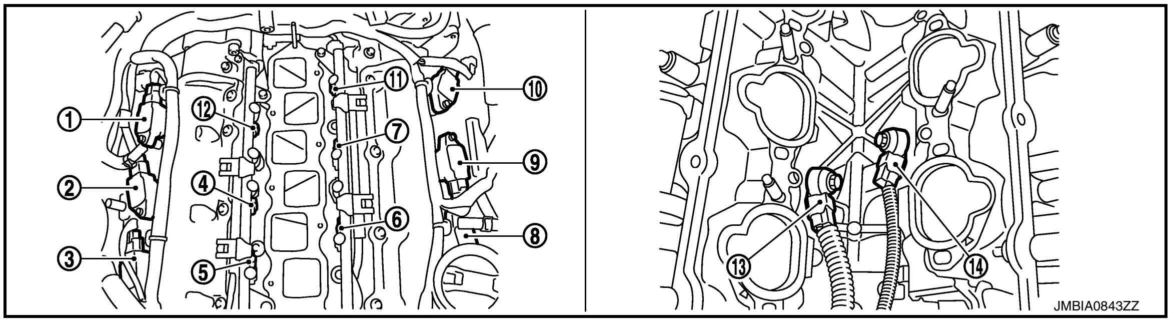


⇦ : Vehicle front

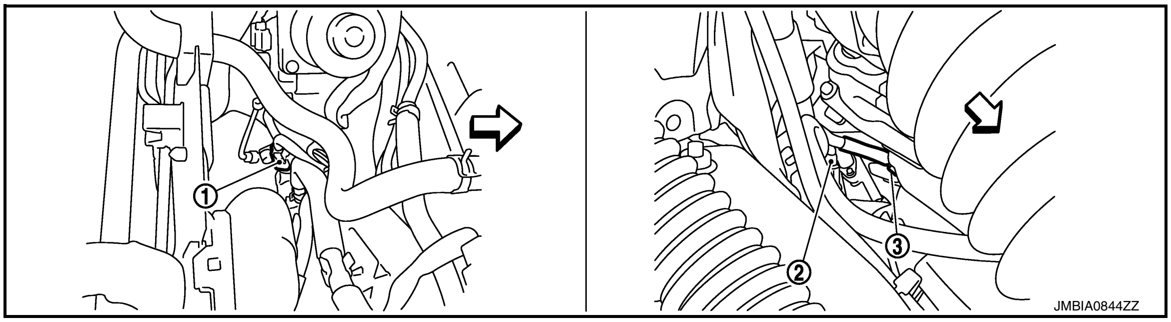
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

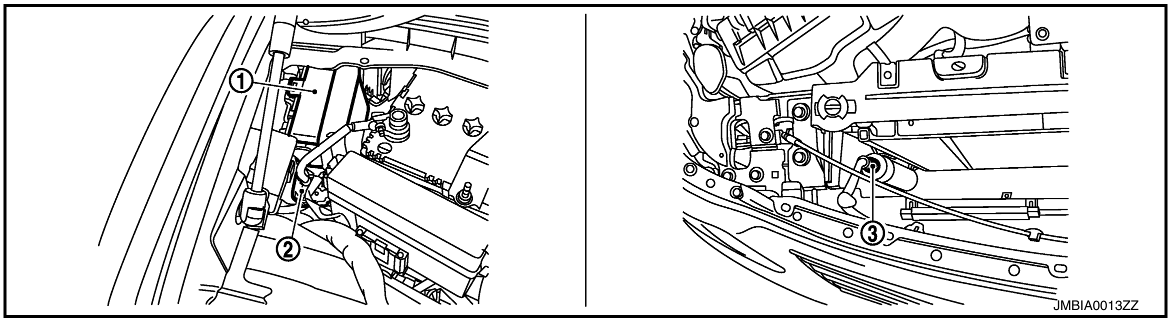


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

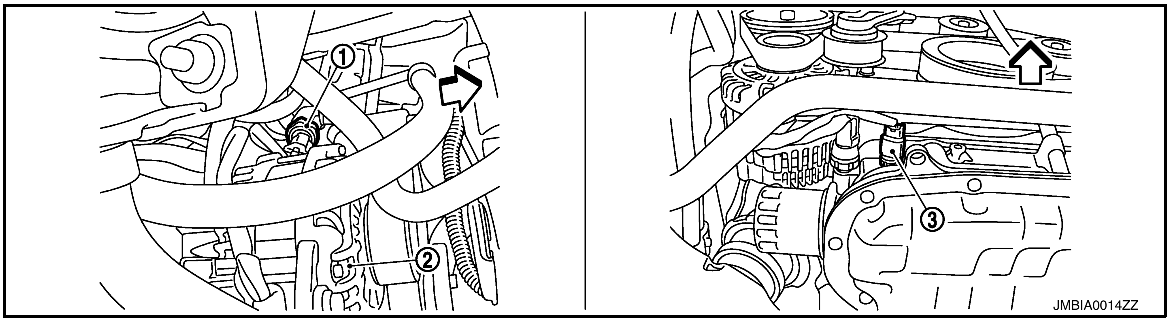


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

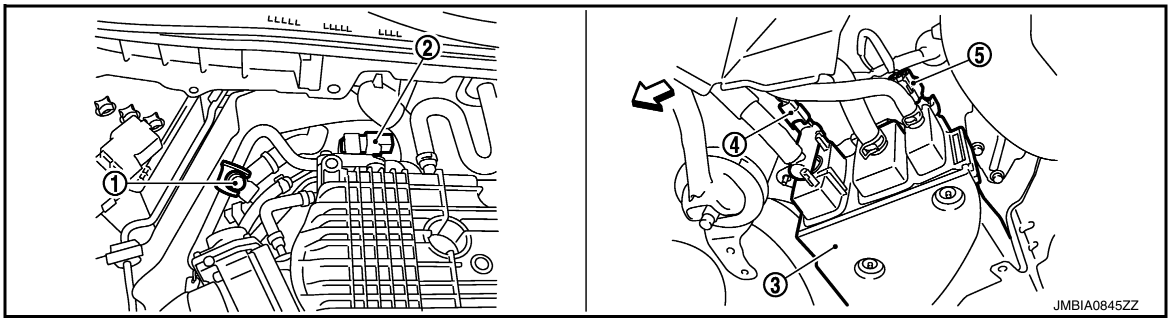


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



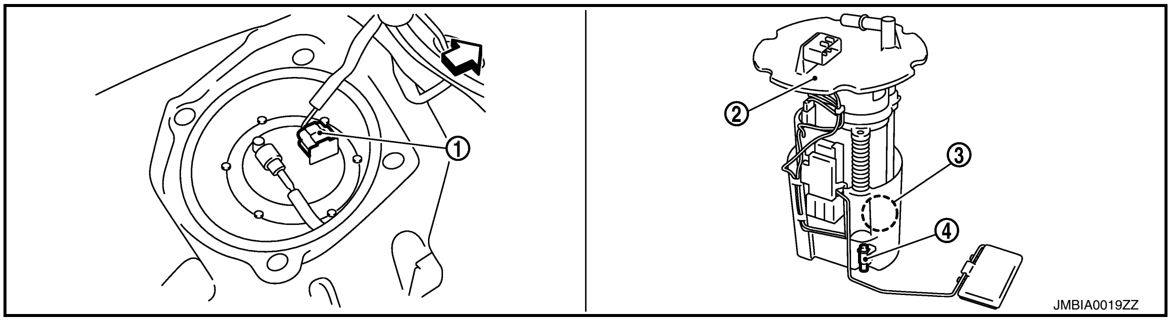
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



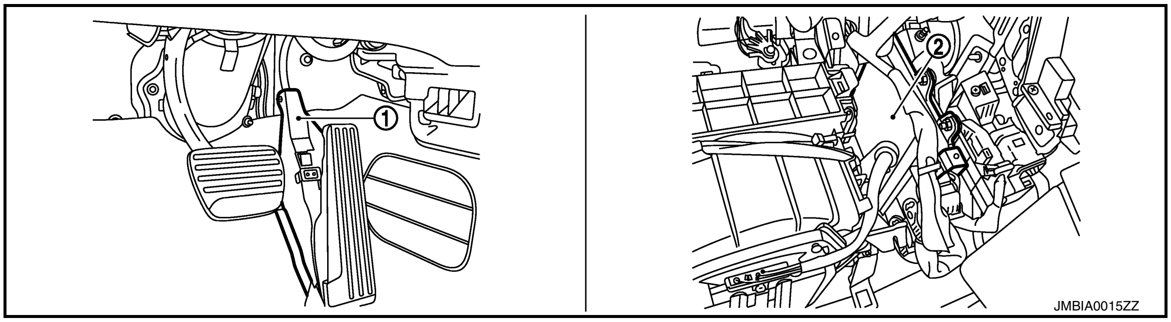
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

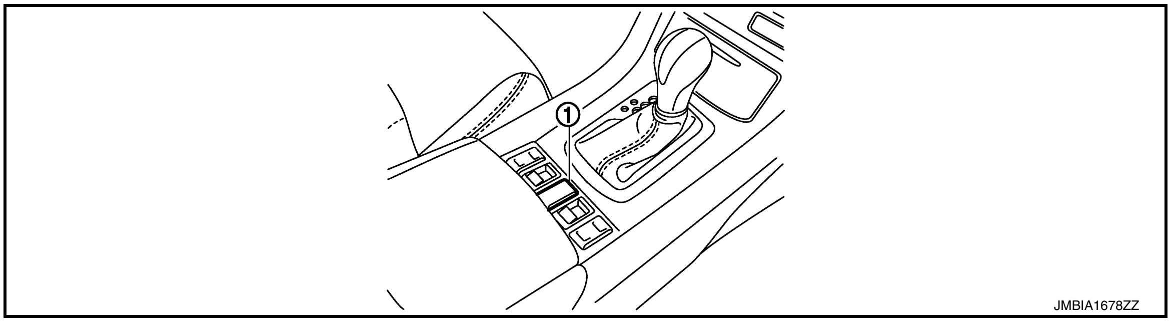


⇦ : Vehicle front

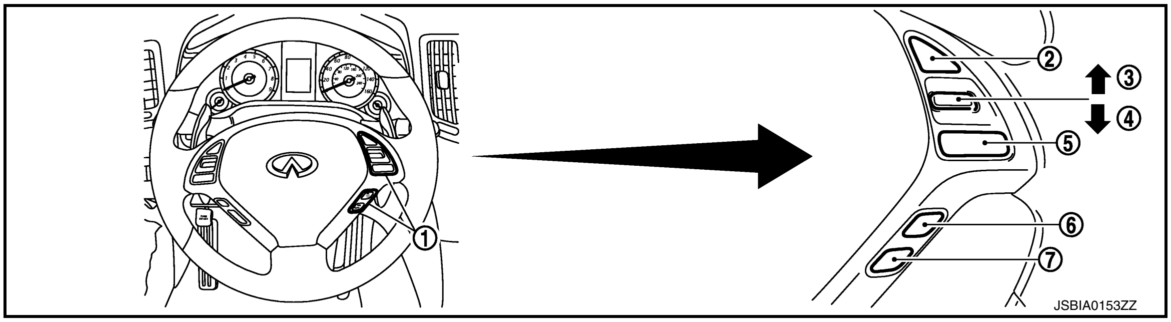
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



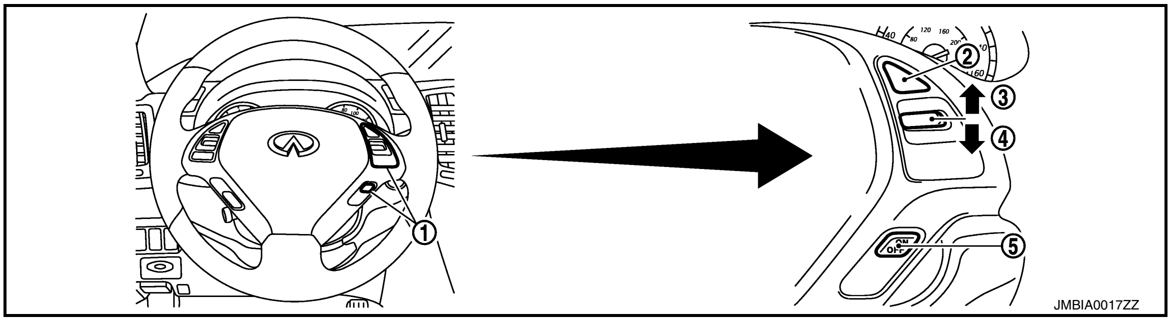
1. Accelerator pedal position sensor
2. ECM



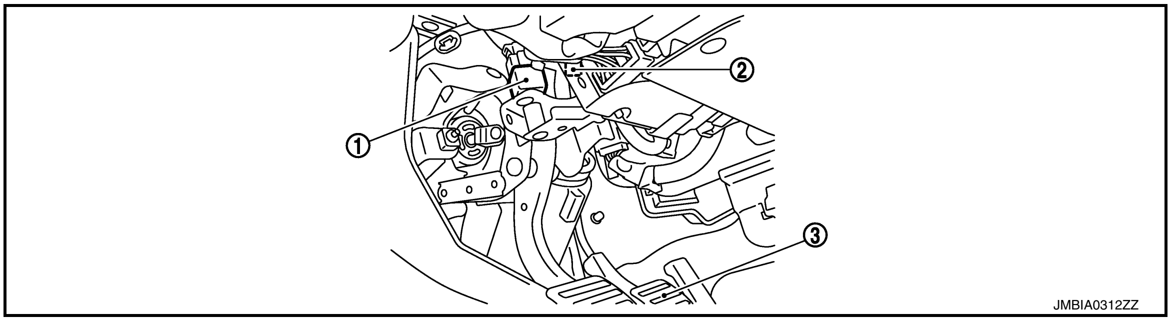
1. Snow mode switch



1. ICC steering switch
2. CANCEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. DISTANCE switch
6. MAIN switch
7. LDP/DCA switch



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



1. Stop lamp switch
2. ASCD brake switch (ASCD models)
   ICC brake switch (ICC models)
3. Brake pedal

Component Description

INFOID:0000000010596684

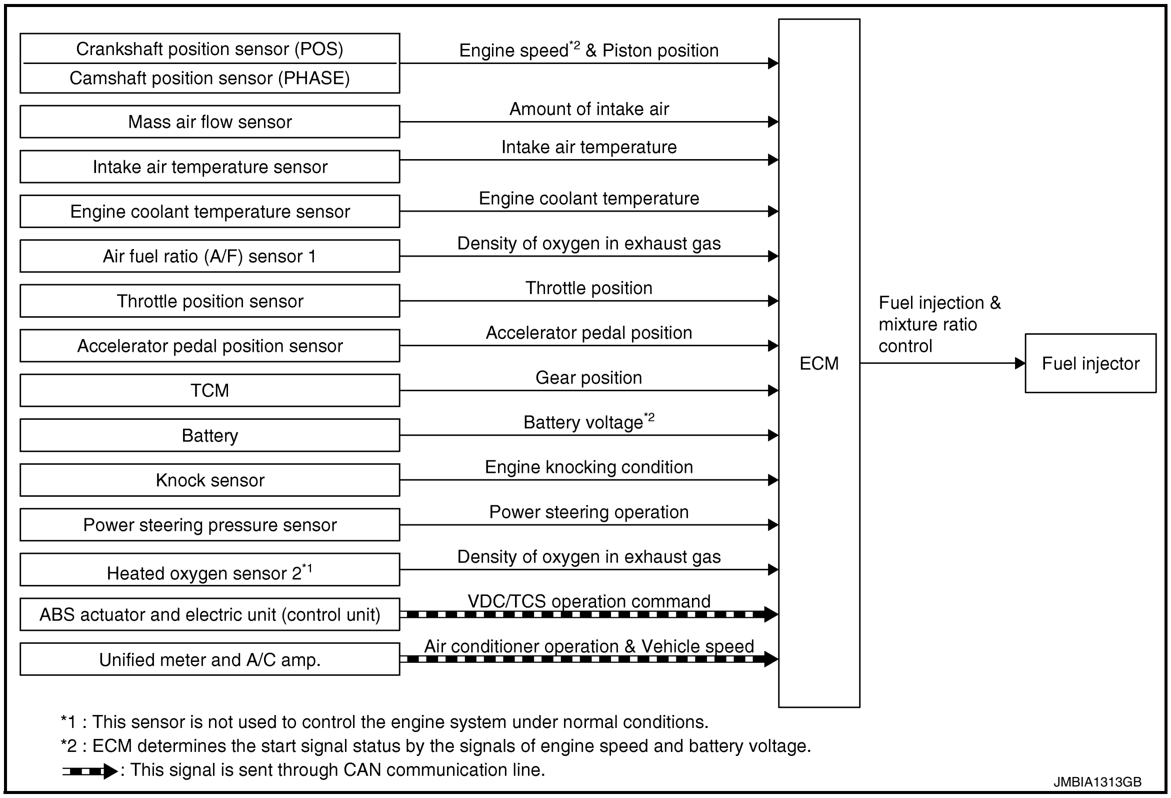
Component	Reference
A/F sensor 1	EC-224, "Description"
A/F sensor 1 heater	EC-179, "Description"
Accelerator pedal position sensor	EC-476, "Description"
ASCD brake switch	EC-445, "Description"
ASCD steering switch	EC-438, "Description"
Battery current sensor	BRC-99, "Description"
Brake booster pressure sensor	BRC-99, "Description"
Camshaft position sensor (PHASE)	EC-301, "Description"
Cooling fan control module	EC-500, "Description"
Cooling fan motor	EC-500, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Electric throttle control actuator	EC-418, "Description"
Engine coolant temperature sensor	EC-209, "Description"
Engine oil temperature sensor	EC-277, "Description"
EVAP canister purge volume control solenoid valve	EC-315, "Description"
EVAP canister vent control valve	EC-323, "Description"
EVAP control system pressure sensor	EC-331, "Description"
Fuel injector	EC-506, "Description"
Fuel level sensor	EC-352, "Description"
Fuel pump	EC-509, "Description"
Fuel tank temperature sensor	EC-270, "Description"
Heated oxygen sensor 2	EC-234, "Description"
Heated oxygen sensor 2 heater	EC-182, "Description"
ICC brake switch	EC-450, "Description"
ICC steering switch	EC-441, "Description"
Ignition signal	EC-516, "Description"
Intake air temperature sensor	EC-203, "Description"
Intake valve timing control solenoid valve	EC-185, "Description"

Component	Reference
Knock sensor	EC-294, "Description"
Mass air flow sensor	EC-188, "Description"
PCV valve	EC-527, "Description"
Power steering pressure sensor	EC-370, "Description"
Refrigerant pressure sensor	EC-529, "Description"
Stop lamp switch	EC-468, "Description"
Throttle control motor	EC-415, "Description"
Throttle control motor relay	EC-423, "Description"
Throttle position sensor	EC-212, "Description"
VVEL actuator motor	EC-393, "Description"
VVEL actuator motor relay	EC-397, "Description"
VVEL control module	EC-461, "Description"
VVEL control shaft position sensor	EC-389, "Description"

MULTIPORT FUEL INJECTION SYSTEM

System Diagram

INFOID:0000000010596685


Crankshaft position sensor (POS)
Camshaft position sensor (PHASE)
Engine speed*2 & Piston position
Mass air flow sensor
Amount of intake air
Intake air temperature sensor
Intake air temperature
Engine coolant temperature sensor
Engine coolant temperature
Air fuel ratio (A/F) sensor 1
Density of oxygen in exhaust gas
Throttle position sensor
Throttle position
Accelerator pedal position sensor
Accelerator pedal position
TCM
Gear position
Battery
Battery voltage*2
Knock sensor
Engine knocking condition
Power steering pressure sensor
Power steering operation
Heated oxygen sensor 2*1
Density of oxygen in exhaust gas
ABS actuator and electric unit (control unit)
VDC/TCS operation command
Unified meter and A/C amp.
Air conditioner operation & Vehicle speed
ECM
Fuel injection & mixture ratio control
Fuel injector
*1 : This sensor is not used to control the engine system under normal conditions.
*2 : ECM determines the start signal status by the signals of engine speed and battery voltage.
: This signal is sent through CAN communication line.
JMBIA1313GB

System Description

INFOID:0000000010596686

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		
Air fuel ratio (A/F) sensor 1	Density of oxygen in exhaust gas		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
TCM	Gear position		
Battery	Battery voltage*3		
Knock sensor	Engine knocking condition		
Power steering pressure sensor	Power steering operation		
Heated oxygen sensor 2*1	Density of oxygen in exhaust gas		
ABS actuator and electric unit (control unit)*2	VDC/TCS operation command		
Unified meter and A/C amp.	Air conditioner operation*2		
	Vehicle speed*2		

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

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

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

SYSTEM DESCRIPTION

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

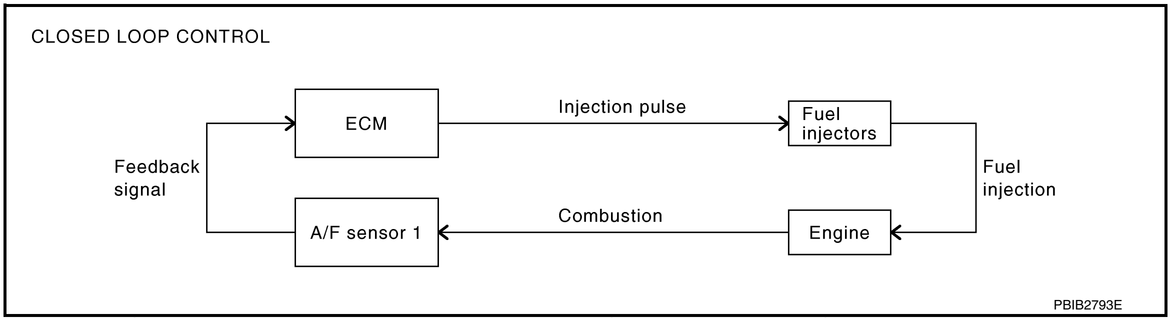
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

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

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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst 1 can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to EC-224, "Description". This maintains the mixture ratio within the range of stoichiometric (ideal air-fuel mixture).
This stage is referred to as the closed loop control condition.
Heated oxygen sensor 2 is located downstream of the three way catalyst 1. Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

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

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

MIXTURE RATIO SELF-LEARNING CONTROL

The mixture ratio feedback control system monitors the mixture ratio signal transmitted from A/F sensor 1. This feedback signal is then sent to the ECM. The ECM controls the basic mixture ratio as close to the theoretical mixture ratio as possible. However, the basic mixture ratio is not necessarily controlled as originally designed. Both manufacturing differences (i.e., mass air flow sensor hot wire) and characteristic changes during operation (i.e., fuel injector clogging) directly affect mixture ratio.

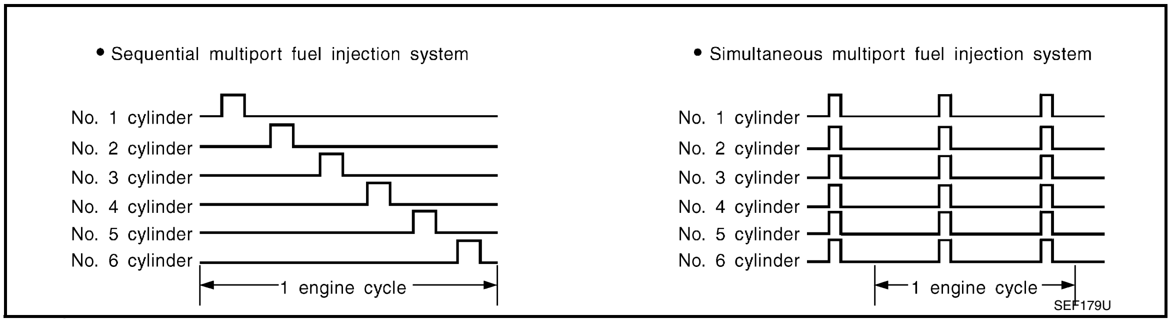
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.

“Fuel trim” refers to the feedback compensation value compared against the basic injection duration. Fuel trim includes short-term fuel trim and long-term fuel trim.

“Short-term fuel trim” is the short-term fuel compensation used to maintain the mixture ratio at its theoretical value. The signal from A/F sensor 1 indicates whether the mixture ratio is RICH or LEAN compared to the theoretical value. The signal then triggers a reduction in fuel volume if the mixture ratio is rich, and an increase in fuel volume if it is lean.

“Long-term fuel trim” is overall fuel compensation carried out over time to compensate for continual deviation of the short-term fuel trim from the central value. Continual deviation will occur due to individual engine differences, wear over time and changes in the usage environment.

FUEL INJECTION TIMING



Two types of systems are used.

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

FUEL SHUT-OFF

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

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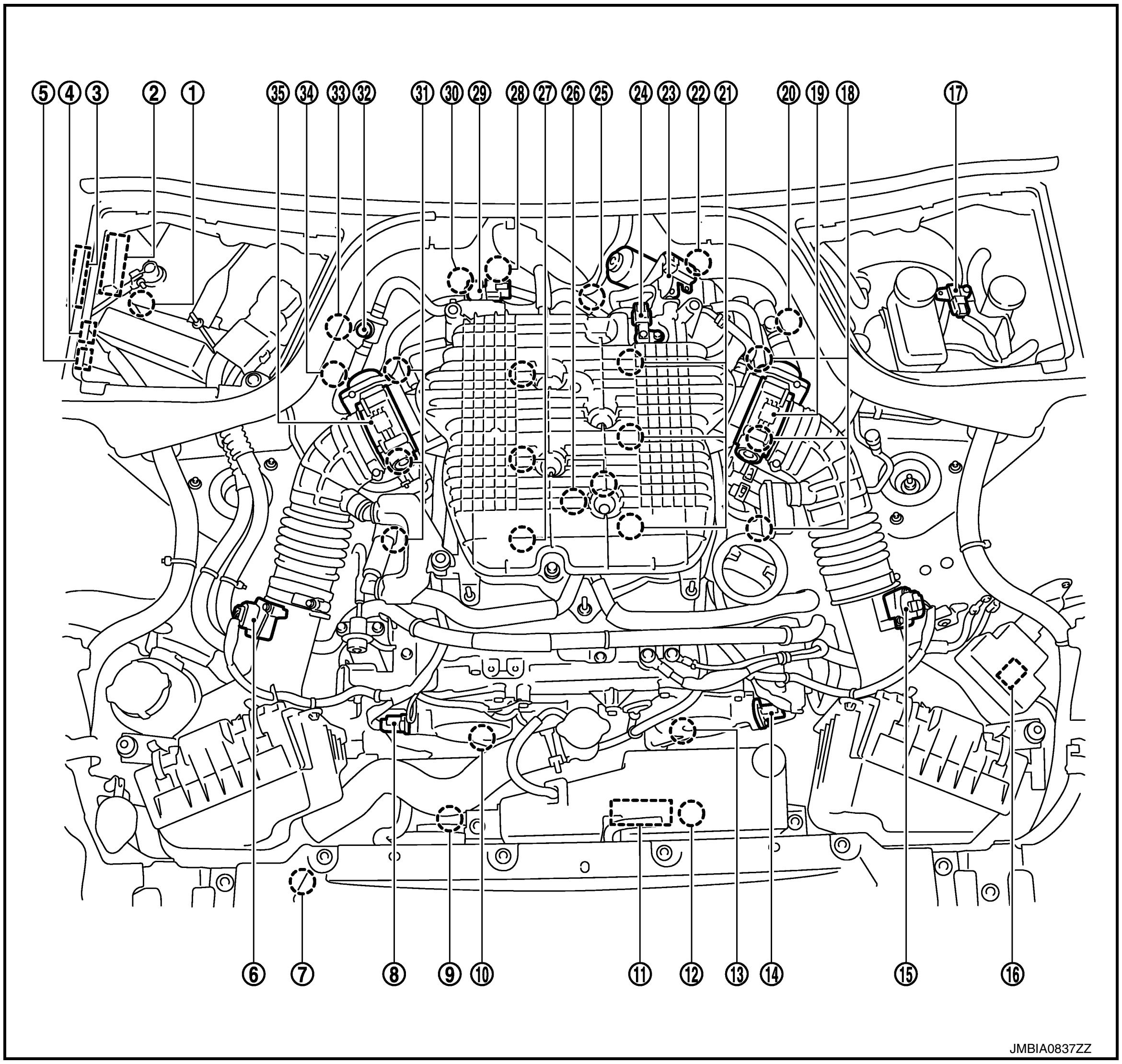
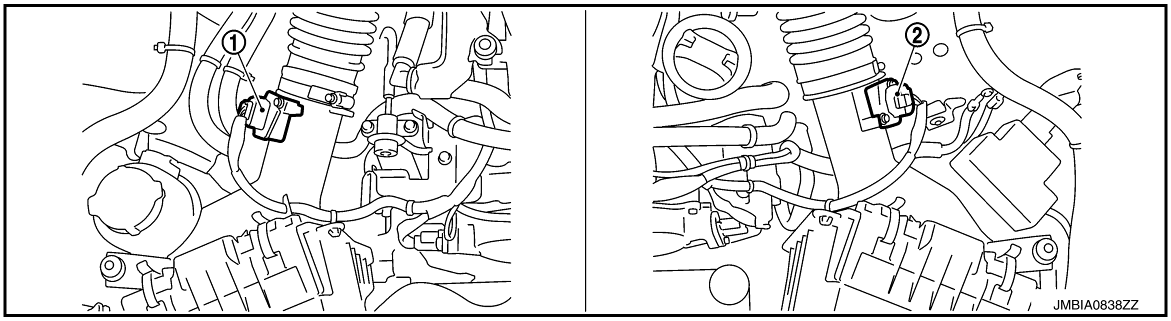
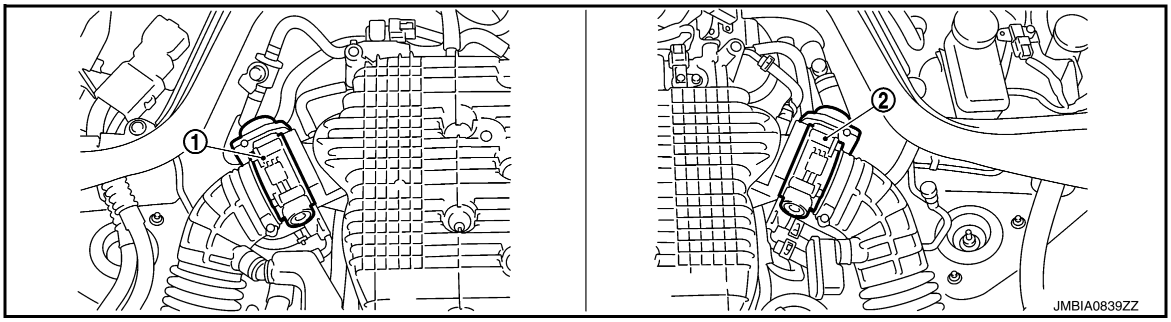


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)

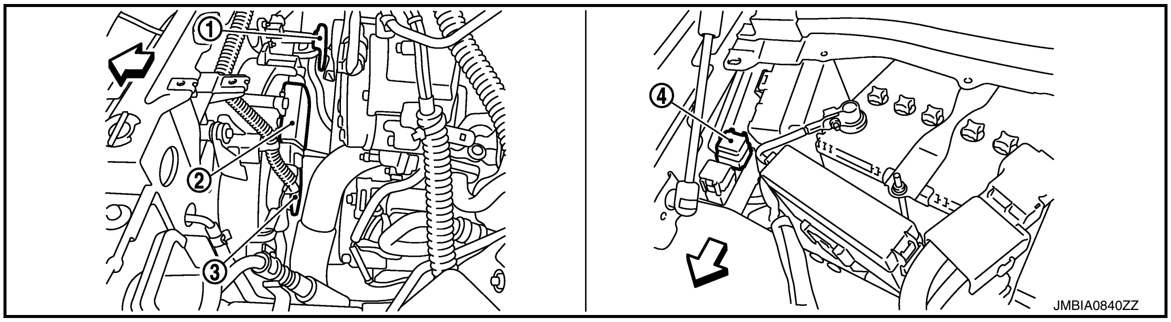
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

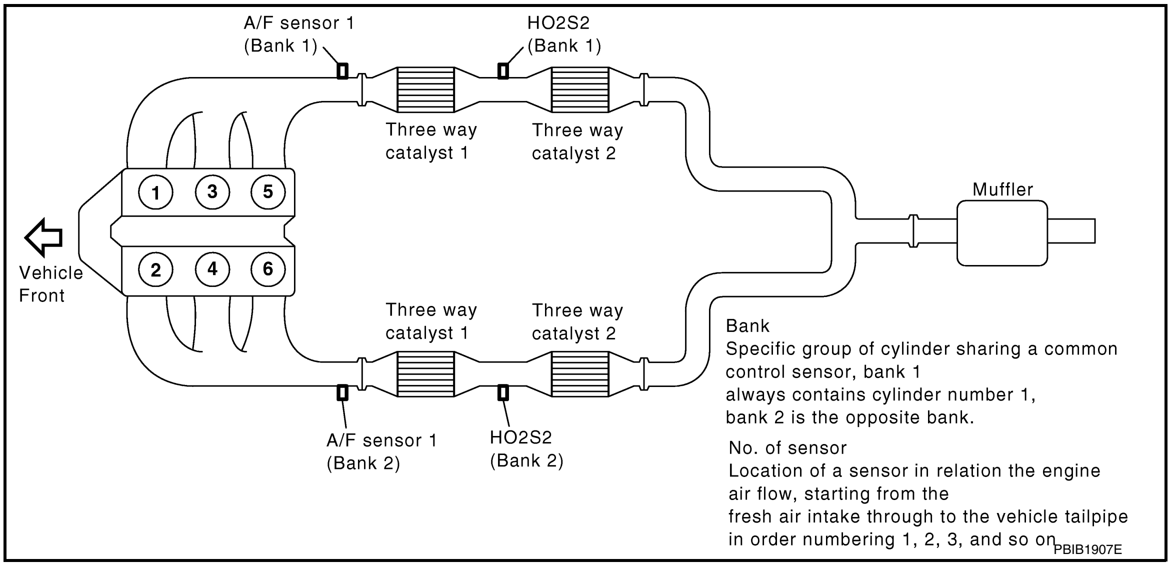


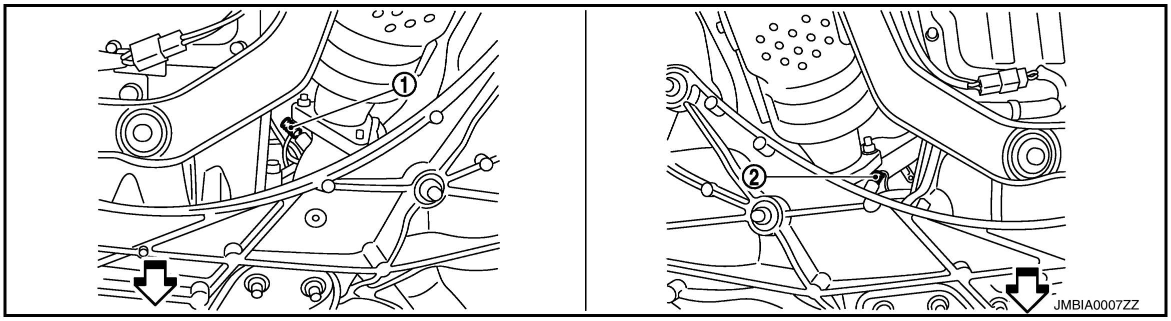
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

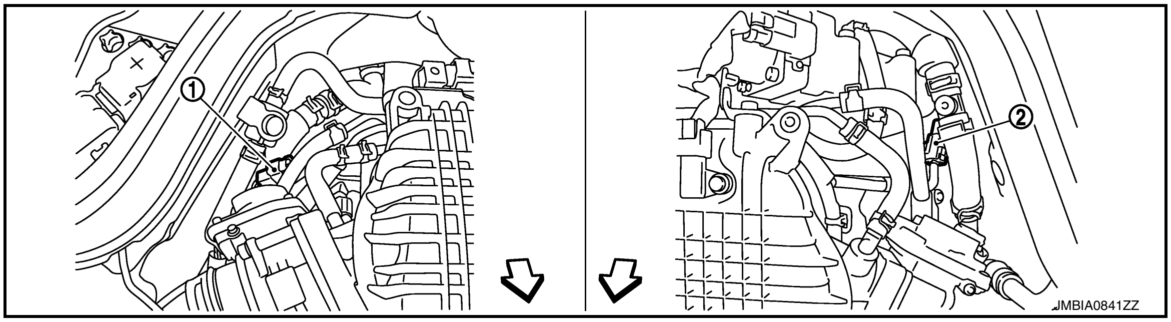
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1
(Bank 1)
HO2S2
(Bank 1)
Three way
catalyst 1
Three way
catalyst 2
Muffler
1
3
5
2
4
6
Vehicle
Front
Three way
catalyst 1
Three way
catalyst 2
Bank
Specific group of cylinder sharing a common
control sensor, bank 1
always contains cylinder number 1,
bank 2 is the opposite bank.
A/F sensor 1
(Bank 2)
HO2S2
(Bank 2)
No. of sensor
Location of a sensor in relation the engine
air flow, starting from the
fresh air intake through to the vehicle tailpipe
in order numbering 1, 2, 3, and so on
PBIB1907E



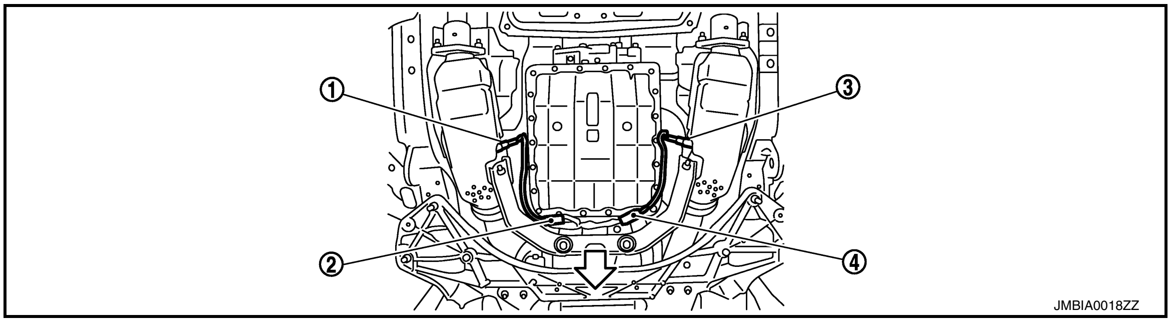
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



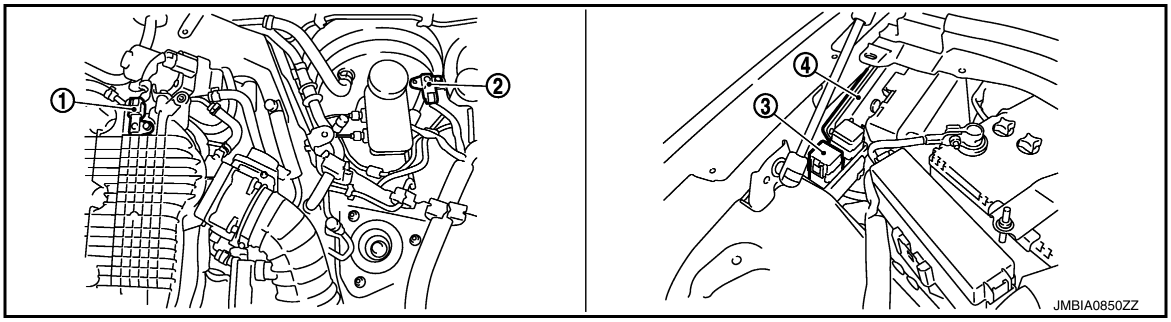
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

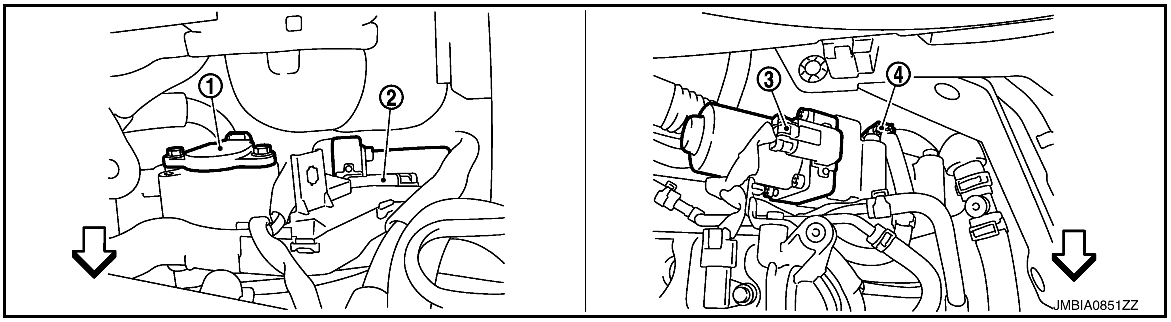


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

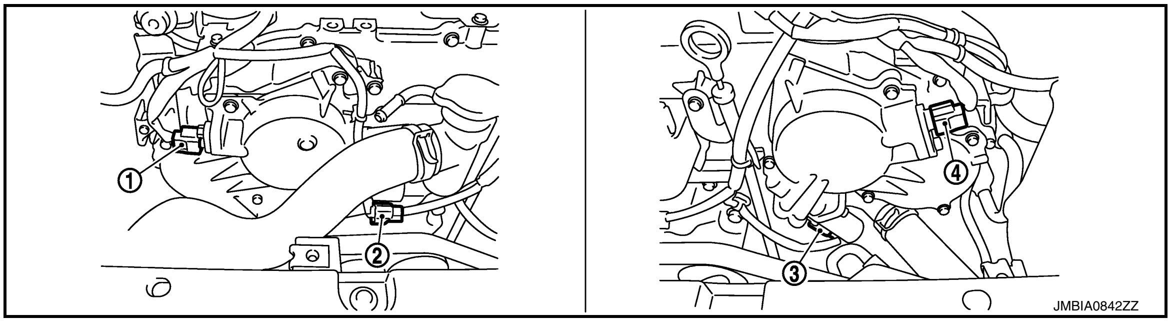


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

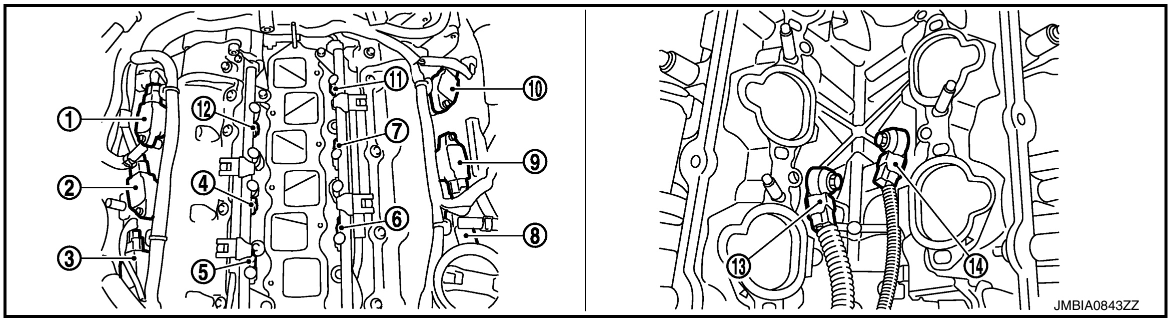


⇦ : Vehicle front

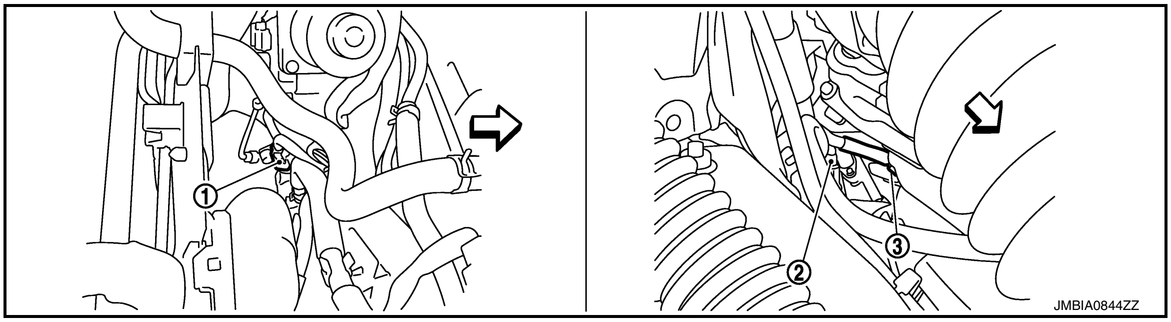
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

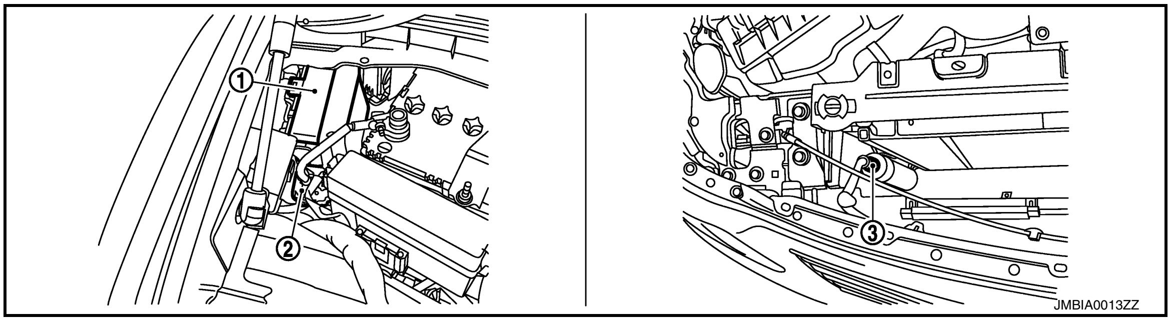


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

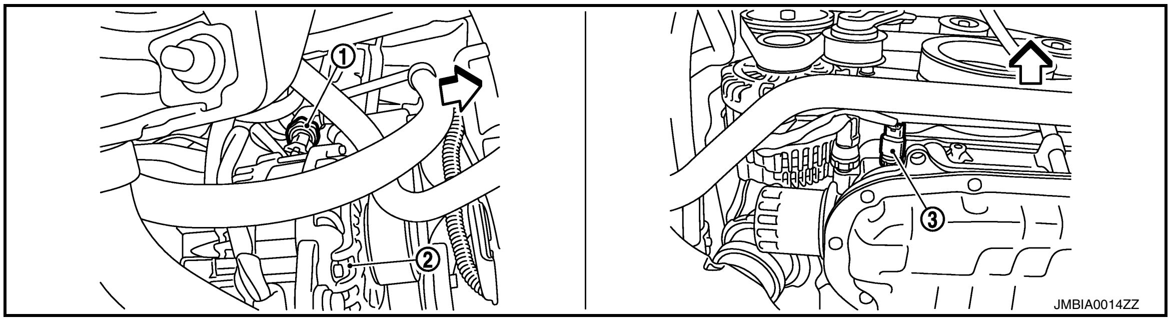


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

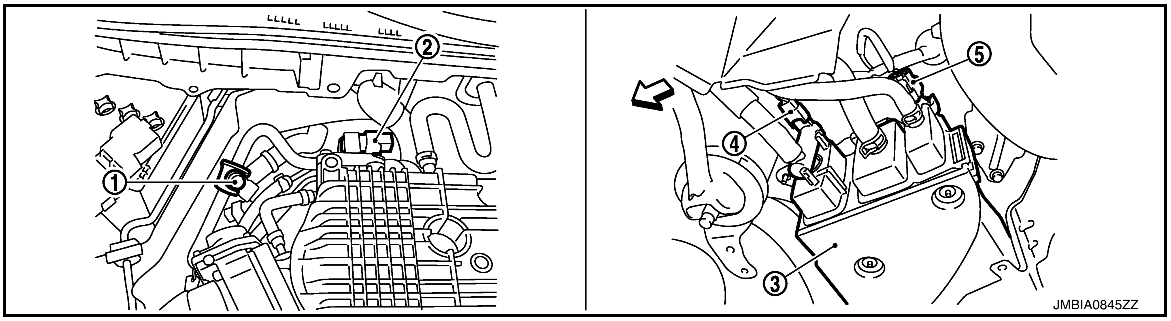


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



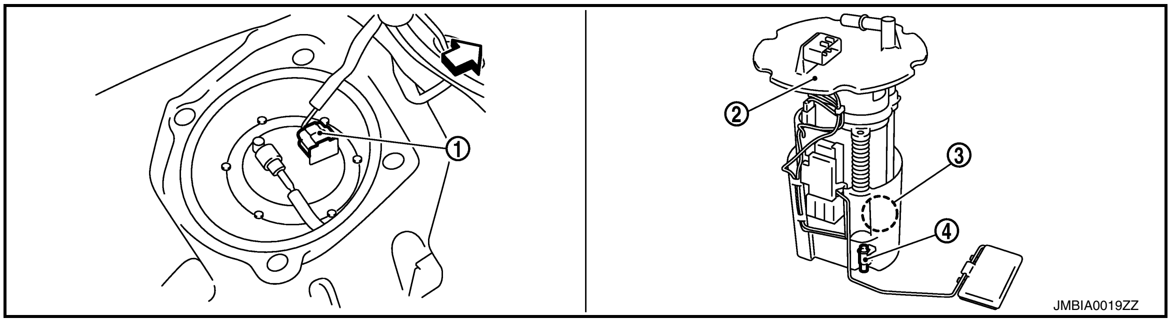
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



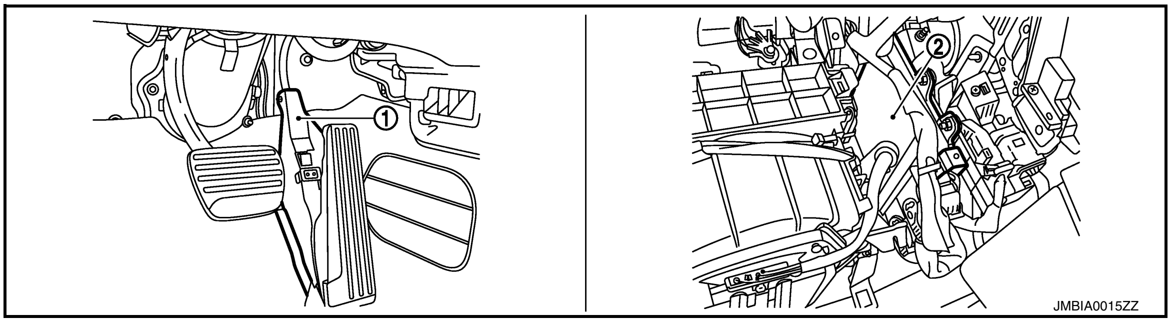
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

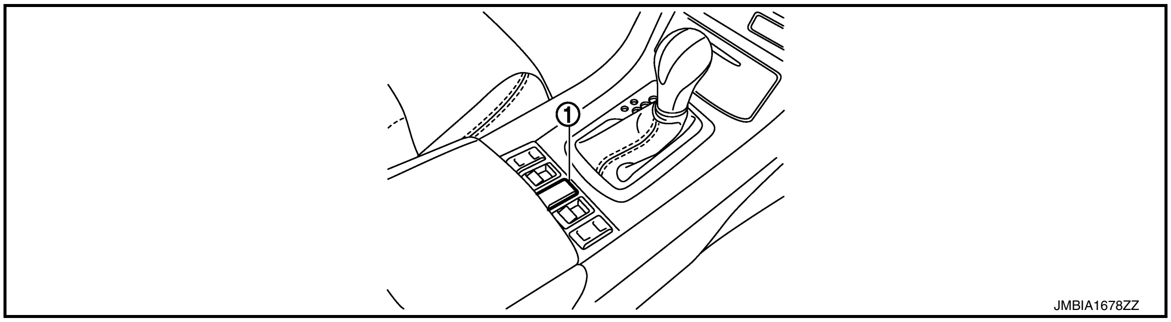


⇦ : Vehicle front

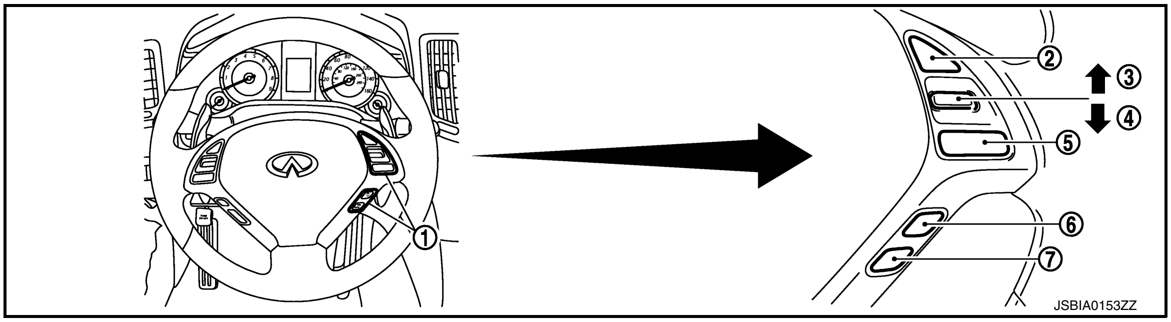
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



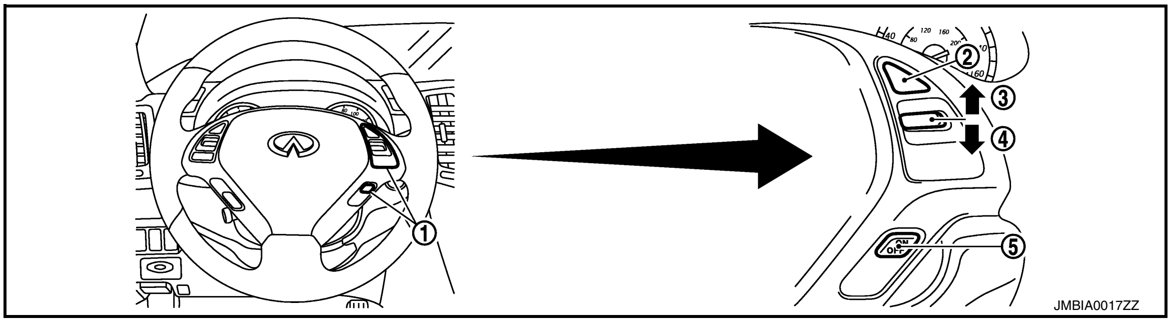
1. Accelerator pedal position sensor
2. ECM



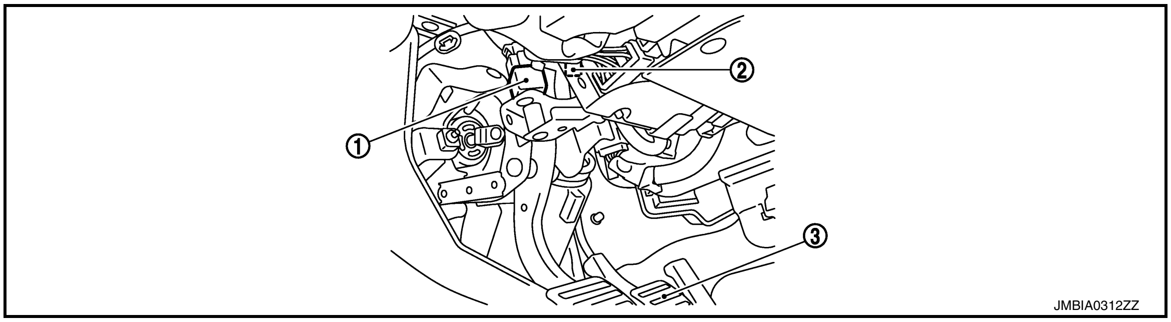
1. Snow mode switch



1. ICC steering switch	2. CANCEL switch	3. RESUME/ACCELERATE switch
4. SET/COAST switch	5. DISTANCE switch	6. MAIN switch
7. LDP/DCA switch		



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



1. Stop lamp switch	2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)	3. Brake pedal

Component Description

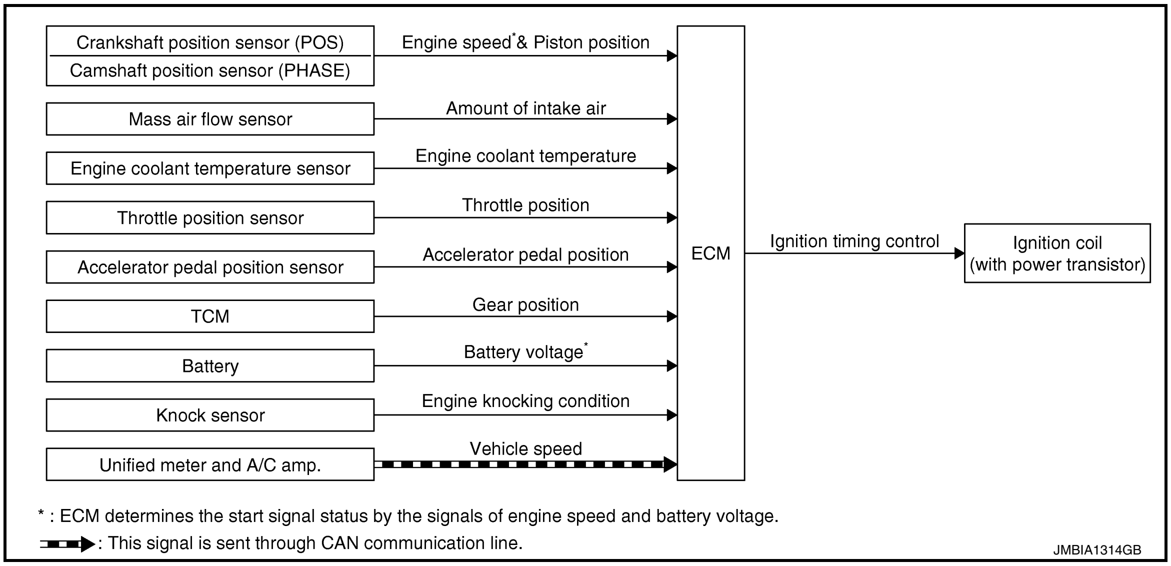
INFOID:0000000010596688

Component	Reference
A/F sensor 1	EC-224, "Description"
Accelerator pedal position sensor	EC-476, "Description"
Camshaft position sensor (PHASE)	EC-301, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Engine coolant temperature sensor	EC-209, "Description"
Fuel injector	EC-506, "Description"
Heated oxygen sensor 2	EC-234, "Description"
Intake air temperature sensor	EC-203, "Description"
Knock sensor	EC-294, "Description"
Mass air flow sensor	EC-188, "Description"
Power steering pressure sensor	EC-370, "Description"
Throttle position sensor	EC-212, "Description"

ELECTRIC IGNITION SYSTEM

System Diagram

INFOID:0000000010596689


Crankshaft position sensor (POS)
Camshaft position sensor (PHASE)
Engine speed* & Piston position
Mass air flow sensor
Amount of intake air
Engine coolant temperature sensor
Engine coolant temperature
Throttle position sensor
Throttle position
Accelerator pedal position sensor
Accelerator pedal position
TCM
Gear position
Battery
Battery voltage*
Knock sensor
Engine knocking condition
Unified meter and A/C amp.
Vehicle speed
ECM
Ignition timing control
Ignition coil
(with power transistor)
* : ECM determines the start signal status by the signals of engine speed and battery voltage.
: This signal is sent through CAN communication line.
JMBIA1314GB

System Description

INFOID:0000000010596690

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		
TCM	Gear position		
Battery	Battery voltage*2		
Knock sensor	Engine knocking		
Unified meter and A/C amp.	Vehicle speed*1		

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

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

SYSTEM DESCRIPTION

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

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

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

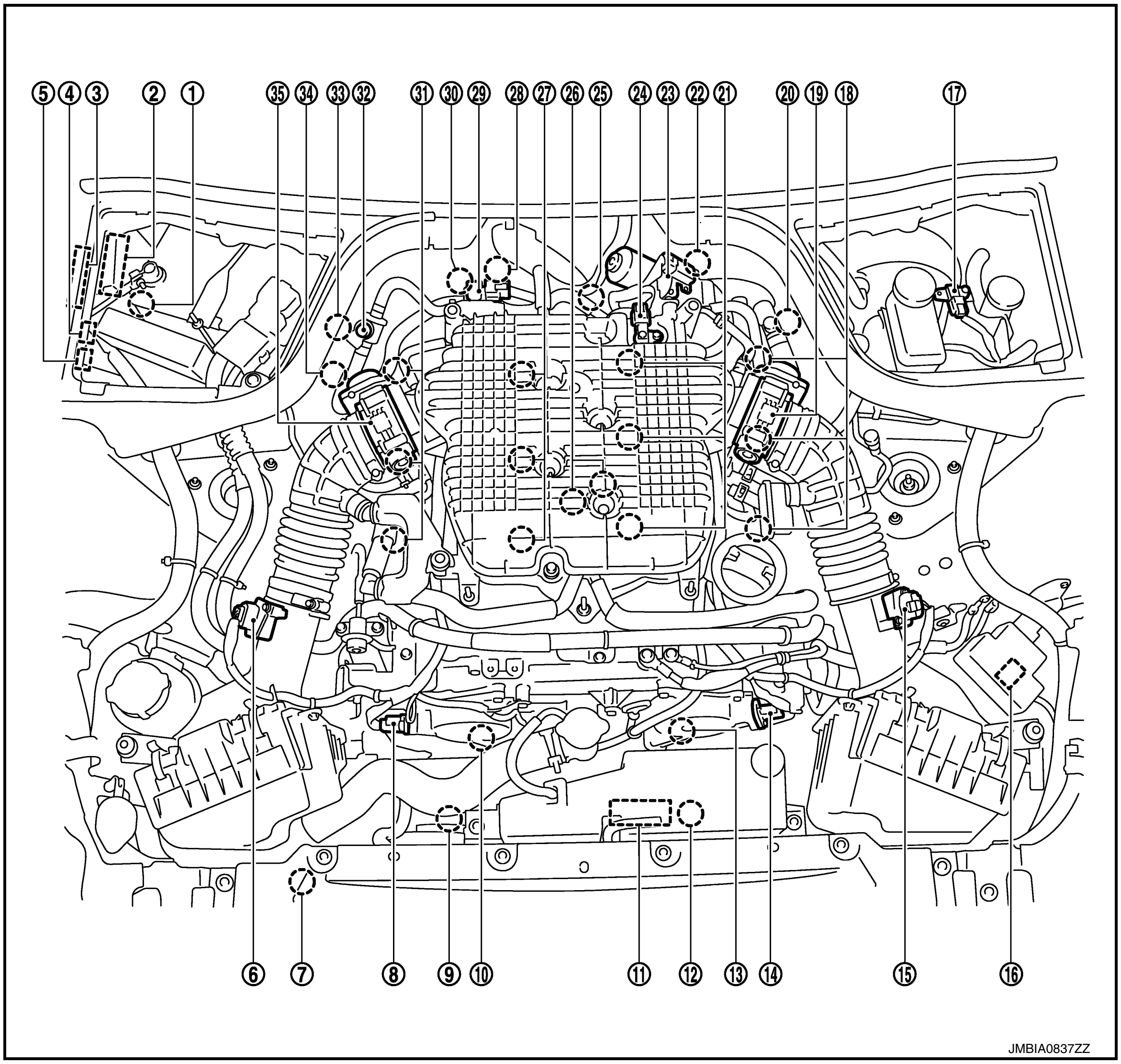
During the following conditions, the ignition timing is revised by the ECM according to the other data stored in the ECM.

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

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.

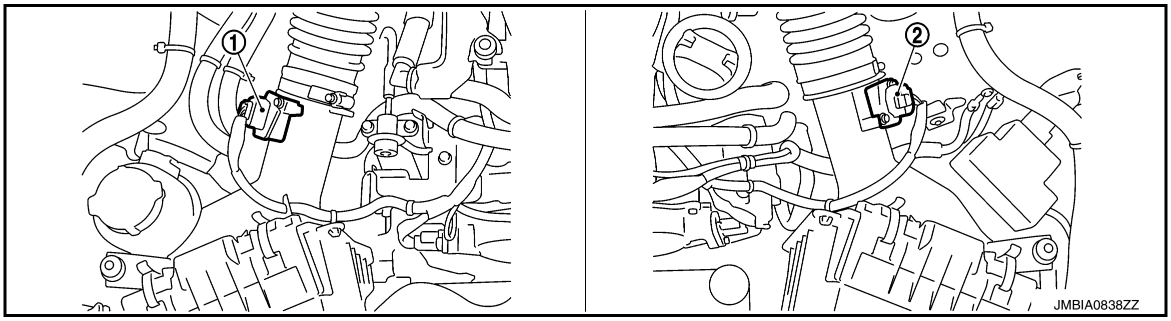
Component Parts Location

INFOID:0000000010596691

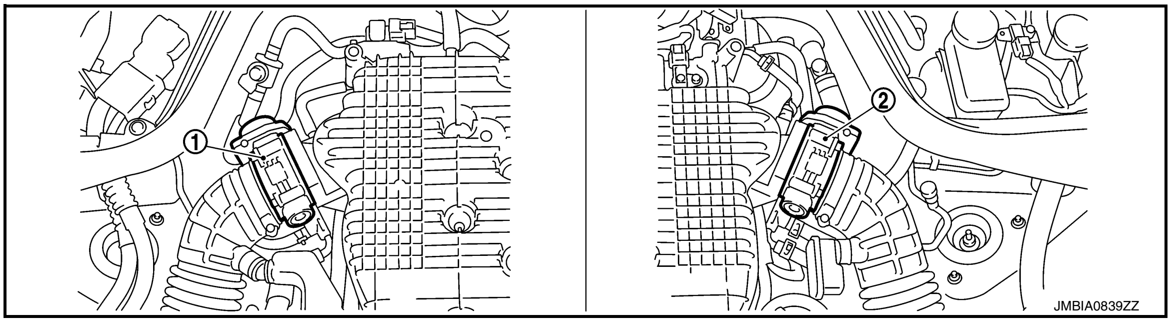


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)

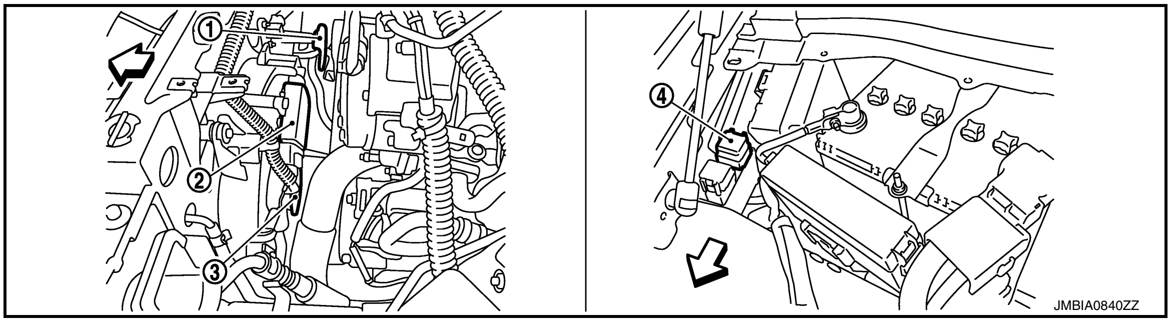
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

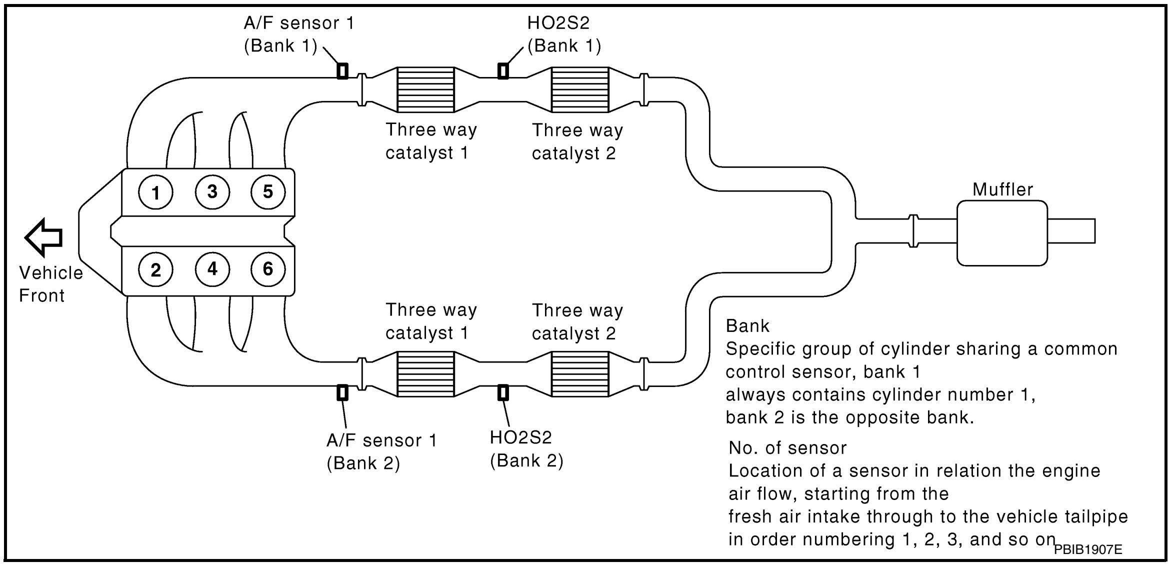


1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



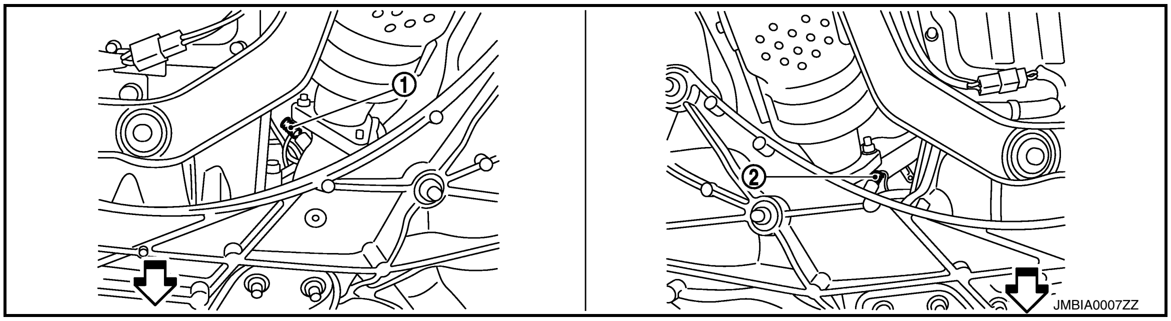
⇦ : Vehicle front

1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay



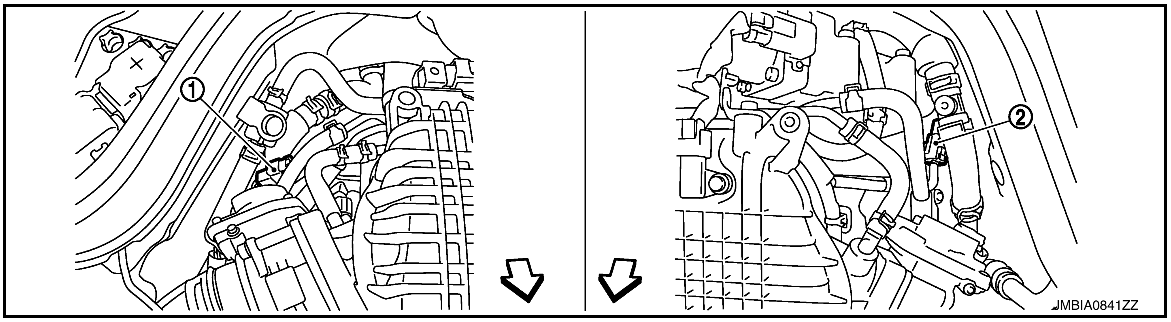
Bank
Specific group of cylinder sharing a common control sensor, bank 1 always contains cylinder number 1, bank 2 is the opposite bank.

No. of sensor
Location of a sensor in relation the engine air flow, starting from the fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on



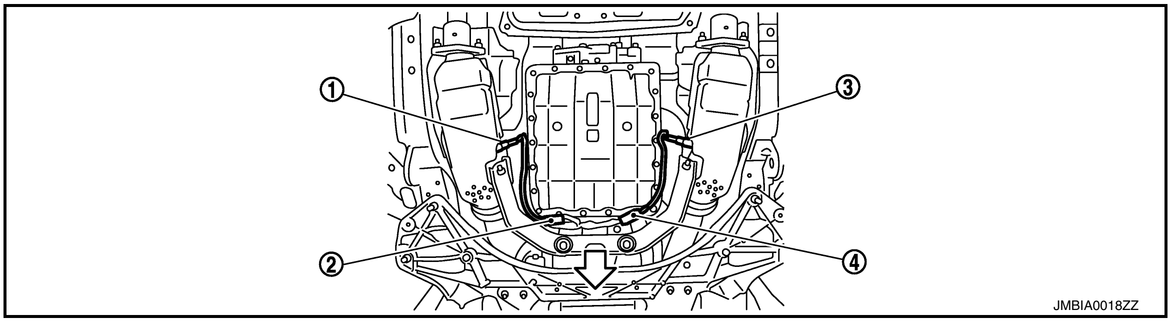
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



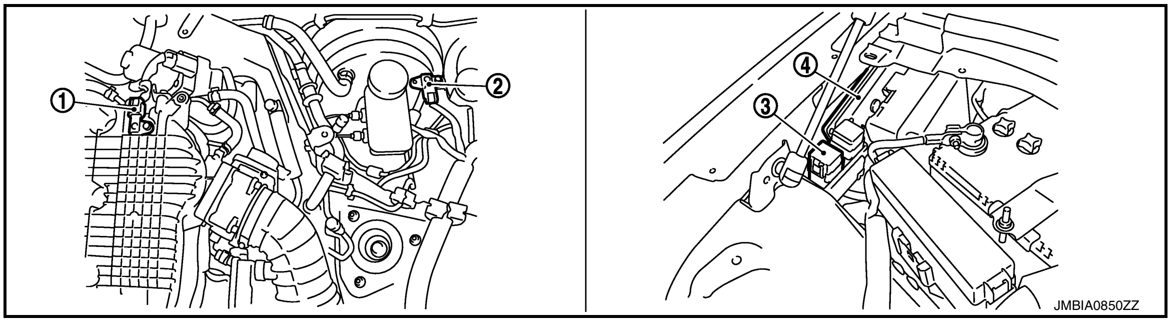
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

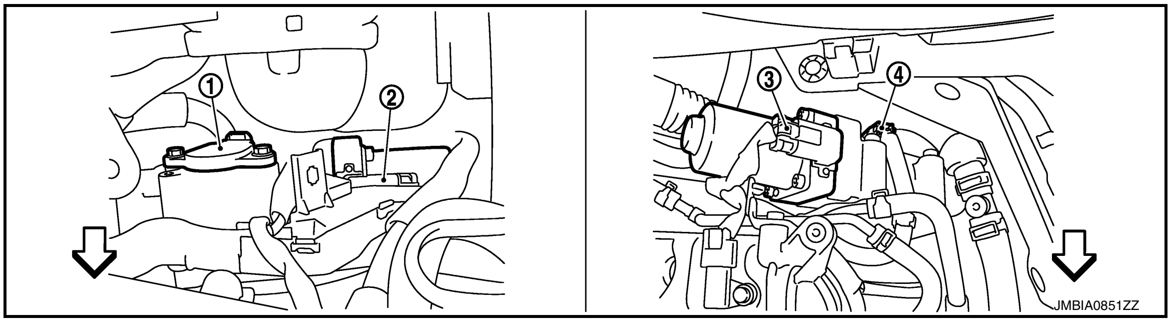


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

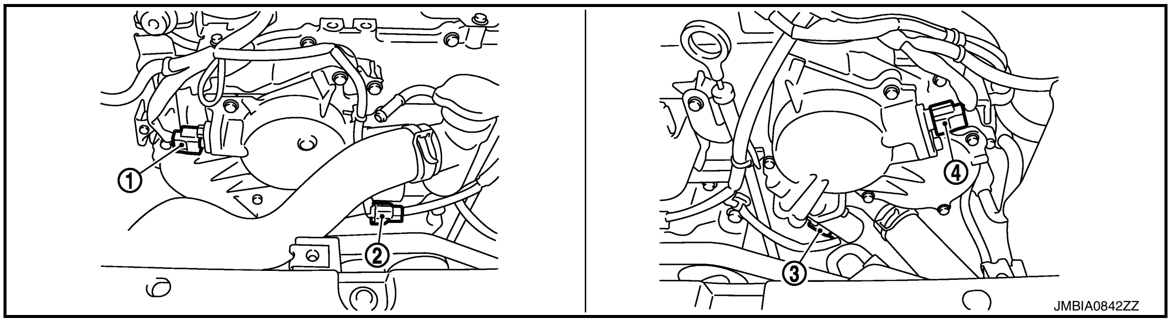


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

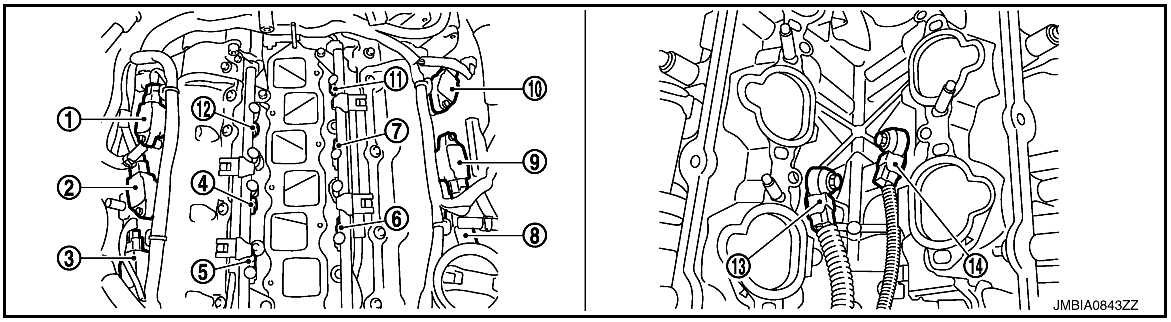


⇦ : Vehicle front

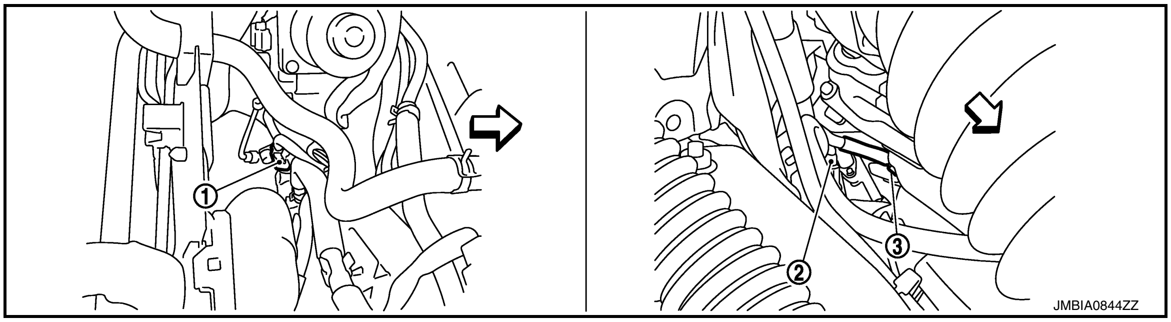
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

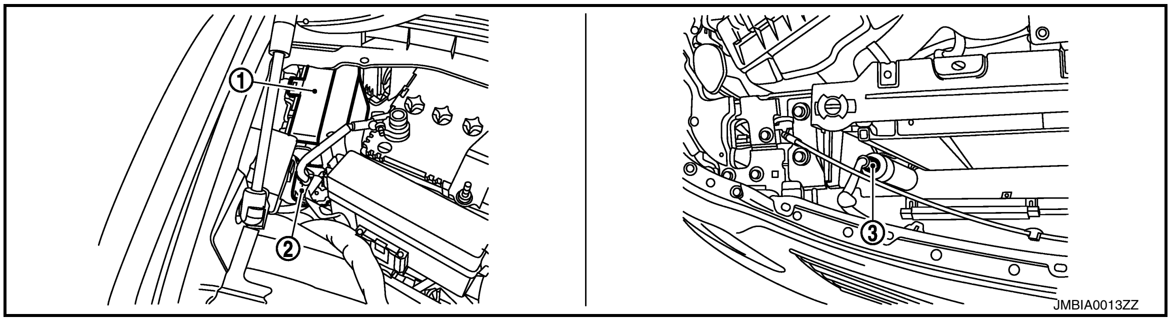


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

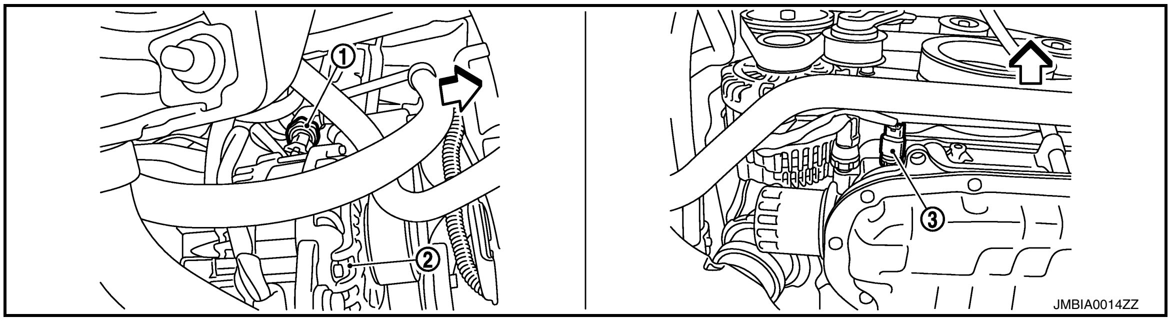


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

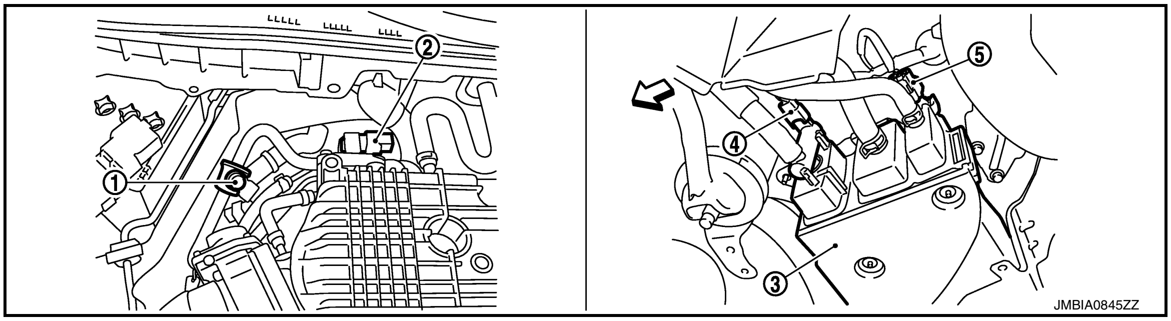


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



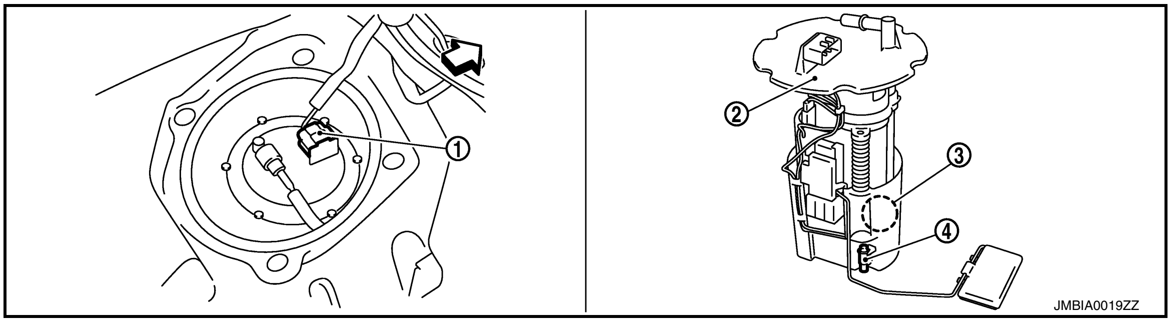
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



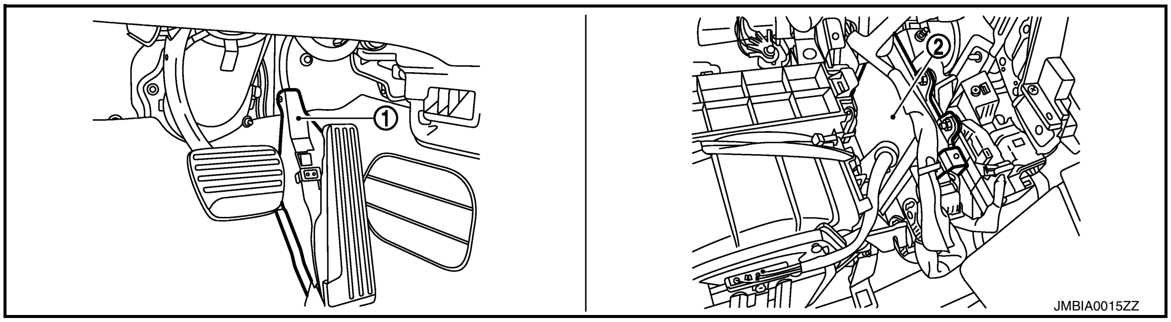
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

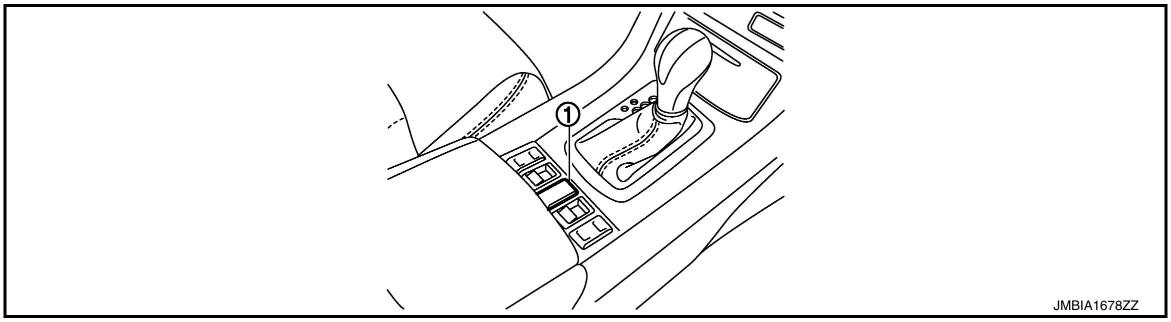


⇦ : Vehicle front

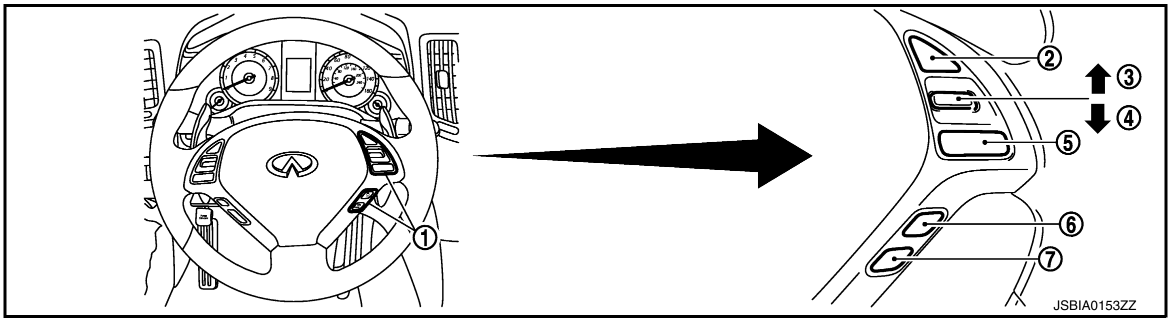
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



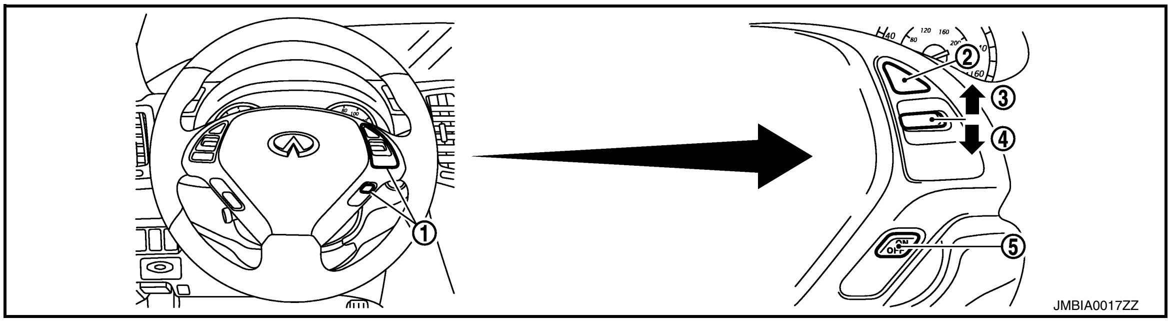
1. Accelerator pedal position sensor
2. ECM



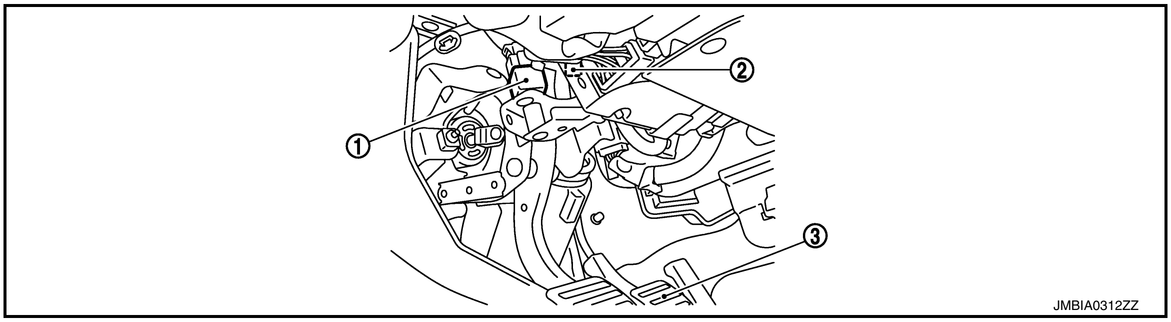
1. Snow mode switch



1. ICC steering switch	2. CANCEL switch	3. RESUME/ACCELERATE switch
4. SET/COAST switch	5. DISTANCE switch	6. MAIN switch
7. LDP/DCA switch		



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



1. Stop lamp switch	2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)	3. Brake pedal

Component Description

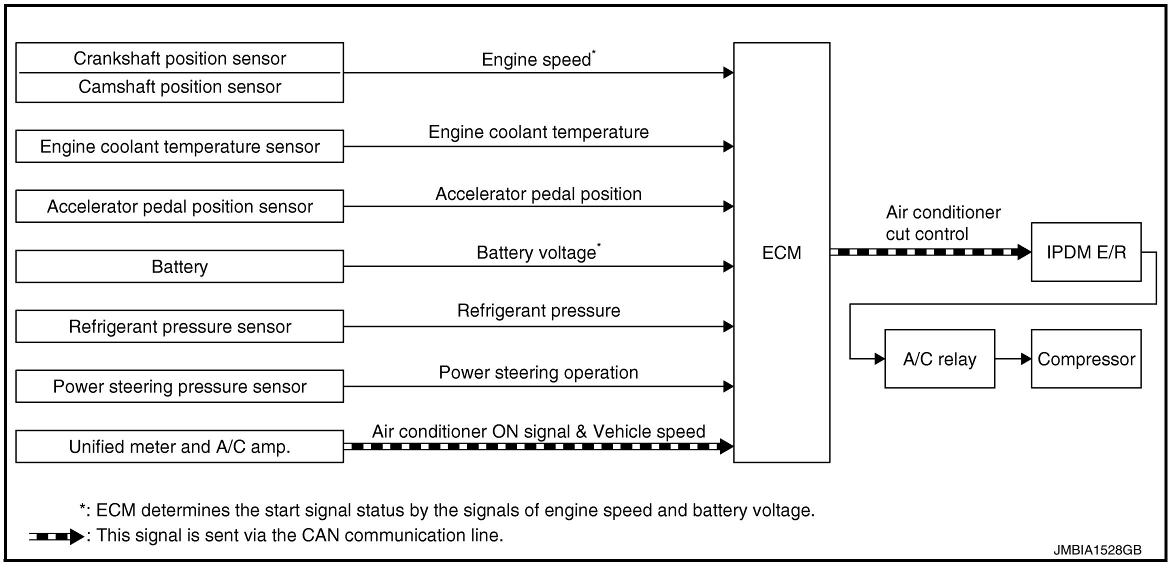
INFOID:0000000010596692

Component	Reference
Accelerator pedal position sensor	EC-476, "Description"
Camshaft position sensor (PHASE)	EC-301, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Engine coolant temperature sensor	EC-209, "Description"
Ignition signal	EC-516, "Description"
Knock sensor	EC-294, "Description"
Mass air flow sensor	EC-188, "Description"
Throttle position sensor	EC-212, "Description"

AIR CONDITIONING CUT CONTROL

System Diagram

INFOID:0000000010596693


Crankshaft position sensor
Camshaft position sensor
Engine speed*
Engine coolant temperature sensor
Engine coolant temperature
Accelerator pedal position sensor
Accelerator pedal position
Battery
Battery voltage*
Refrigerant pressure sensor
Refrigerant pressure
Power steering pressure sensor
Power steering operation
Unified meter and A/C amp.
Air conditioner ON signal & Vehicle speed
ECM
Air conditioner cut control
IPDM E/R
A/C relay
Compressor
*: ECM determines the start signal status by the signals of engine speed and battery voltage.
: This signal is sent via the CAN communication line.
JMBIA1528GB

System Description

INFOID:0000000010596694

INPUT/OUTPUT SIGNAL CHART

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

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

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

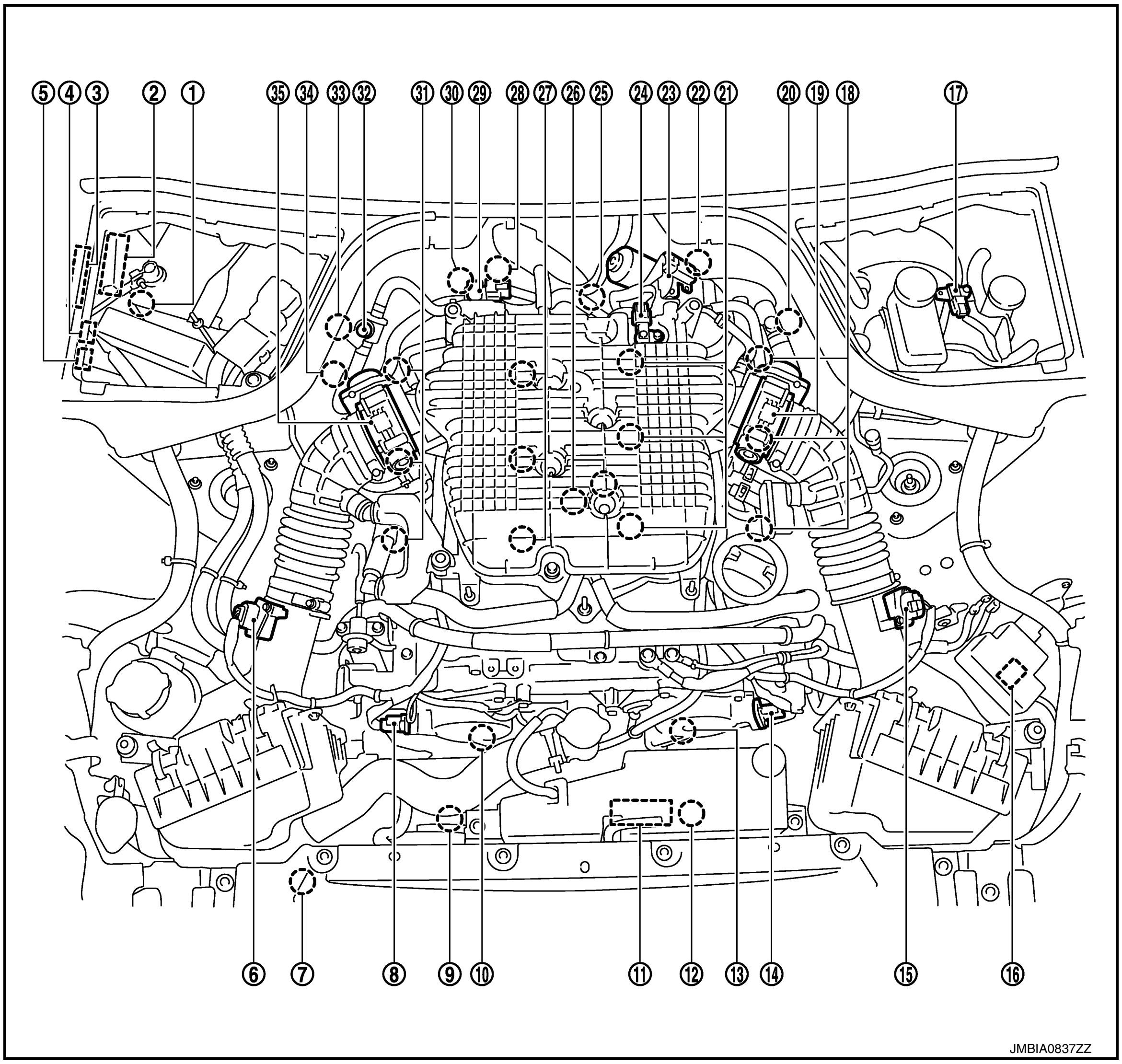
SYSTEM DESCRIPTION

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

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

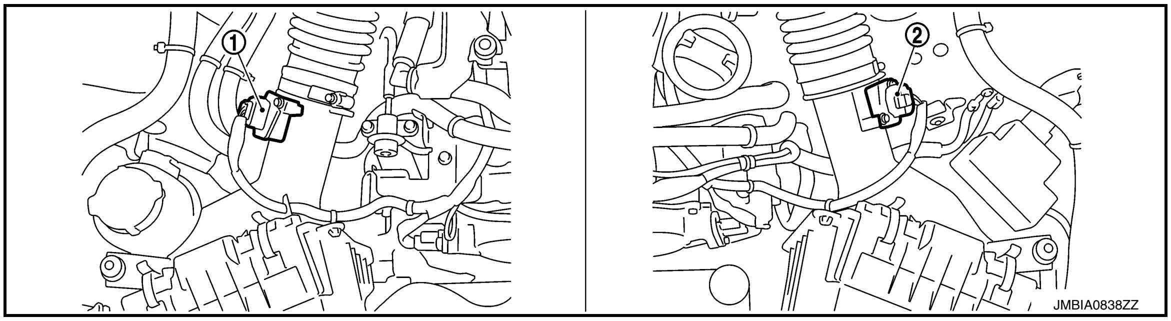
Component Parts Location

INFOID:0000000010596695

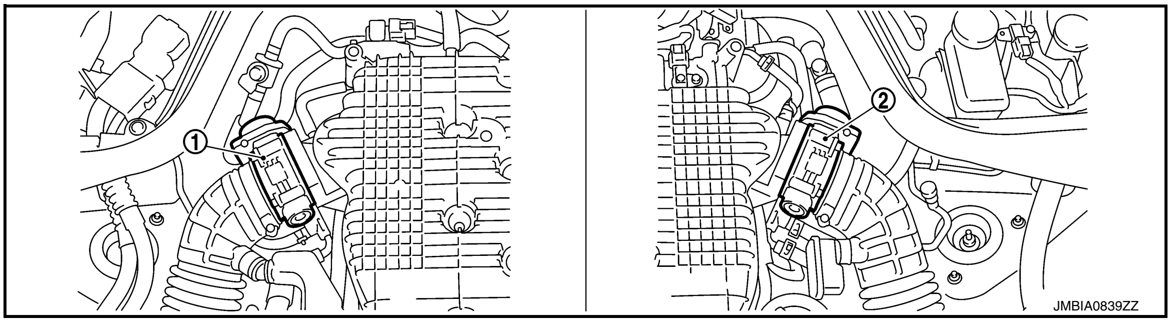


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)

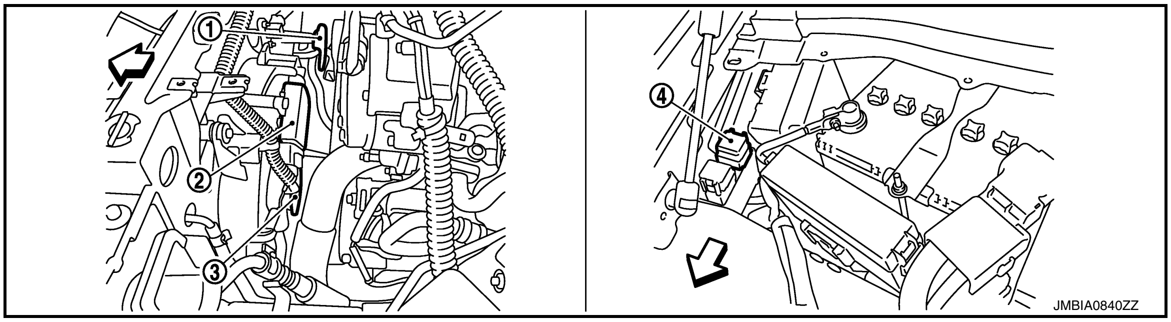
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

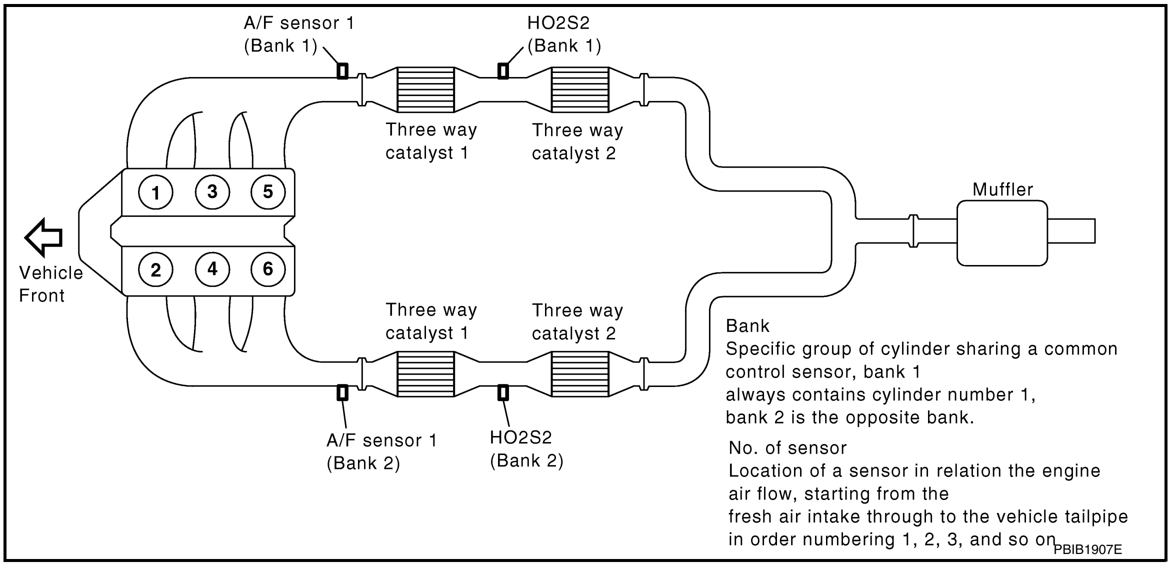


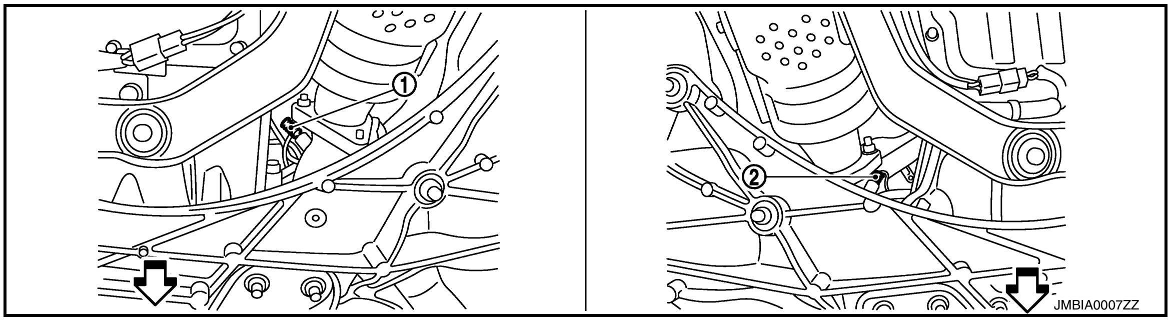
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

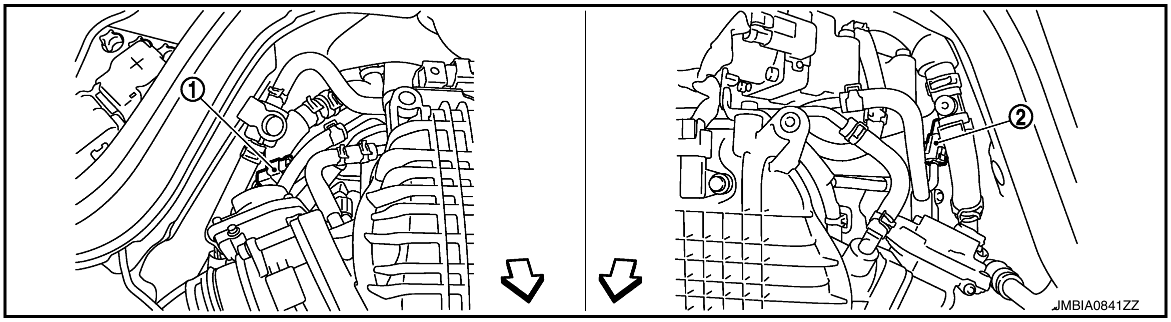
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1
(Bank 1)
HO2S2
(Bank 1)
Three way
catalyst 1
Three way
catalyst 2
Muffler
1
3
5
2
4
6
Vehicle
Front
Three way
catalyst 1
Three way
catalyst 2
Bank
Specific group of cylinder sharing a common
control sensor, bank 1
always contains cylinder number 1,
bank 2 is the opposite bank.
A/F sensor 1
(Bank 2)
HO2S2
(Bank 2)
No. of sensor
Location of a sensor in relation the engine
air flow, starting from the
fresh air intake through to the vehicle tailpipe
in order numbering 1, 2, 3, and so on
PBIB1907E



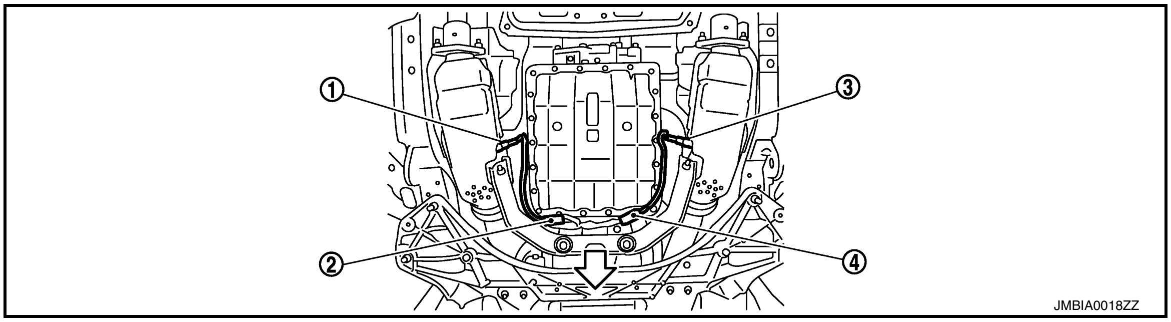
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



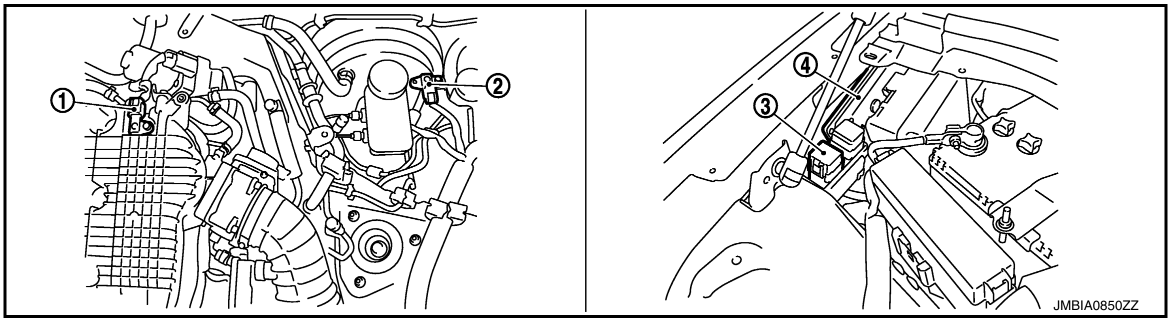
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

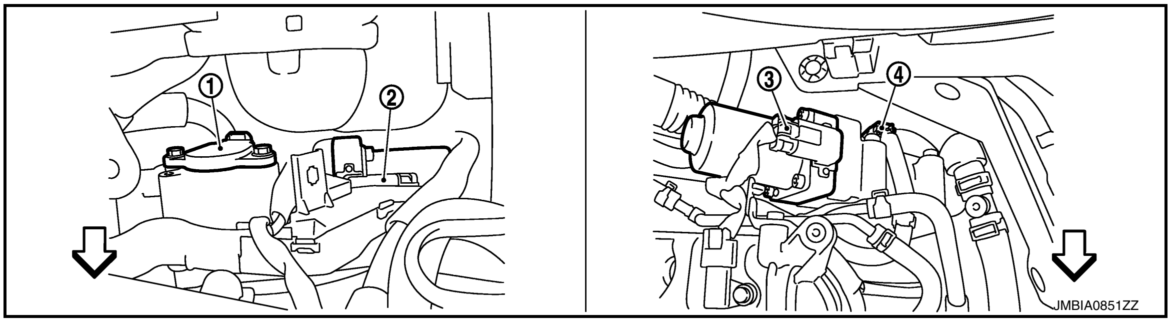


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

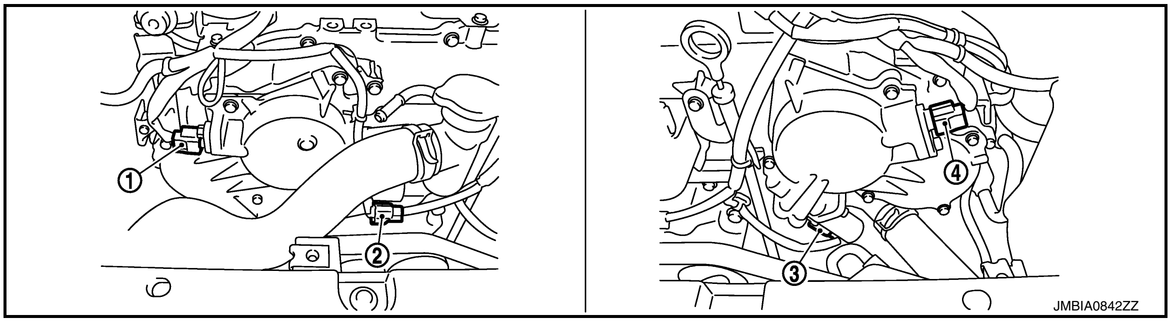


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

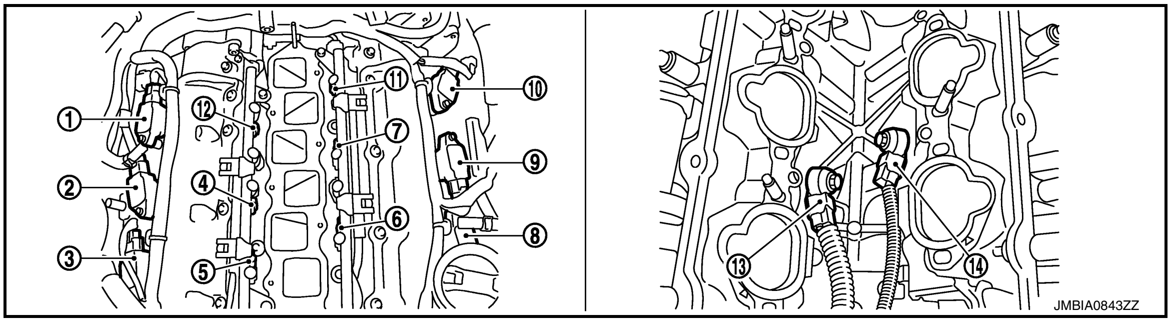


⇦ : Vehicle front

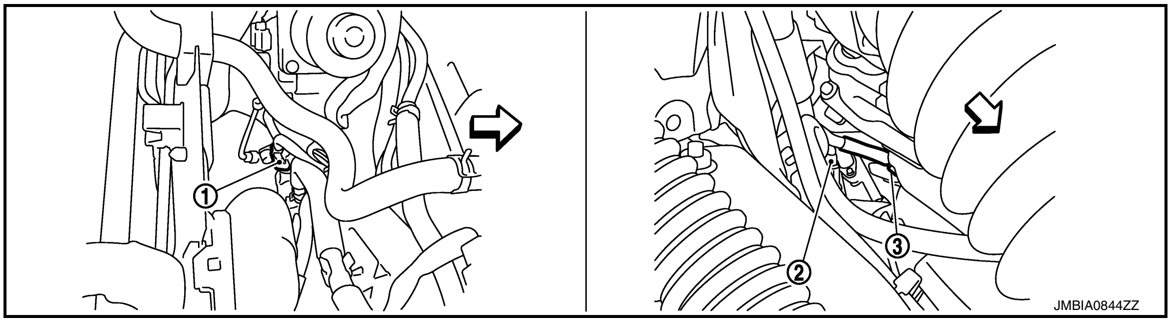
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

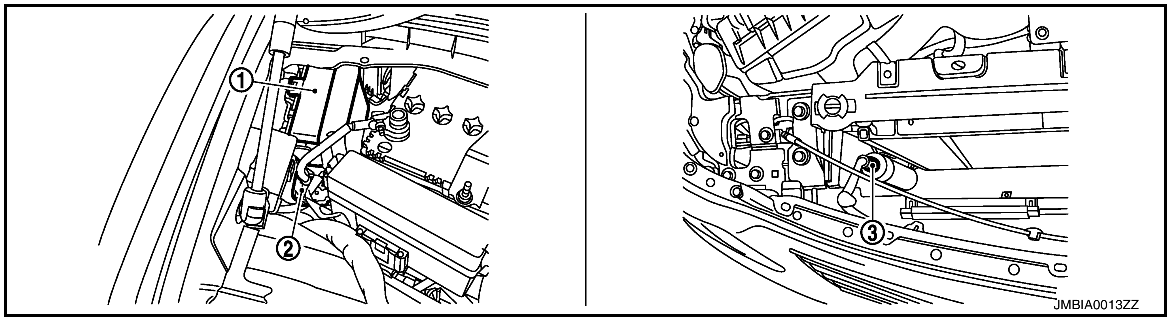


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

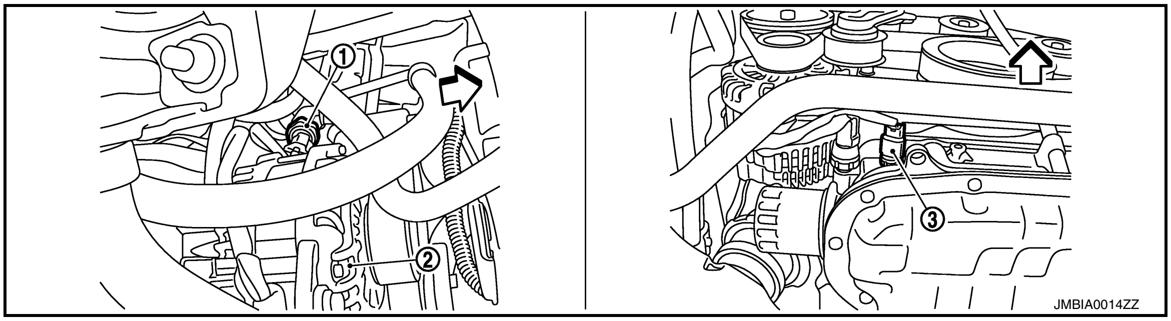


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

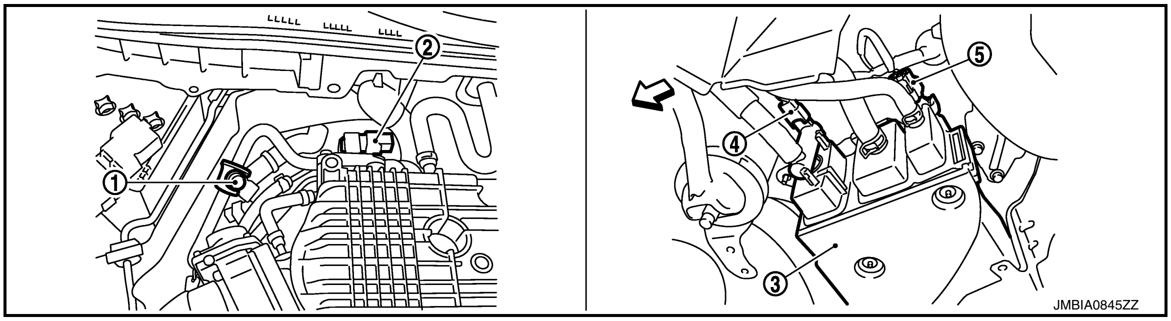


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



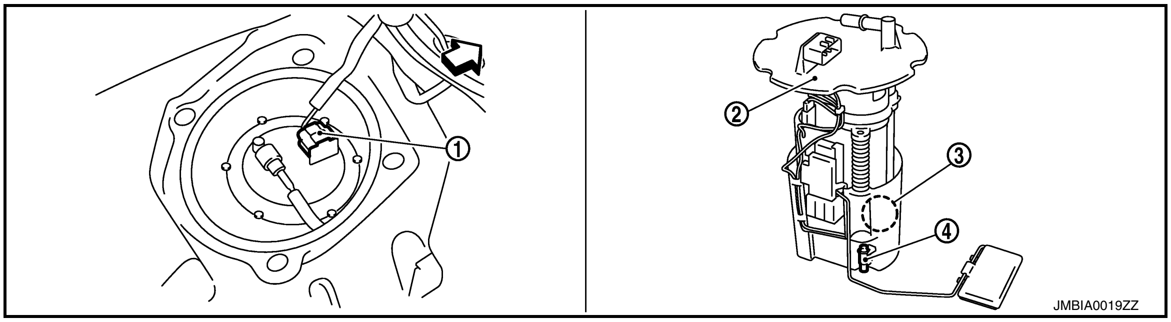
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



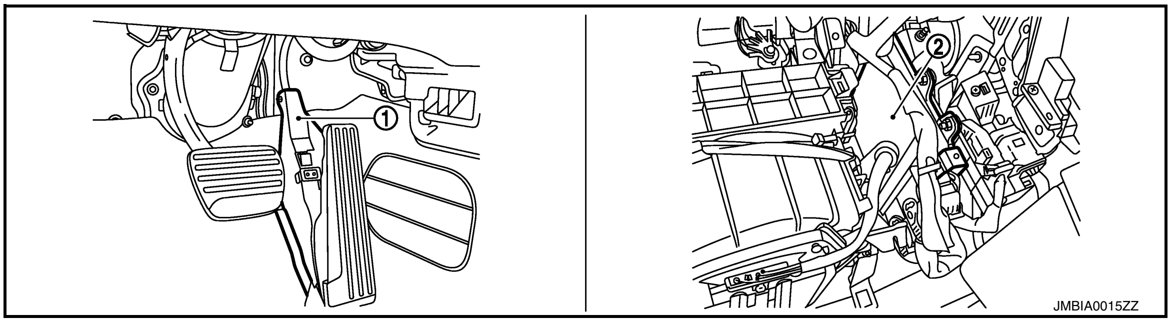
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

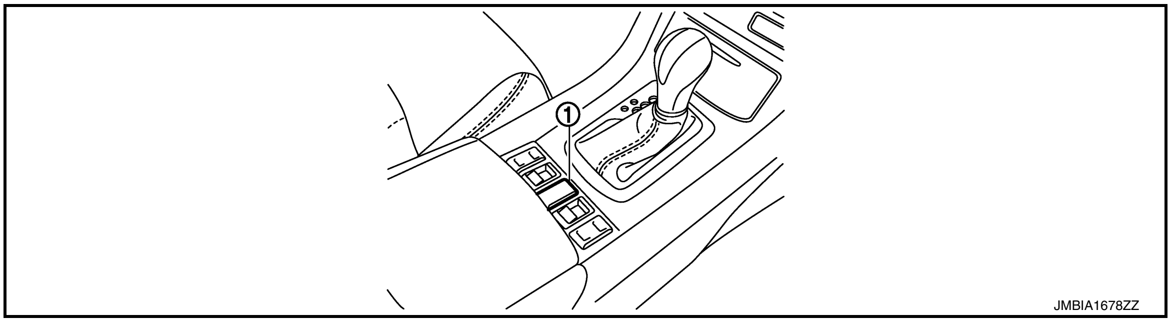


⇦ : Vehicle front

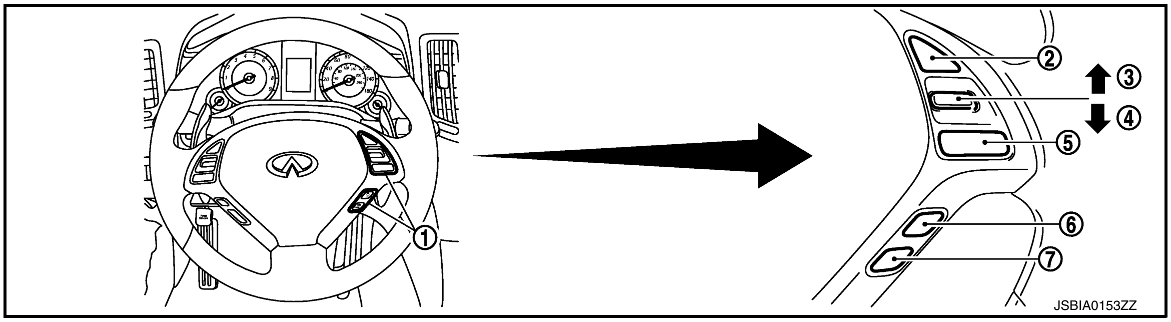
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



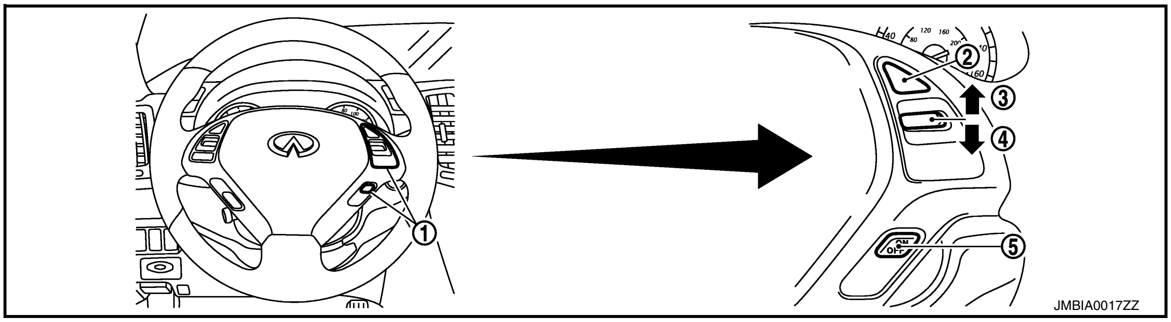
1. Accelerator pedal position sensor
2. ECM



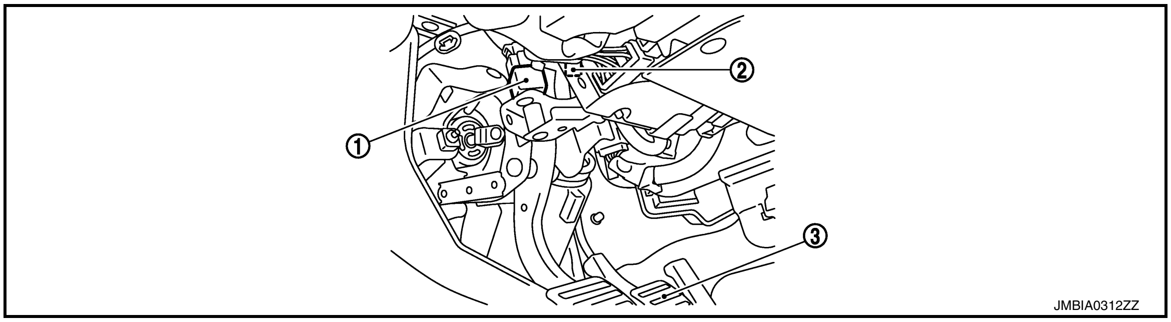
1. Snow mode switch



1. ICC steering switch
2. CANCEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. DISTANCE switch
6. MAIN switch
7. LDP/DCA switch



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



1. Stop lamp switch
2. ASCD brake switch (ASCD models)
   ICC brake switch (ICC models)
3. Brake pedal

Component Description

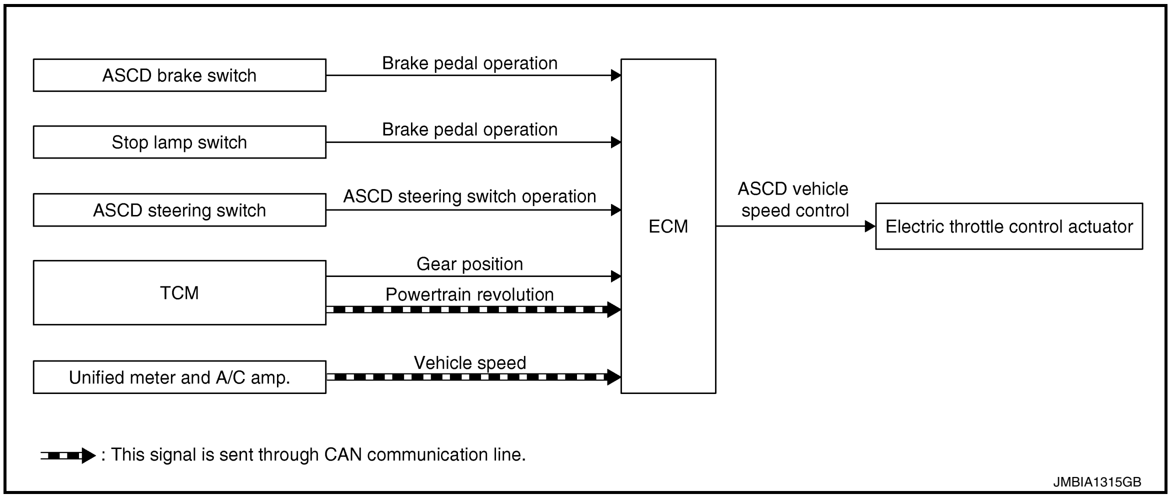
INFOID:0000000010596696

Component	Reference
Accelerator pedal position sensor	EC-476, "Description"
Camshaft position sensor (PHASE)	EC-301, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Engine coolant temperature sensor	EC-209, "Description"
Power steering pressure sensor	EC-370, "Description"
Refrigerant pressure sensor	EC-529, "Description"

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram

INFOID:0000000010596697


ASCD brake switch
Brake pedal operation
Stop lamp switch
Brake pedal operation
ASCD steering switch
ASCD steering switch operation
TCM
Gear position
Powertrain revolution
Unified meter and A/C amp.
Vehicle speed
ECM
ASCD vehicle speed control
Electric throttle control actuator
: This signal is sent through CAN communication line.
JMBIA1315GB

System Description

INFOID:0000000010596698

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	Brake pedal operation		
ASCD steering switch	ASCD steering switch operation		
Unified meter and A/C amp.	Vehicle speed*		
TCM	Gear position		
	Powertrain revolution*		

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

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH).

ECM controls throttle angle of electric throttle control actuator to regulate engine speed.

Operation status of ASCD is indicated by CRUISE indicator and SET indicator in combination meter. If any malfunction occurs in the ASCD system, it automatically deactivates control.

NOTE:

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

SET OPERATION

Press MAIN switch. (The CRUISE indicator in combination meter illuminates.)

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 144 km/h (89 MPH), press SET/COAST switch. (Then SET lamp in combination meter illuminates.)

ACCELERATE OPERATION

If the RESUME/ACCELERATE switch is pressed during cruise control driving, increase the vehicle speed until the switch is released or vehicle speed reaches maximum speed controlled by the system.

And then ASCD will maintain the new set speed.

CANCEL OPERATION

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

- CANCEL switch is pressed
- More than 2 switches at ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed

- Selector lever is in the N, P, R position
- Vehicle speed decreased to 13 km/h (8 MPH) lower than the set speed
- TCS system is operated

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

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

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

COAST OPERATION

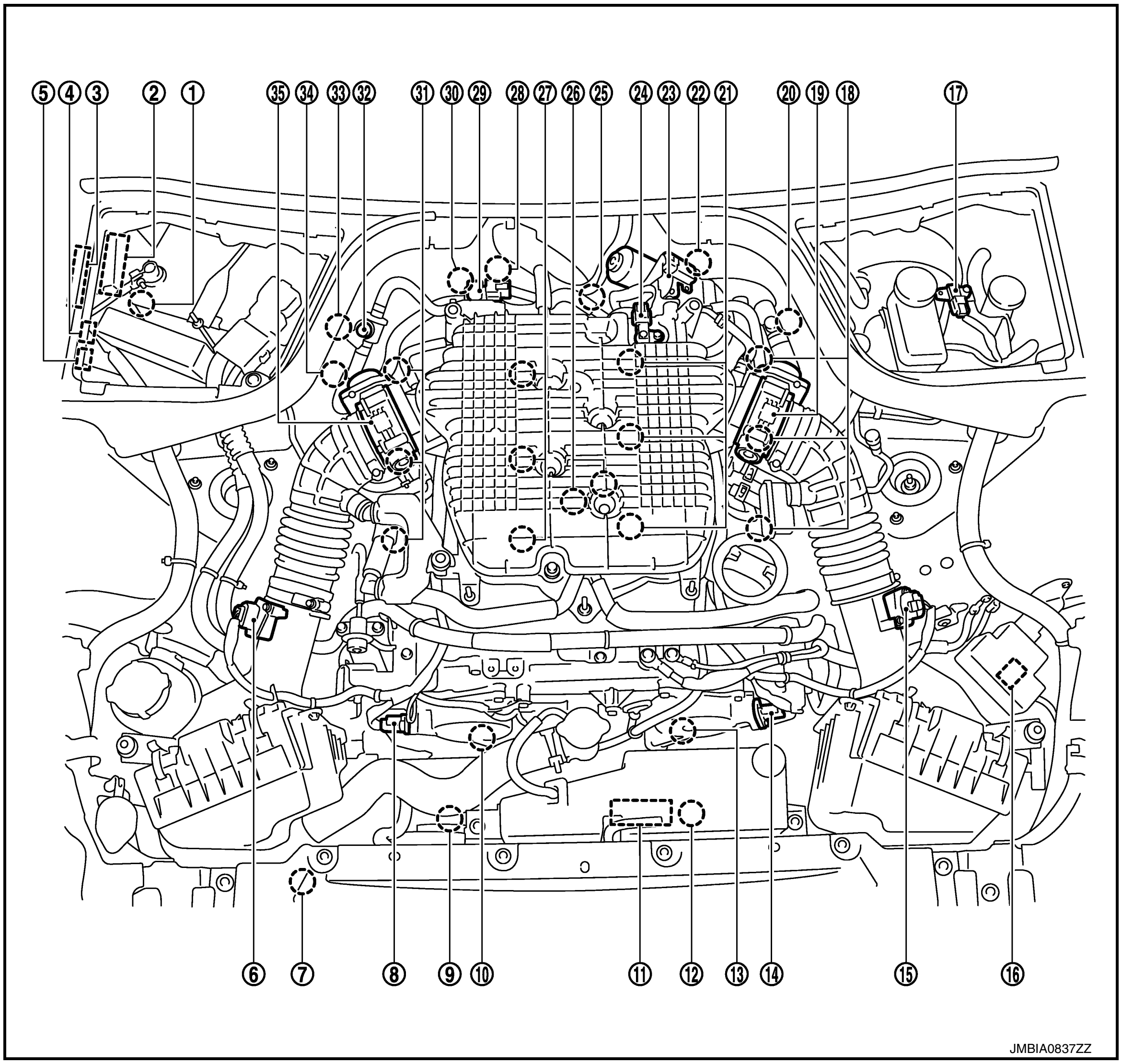
When the SET/COAST switch is pressed during cruise control driving, decrease vehicle set speed until the switch is released. And then ASCD will maintain the new set speed.

RESUME OPERATION

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

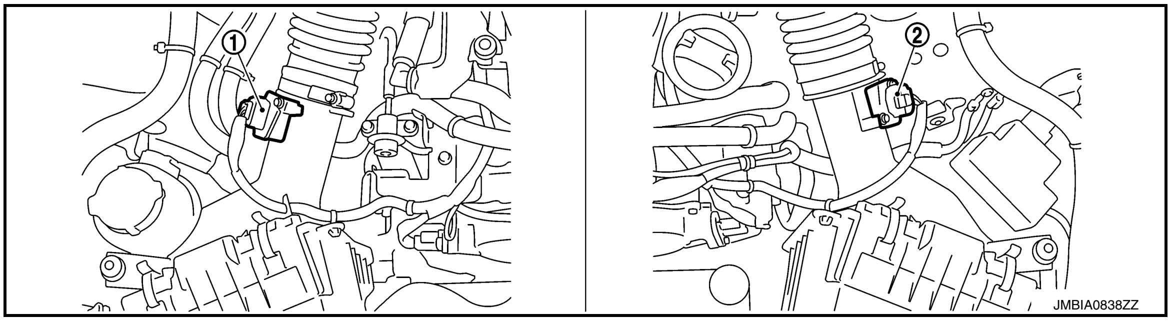
- Brake pedal is released
- A/T selector lever is in the P and N positions
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Parts Location

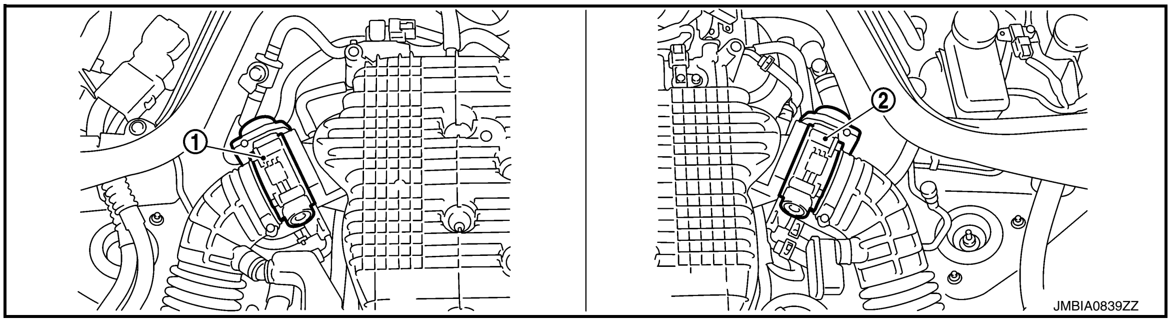


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)

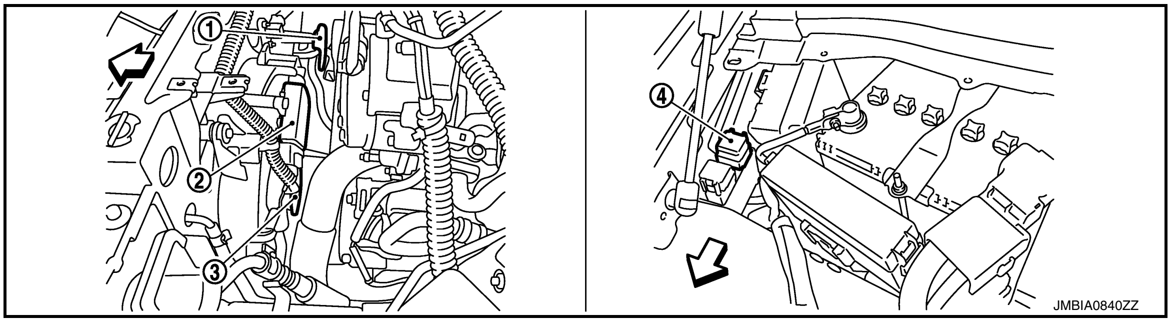
31. Ignition coil (with power transistor) and spark plug (bank 1)	32. EVAP service port	33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)	35. Electric throttle control actuator (bank 1)	



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

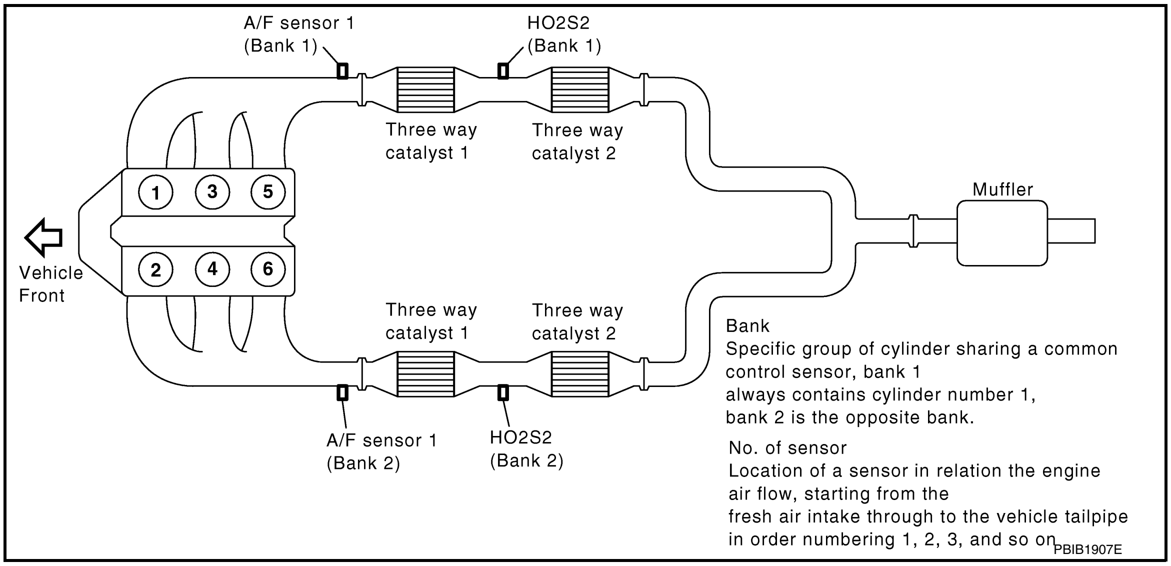


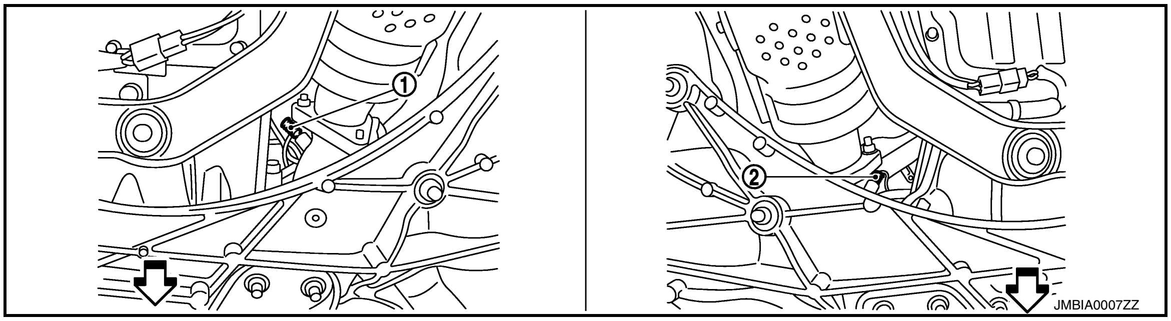
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

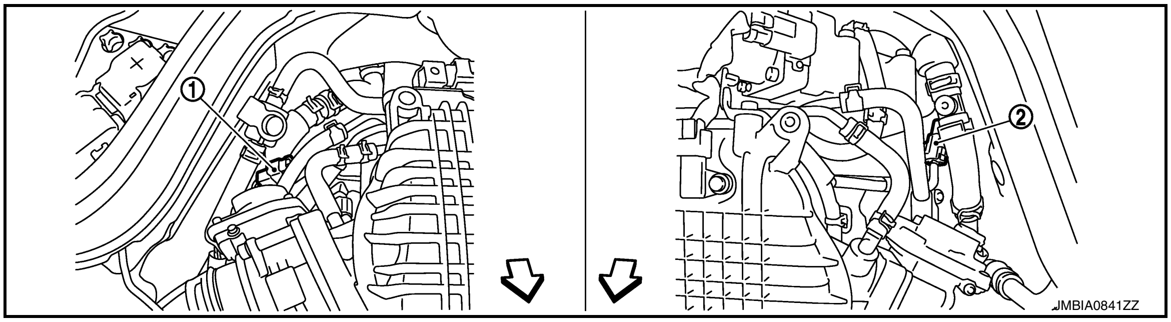
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1
(Bank 1)
HO2S2
(Bank 1)
Three way
catalyst 1
Three way
catalyst 2
Muffler
1
3
5
2
4
6
Vehicle
Front
Three way
catalyst 1
Three way
catalyst 2
Bank
Specific group of cylinder sharing a common control sensor, bank 1 always contains cylinder number 1, bank 2 is the opposite bank.
A/F sensor 1
(Bank 2)
HO2S2
(Bank 2)
No. of sensor
Location of a sensor in relation the engine air flow, starting from the fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on
PBIB1907E



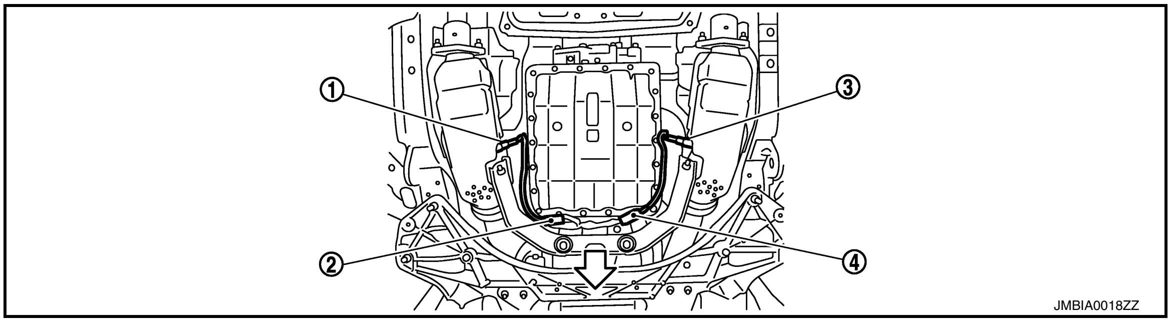
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



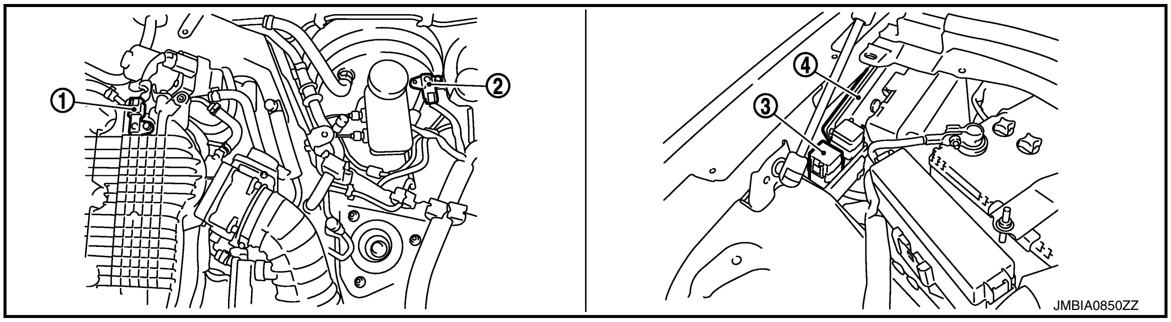
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

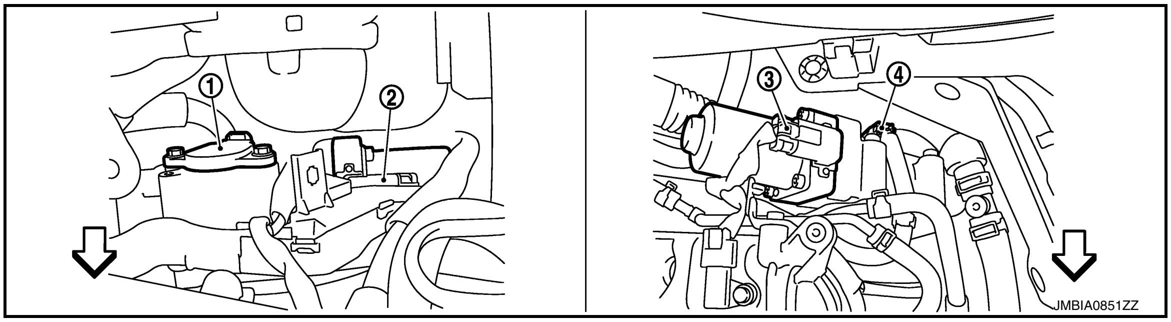


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

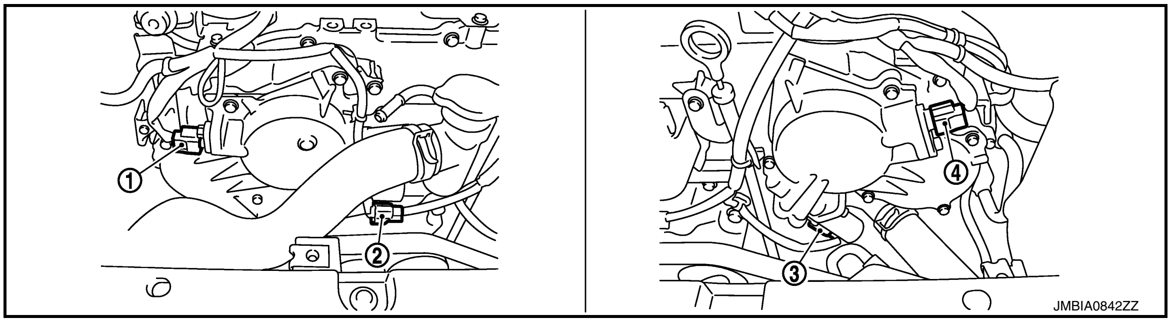


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

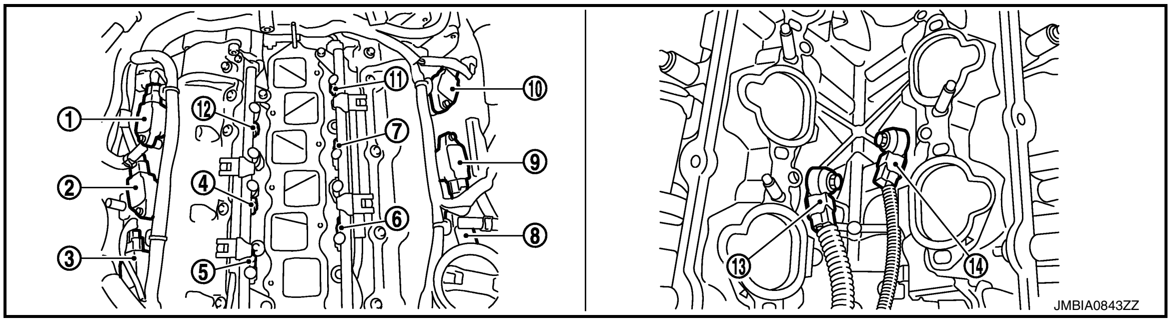


⇦ : Vehicle front

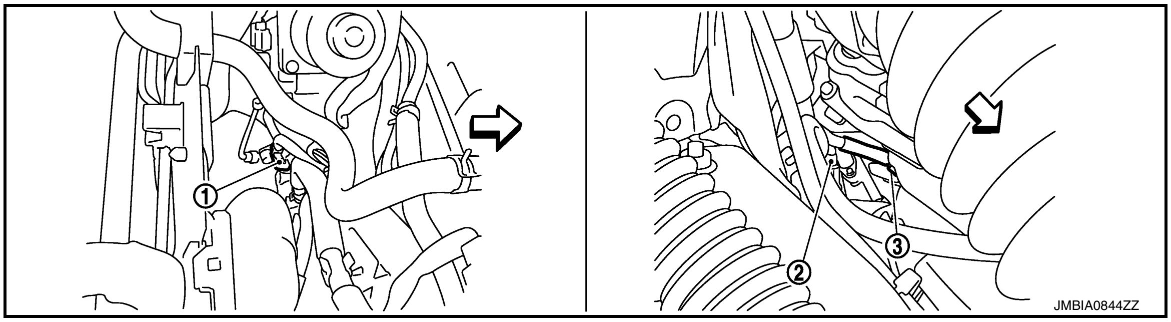
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

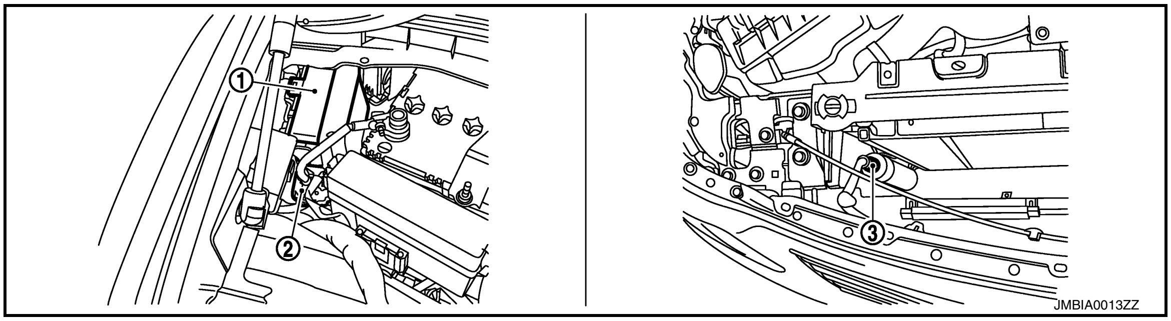


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

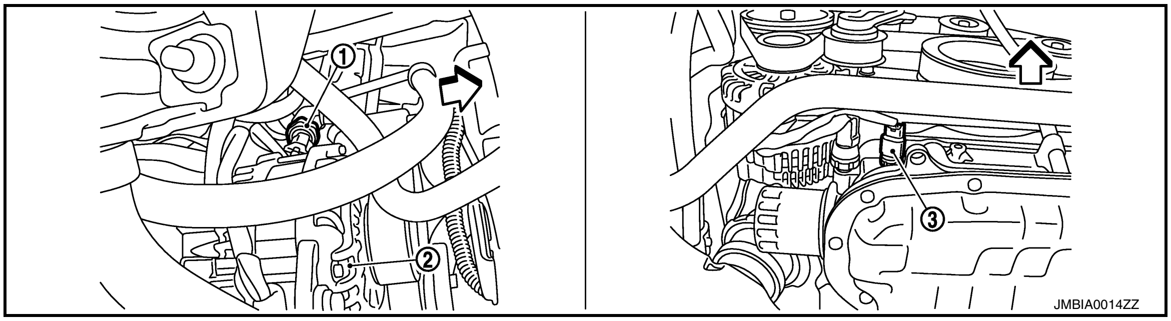


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

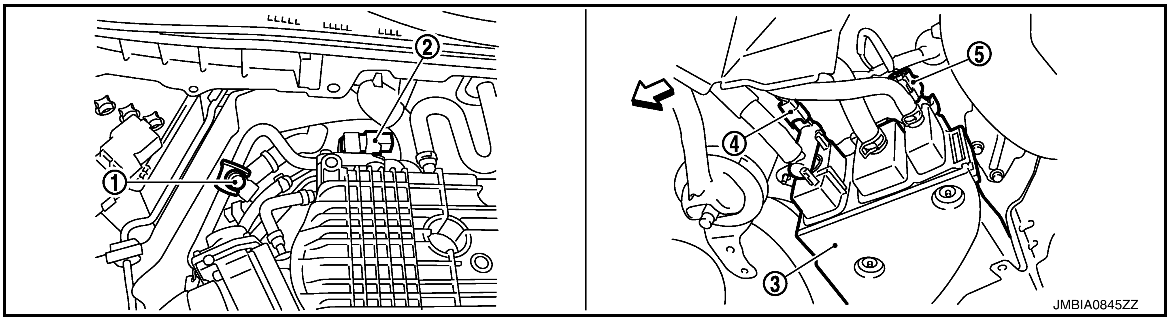


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



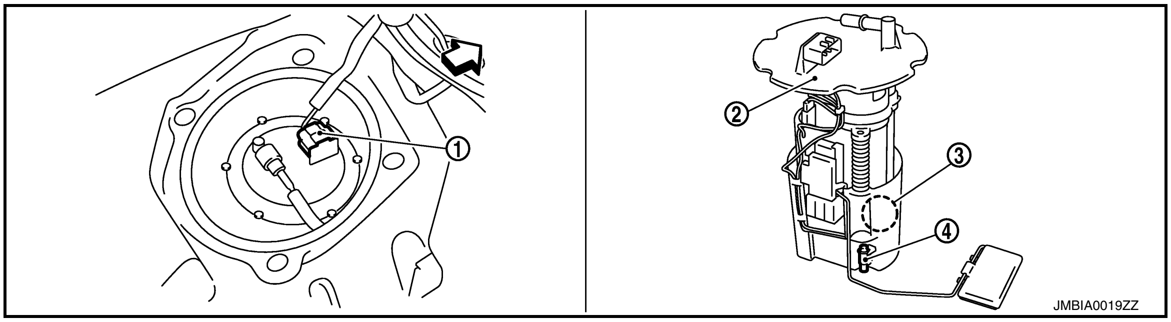
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



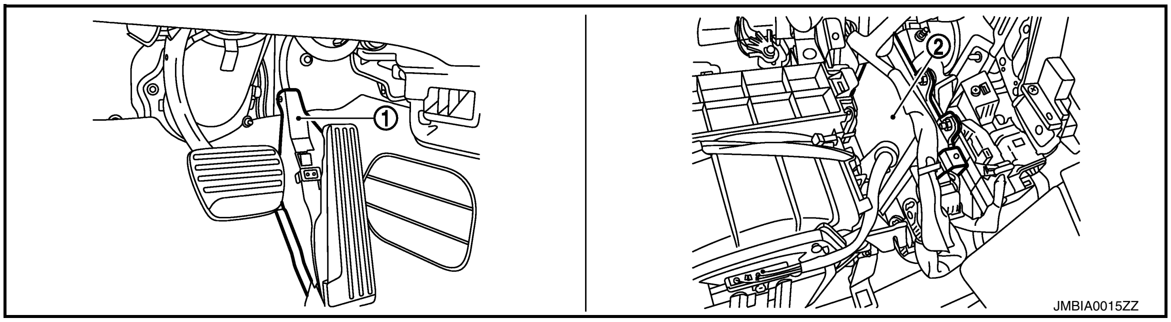
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

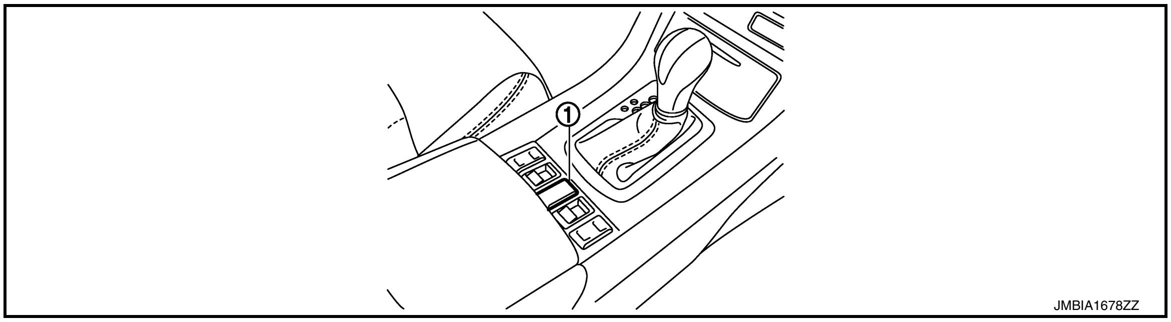


⇦ : Vehicle front

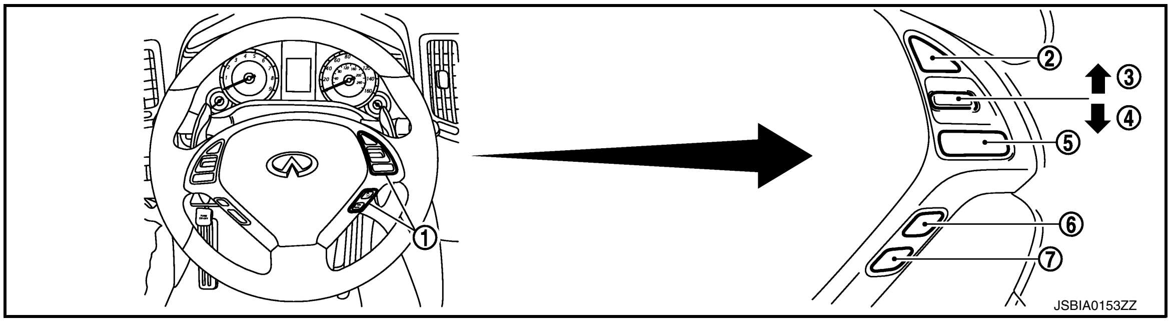
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



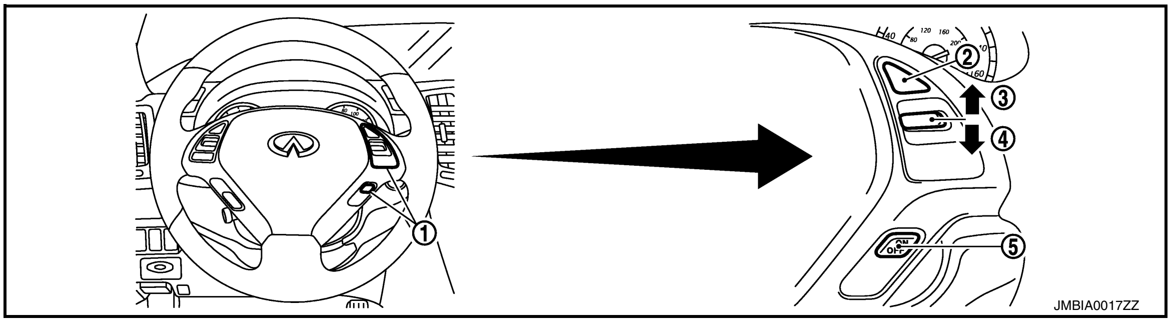
1. Accelerator pedal position sensor
2. ECM



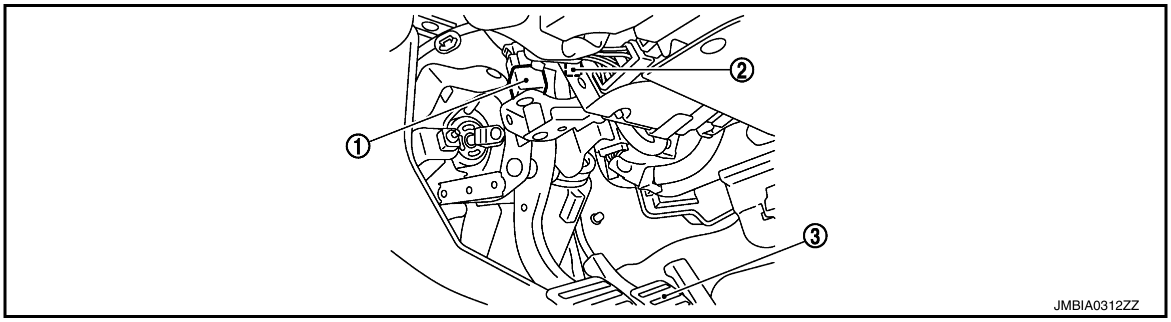
1. Snow mode switch



1. ICC steering switch
2. CANCEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. DISTANCE switch
6. MAIN switch
7. LDP/DCA switch



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



1. Stop lamp switch
2. ASCD brake switch (ASCD models)
ICC brake switch (ICC models)
3. Brake pedal

Component Description

INFOID:0000000010596700

Component	Reference
ASCD brake switch	EC-445, "Description"
ASCD indicator	EC-499, "Description"
ASCD steering switch	EC-438, "Description"
Electric throttle control actuator	EC-423, "Description"
Stop lamp switch	EC-445, "Description"

CAN COMMUNICATION

System Description

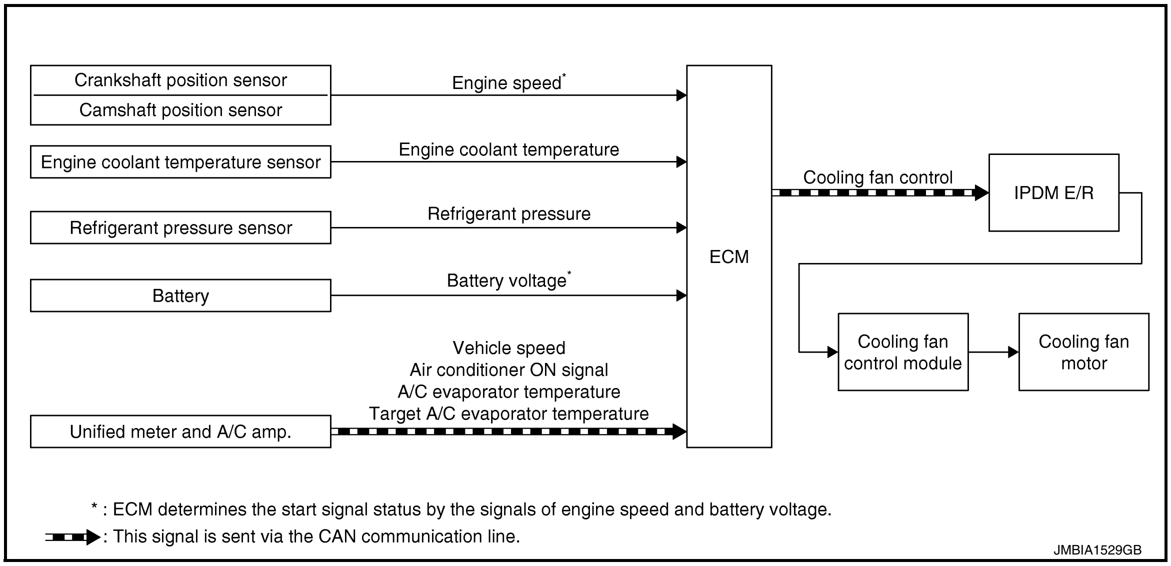
INFOID:0000000010596701

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-8, "CAN Communication Control Circuit", about CAN communication for detail.

COOLING FAN CONTROL

System Diagram

INFOID:0000000010596702


Crankshaft position sensor
Camshaft position sensor
Engine speed*
Engine coolant temperature sensor
Engine coolant temperature
Refrigerant pressure sensor
Refrigerant pressure
Battery
Battery voltage*
Unified meter and A/C amp.
Vehicle speed
Air conditioner ON signal
A/C evaporator temperature
Target A/C evaporator temperature
ECM
Cooling fan control
IPDM E/R
Cooling fan control module
Cooling fan motor
* : ECM determines the start signal status by the signals of engine speed and battery voltage.
: This signal is sent via the CAN communication line.
JMBIA1529GB

System Description

INFOID:0000000010596703

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 control module ↓ Cooling fan motor
Engine coolant temperature sensor	Engine coolant temperature		
Refrigerant pressure sensor	Refrigerant pressure		
Battery	Battery voltage*1		
Unified meter and A/C amp.	Vehicle speed*2		
	Air conditioner ON signal*2		
	A/C evaporator temperature*2		
	Target A/C evaporator temperature*2		

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

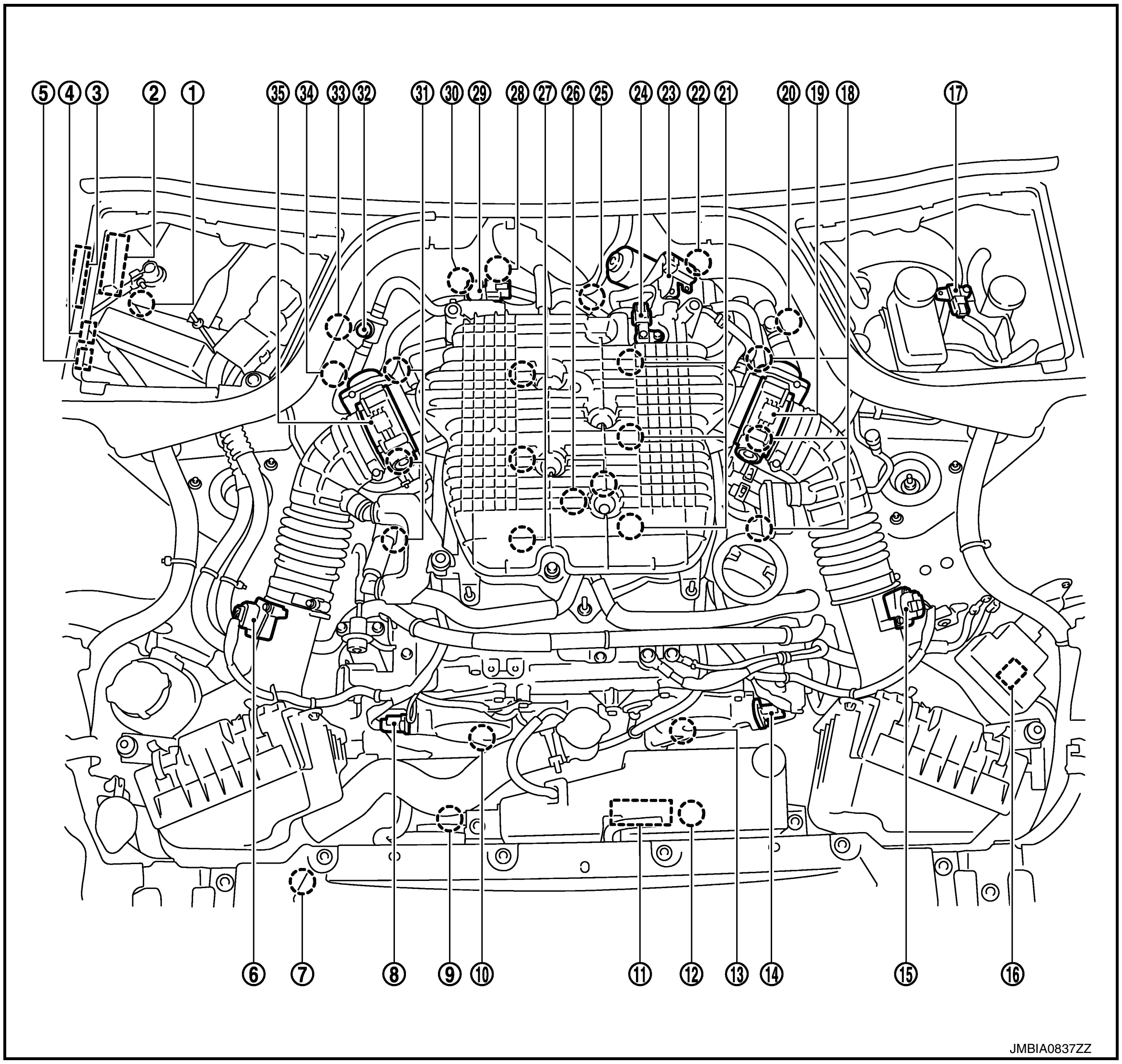
*2: This signal is sent to ECM via the CAN communication line.

SYSTEM DESCRIPTION

ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, air conditioner ON signal, refrigerant pressure, target A/C evaporator temperature and A/C evaporator temperature.

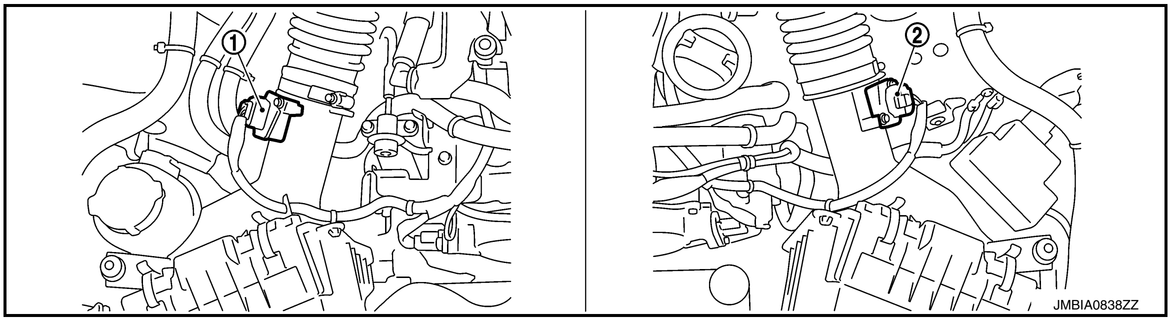
Cooling fan control signal is sent to IPDM E/R from ECM by CAN communication line. Then, IPDM E/R sends ON/OFF pulse duty signal to cooling fan control module. Corresponding to this ON/OFF pulse duty signal, cooling fan control module gives cooling fan motor operating voltage to cooling fan motors. Cooling fan speed is controlled by duty cycle of cooling fan motor operating voltage sent from cooling fan control module.

Component Parts Location

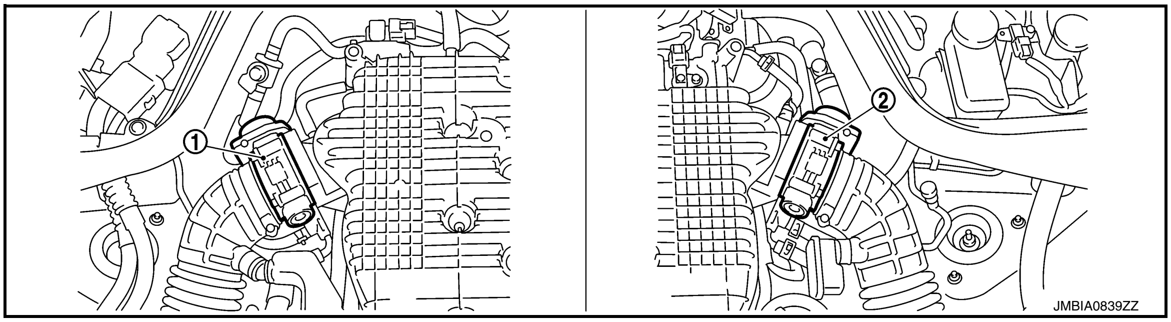


1.	Battery current sensor	2.	IPDM E/R	3.	VVEL control module
4.	Cooling fan relay	5.	VVEL actuator motor relay	6.	Mass air flow sensor (with intake air temperature sensor) (bank 1)
7.	Refrigerant pressure sensor	8.	Camshaft position sensor (PHASE) (bank 1)	9.	Cooling fan motor-2
10.	Intake valve timing control solenoid valve (bank 1)	11.	Cooling fan control module	12.	Cooling fan motor-1
13.	Intake valve timing control solenoid valve (bank 2)	14.	Camshaft position sensor (PHASE) (bank 2)	15.	Mass air flow sensor (bank 2)
16.	ICC brake hold relay (ICC models)	17.	Brake booster pressure sensor	18.	Ignition coil (with power transistor) and spark plug (bank 2)
19.	Electric throttle control actuator (bank 2)	20.	A/F sensor 1 (bank 2)	21.	Fuel injector (bank 2)
22.	VVEL control shaft position sensor (bank 2)	23.	VVEL actuator motor (bank 2)	24.	Manifold absolute pressure (MAP) sensor
25.	Engine coolant temperature sensor	26.	Knock sensor	27.	Fuel injector (bank 1)
28.	VVEL actuator motor (bank 1)	29.	EVAP canister purge volume control solenoid valve	30.	VVEL control shaft position sensor (bank 1)

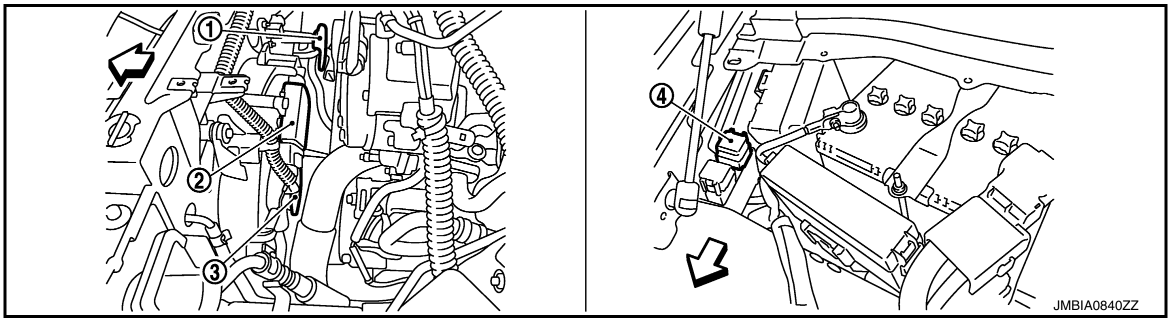
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

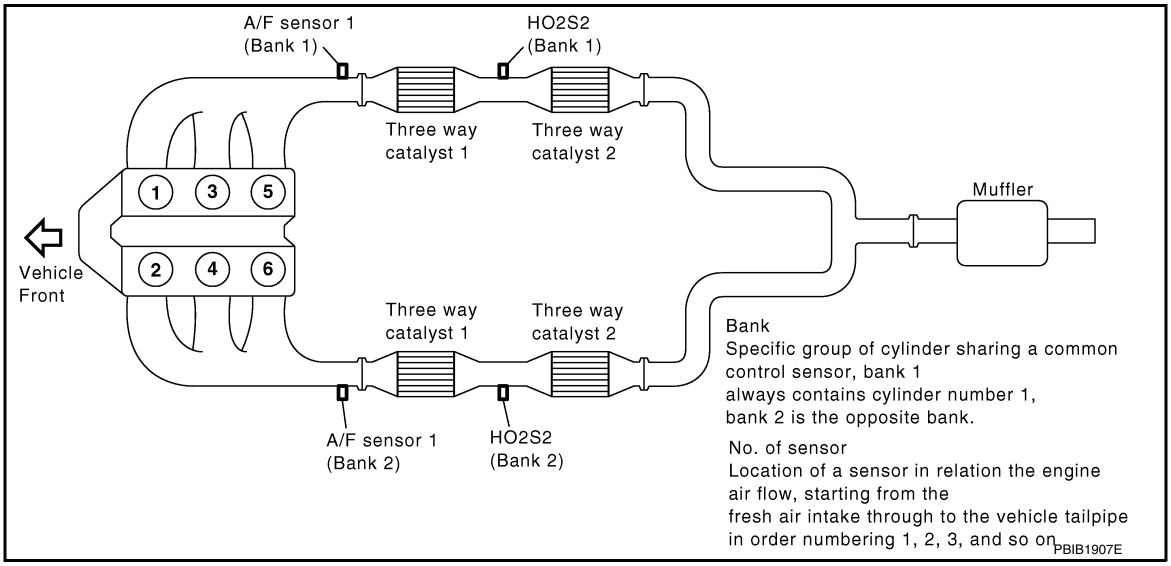


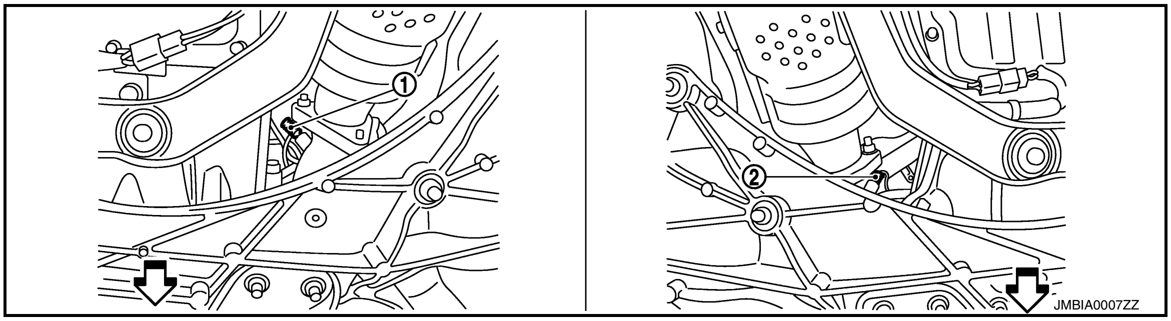
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

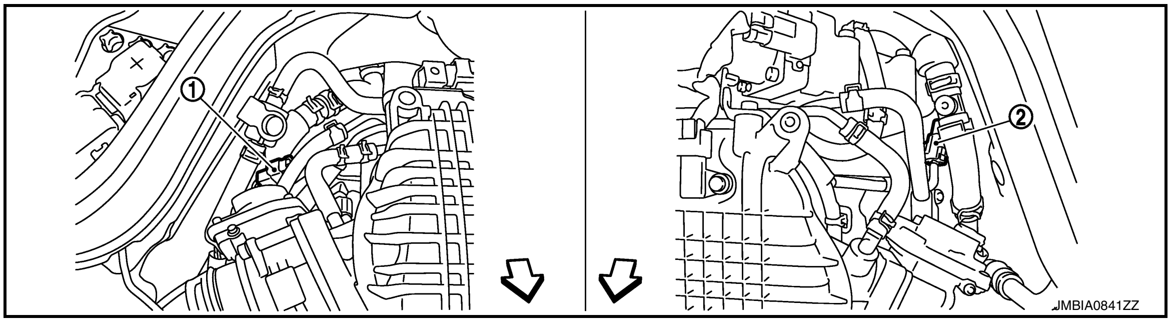
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1
(Bank 1)
HO2S2
(Bank 1)
Three way
catalyst 1
Three way
catalyst 2
Muffler
1
3
5
2
4
6
Vehicle
Front
Three way
catalyst 1
Three way
catalyst 2
A/F sensor 1
(Bank 2)
HO2S2
(Bank 2)
Bank
Specific group of cylinder sharing a common
control sensor, bank 1
always contains cylinder number 1,
bank 2 is the opposite bank.
No. of sensor
Location of a sensor in relation the engine
air flow, starting from the
fresh air intake through to the vehicle tailpipe
in order numbering 1, 2, 3, and so on
PBIB1907E



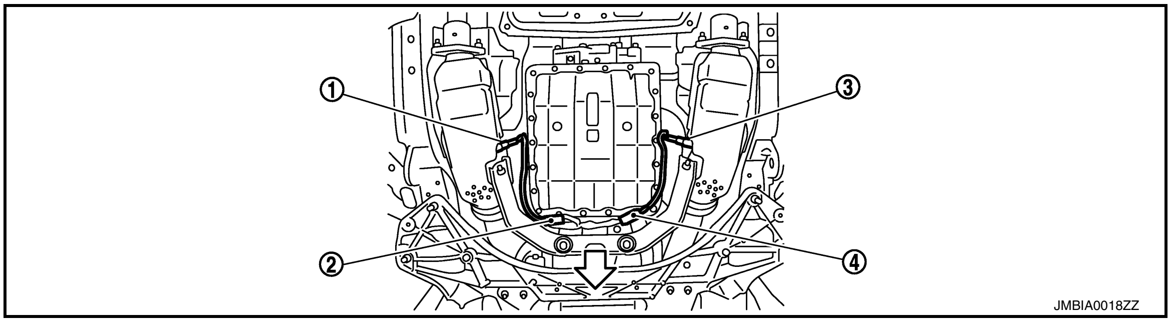
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



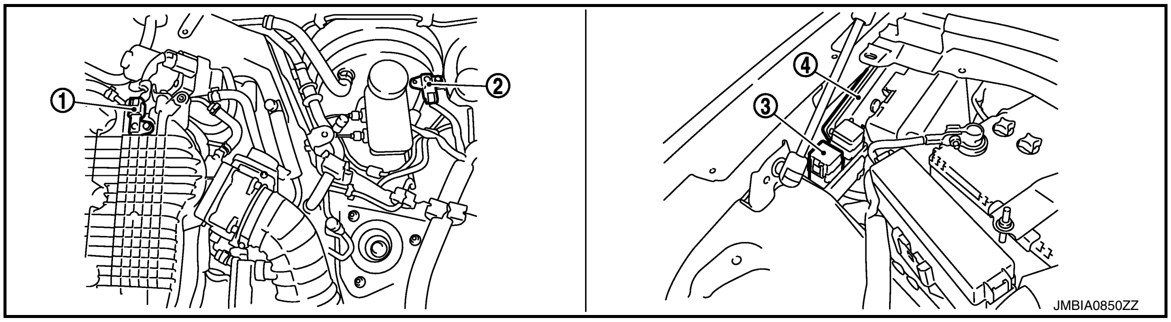
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

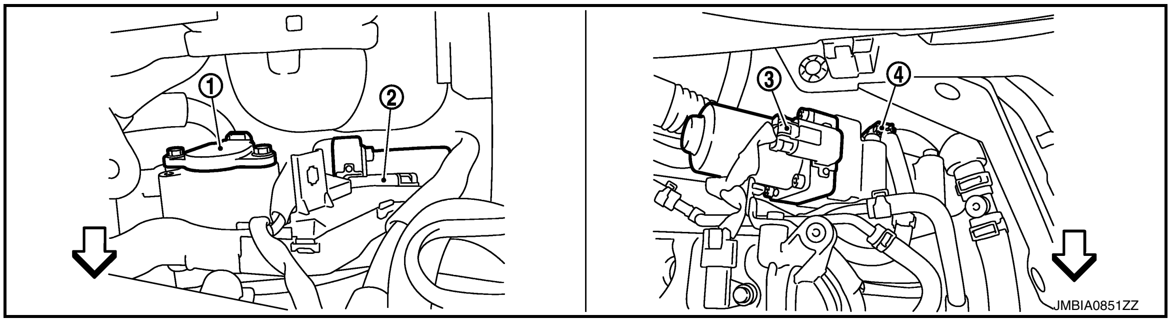


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

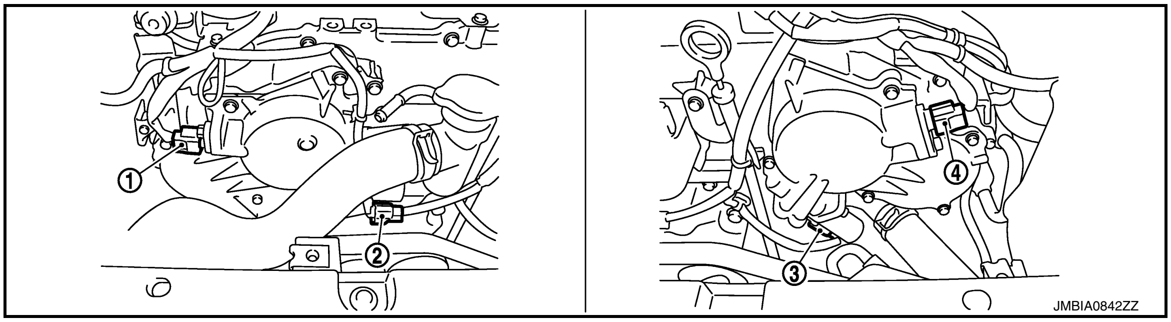


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

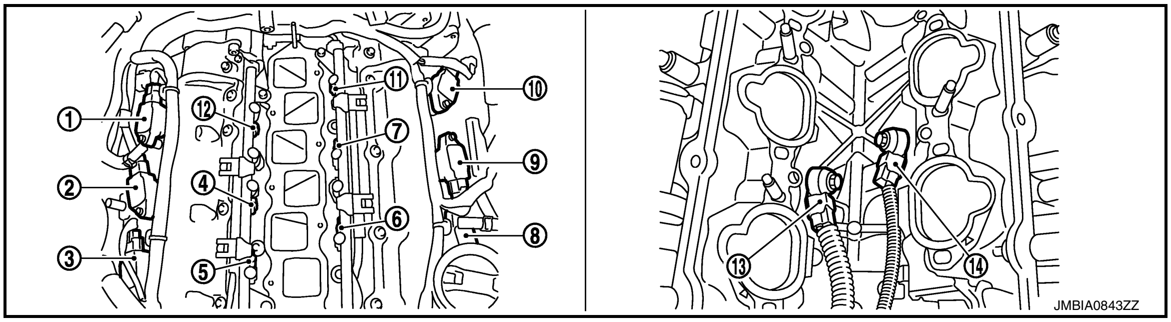


⇦ : Vehicle front

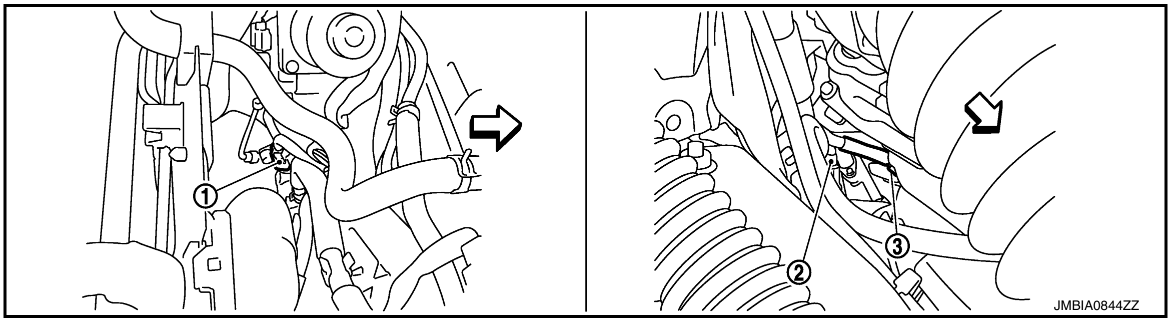
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

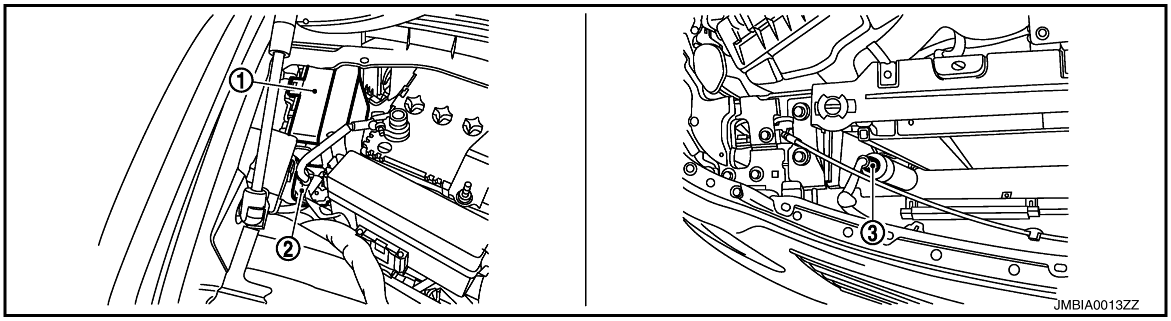


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

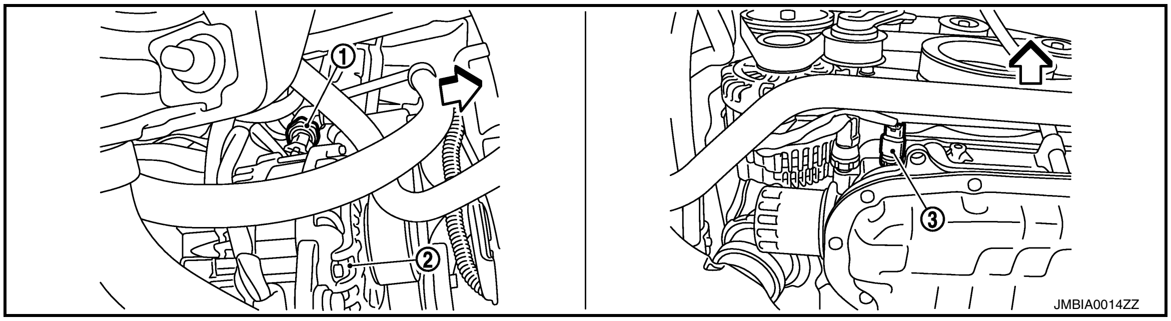


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

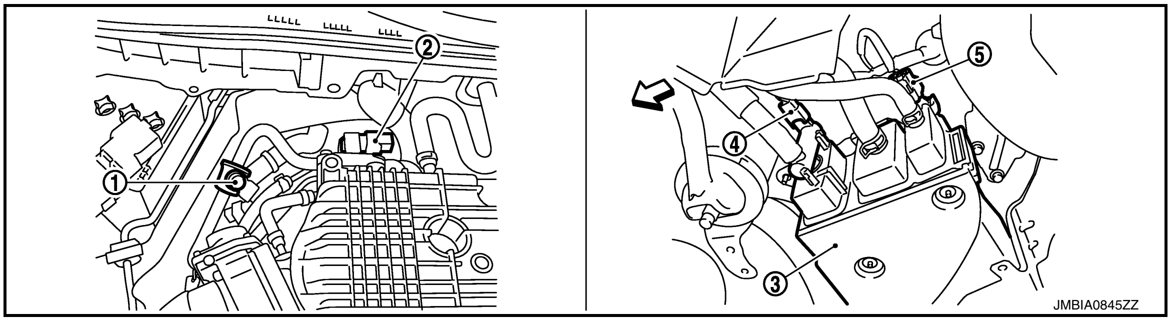


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



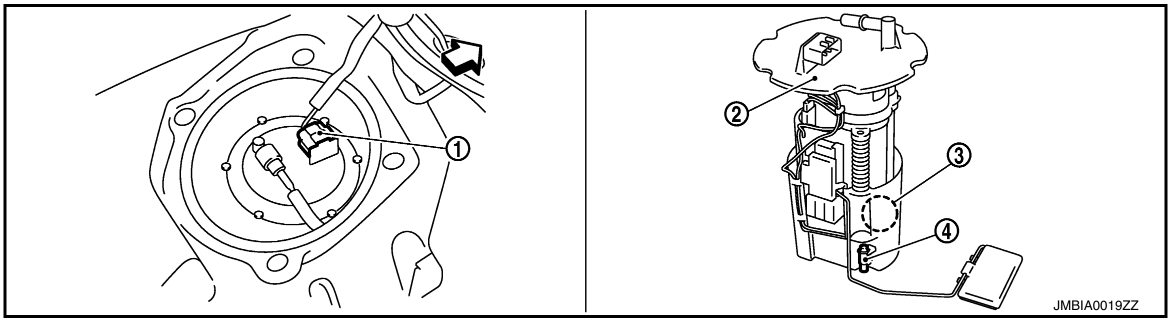
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



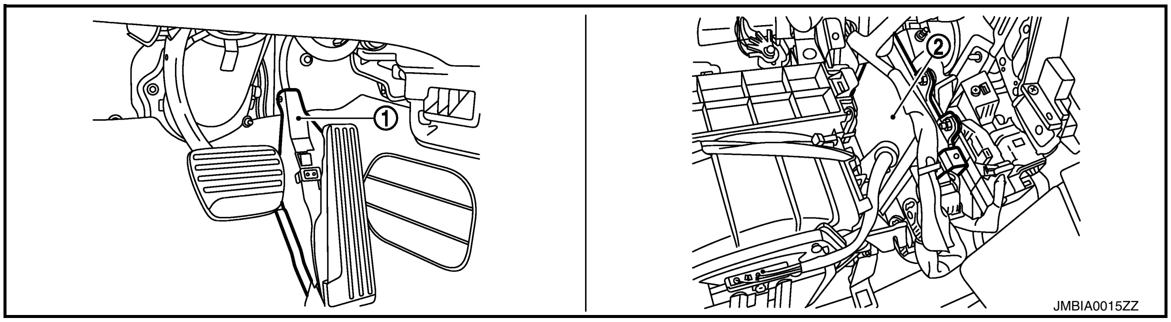
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

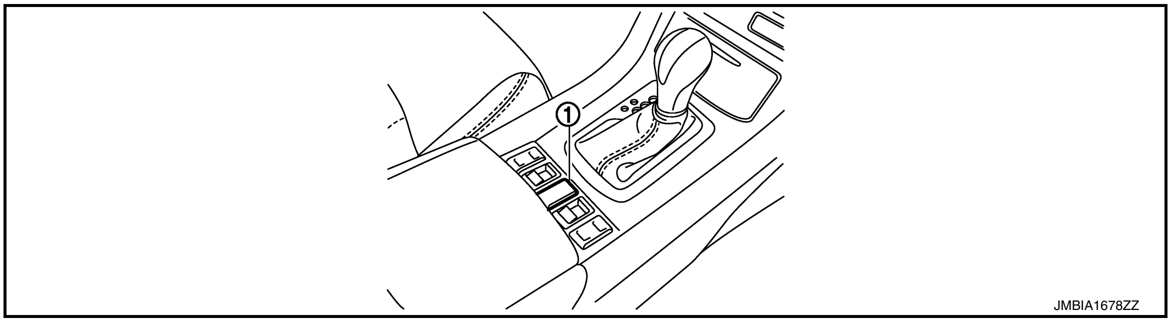


⇦ : Vehicle front

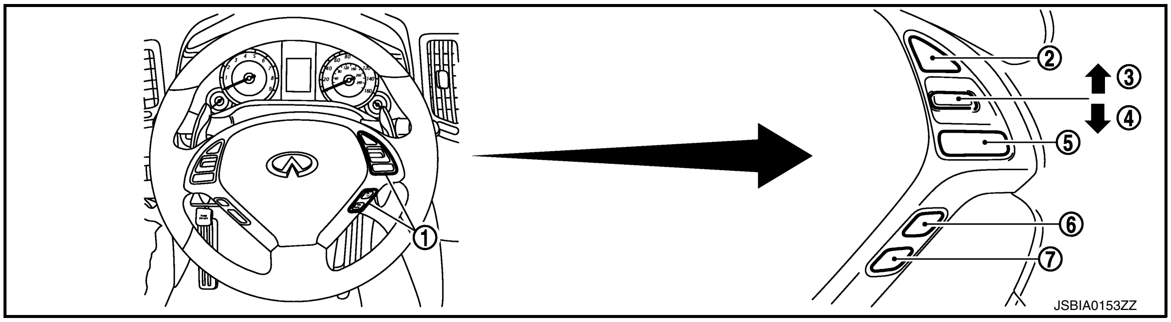
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



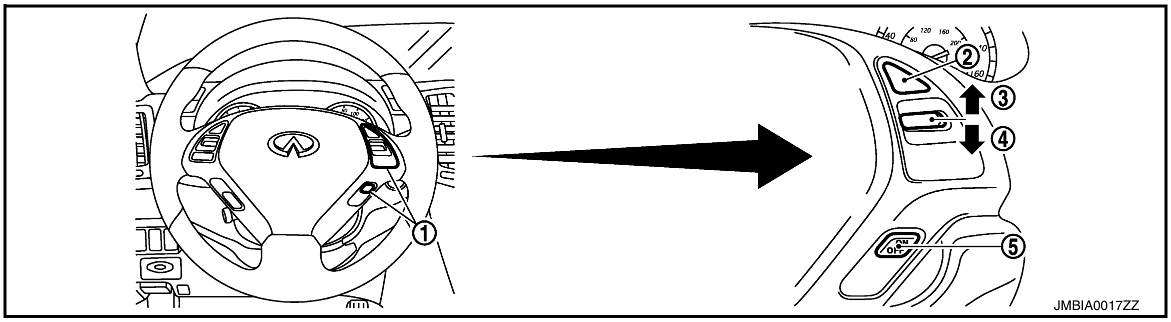
1. Accelerator pedal position sensor
2. ECM



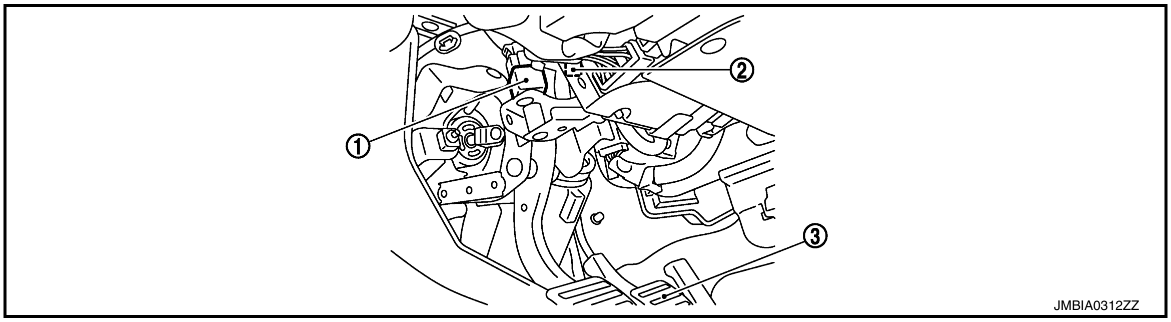
1. Snow mode switch



1. ICC steering switch	2. CANCEL switch	3. RESUME/ACCELERATE switch
4. SET/COAST switch	5. DISTANCE switch	6. MAIN switch
7. LDP/DCA switch		



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



1. Stop lamp switch	2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)	3. Brake pedal

Component Description

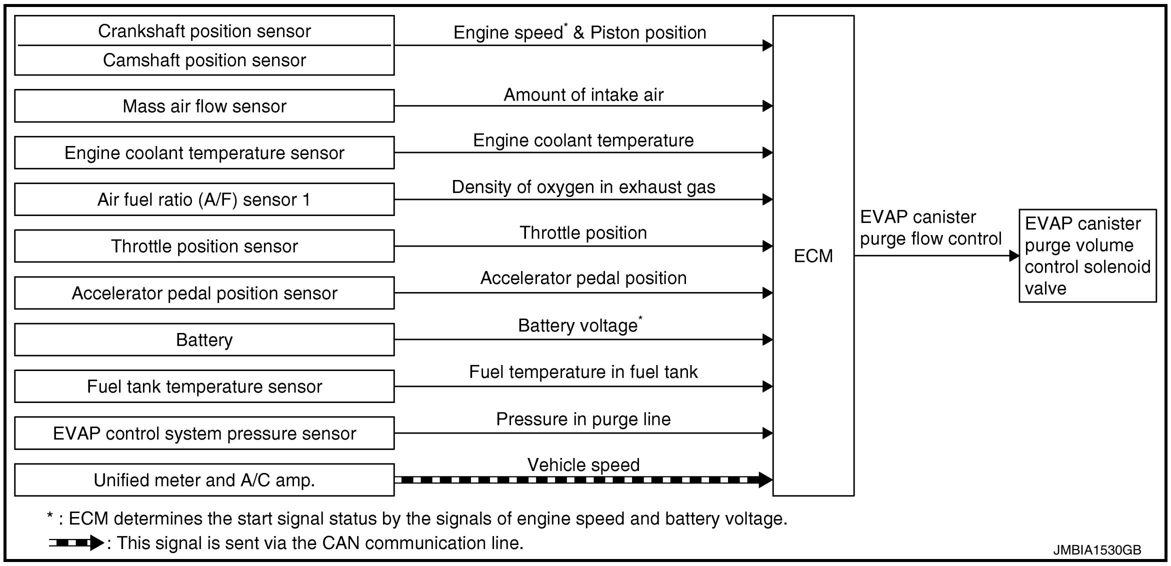
INFOID:0000000010596705

Component	Reference
Camshaft position sensor (PHASE)	EC-301, "Description"
Cooling fan control module	EC-500, "Description"
Cooling fan motor	EC-500, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Engine coolant temperature sensor	EC-209, "Description"
Refrigerant pressure sensor	EC-529, "Description"

EVAPORATIVE EMISSION SYSTEM

System Diagram

INFOID:0000000010596706


Crankshaft position sensor
Camshaft position sensor
Engine speed* & Piston position
Mass air flow sensor
Amount of intake air
Engine coolant temperature sensor
Engine coolant temperature
Air fuel ratio (A/F) sensor 1
Density of oxygen in exhaust gas
Throttle position sensor
Throttle position
Accelerator pedal position sensor
Accelerator pedal position
Battery
Battery voltage*
Fuel tank temperature sensor
Fuel temperature in fuel tank
EVAP control system pressure sensor
Pressure in purge line
Unified meter and A/C amp.
Vehicle speed
ECM
EVAP canister purge flow control
EVAP canister purge volume control solenoid valve
JMBIA1530GB

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

: This signal is sent via the CAN communication line.

System Description

INFOID:0000000010596707

INPUT/OUTPUT SIGNAL CHART

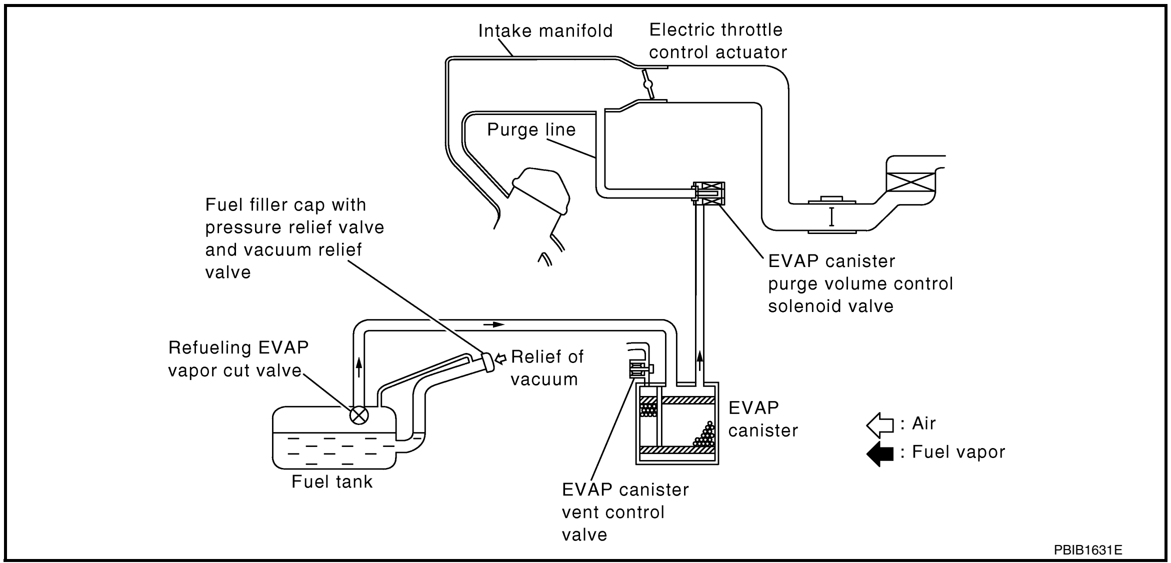
Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant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

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

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

EVAPORATIVE EMISSION SYSTEM

SYSTEM DESCRIPTION


Intake manifold
Electric throttle control actuator
Purge line
Fuel filler cap with pressure relief valve and vacuum relief valve
EVAP canister purge volume control solenoid valve
Refueling EVAP vapor cut valve
Relief of vacuum
EVAP canister
⇦ : Air
⬅ : Fuel vapor
Fuel tank
EVAP canister vent control valve
PBIB1631E

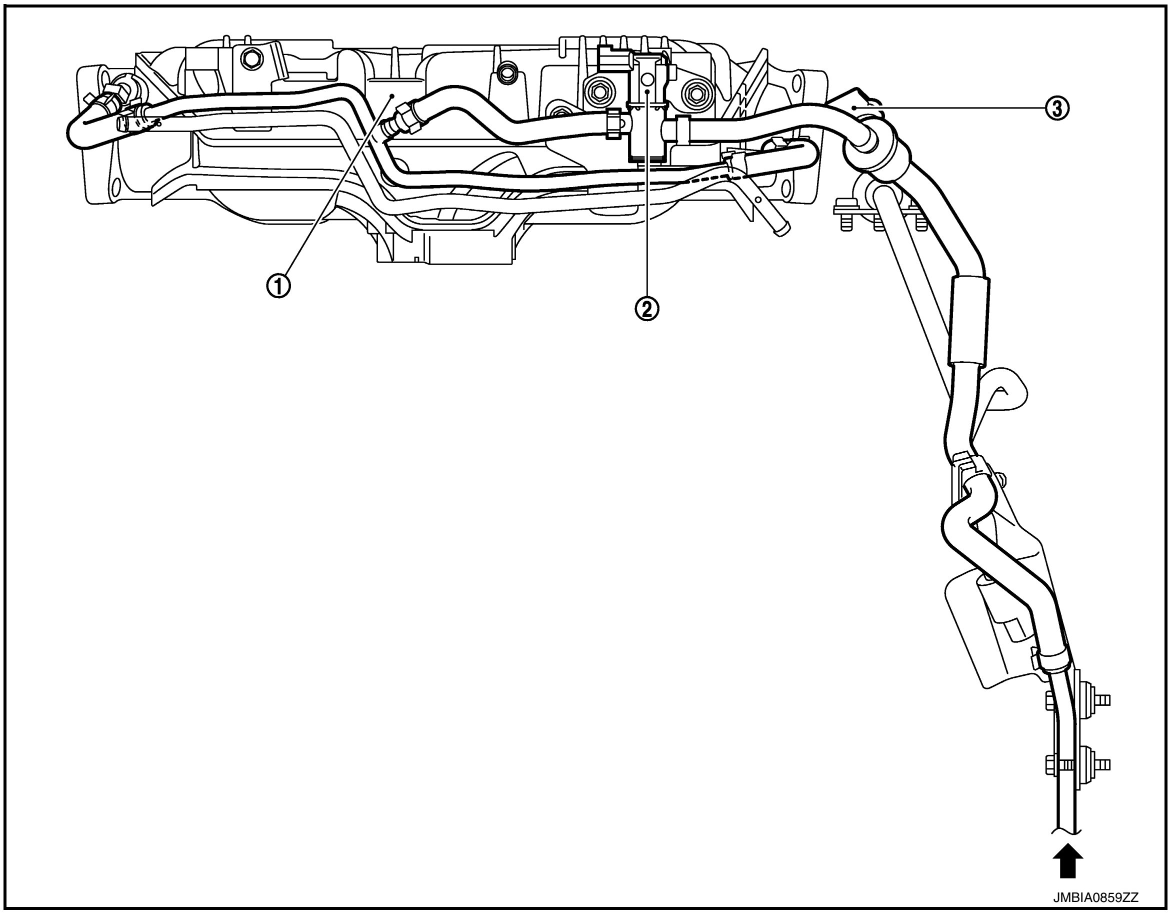
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.

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

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

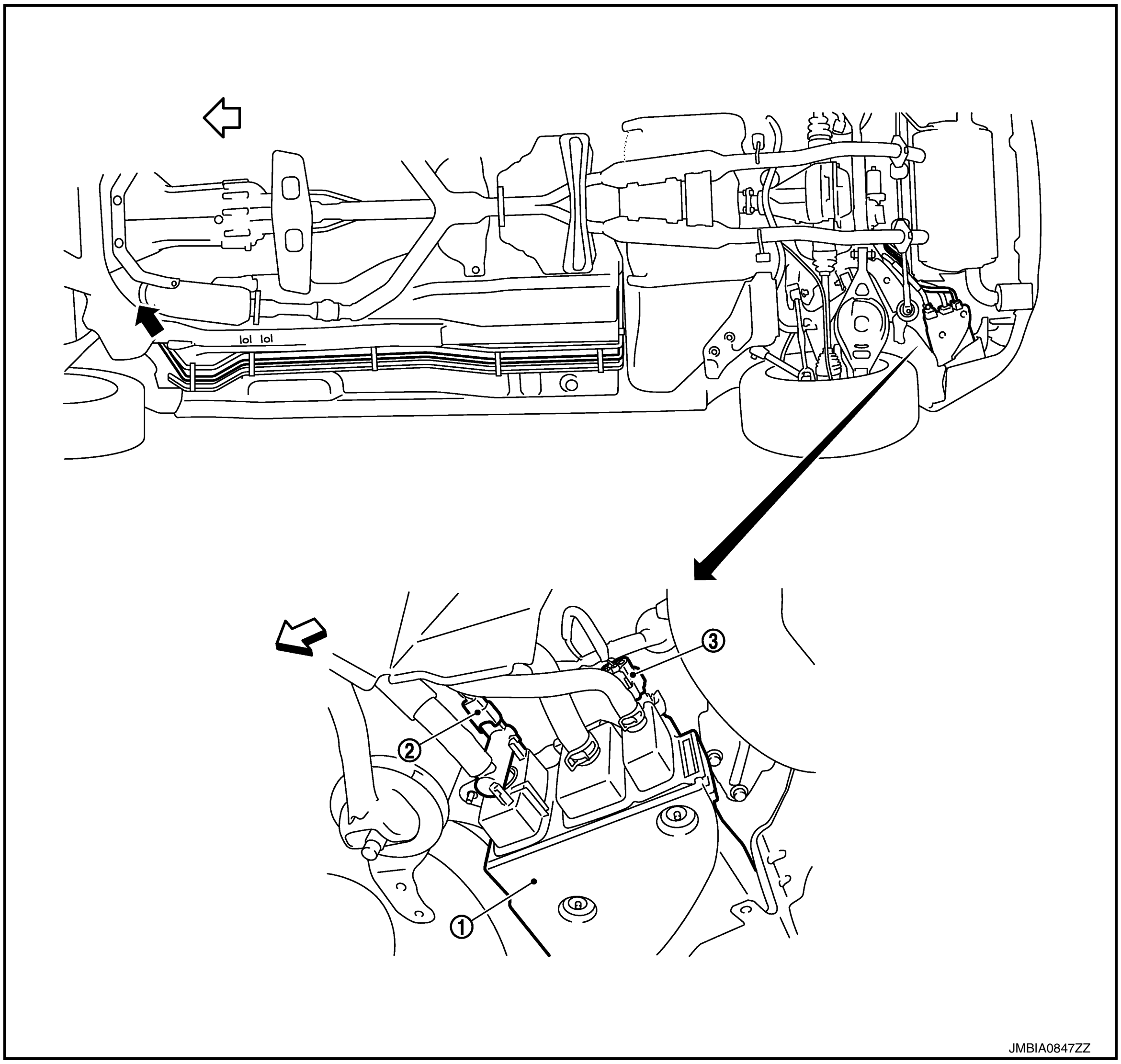
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



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

⬅ : From next figure



⇦ : Vehicle front

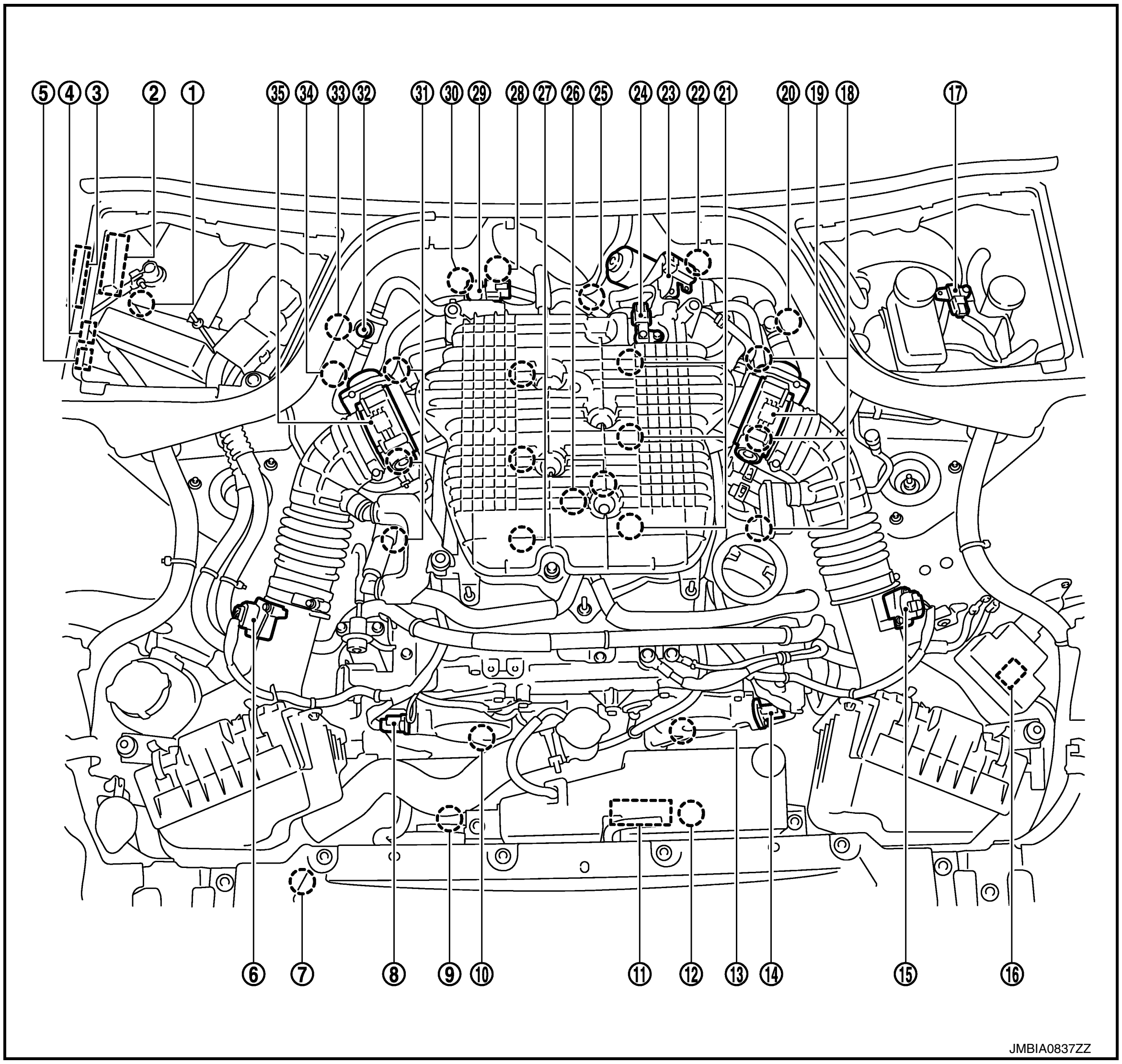
1. EVAP canister
2. EVAP canister vent control valve
3. EVAP control system pressure sensor

⬅ : To previous figure

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

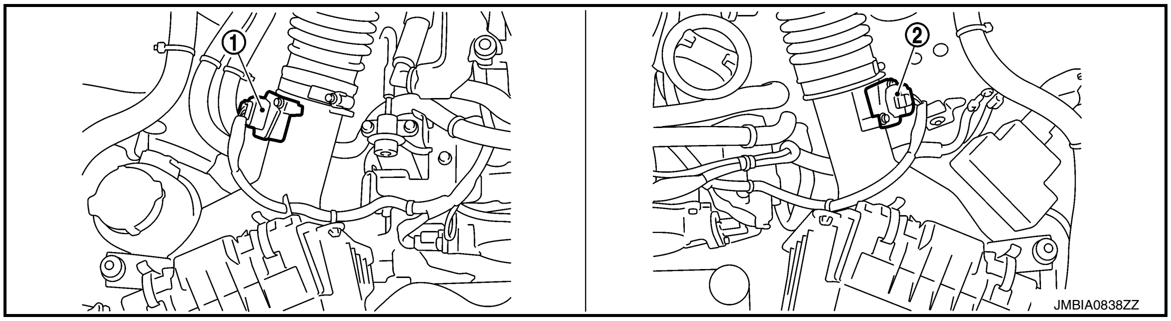
Component Parts Location

INFOID:0000000010596708

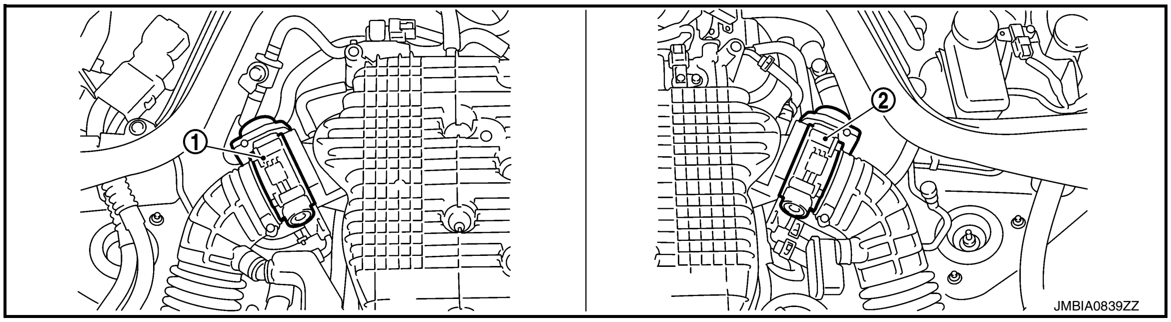


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)

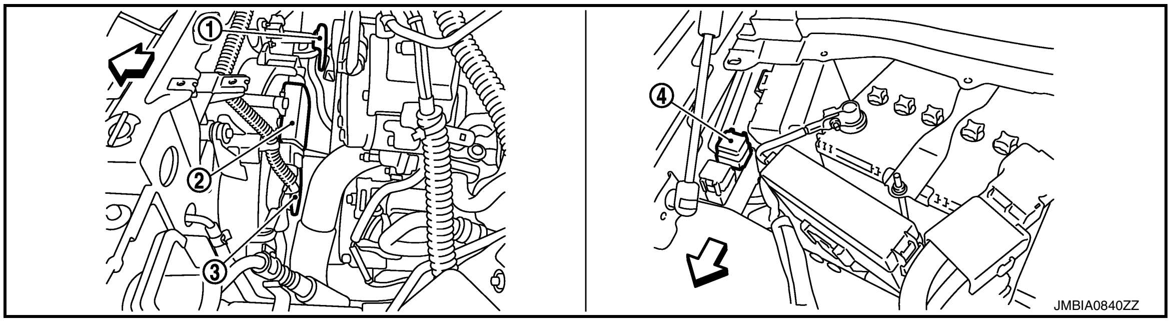
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

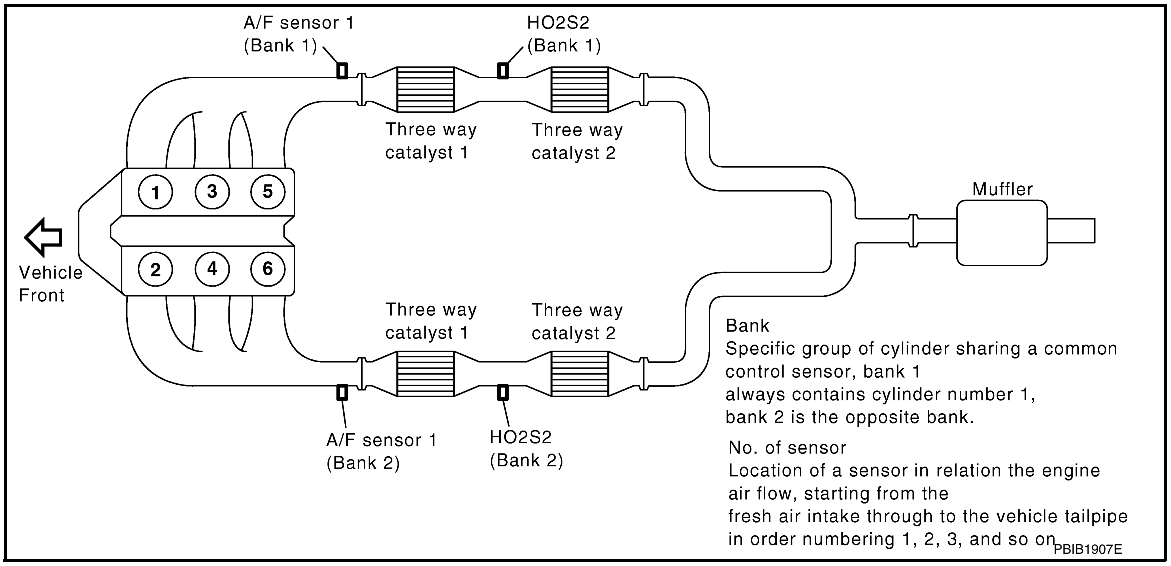


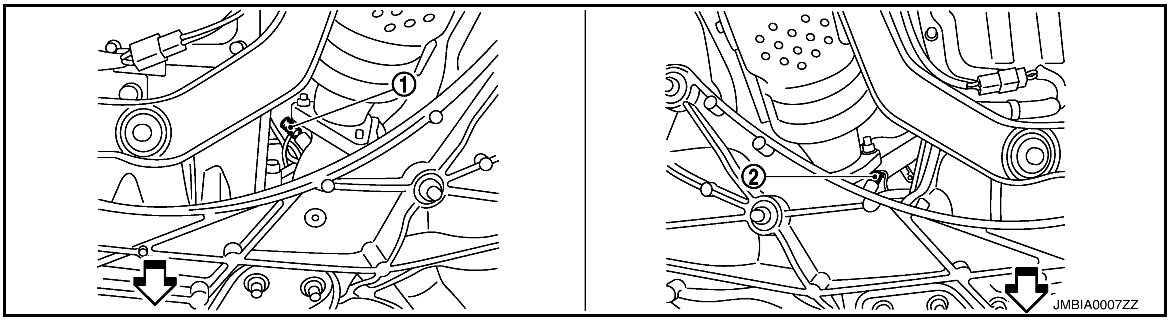
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

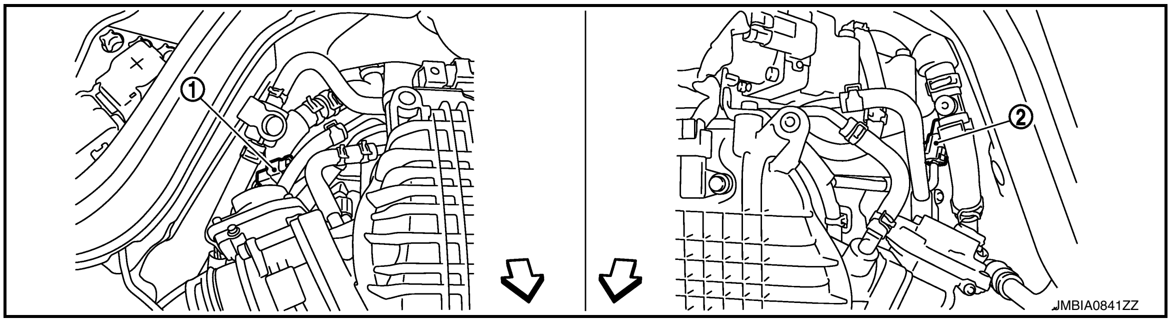
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1
(Bank 1)
HO2S2
(Bank 1)
Three way
catalyst 1
Three way
catalyst 2
Muffler
1
3
5
2
4
6
Vehicle
Front
Three way
catalyst 1
Three way
catalyst 2
A/F sensor 1
(Bank 2)
HO2S2
(Bank 2)
Bank
Specific group of cylinder sharing a common
control sensor, bank 1
always contains cylinder number 1,
bank 2 is the opposite bank.
No. of sensor
Location of a sensor in relation the engine
air flow, starting from the
fresh air intake through to the vehicle tailpipe
in order numbering 1, 2, 3, and so on
PBIB1907E



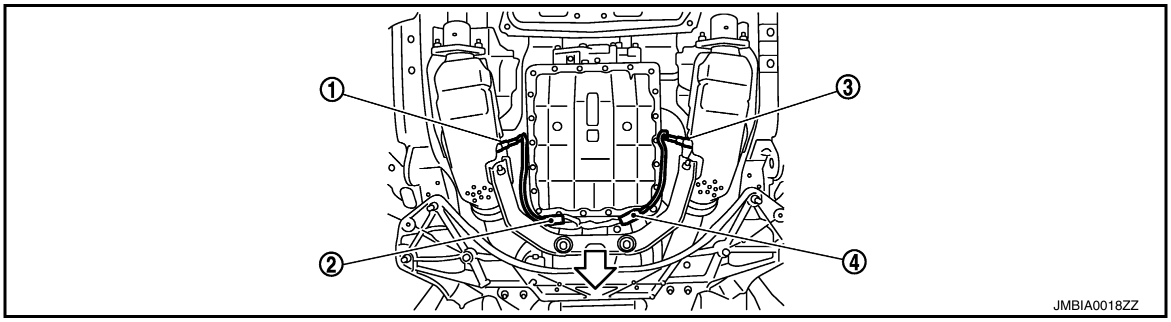
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



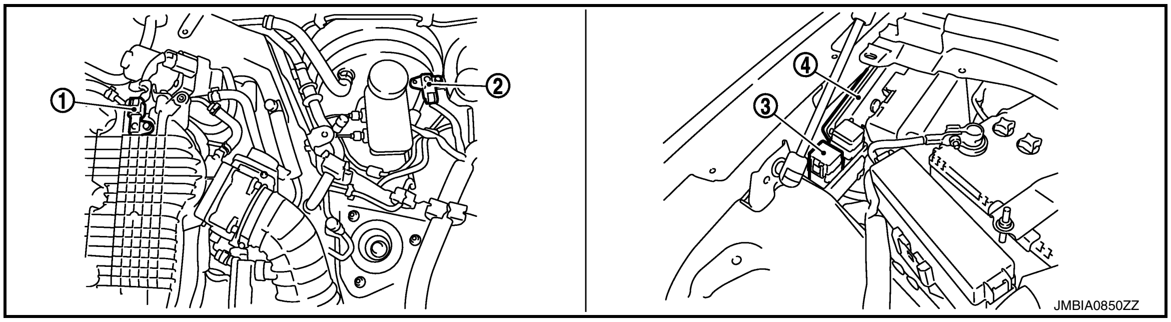
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

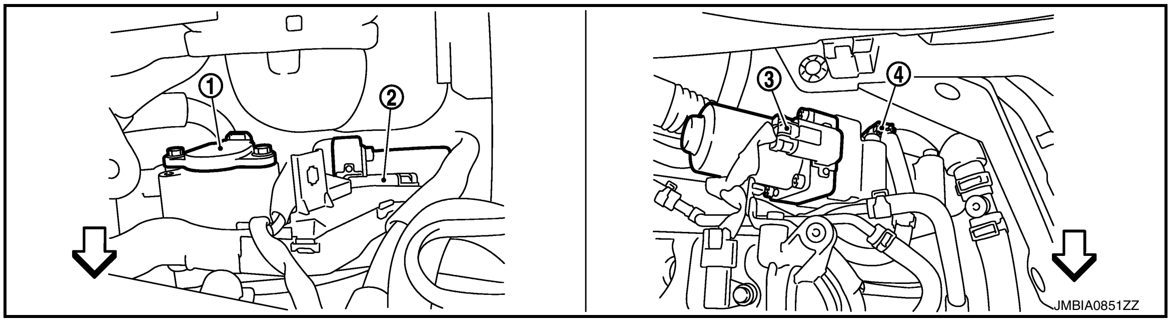


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

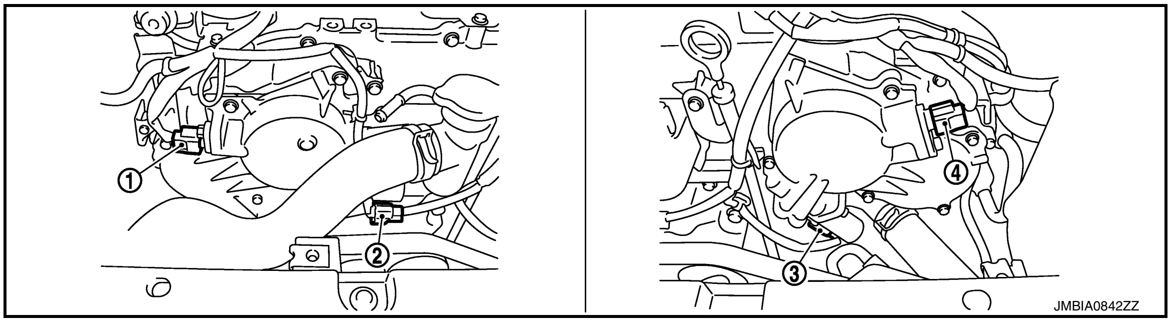


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

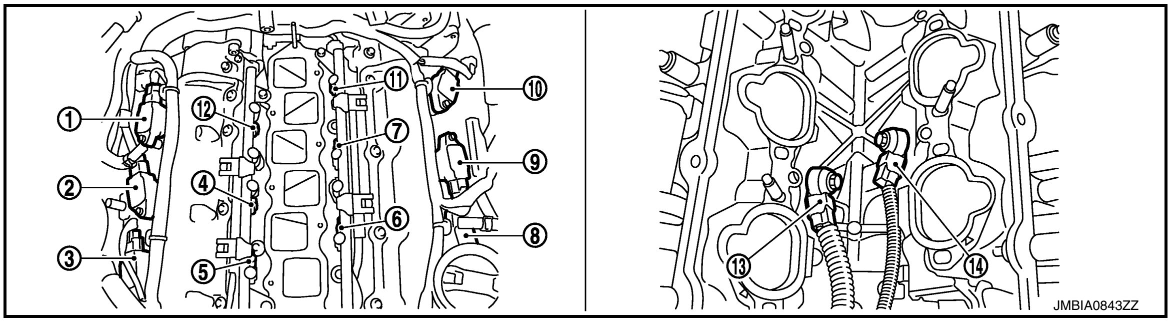


⇦ : Vehicle front

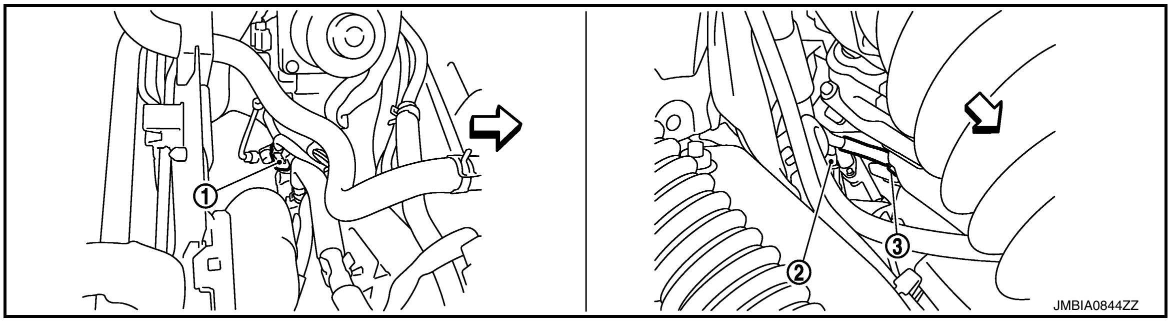
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

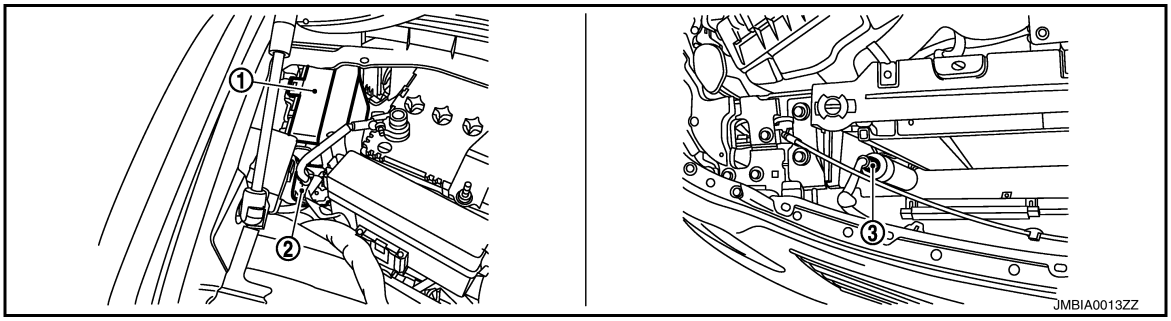


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

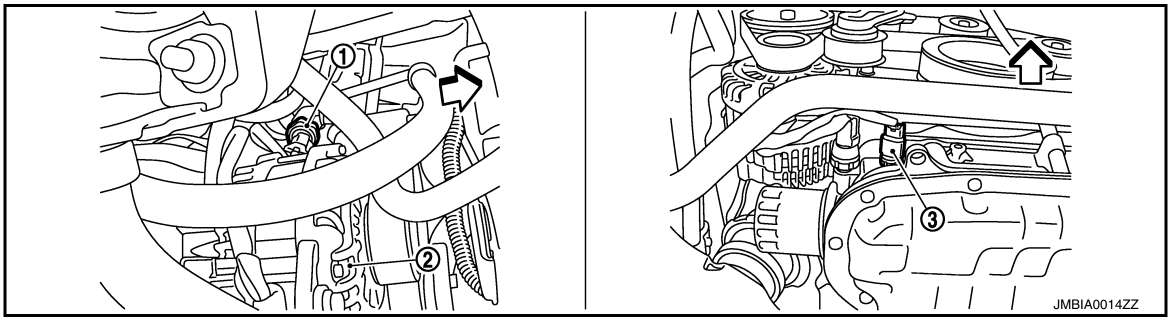


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

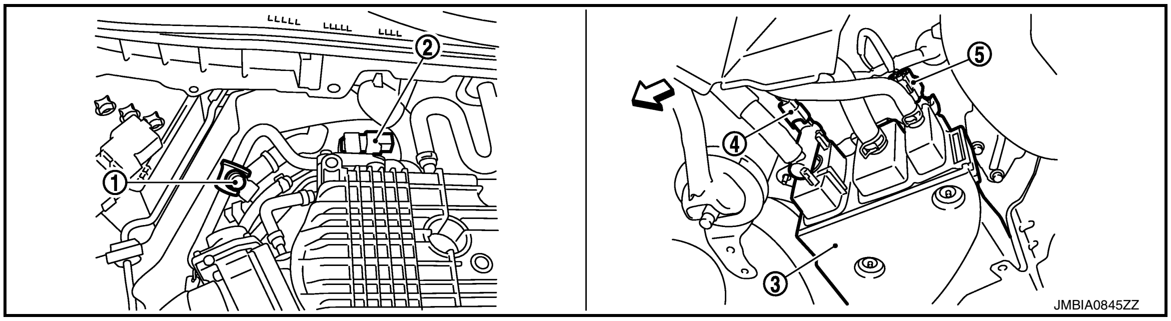


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



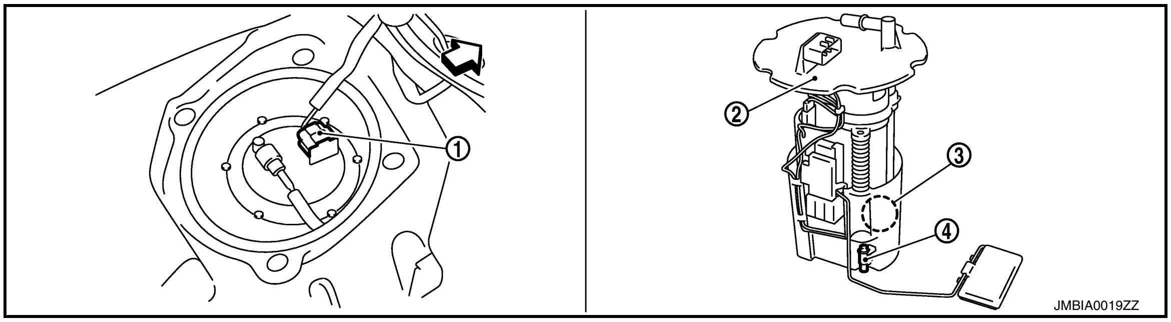
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



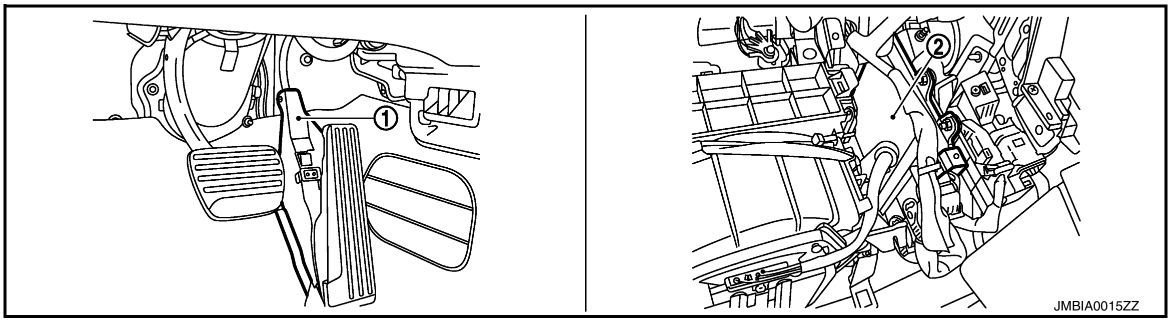
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

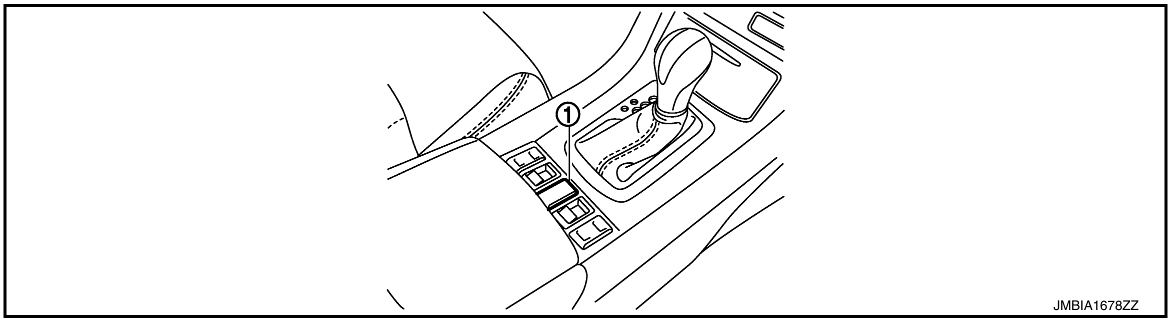


⇦ : Vehicle front

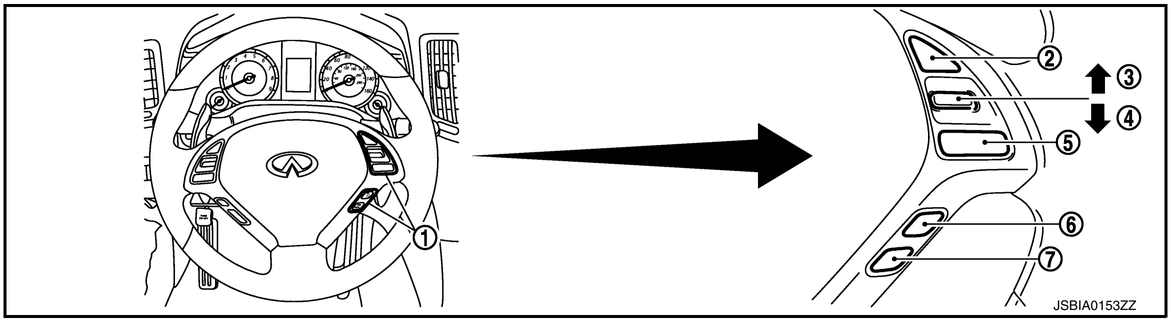
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



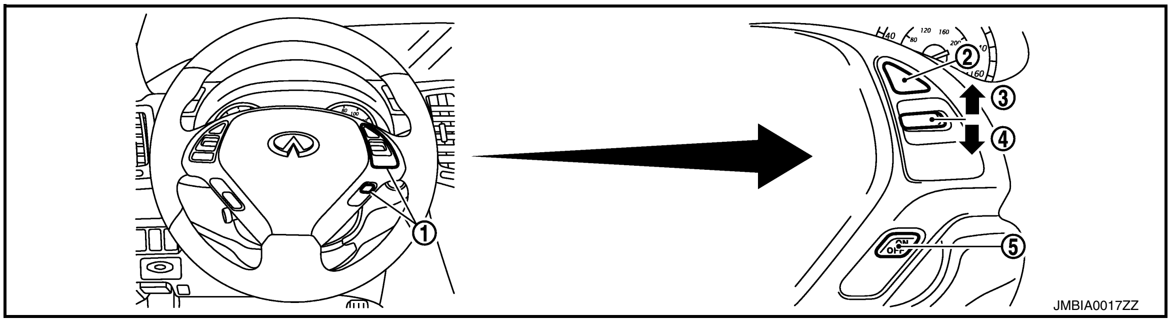
1. Accelerator pedal position sensor
2. ECM



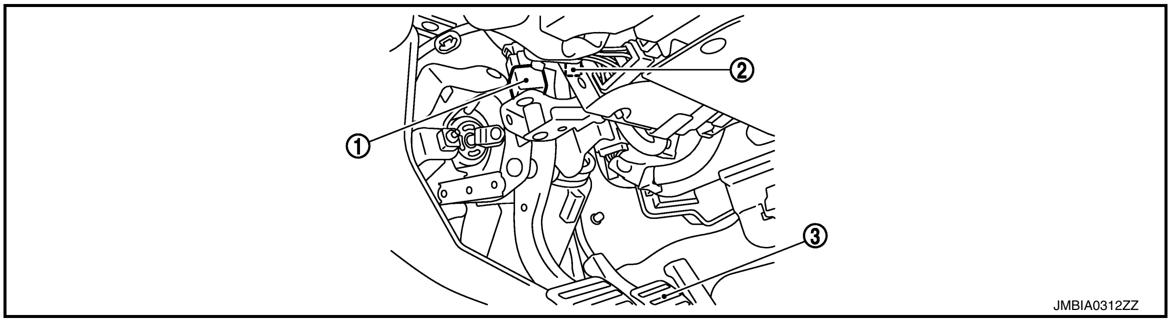
1. Snow mode switch



1. ICC steering switch
2. CANCEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. DISTANCE switch
6. MAIN switch
7. LDP/DCA switch



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



1. Stop lamp switch
2. ASCD brake switch (ASCD models)
ICC brake switch (ICC models)
3. Brake pedal

Component Description

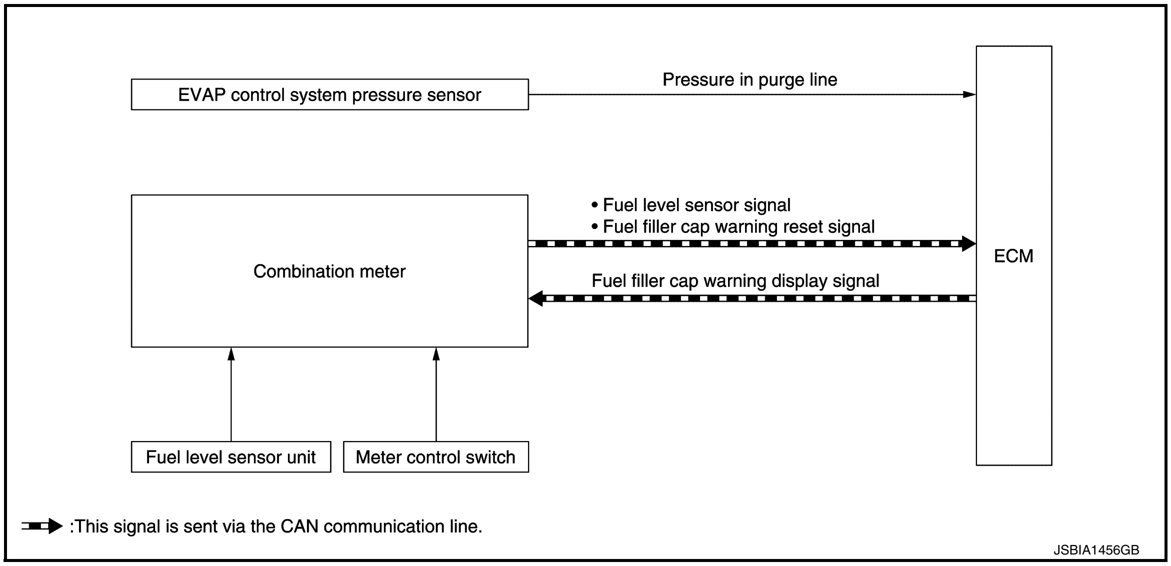
INFOID:0000000010596709

Component	Reference
A/F sensor 1	EC-224, "Description"
Accelerator pedal position sensor	EC-476, "Description"
Camshaft position sensor (PHASE)	EC-301, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Engine coolant temperature sensor	EC-209, "Description"
EVAP canister purge volume control solenoid valve	EC-315, "Description"
EVAP control system pressure sensor	EC-331, "Description"
Fuel tank temperature sensor	EC-270, "Description"
Mass air flow sensor	EC-188, "Description"
Throttle position sensor	EC-212, "Description"

FUEL FILLER CAP WARNING SYSTEM

System Diagram

INFOID:0000000010596710


EVAP control system pressure sensor
Pressure in purge line
ECM
• Fuel level sensor signal
• Fuel filler cap warning reset signal
Combination meter
Fuel filler cap warning display signal
Fuel level sensor unit
Meter control switch
:This signal is sent via the CAN communication line.
JSBIA1456GB

System Description

INFOID:0000000010596711

INPUT/OUTPUT SIGNAL CHART

Input

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

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

Output

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

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

SYSTEM DESCRIPTION

The fuel filler cap warning system alerts the driver to the prevention of the fuel filler being left uncapped and malfunction occurrences after refueling, by turning ON the fuel filler cap warning display on the combination meter.

ECM judges a refueled state, based on a fuel level signal transmitted from the combination meter.

When a very small leak is detected through the EVAP leak diagnosis performed after judging the refueled state, ECM transmits a fuel filler cap warning display signal (request for display ON) to the combination meter via CAN communication.

When receiving the signal, the combination meter turns ON the fuel filler cap warning display.

CAUTION:

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

Reset Operation

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

- Reset operation is performed by operating the meter control switch on the combination meter.
- When the reset operation is performed, the combination meter transmits a fuel filler cap warning reset signal to ECM via CAN communication. ECM transmits a fuel filler cap warning display signal (request for display OFF) to the combination meter via CAN communication. When receiving the signal, the combination meter turns OFF the fuel filler cap warning display.
- EVAP leak diagnosis result is normal.
- Fuel refilled.

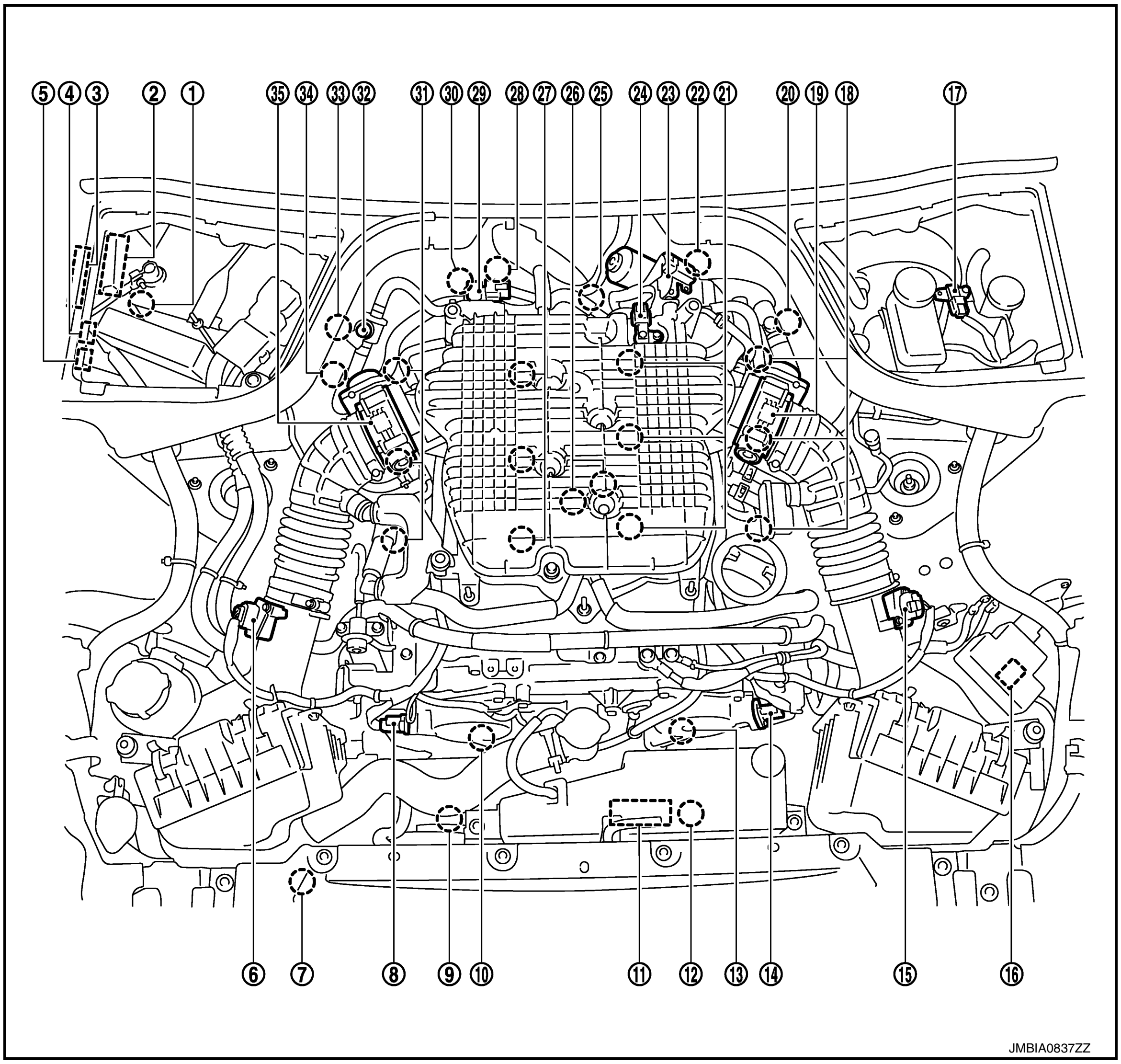
- DTC erased by using CONSULT.

NOTE:

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

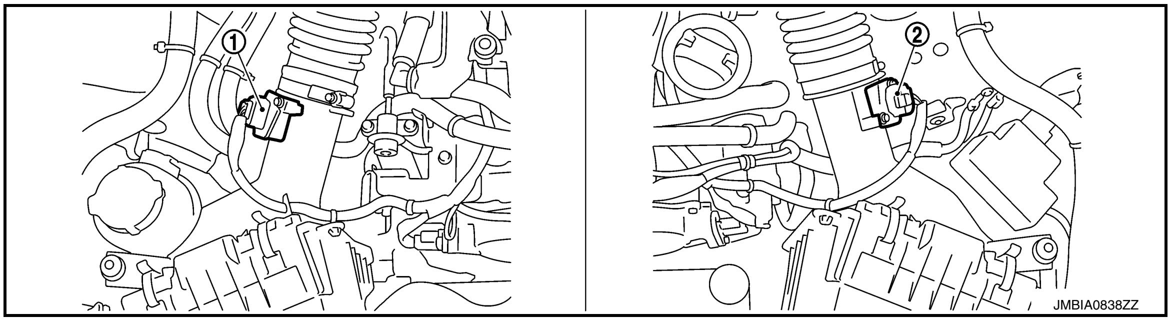
Component Parts Location

INFOID:0000000010596712

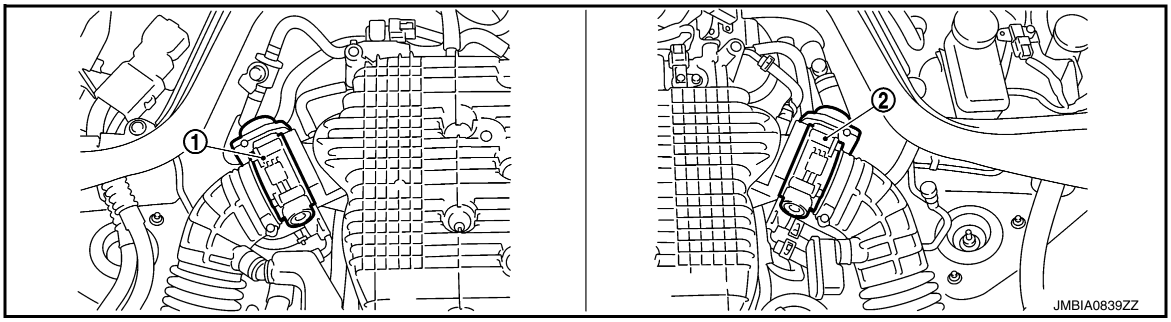


1.	Battery current sensor	2.	IPDM E/R	3.	VVEL control module
4.	Cooling fan relay	5.	VVEL actuator motor relay	6.	Mass air flow sensor (with intake air temperature sensor) (bank 1)
7.	Refrigerant pressure sensor	8.	Camshaft position sensor (PHASE) (bank 1)	9.	Cooling fan motor-2
10.	Intake valve timing control solenoid valve (bank 1)	11.	Cooling fan control module	12.	Cooling fan motor-1
13.	Intake valve timing control solenoid valve (bank 2)	14.	Camshaft position sensor (PHASE) (bank 2)	15.	Mass air flow sensor (bank 2)
16.	ICC brake hold relay (ICC models)	17.	Brake booster pressure sensor	18.	Ignition coil (with power transistor) and spark plug (bank 2)
19.	Electric throttle control actuator (bank 2)	20.	A/F sensor 1 (bank 2)	21.	Fuel injector (bank 2)
22.	VVEL control shaft position sensor (bank 2)	23.	VVEL actuator motor (bank 2)	24.	Manifold absolute pressure (MAP) sensor
25.	Engine coolant temperature sensor	26.	Knock sensor	27.	Fuel injector (bank 1)

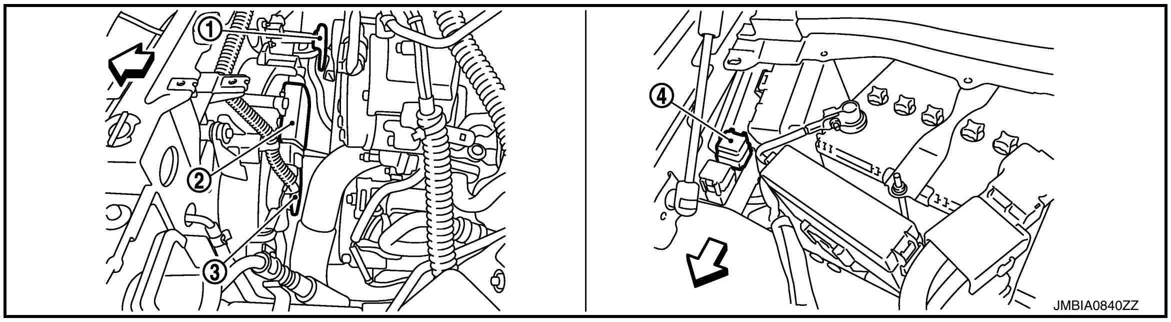
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

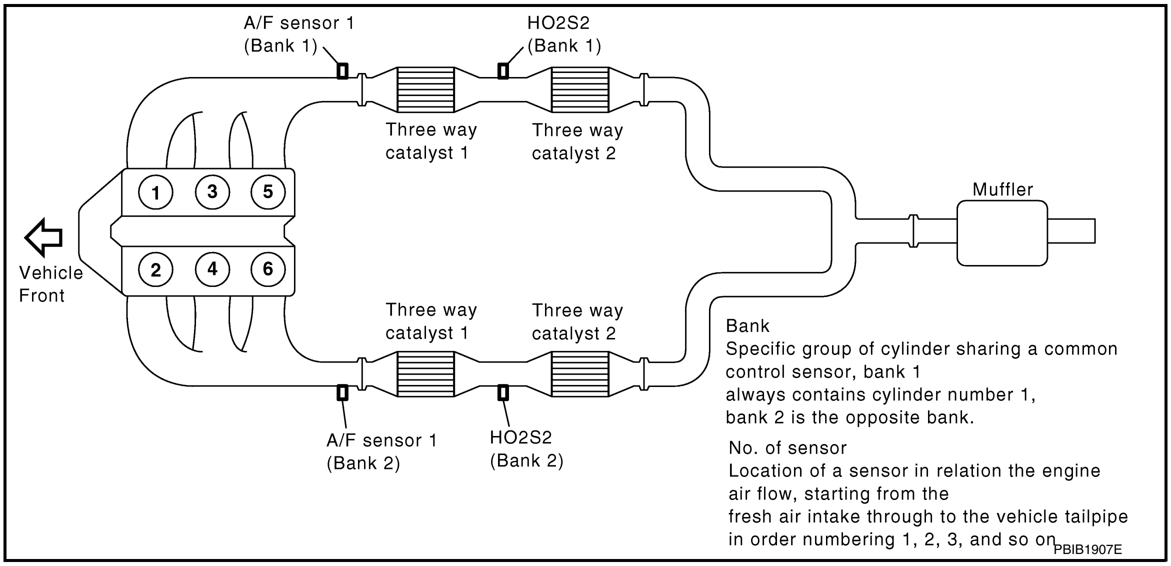


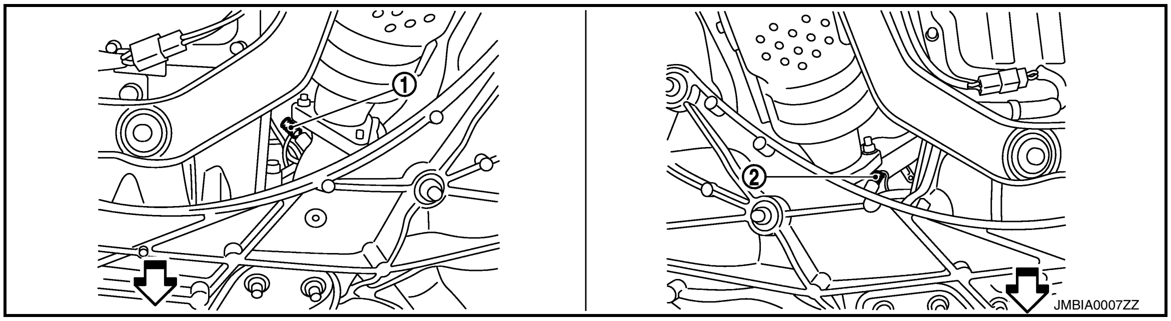
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

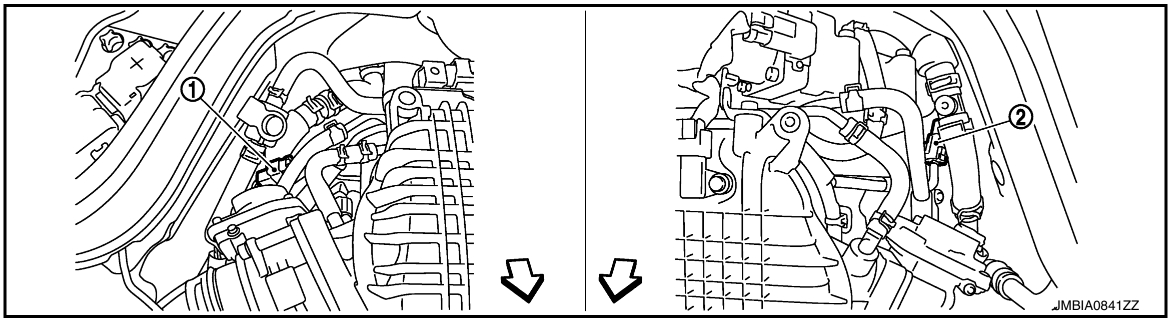
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1 (Bank 1)
HO2S2 (Bank 1)
Three way catalyst 1
Three way catalyst 2
Muffler
1
3
5
2
4
6
Vehicle Front
Three way catalyst 1
Three way catalyst 2
Bank
Specific group of cylinder sharing a common control sensor, bank 1 always contains cylinder number 1, bank 2 is the opposite bank.
A/F sensor 1 (Bank 2)
HO2S2 (Bank 2)
No. of sensor
Location of a sensor in relation the engine air flow, starting from the fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on
PBIB1907E



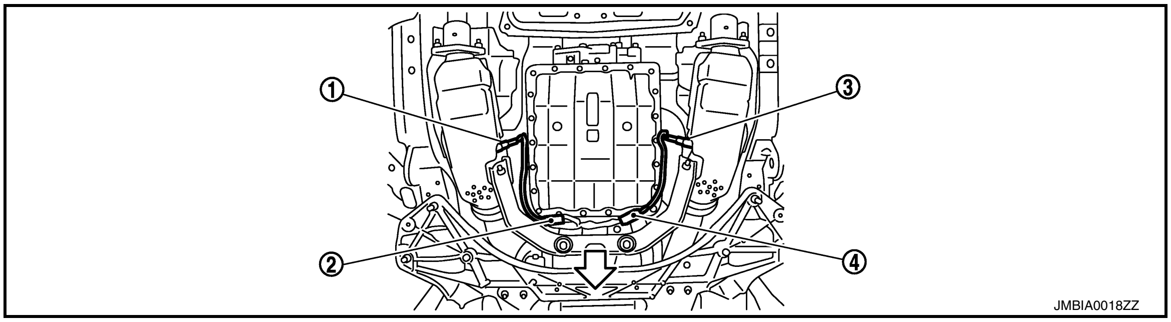
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



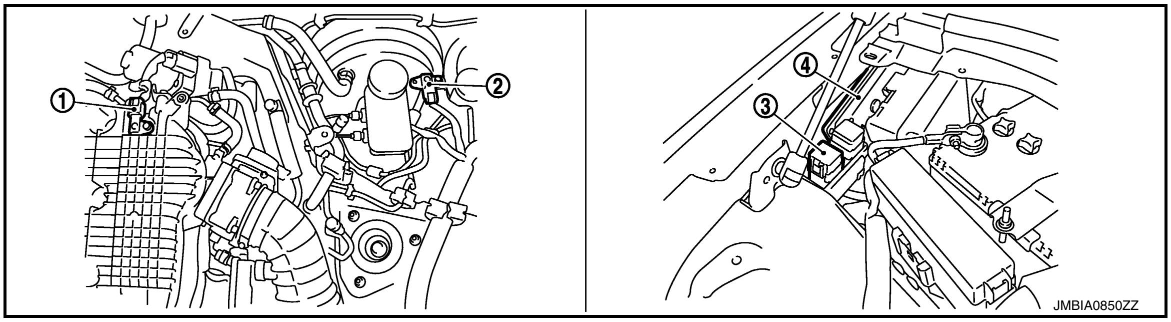
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

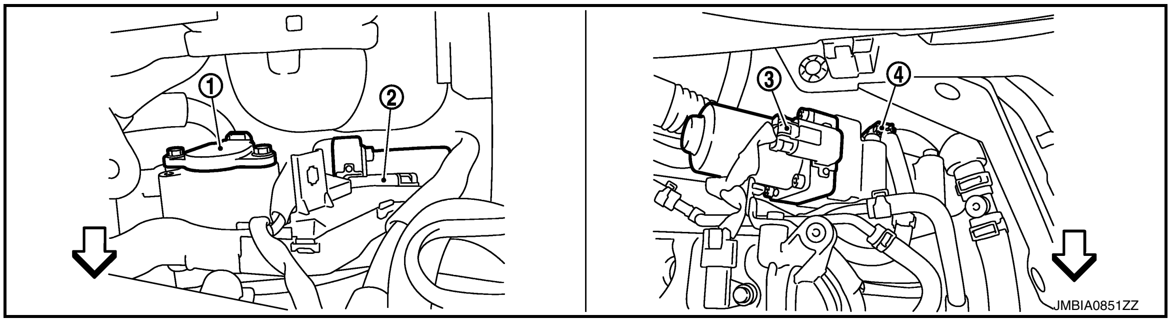


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

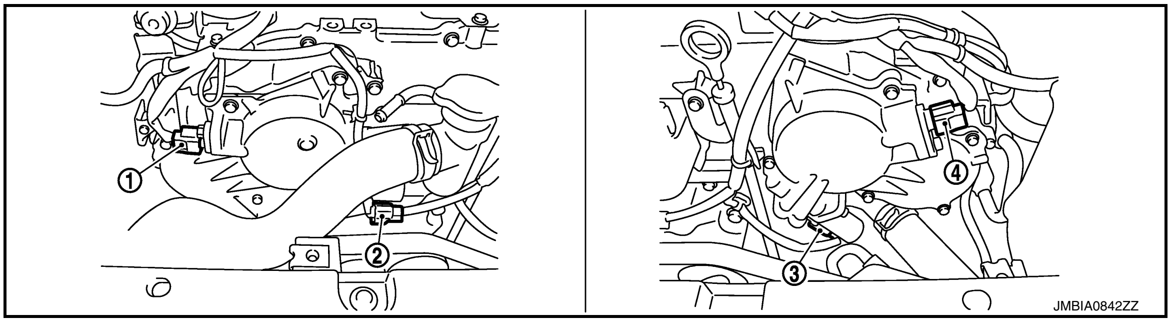


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

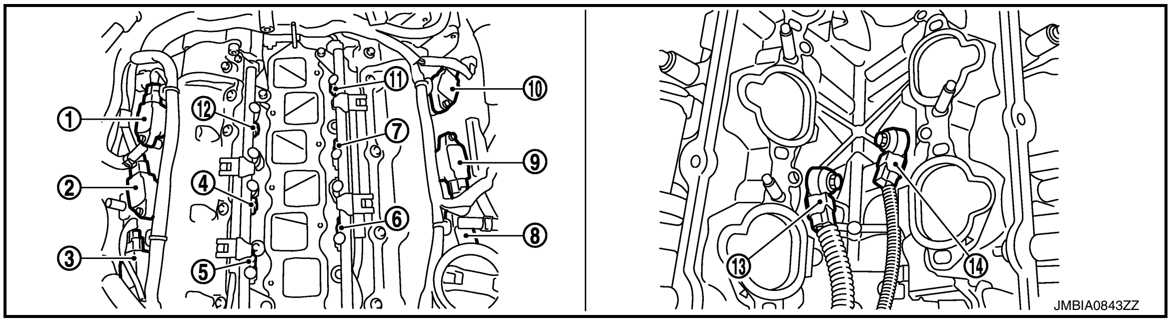


⇦ : Vehicle front

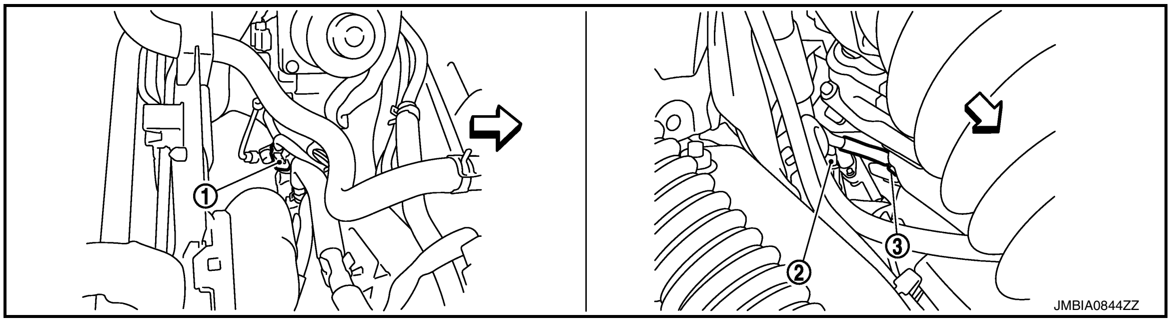
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

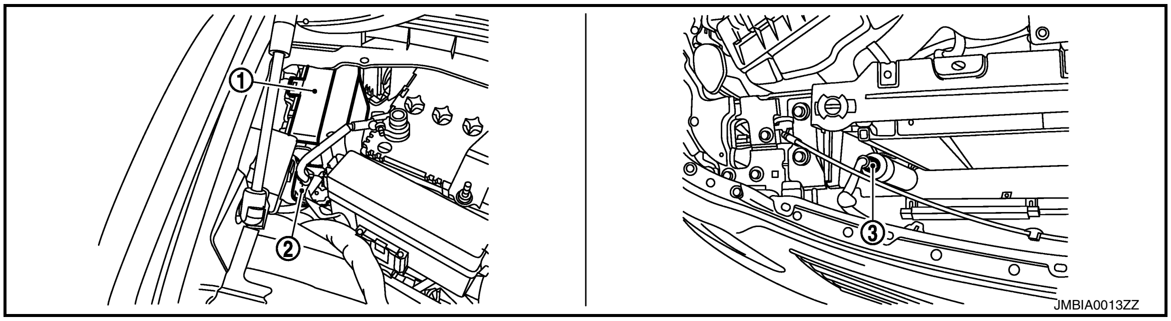


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

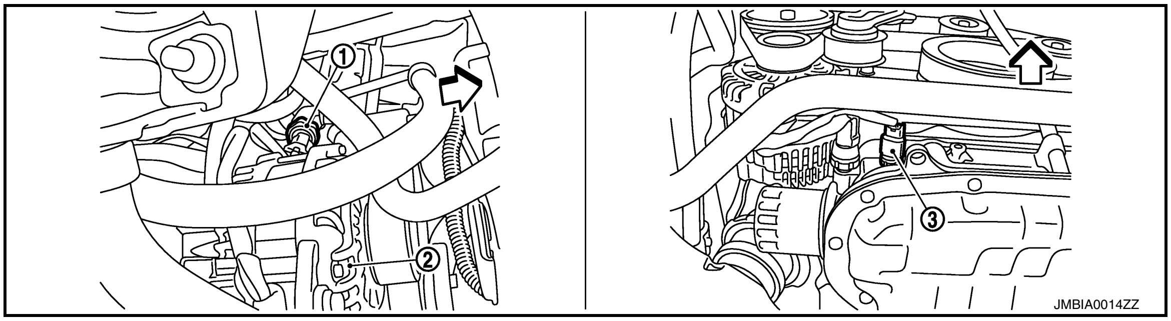


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

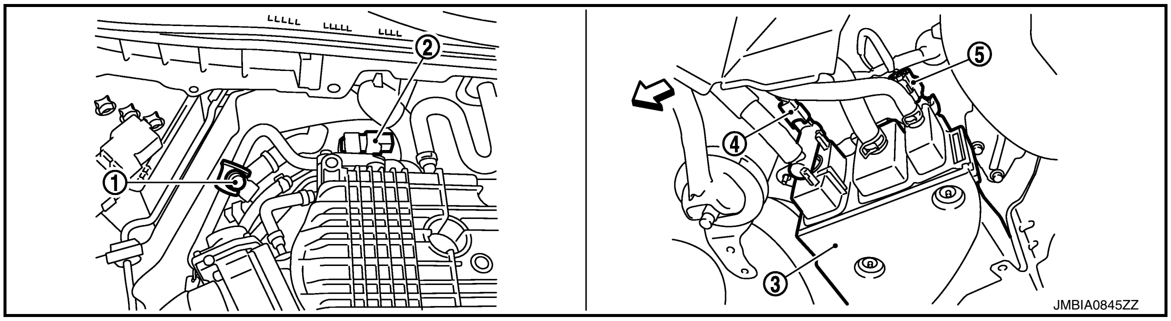


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



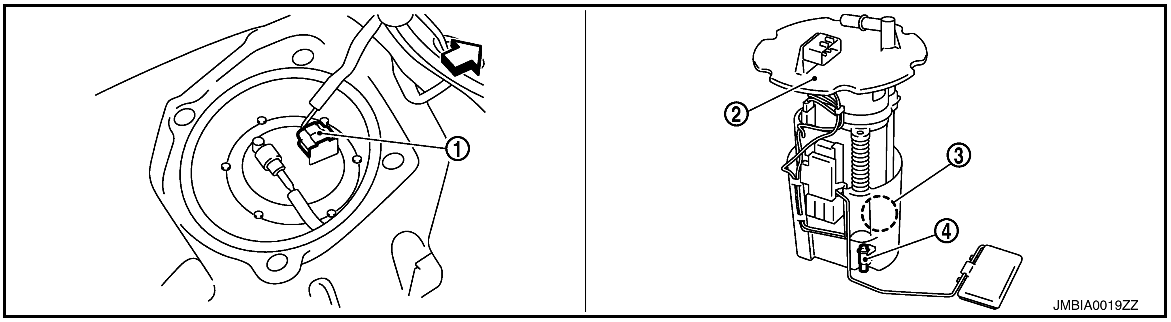
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



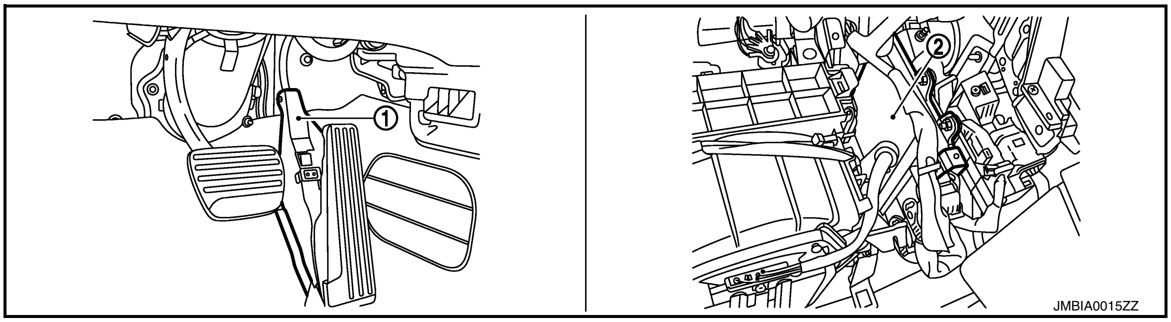
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

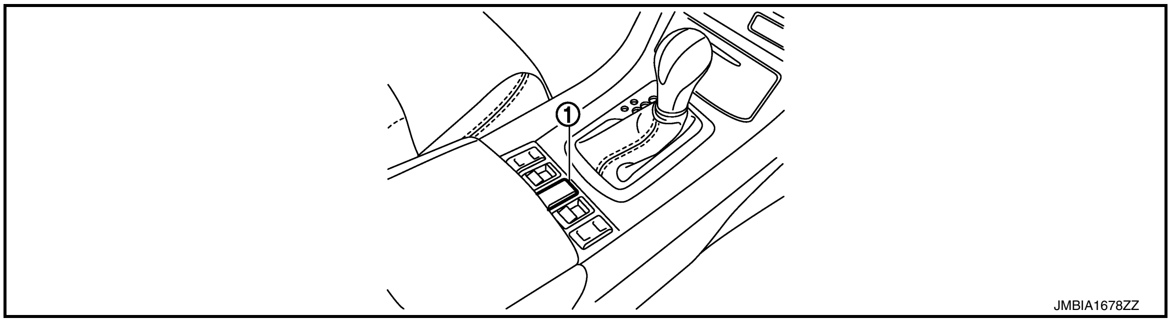


⇦ : Vehicle front

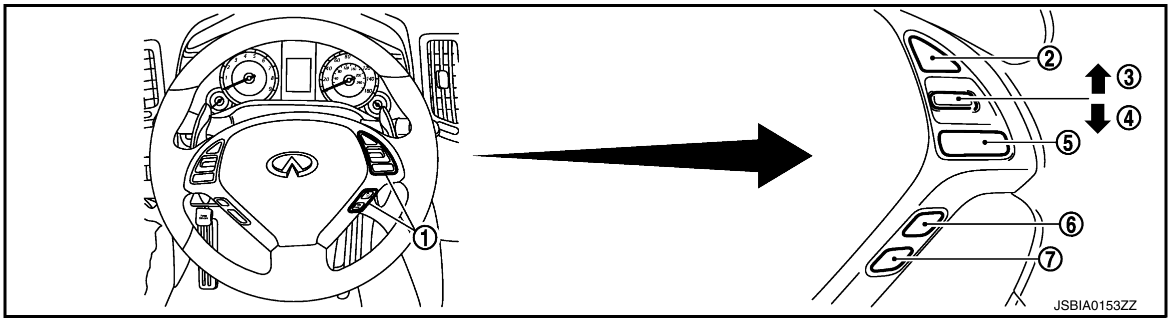
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



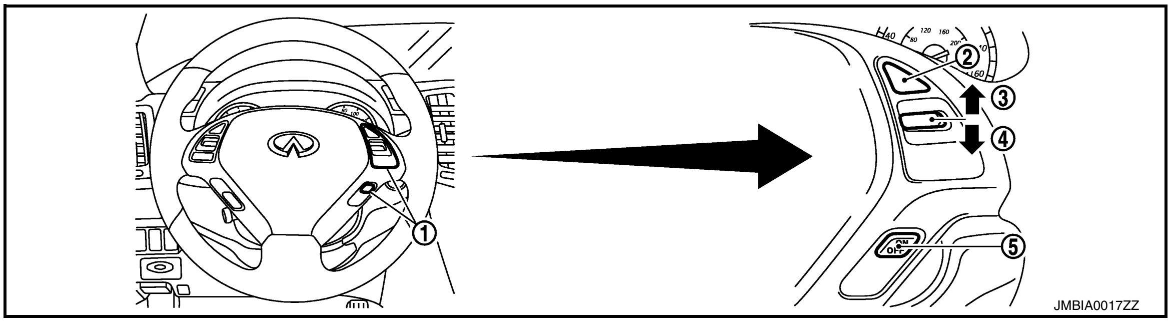
1. Accelerator pedal position sensor
2. ECM



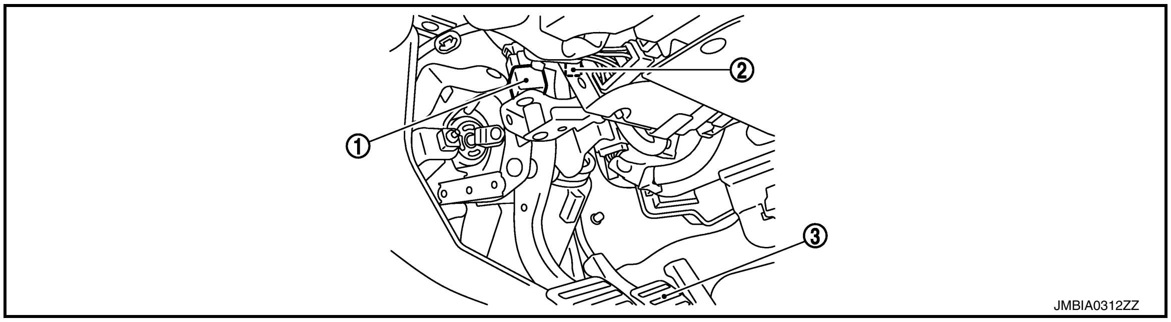
1. Snow mode switch



1. ICC steering switch	2. CANCEL switch	3. RESUME/ACCELERATE switch
4. SET/COAST switch	5. DISTANCE switch	6. MAIN switch
7. LDP/DCA switch		



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



1. Stop lamp switch	2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)	3. Brake pedal

Component Description

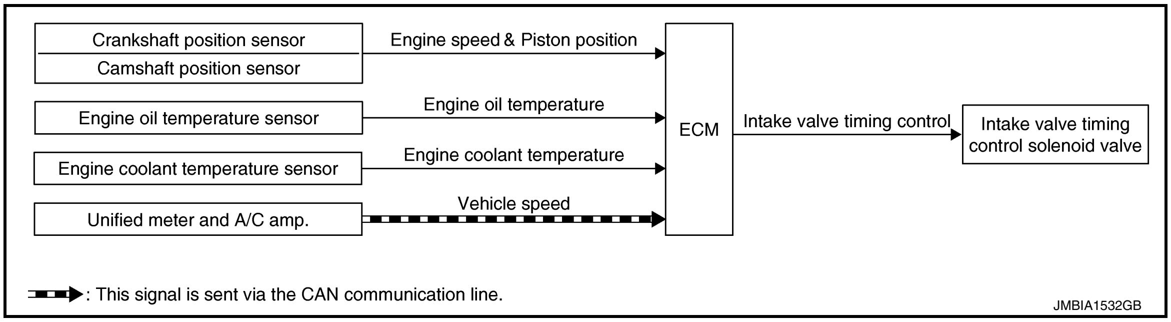
INFOID:0000000010596713

Component	Reference
EVAP control system pressure sensor	EC-331, "Description"
Fuel level sensor	EC-352, "Description"

INTAKE VALVE TIMING CONTROL

System Diagram

INFOID:0000000010596714


Crankshaft position sensor
Camshaft position sensor
Engine speed & Piston position
Engine oil temperature sensor
Engine oil temperature
Engine coolant temperature sensor
Engine coolant temperature
Unified meter and A/C amp.
Vehicle speed
ECM
Intake valve timing control
Intake valve timing control solenoid valve
: This signal is sent via the CAN communication line.
JMBIA1532GB

System Description

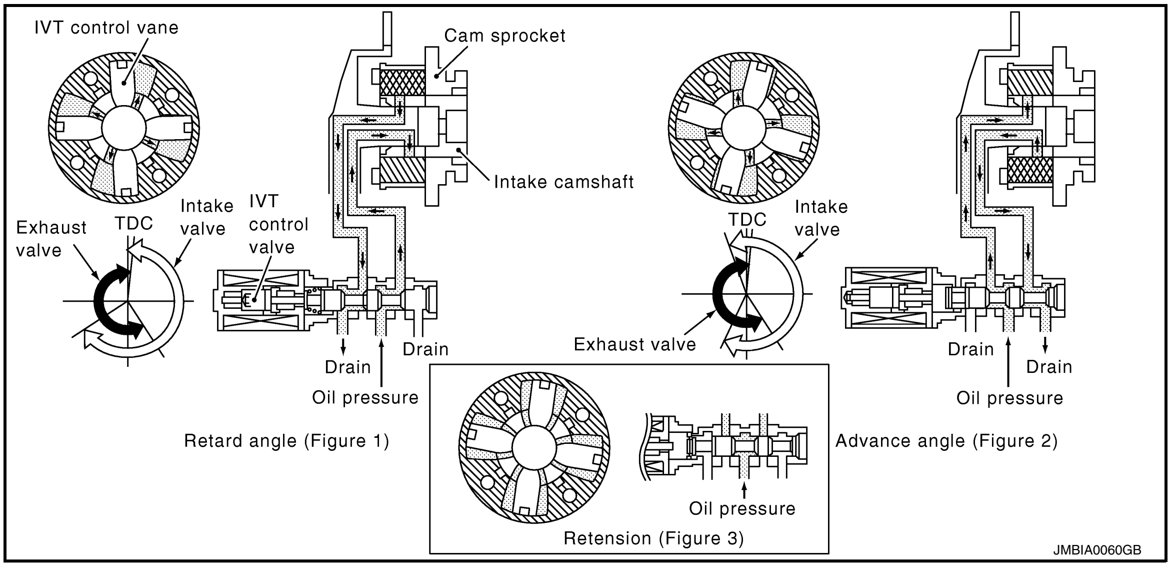
INFOID:0000000010596715

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 oil temperature sensor	Engine oil temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Unified meter and A/C amp.	Vehicle speed*		

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

SYSTEM DESCRIPTION

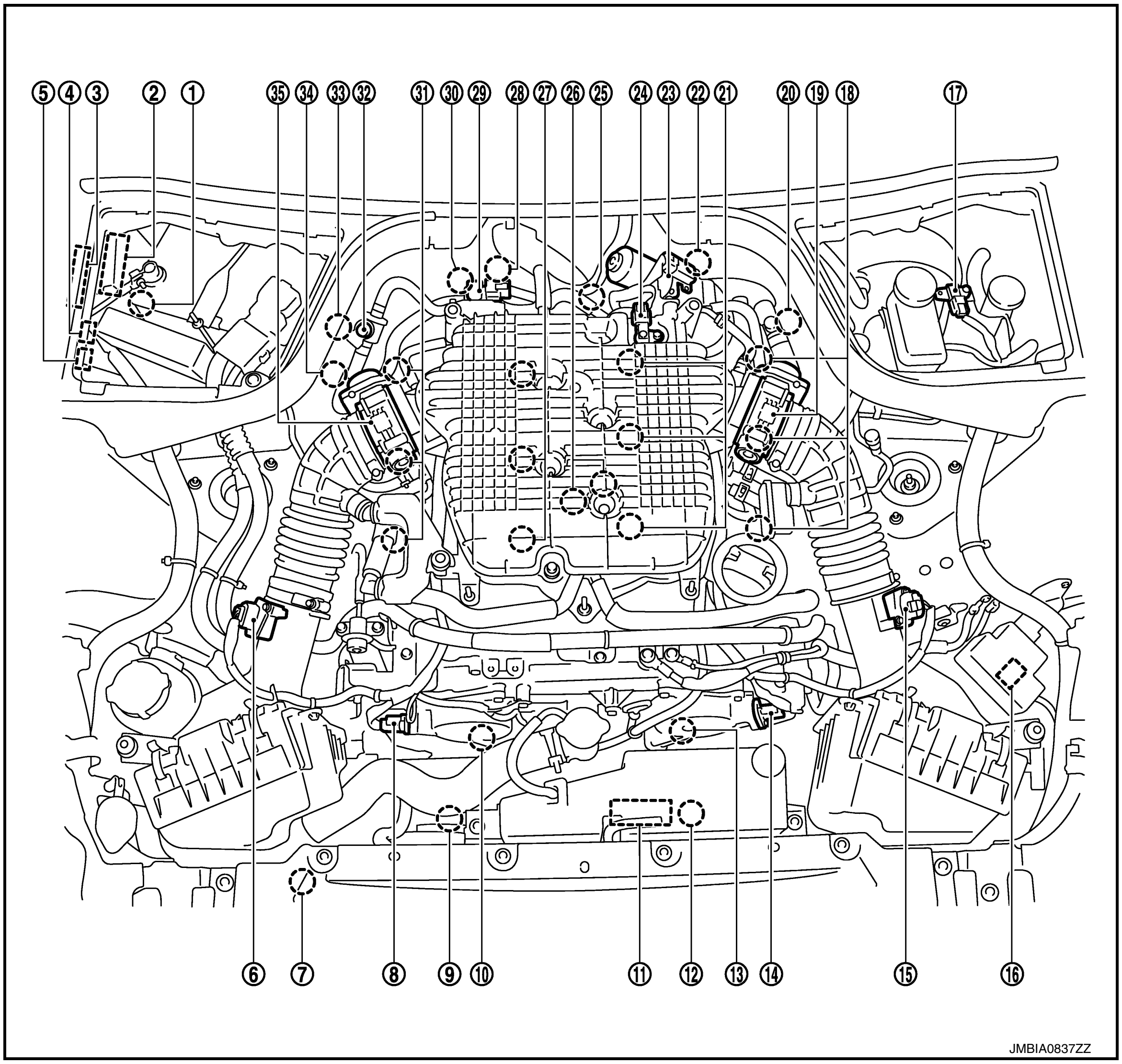


This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

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

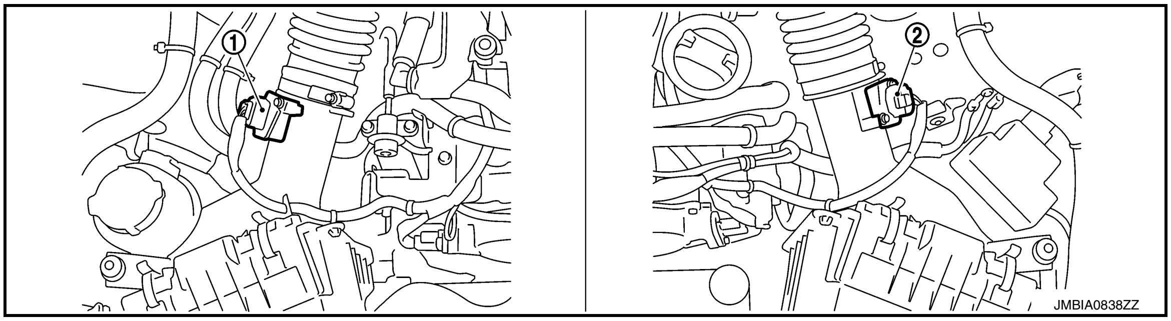
Component Parts Location

INFOID:0000000010596716

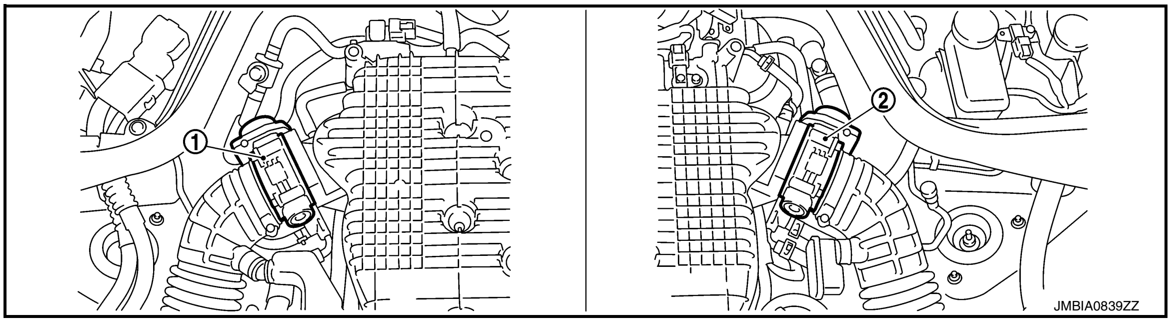


1.	Battery current sensor	2.	IPDM E/R	3.	VVEL control module
4.	Cooling fan relay	5.	VVEL actuator motor relay	6.	Mass air flow sensor (with intake air temperature sensor) (bank 1)
7.	Refrigerant pressure sensor	8.	Camshaft position sensor (PHASE) (bank 1)	9.	Cooling fan motor-2
10.	Intake valve timing control solenoid valve (bank 1)	11.	Cooling fan control module	12.	Cooling fan motor-1
13.	Intake valve timing control solenoid valve (bank 2)	14.	Camshaft position sensor (PHASE) (bank 2)	15.	Mass air flow sensor (bank 2)
16.	ICC brake hold relay (ICC models)	17.	Brake booster pressure sensor	18.	Ignition coil (with power transistor) and spark plug (bank 2)
19.	Electric throttle control actuator (bank 2)	20.	A/F sensor 1 (bank 2)	21.	Fuel injector (bank 2)
22.	VVEL control shaft position sensor (bank 2)	23.	VVEL actuator motor (bank 2)	24.	Manifold absolute pressure (MAP) sensor
25.	Engine coolant temperature sensor	26.	Knock sensor	27.	Fuel injector (bank 1)
28.	VVEL actuator motor (bank 1)	29.	EVAP canister purge volume control solenoid valve	30.	VVEL control shaft position sensor (bank 1)

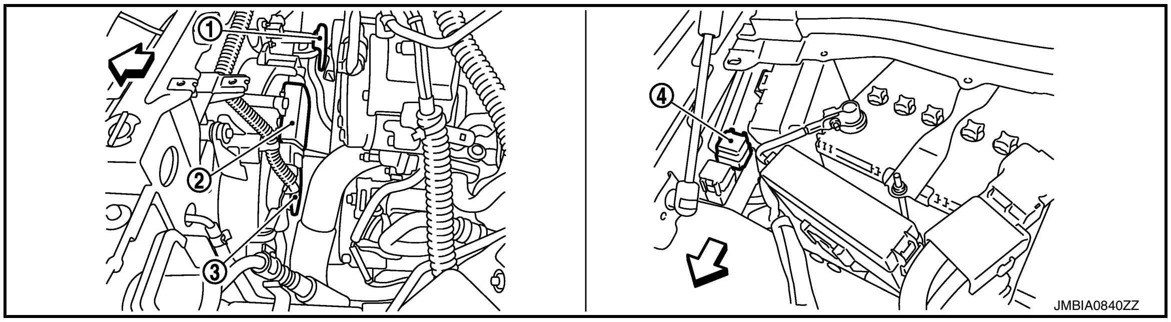
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

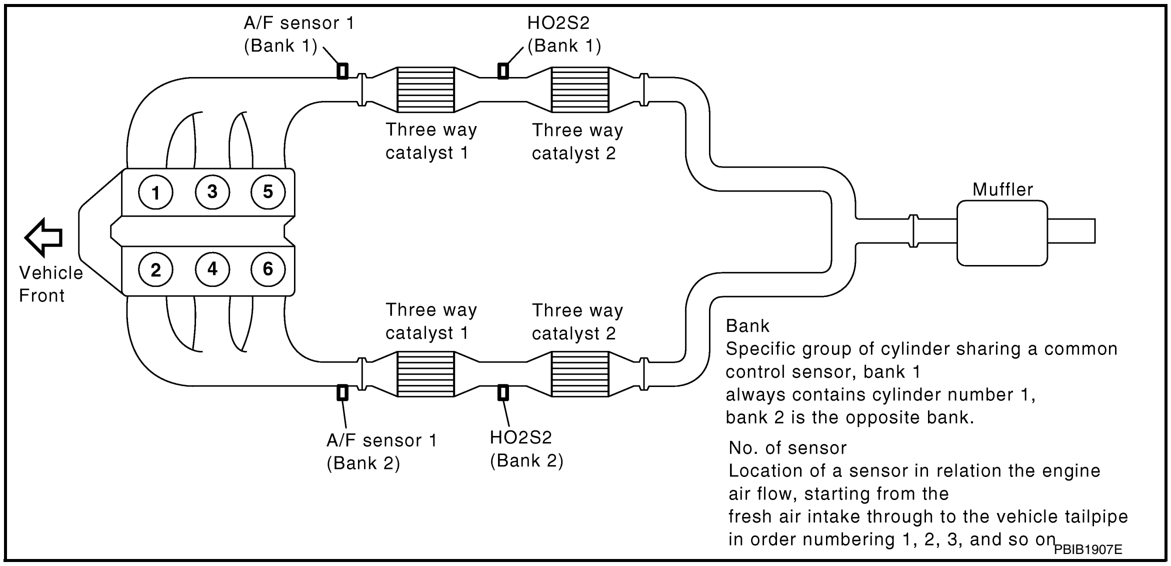


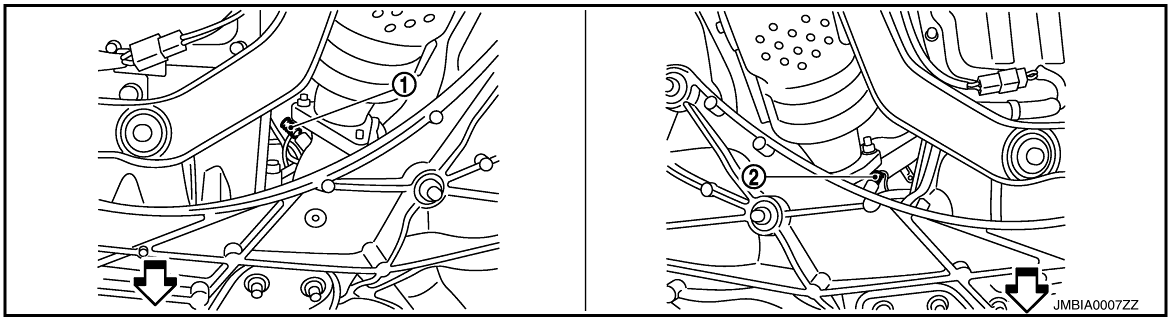
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



⇦ : Vehicle front

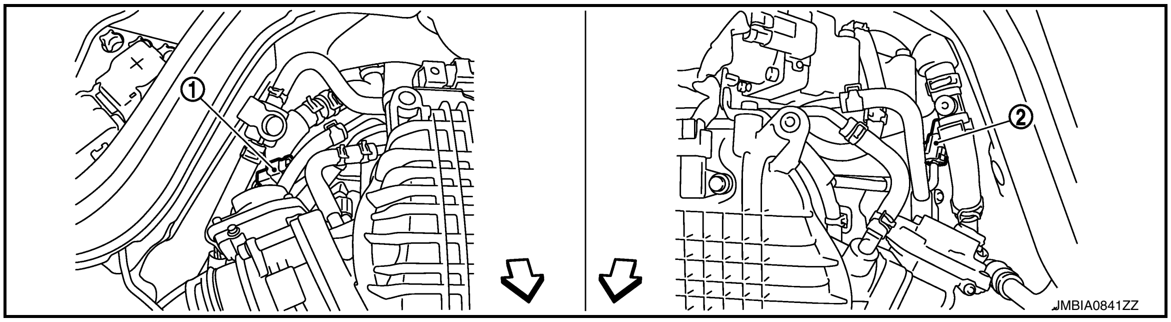
1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay


A/F sensor 1
(Bank 1)
HO2S2
(Bank 1)
Three way
catalyst 1
Three way
catalyst 2
Muffler
1
3
5
2
4
6
Vehicle
Front
Three way
catalyst 1
Three way
catalyst 2
Bank
Specific group of cylinder sharing a common
control sensor, bank 1
always contains cylinder number 1,
bank 2 is the opposite bank.
A/F sensor 1
(Bank 2)
HO2S2
(Bank 2)
No. of sensor
Location of a sensor in relation the engine
air flow, starting from the
fresh air intake through to the vehicle tailpipe
in order numbering 1, 2, 3, and so on
PBIB1907E



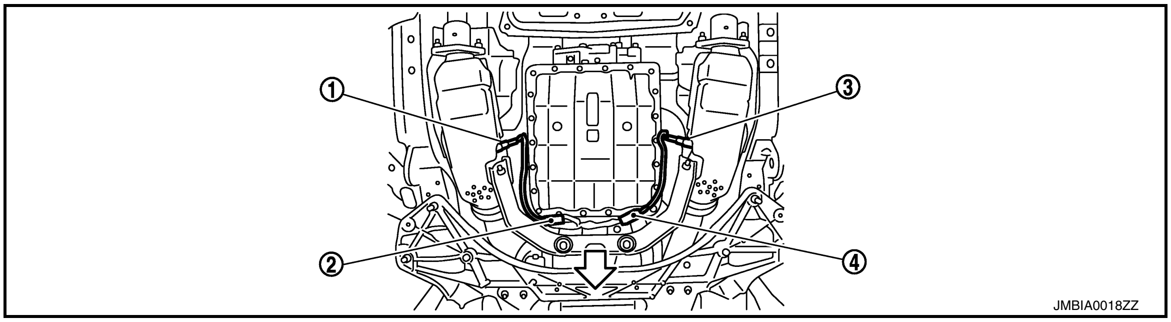
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



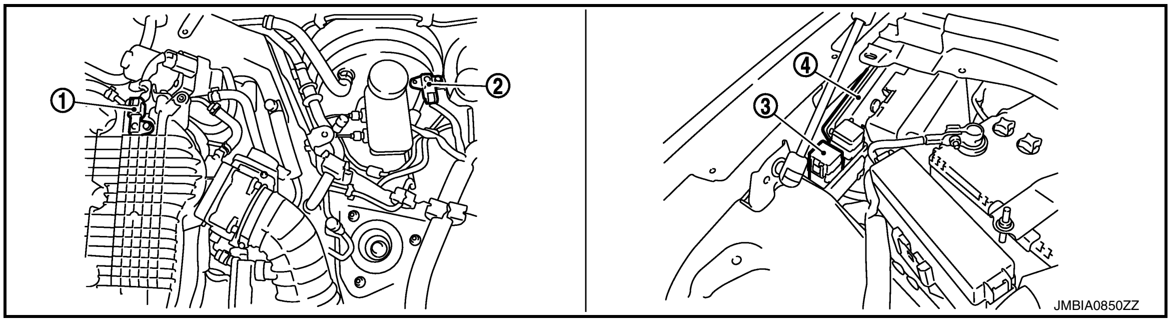
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

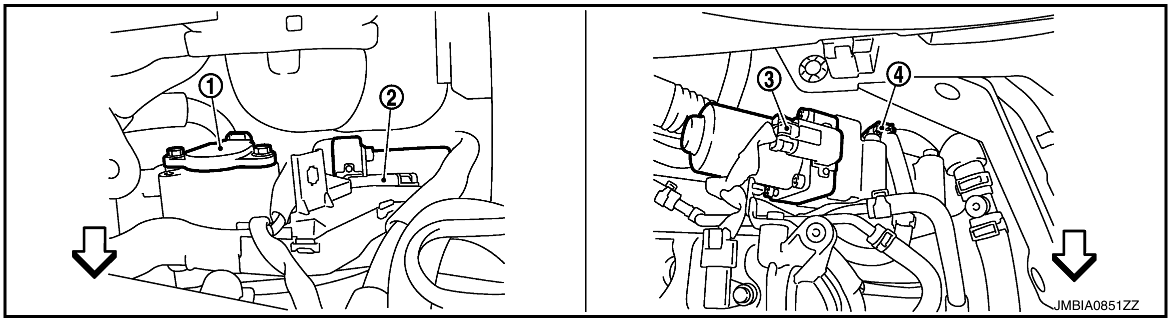


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

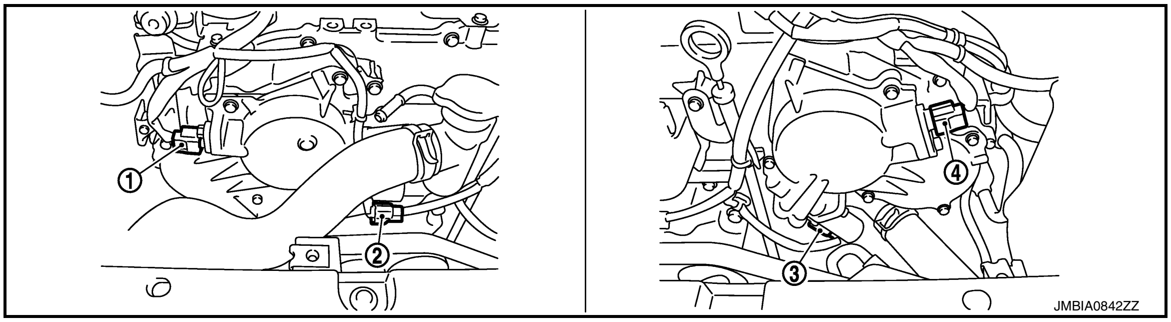


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

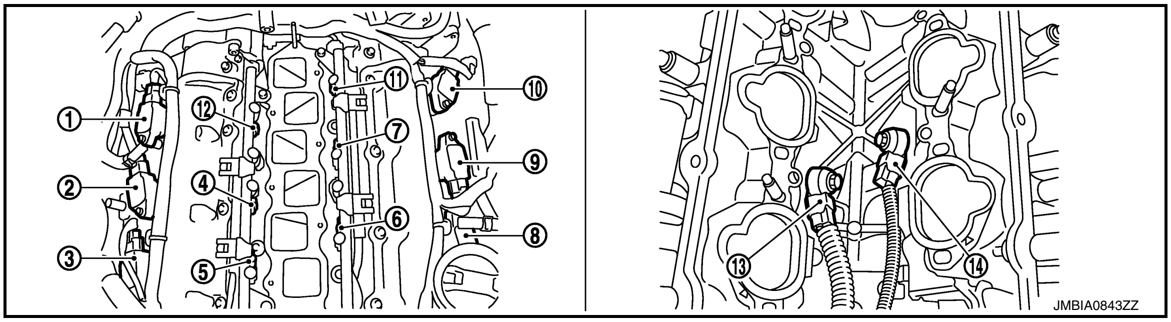


⇦ : Vehicle front

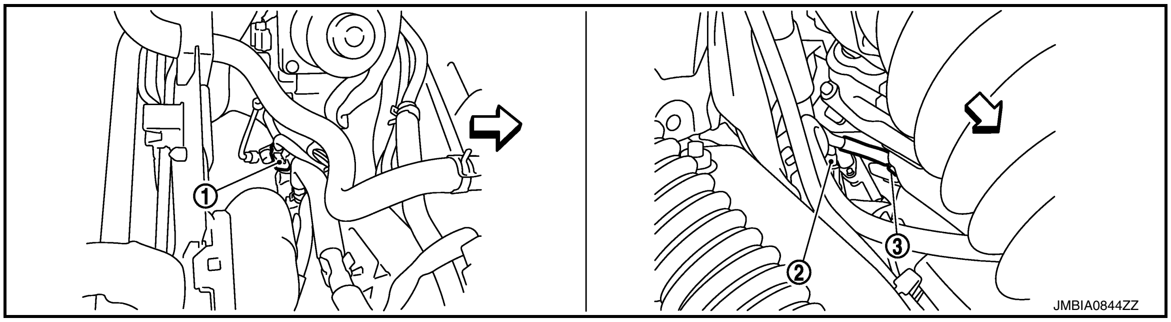
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

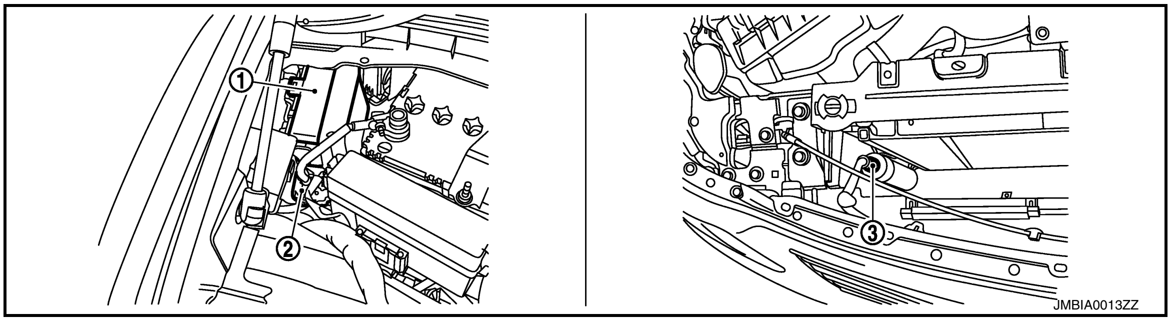


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

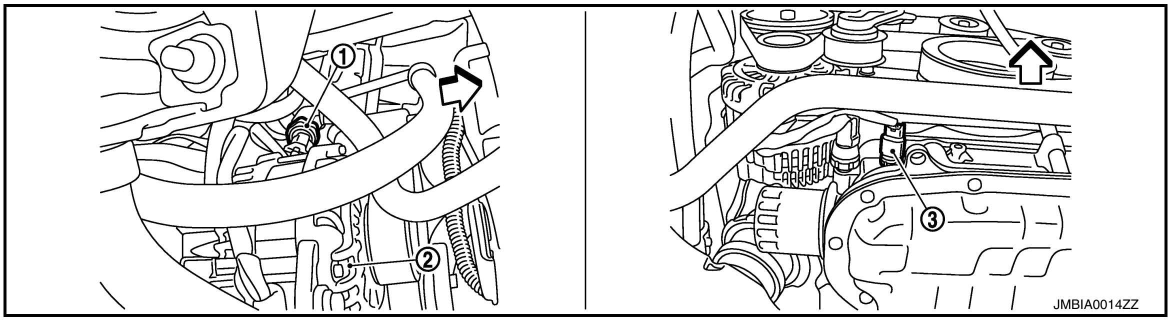


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

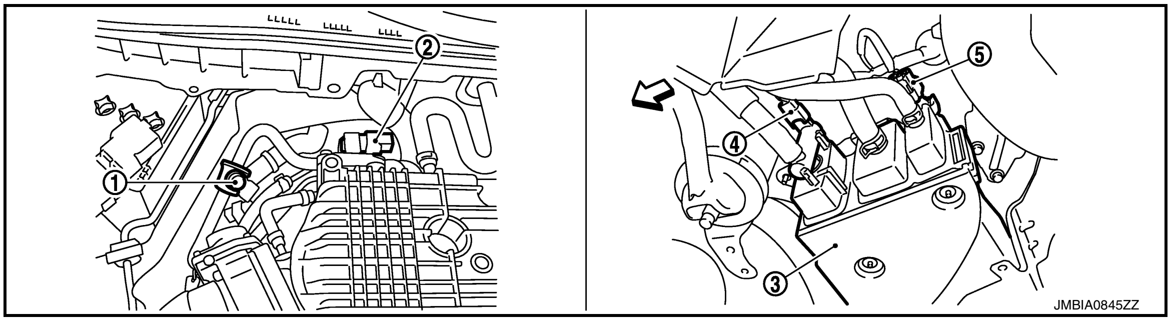


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



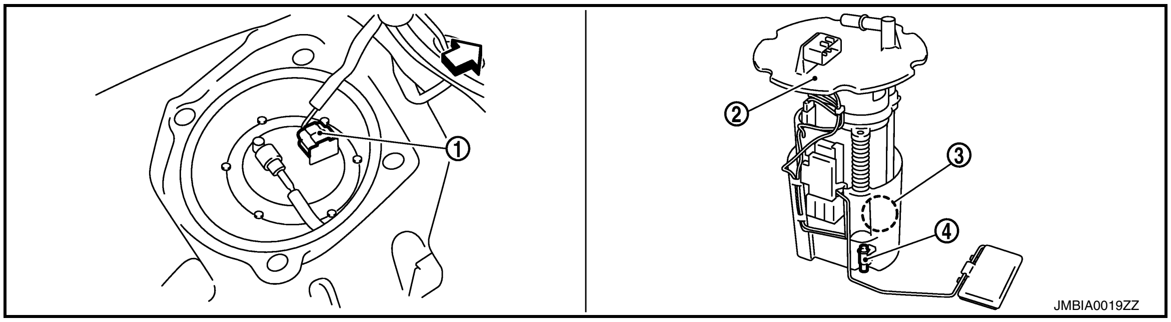
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



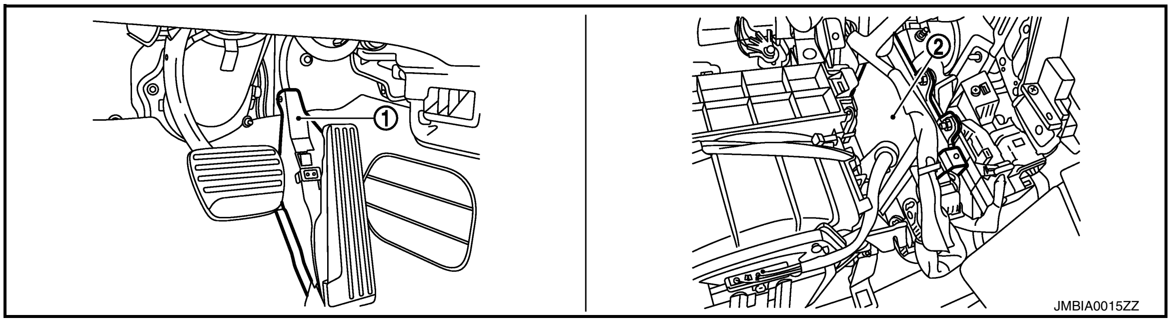
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

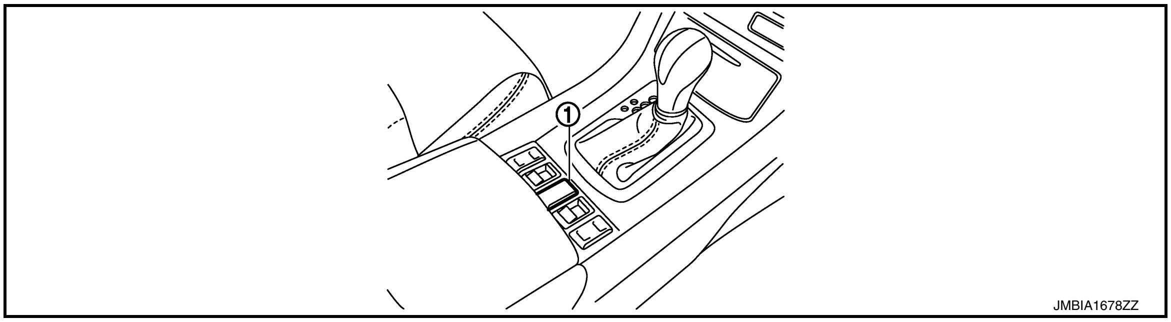


⇦ : Vehicle front

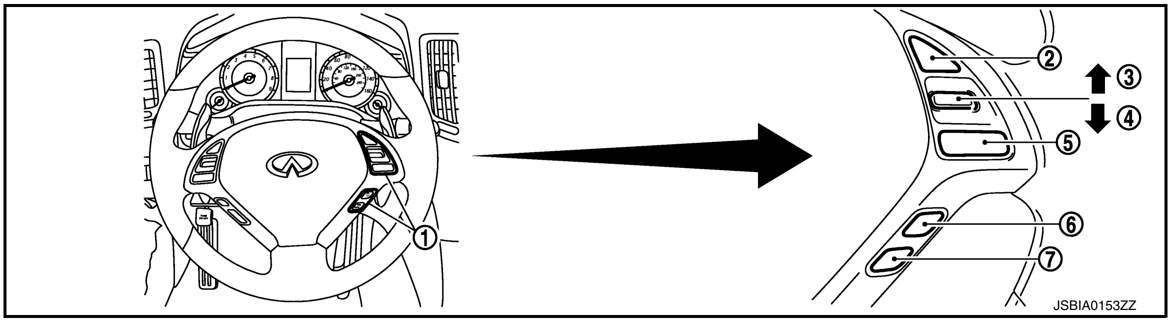
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



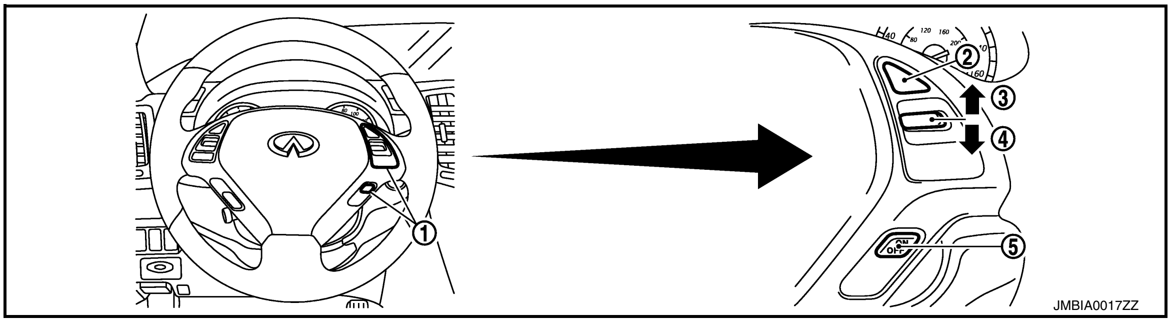
1. Accelerator pedal position sensor
2. ECM



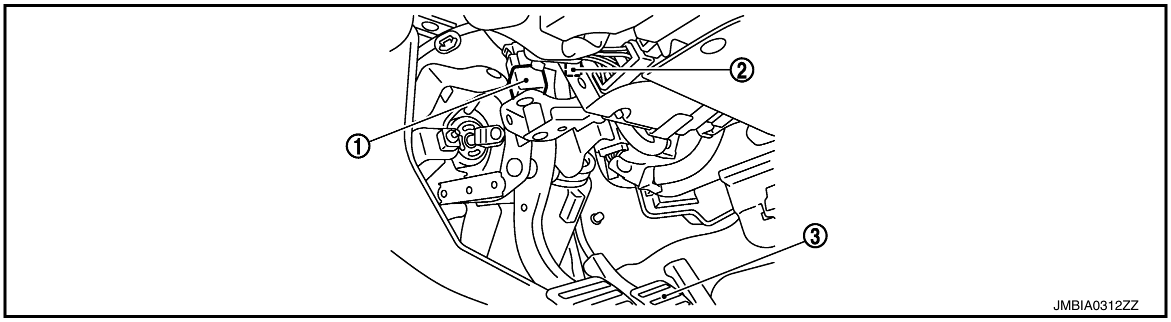
1. Snow mode switch



1. ICC steering switch
2. CANCEL switch
3. RESUME/ACCELERATE switch
4. SET/COAST switch
5. DISTANCE switch
6. MAIN switch
7. LDP/DCA switch



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



1. Stop lamp switch
2. ASCD brake switch (ASCD models)
ICC brake switch (ICC models)
3. Brake pedal

Component Description

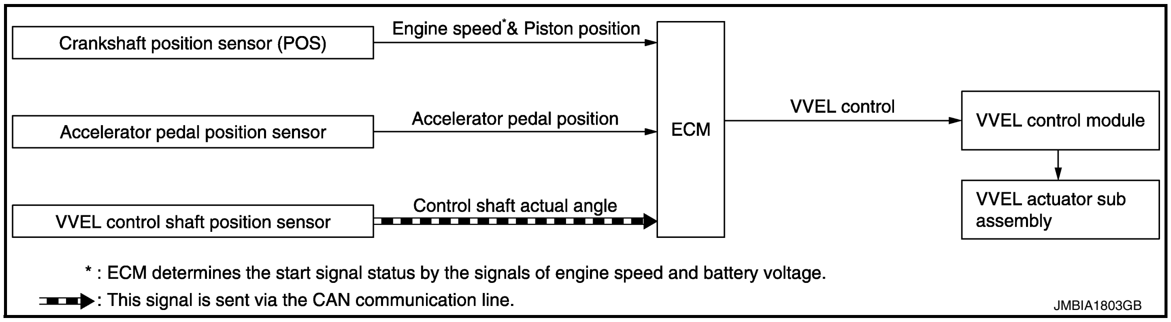
INFOID:0000000010596717

Component	Reference
Camshaft position sensor (PHASE)	EC-301, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
Engine coolant temperature sensor	EC-209, "Description"
Engine oil temperature sensor	EC-277, "Description"
Intake valve timing control solenoid valve	EC-185, "Description"

VVEL SYSTEM

System Diagram

INFOID:0000000010596718


Crankshaft position sensor (POS)
Engine speed* & Piston position
Accelerator pedal position sensor
Accelerator pedal position
VVEL control shaft position sensor
Control shaft actual angle
ECM
VVEL control
VVEL control module
VVEL actuator sub assembly
* : ECM determines the start signal status by the signals of engine speed and battery voltage.
: This signal is sent via the CAN communication line.
JMBIA1803GB

System Description

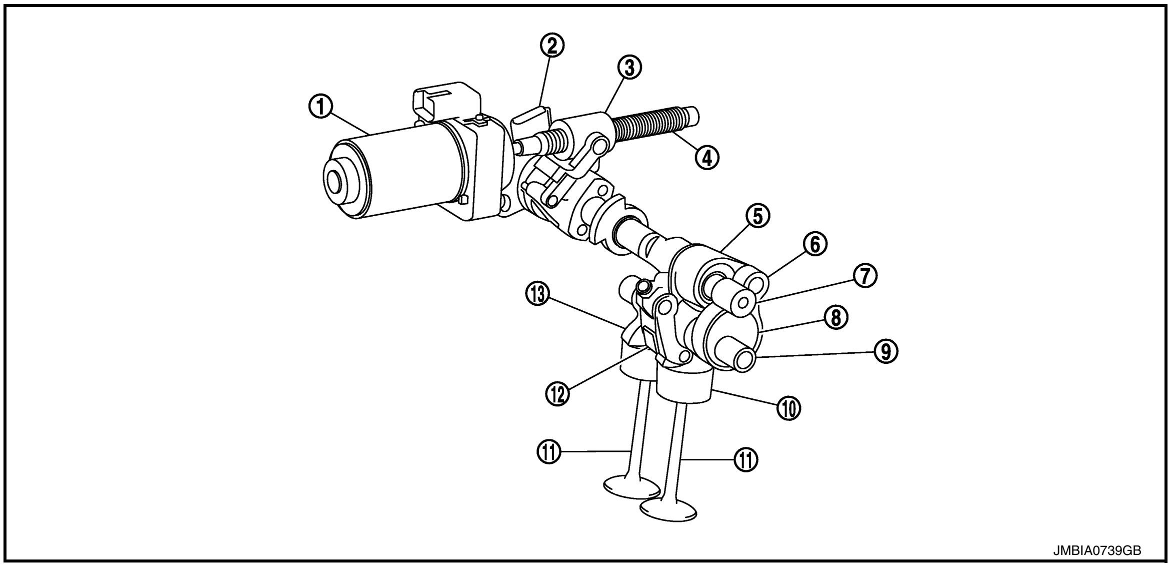
INFOID:0000000010596719

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed and piston position	VVEL control	VVEL control module ↓ VVEL actuator sub assembly
Accelerator pedal position sensor	Accelerator pedal position		
VVEL control shaft position sensor	Control shaft actual angle*		

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

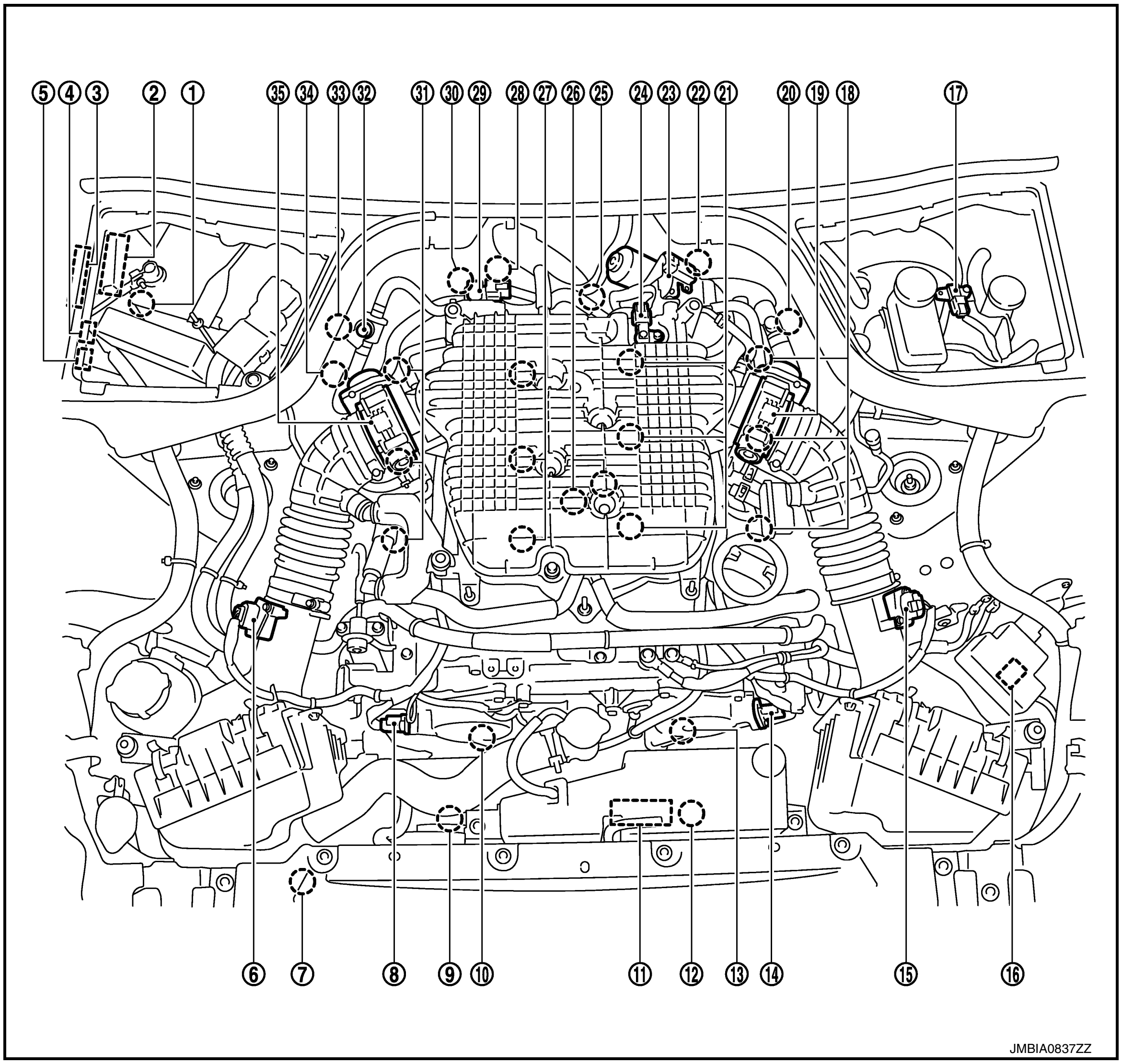
SYSTEM DESCRIPTION



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

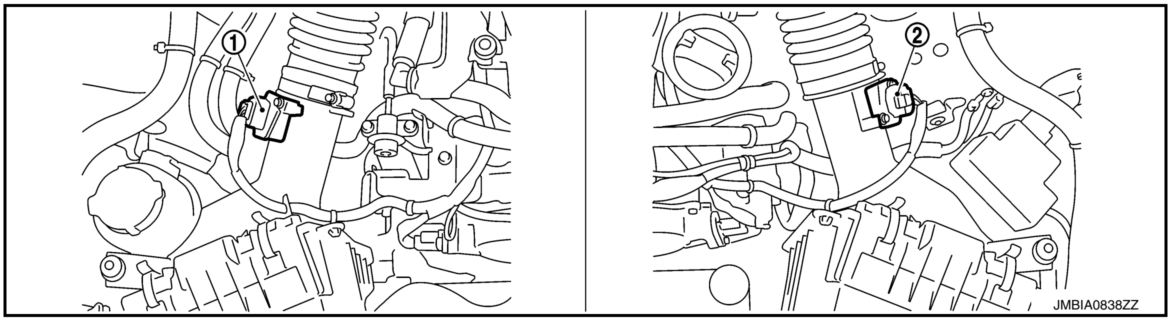
VVEL (Variable Valve Event & Lift) is a system that controls valve event and valve lift continuously. Rotational movement of the drive shaft equipped with eccentric cam is transmitted to output cam via the rocker arm and two kinds of links to depress the intake valve. ECM decides the target valve lift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

Component Parts Location

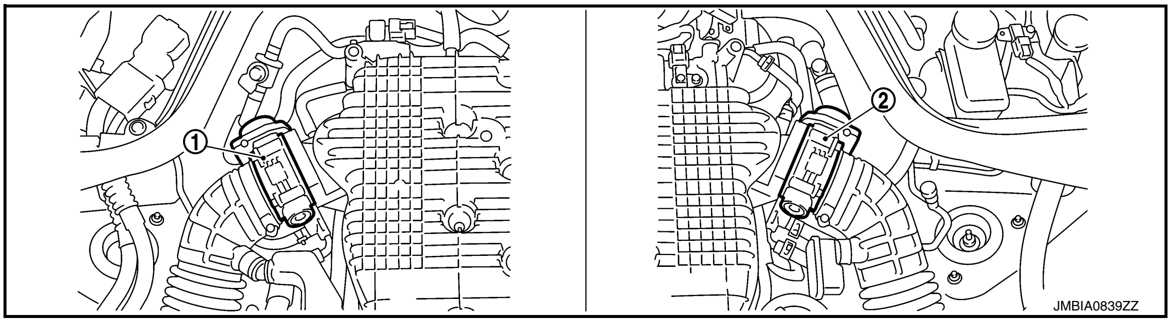


1. Battery current sensor
2. IPDM E/R
3. VVEL control module
4. Cooling fan relay
5. VVEL actuator motor relay
6. Mass air flow sensor (with intake air temperature sensor) (bank 1)
7. Refrigerant pressure sensor
8. Camshaft position sensor (PHASE) (bank 1)
9. Cooling fan motor-2
10. Intake valve timing control solenoid valve (bank 1)
11. Cooling fan control module
12. Cooling fan motor-1
13. Intake valve timing control solenoid valve (bank 2)
14. Camshaft position sensor (PHASE) (bank 2)
15. Mass air flow sensor (bank 2)
16. ICC brake hold relay (ICC models)
17. Brake booster pressure sensor
18. Ignition coil (with power transistor) and spark plug (bank 2)
19. Electric throttle control actuator (bank 2)
20. A/F sensor 1 (bank 2)
21. Fuel injector (bank 2)
22. VVEL control shaft position sensor (bank 2)
23. VVEL actuator motor (bank 2)
24. Manifold absolute pressure (MAP) sensor
25. Engine coolant temperature sensor
26. Knock sensor
27. Fuel injector (bank 1)
28. VVEL actuator motor (bank 1)
29. EVAP canister purge volume control solenoid valve
30. VVEL control shaft position sensor (bank 1)

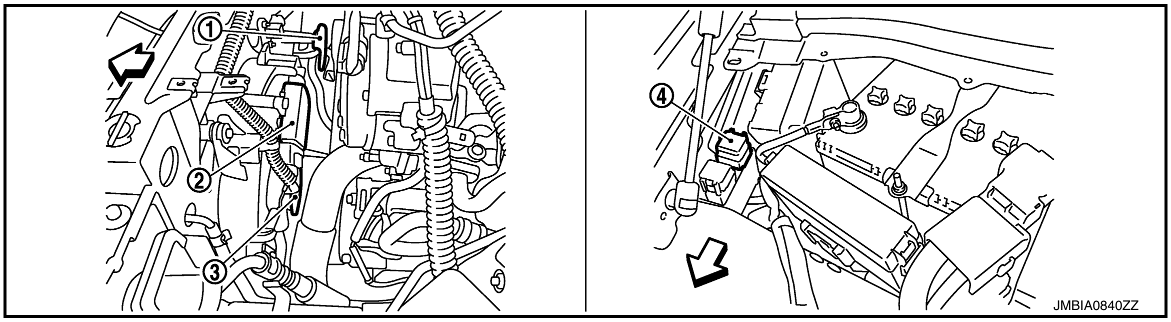
31. Ignition coil (with power transistor) and spark plug (bank 1)
32. EVAP service port
33. A/F sensor 1 (bank 1)
34. Crankshaft position sensor (POS)
35. Electric throttle control actuator (bank 1)



1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (bank 2)

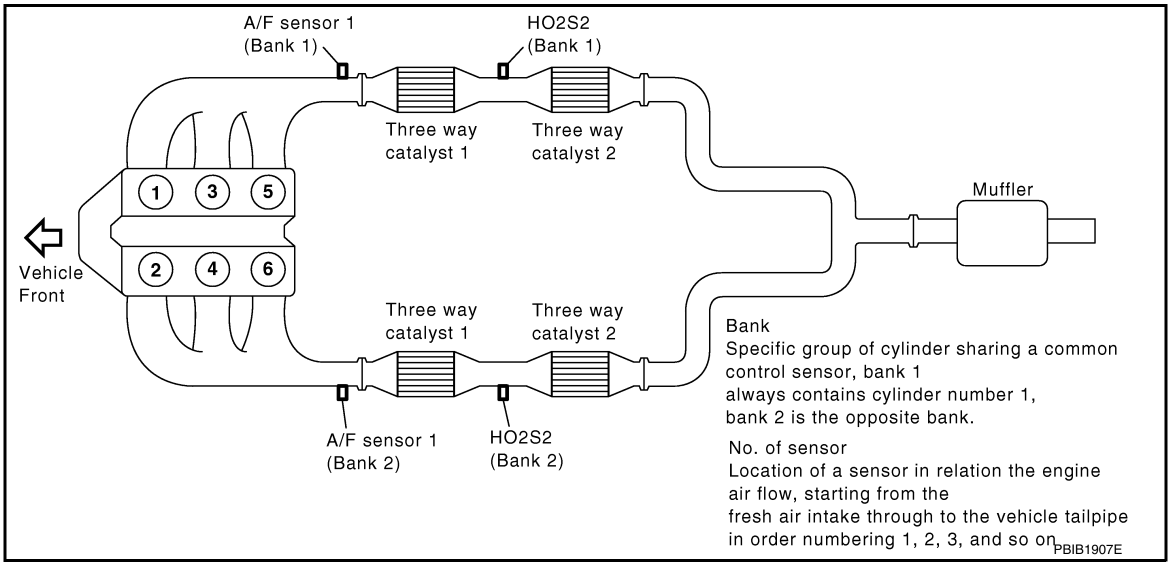


1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



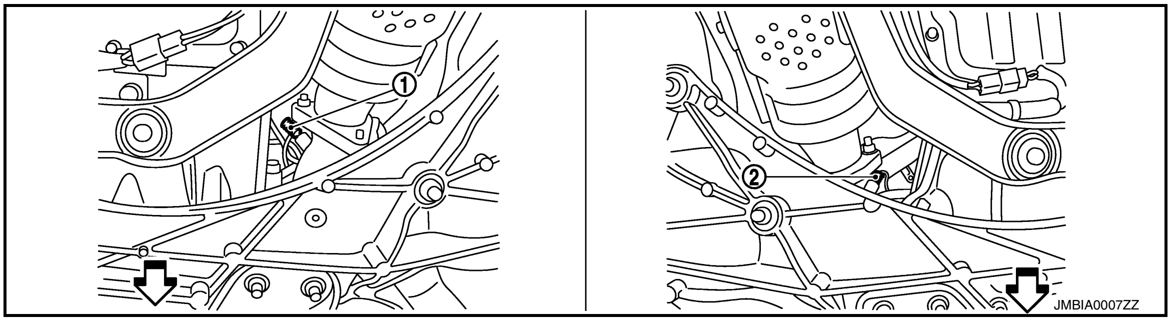
⇦ : Vehicle front

1. Cooling fan motor-2
2. Cooling fan control module
3. Cooling fan motor-1
4. Cooling fan relay



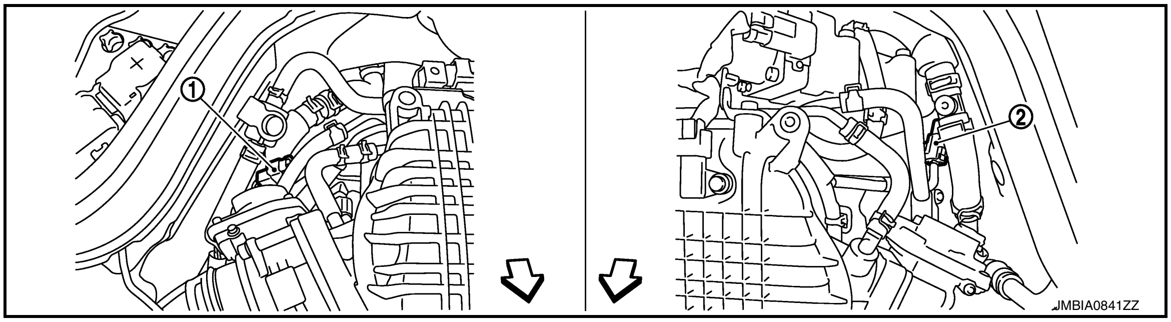
Bank
Specific group of cylinder sharing a common control sensor, bank 1 always contains cylinder number 1, bank 2 is the opposite bank.

No. of sensor
Location of a sensor in relation the engine air flow, starting from the fresh air intake through to the vehicle tailpipe in order numbering 1, 2, 3, and so on



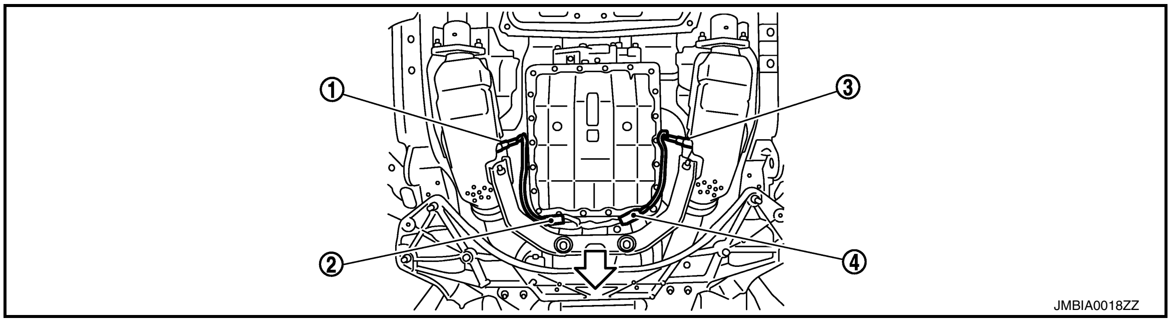
⇦ : Vehicle front

1. A/F sensor 1 (bank 1)
2. A/F sensor 1 (bank 2)



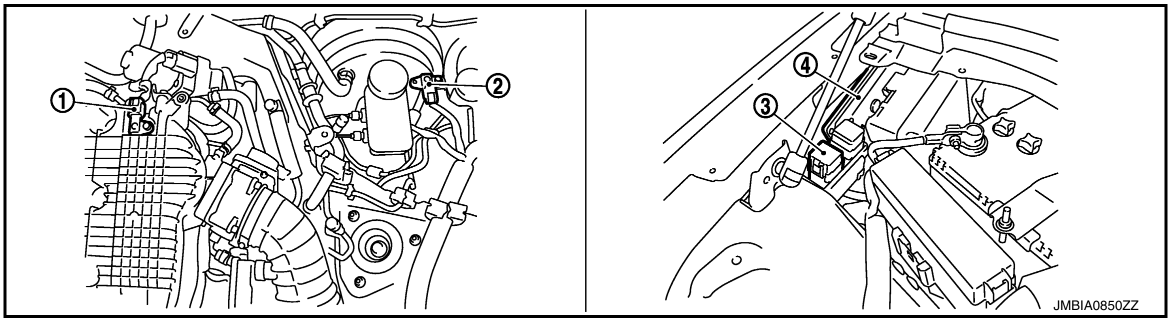
⇦ : Vehicle front

1. A/F sensor 1 (bank 1) harness connector
2. A/F sensor 1 (bank 2) harness connector

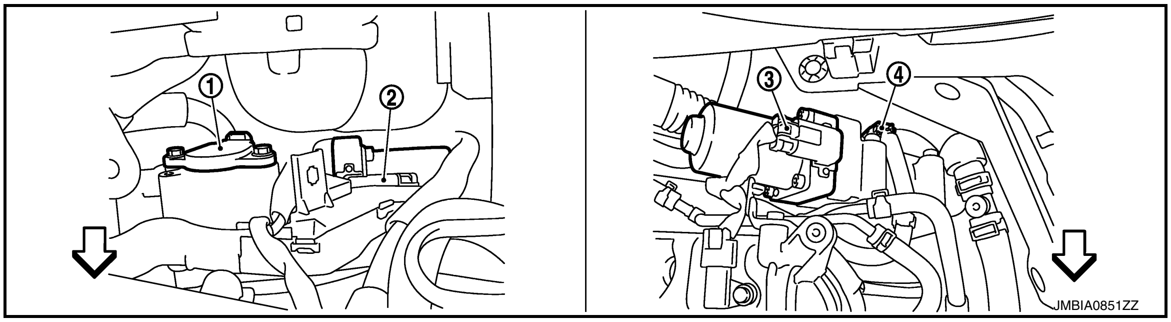


⇦ : Vehicle front

1. Heated oxygen sensor 2 (bank 2)
2. Heated oxygen sensor 2 (bank 2) harness connector
3. Heated oxygen sensor 2 (bank 1)
4. Heated oxygen sensor 2 (bank 1) harness connector

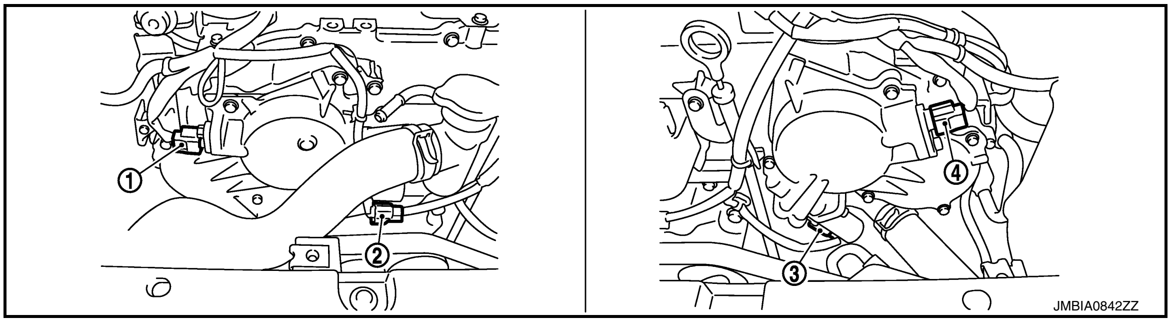


1. Manifold absolute pressure (MAP) sensor
2. Brake booster pressure sensor
3. VVEL actuator motor relay
4. VVEL control module

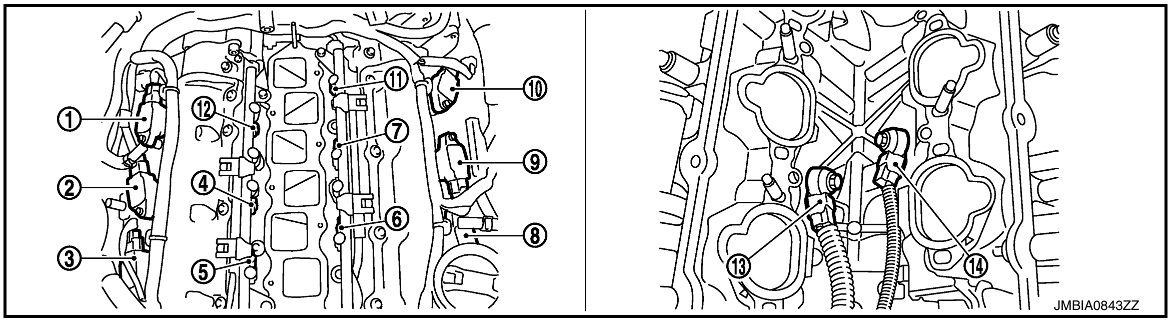


⇦ : Vehicle front

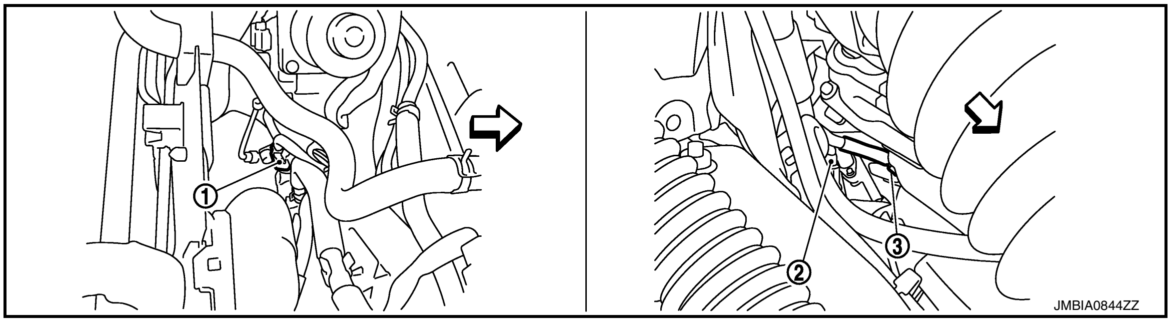
1. VVEL control shaft position sensor (bank 1)
2. VVEL actuator motor (bank 1)
3. VVEL actuator motor (bank 2)
4. VVEL control shaft position sensor (bank 2)



1. Camshaft position sensor (PHASE) (bank 1)
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Camshaft position sensor (PHASE) (bank 2)

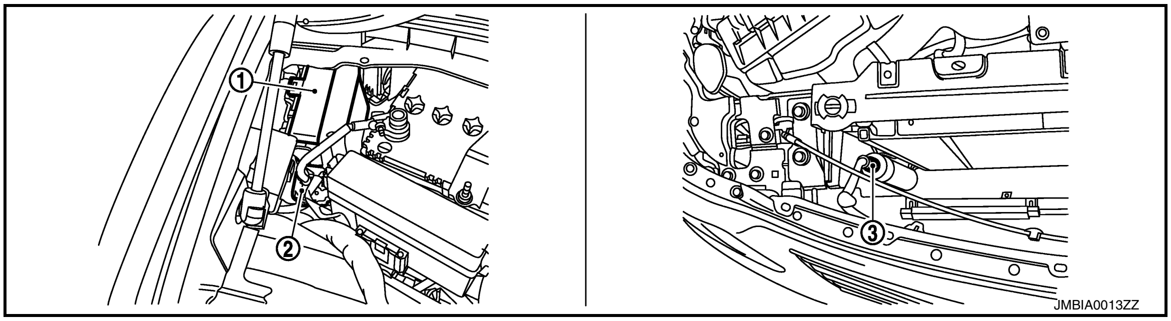


1. Ignition coil No.5 (with power transistor)
2. Ignition coil No.3 (with power transistor)
3. Ignition coil No.1 (with power transistor)
4. Fuel injector No.3
5. Fuel injector No.1
6. Fuel injector No.2
7. Fuel injector No.4
8. Ignition coil No.2 (with power transistor)
9. Ignition coil No.4 (with power transistor)
10. Ignition coil No.6 (with power transistor)
11. Fuel injector No.6
12. Fuel injector No.5
13. Knock sensor (bank 1)
14. Knock sensor (bank 2)

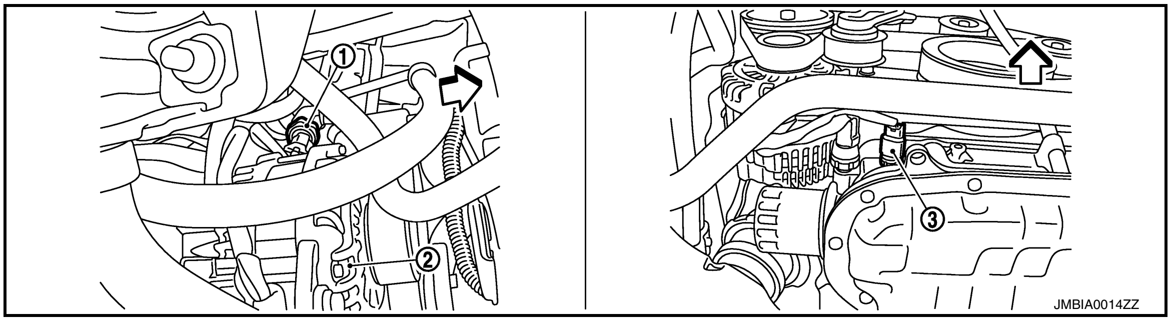


⇦ : Vehicle front

1. Engine coolant temperature sensor
2. A/F sensor 1 (bank 1)
3. Crankshaft position sensor (POS)

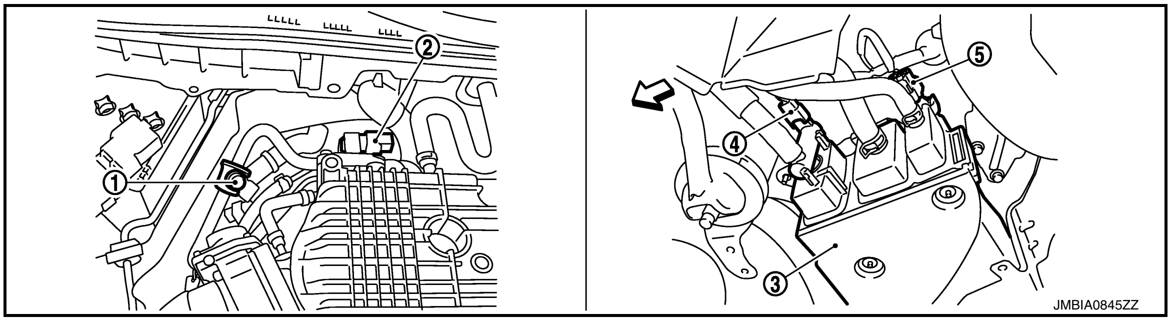


1. IPDM E/R
2. Battery current sensor
3. Refrigerant pressure sensor



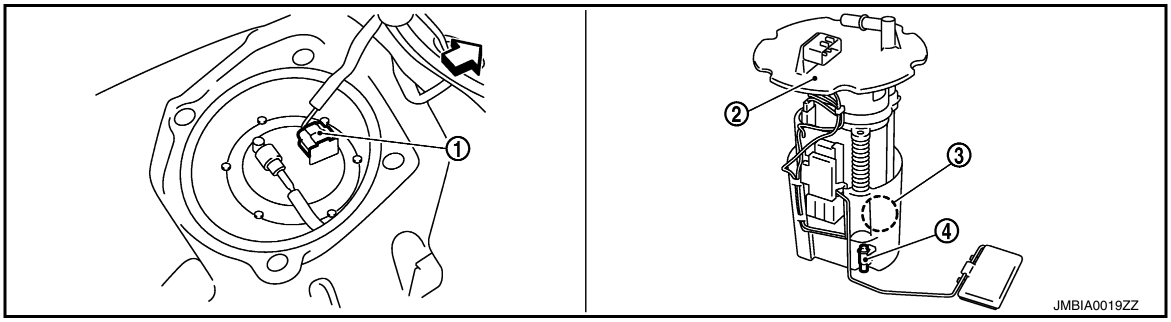
⇦ : Vehicle front

1. Power steering pressure sensor
2. Alternator
3. Engine oil temperature sensor



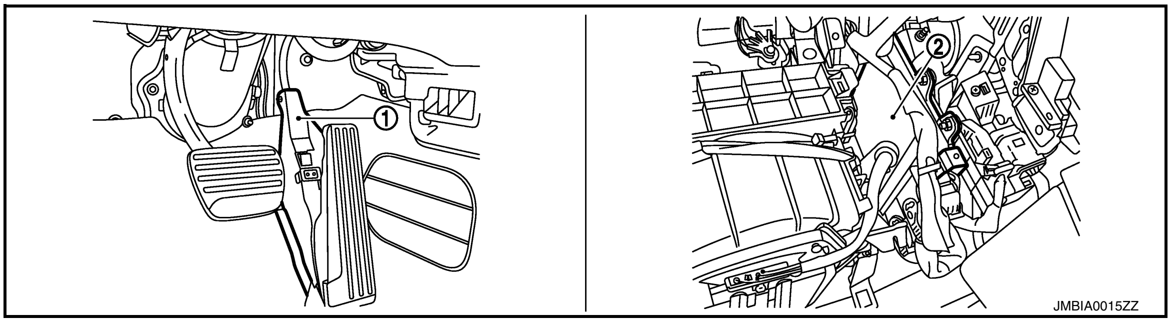
⇦ : Vehicle front

1. EVAP service port
2. EVAP canister purge volume control solenoid valve
3. EVAP canister
4. EVAP canister vent control valve
5. EVAP control system pressure sensor

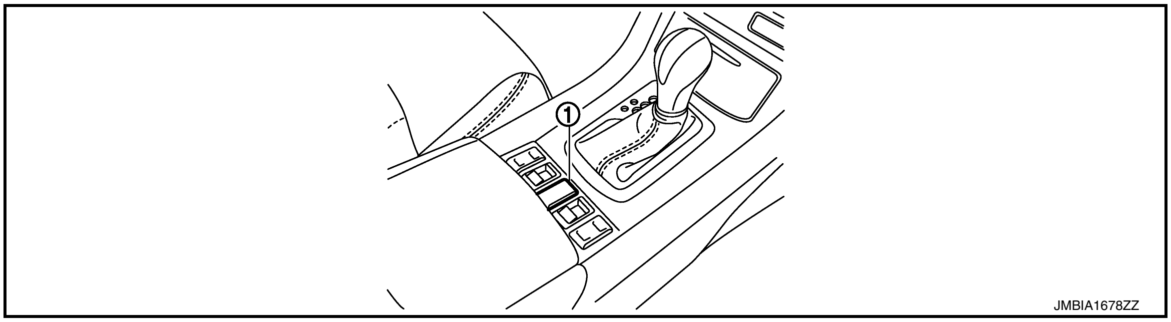


⇦ : Vehicle front

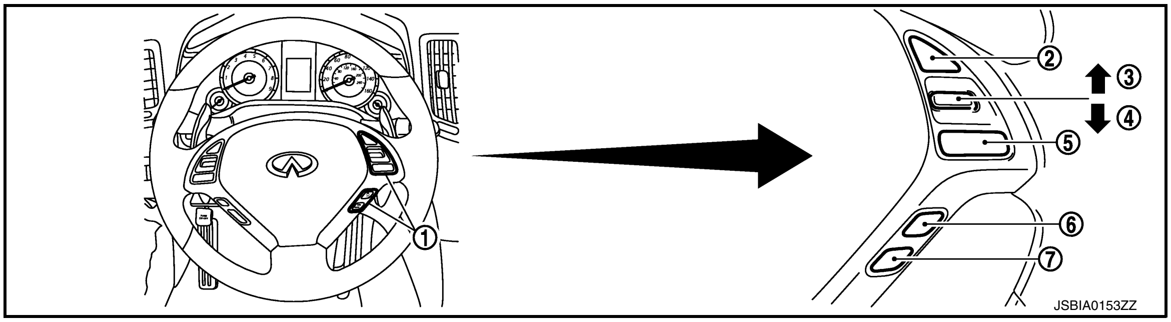
1. Fuel level sensor unit and fuel pump harness connector
2. Fuel level sensor unit and fuel pump
3. Fuel pressure regulator
4. Fuel tank temperature sensor



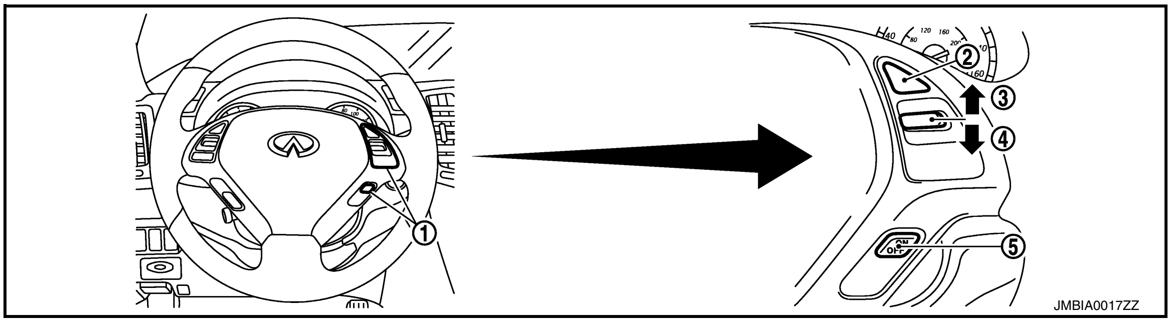
1. Accelerator pedal position sensor
2. ECM



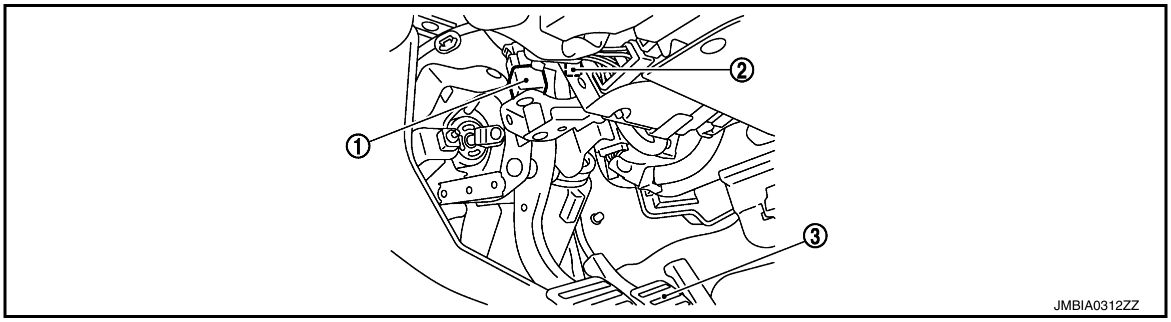
1. Snow mode switch



1.	ICC steering switch	2.	CANCEL switch	3.	RESUME/ACCELERATE switch
4.	SET/COAST switch	5.	DISTANCE switch	6.	MAIN switch
7.	LDP/DCA switch				



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



1.	Stop lamp switch	2.	ASCD brake switch (ASCD models) ICC brake switch (ICC models)	3.	Brake pedal

Component Description

INFOID:0000000010596721

Component	Reference
Accelerator pedal position sensor	EC-476, "Description"
Crankshaft position sensor (POS)	EC-297, "Description"
VVEL actuator motor	EC-393, "Description"
VVEL actuator motor relay	EC-397, "Description"
VVEL control module	EC-461, "Description"
VVEL control shaft position sensor	EC-389, "Description"

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000010596722

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

GST (Generic Scan Tool)

INFOID:0000000010596723

When GST is connected with a data link connector equipped on the vehicle side, it will communicate with the control unit equipped in the vehicle and then enable various kinds of diagnostic tests. Refer to EC-135, "Diagnosis Description".

NOTE:

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

A
EC
C
D
E
F
G
H
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DIAGNOSIS SYSTEM (ECM)

DIAGNOSIS DESCRIPTION

DIAGNOSIS DESCRIPTION : 1st Trip Detection Logic and Two Trip Detection Logic

INFOID:0000000010596724

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

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminated	Blinking	Illuminated				
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 – P0308 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-576, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DIAGNOSIS DESCRIPTION : DTC and Freeze Frame Data

INFOID:0000000010596725

DTC AND 1ST TRIP DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not recur, the 1st trip DTC will not be displayed.
If a malfunction is detected during the 1st trip, the 1st trip DTC is saved in the ECM memory. The MIL will not light up (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are saved in the ECM memory and the MIL lights up. In other words, the DTC is stored in the ECM memory and the MIL lights up when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is stored and a non-diagnostic operation is performed between the 1st and 2nd trips, only the 1st trip DTC will continue to be stored. For malfunctions that blink or light up the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-576, "DTC Index". These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT.
1st trip DTC is specified in Service $07 of SAE J1979/ISO 15031-5. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to EC-9, "Work Flow". Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

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

Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/MIL on) is stored in the ECM memory, 1st trip freeze frame data is no longer stored. Remember, only one set of freeze frame data can be stored in the ECM. The ECM has the following priorities to update the data.

Priority	Items	
1	Freeze frame data	Misfire — DTC: P0300 – P0308 Fuel Injection System Function — DTC: P0171, P0172, P0174, P0175
2		Except the above items (Includes A/T related items)
3	1st trip freeze frame data	

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

Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased.

DIAGNOSIS DESCRIPTION : Counter System

INFOID:0000000010596726

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

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

COUNTER SYSTEM CHART

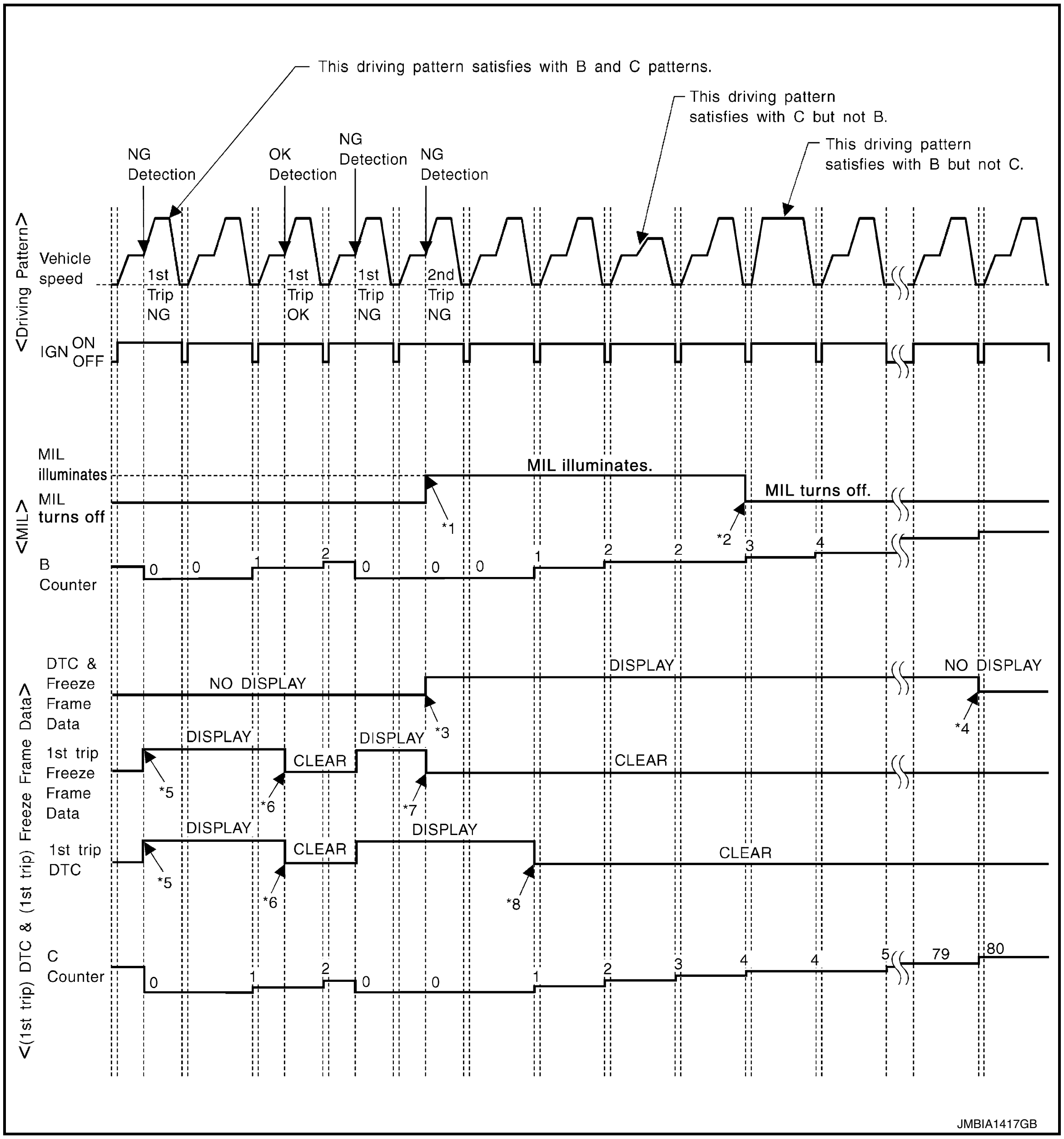
Items	Fuel Injection System	Misfire	Other
MIL (turns OFF)	3 (pattern B)	3 (pattern B)	3 (pattern B)
DTC, Freeze Frame Data (no display)	80 (pattern C)	80 (pattern C)	40 (pattern A)
1st Trip DTC (clear)	1 (pattern C), *1	1 (pattern C), *1	1 (pattern B)
1st Trip Freeze Frame Data (clear)	*1, *2	*1, *2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

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

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

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

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



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

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

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

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

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

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

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

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

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

Driving Pattern B
Refer to EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern C

Refer to EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Example:

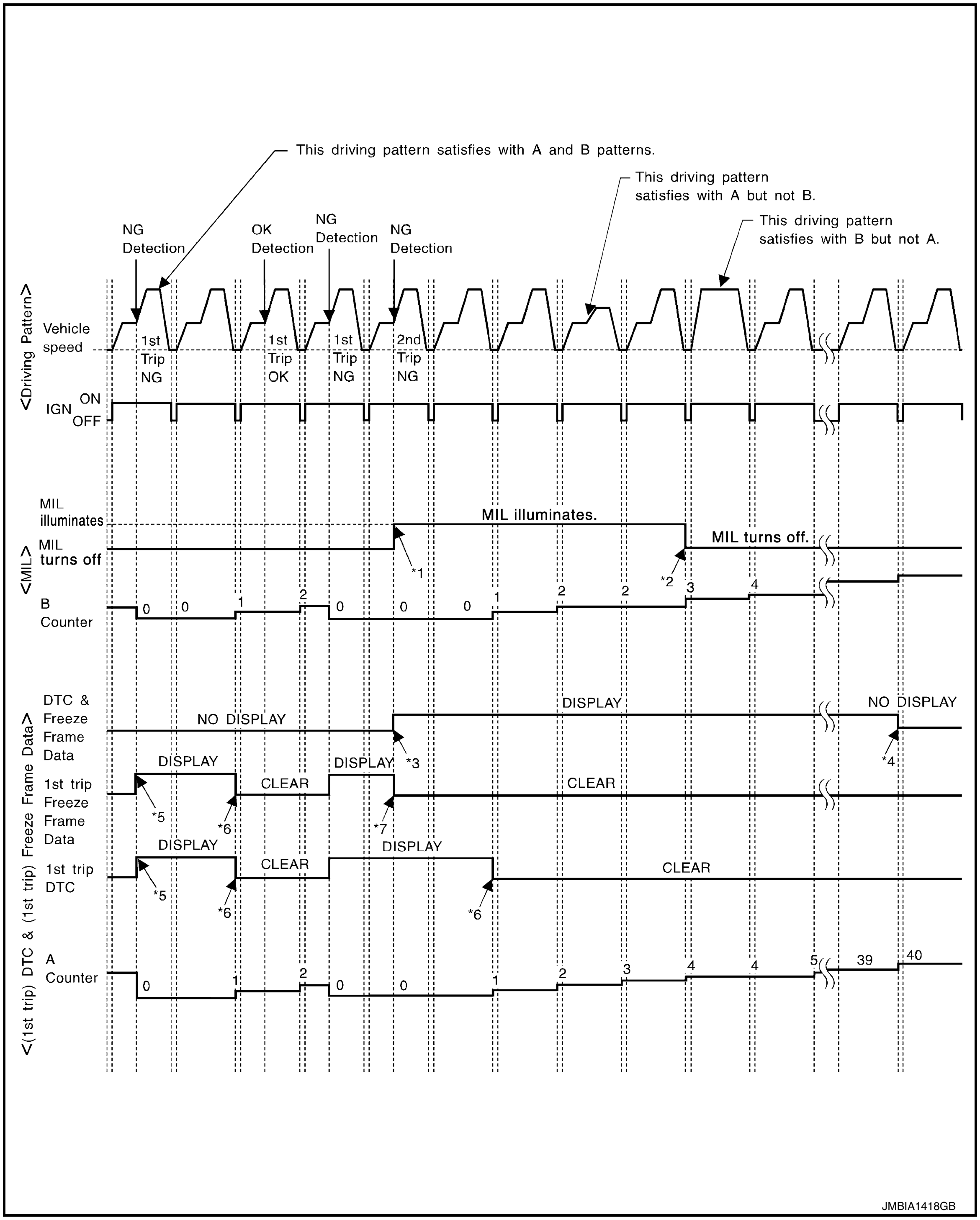
If the stored freeze frame data is as per the following:

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

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

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

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



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

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

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

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

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

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

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

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

Driving Pattern A
Refer to EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

Driving Pattern B
Refer to EC-140, "DIAGNOSIS DESCRIPTION : Driving Pattern".

DIAGNOSIS DESCRIPTION : Driving Pattern

INFOID:0000000010596727

CAUTION:
Always drive at a safe speed.

DRIVING PATTERN A

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

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

DRIVING PATTERN B

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

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

DRIVING PATTERN C

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

Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]

Engine coolant temperature condition:

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

NOTE:

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

DRIVING PATTERN D

Driving pattern D means a trip satisfying the following conditions.

- The state of driving at 40 km/h (25 MPH) reaches 300 seconds or more in total.
- Idle speed lasts 30 seconds or more.
- A lapse of 600 seconds or more after engine start.

NOTE:

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

DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code

INFOID:0000000010596728

System Readiness Test (SRT) code is specified in Service $01 of SAE J1979/ISO 15031-5.

As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.

In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.

Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:

The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.

If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

NOTE:

If permanent DTC is stored or MIL illuminates during the state emissions inspection, the vehicle is also returned to the customer untested even though the SRT indicates “CMPLT” for all test items. Therefore, it is important to check SRT (“CMPLT”), DTC (No DTCs) and permanent DTC (NO permanent DTCs) before the inspection.

SRT SET TIMING

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

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

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

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

—: Self-diagnosis is not carried out.

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

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

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

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

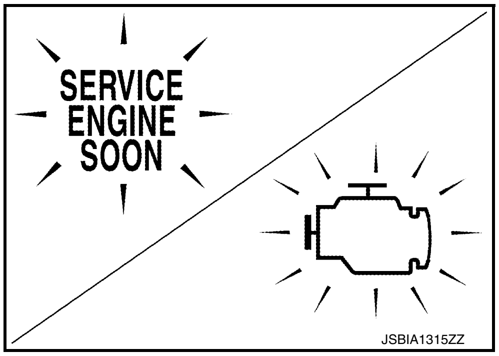
- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- During SRT driving pattern, the 1st trip DTC (NG) is detected prior to “CMPLT” of SRT and the self-diagnosis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

  NOTE:

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

DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)

INFOID:0000000010596729



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

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

   NOTE:

   Check the MIL circuit if MIL does not illuminate. Refer to EC-521, "Component Function Check".
2. When the engine is started, the MIL should go off.

   NOTE:

If MIL continues to illuminate/blink, perform self-diagnoses and inspect/repair accordingly because an emission-related ECU has detected a malfunction in the emission control systems components and/or the powertrain control components (which affect vehicle emissions).

On Board Diagnosis Function

INFOID:0000000010596730

ON BOARD DIAGNOSIS ITEM

The on board diagnostic system has the following functions.

Diagnostic test mode	Function
Bulb check	MIL can be checked.
SRT status	ECM can read if SRT codes are set.
Malfunction warning	If ECM detects a malfunction, it illuminates or blinks MIL to inform the driver that a malfunction has been detected.
Self-diagnostic results	DTCs or 1st trip DTCs stored in ECM can be read.
Accelerator pedal released position learning	ECM can learn the accelerator pedal released position. Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".
Throttle valve closed position learning	ECM can learn the throttle valve closed position. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".
Idle air volume learning	ECM can learn the idle air volume. Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".
Mixture ratio self-learning value clear	Mixture ratio self-learning value can be erased. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".

BULB CHECK MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. The MIL on the instrument panel should stay ON.
   If it remains OFF, check MIL circuit. Refer to EC-521, "Diagnosis Procedure".

SRT STATUS MODE

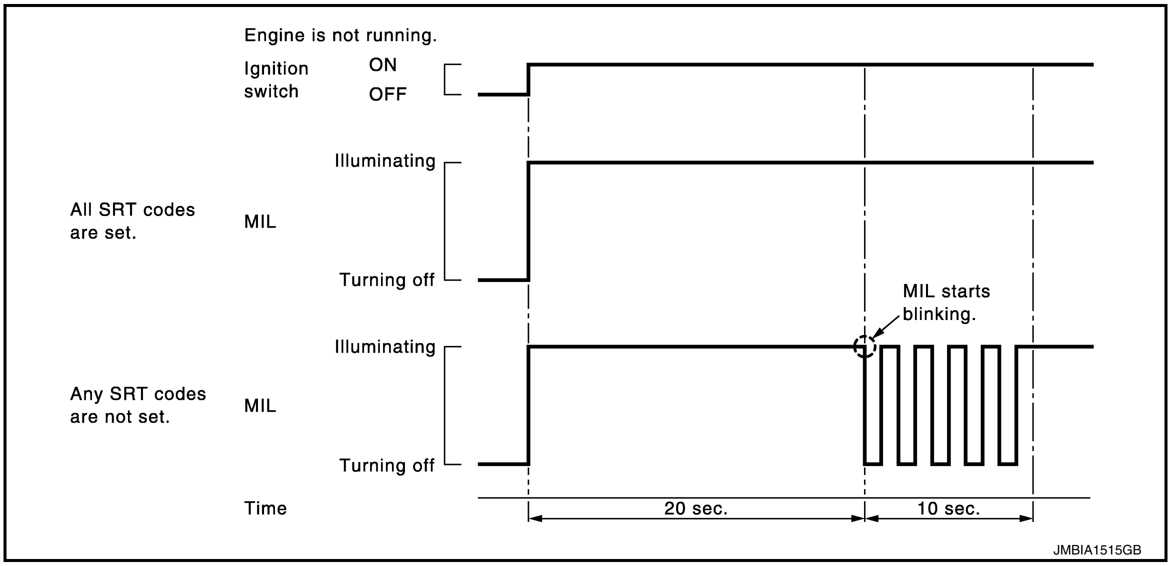
Description

This function allows to read if ECM has completed the self-diagnoses of major emission control systems and components. For SRT, refer to EC-141, "DIAGNOSIS DESCRIPTION : System Readiness Test (SRT) Code".

Operation Procedure

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

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



MALFUNCTION WARNING MODE

Description

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

Operation Procedure

1. Turn ignition switch ON.
2. Check that MIL illuminates.
   If it remains OFF, check MIL circuit. Refer to EC-521, "Diagnosis Procedure".
3. Start engine and let it idle.
   - For two trip detection logic diagnoses, ECM turns on MIL when it detects the same malfunction twice in the two consecutive driving cycles.
   - For 1st trip detection logic diagnoses, ECM turns on MIL when it detects a malfunction in one driving cycle.
   - ECM blinks MIL when it detects a malfunction that may damage the three way catalyst (misfire).

SELF-DIAGNOSTIC RESULTS MODE

Description

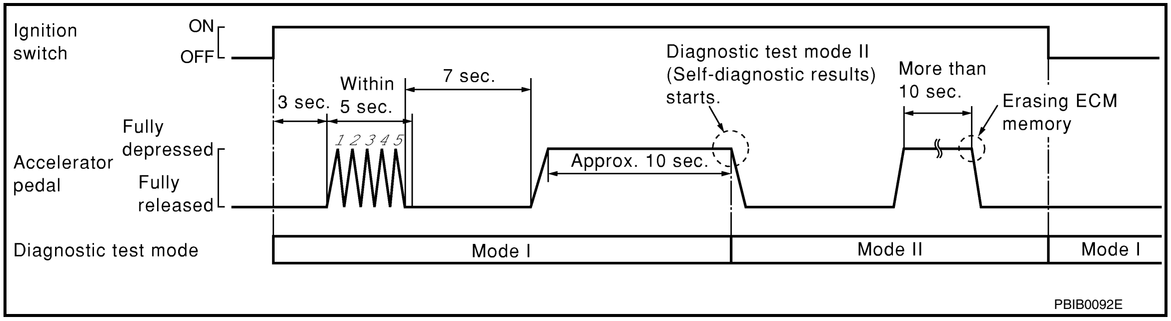
This function allows to indicate DTCs or 1st trip DTCs stored in ECM according to the number of times MIL is blinking.

How to Set Self-diagnostic Results Mode

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

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

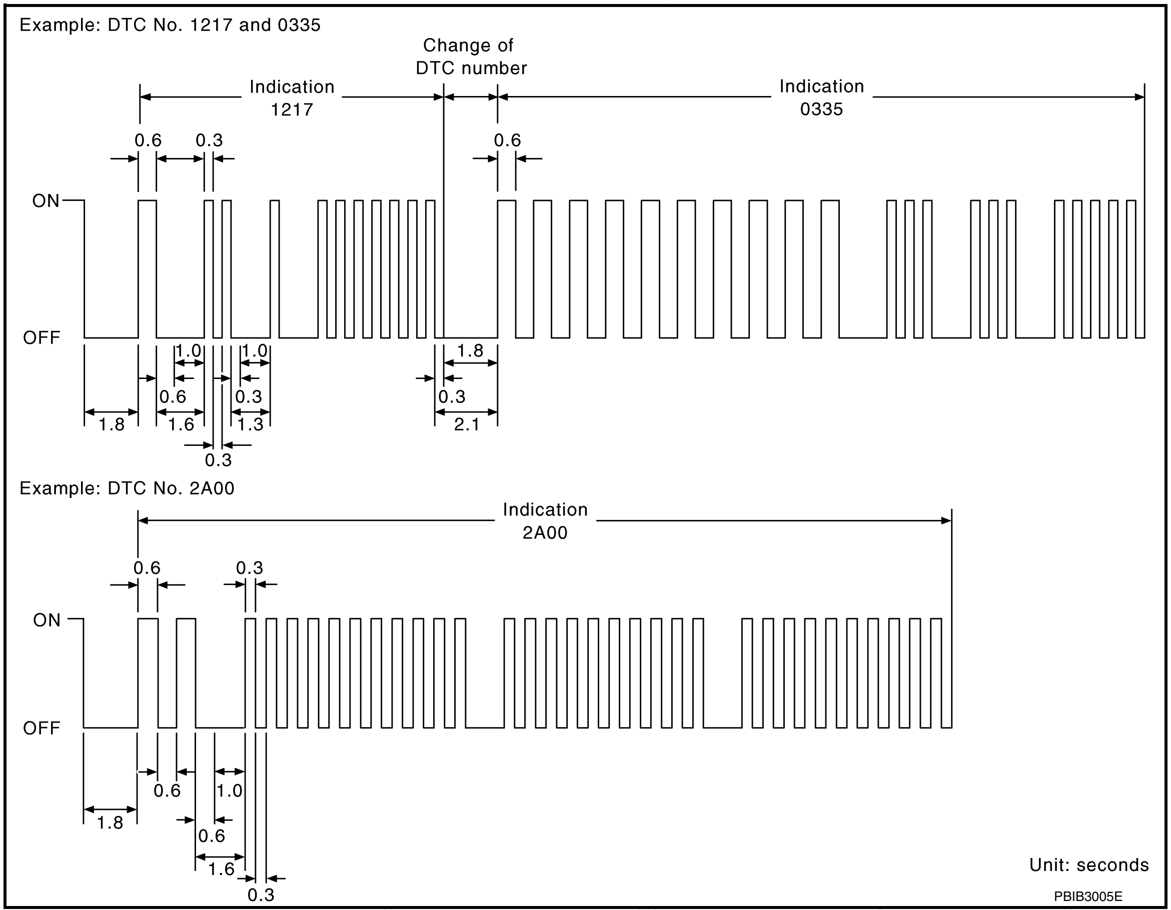
NOTE:
Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



How to Read Self-diagnostic Results

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

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



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

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

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

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

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

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

In this way, all the detected malfunctions are classified by their DTC numbers. The DTC 0000 refers to no malfunction. Refer to EC-576, "DTC Index".

How to Erase Self-diagnostic Results

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

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

NOTE:

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

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

CONSULT Function

INFOID:0000000010596731

FUNCTION

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

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

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

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-576, "DTC Index".

How to Read DTC and 1st Trip DTC

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

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

How to Erase DTC and 1st Trip DTC

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.
- If the DTC is not for A/T related items (see EC-576, "DTC Index"), skip step 1.

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

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DIAG TROUBLE CODE [PXXXX]	• The engine control component part/control system has a trouble code that is displayed as PXXXX. (Refer to EC-576, "DTC Index".)
CAL/LD VALUE [%]	• The calculated load value at the moment a malfunction is detected is displayed.
COOLANT TEMP [°C] or [°F]	• The engine coolant temperature at the moment a malfunction is detected is displayed.
L-FUEL TRM-B1 [%]	• “Long-term fuel trim” at the moment a malfunction is detected is displayed. • The long-term fuel trim indicates much more gradual feedback compensation to the base fuel schedule than short-term fuel trim.
L-FUEL TRM-B2 [%]	
S-FUEL TRM-B1 [%]	• “Short-term fuel trim” at the moment a malfunction is detected is displayed. • The short-term fuel trim indicates dynamic or instantaneous feedback compensation to the base fuel schedule.
S-FUEL TRM-B2 [%]	
ENGINE SPEED [rpm]	• The engine speed at the moment a malfunction is detected is displayed
VEHICL SPEED [km/h] or [mph]	• The vehicle speed at the moment a malfunction is detected is displayed
ABSOL TH·P/S [%]	• The throttle valve opening angle at the moment a malfunction is detected is displayed
B/FUEL SCHDL [msec]	• The base fuel schedule at the moment a malfunction is detected is displayed
INT/A TEMP SE [°C] or [°F]	• The intake air temperature at the moment a malfunction is detected is displayed
FUEL SYS-B1	• “Fuel injection system status” at the moment a malfunction is detected is displayed. • One of the following mode is displayed. Mode2: Open loop due to detected system malfunction Mode3: Open loop due to driving conditions (power enrichment, deceleration enleanment) Mode4: Closed loop - using oxygen sensor(s) as feedback for fuel control Mode5: Open loop - has not yet satisfied condition to go to closed loop
FUEL SYS-B2	
INT MANI PRES [kPa]	• These items are displayed but are not applicable to this model.
COMBUST CONDITION	

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

DATA MONITOR MODE

NOTE:

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

Monitored Item

For reference values of the following items, refer to EC-534, "Reference Value".

×: 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”.
MAS A/F SE-B2			
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. • This data also includes the data for the air-fuel ratio learning control. • When engine is running, specification range is indicated in “SPEC”.
A/F ALPHA-B2			
COOLAN TEMP/S	°C or °F	• The engine coolant temperature (determined by the signal voltage of the engine coolant temperature sensor) is displayed.	• When the engine coolant temperature sensor is open or short-circuited, ECM enters fail-safe mode. The engine coolant temperature determined by the ECM is displayed.
A/F SEN1 (B1)	V	• The A/F signal computed from the input signal of the air fuel ratio (A/F) sensor 1 is displayed.	
A/F SEN1 (B2)			
HO2S2 (B1)	V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 (B2)			
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.
HO2S2 MNTR (B2)			
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, they 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, they differs from ECM terminal voltage signal.
TP SEN 2-B1			
FUEL T/TMP SE	°C or °F	• The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
EVAP SYS PRES	V	• The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE	V	• The signal voltage of the fuel level sensor is displayed.	
START SIGNAL	ON/OFF	• Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	• After starting the engine, [OFF] is 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) signal.	
PW/ST SIGNAL	ON/OFF	• [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated.	
LOAD SIGNAL	ON/OFF	• Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	• Indicates [ON/OFF] condition from the heater fan switch signal.	
BOOST VCUM SW	ON/OFF	• Always a certain value is displayed. • This item is not efficient for this models.	
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.
INJ PULSE-B2			
IGN TIMING	BTDC	• Indicates the ignition timing computed by ECM according to the input signals.	• When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	• “Calculated load value” indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g/s	• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
INT/V TIM (B1)	°CA	• Indicates [°CA] of intake camshaft advance angle.	
INT/V TIM (B2)			
INT/V SOL (B1)	%	• The control value of the intake valve timing control solenoid valve (determined by ECM according to the input signals) is indicated. • The advance angle becomes larger as the value increases.	
INT/V SOL (B2)			
TP SEN 1-B2	V	• The throttle position sensor signal voltage is displayed.	• TP SEN 2-B2 signal is converted by ECM internally. Thus, they differs from ECM terminal voltage signal.
TP SEN 2-B2			
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.	

Monitored item	Unit	Description	Remarks
VENT CONT/V	ON/OFF	• The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open	
THRTL RELAY	ON/OFF	• Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
HO2S2 HTR (B1)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
HO2S2 HTR (B2)			
I/P PULLY SPD	rpm	• Indicates the engine speed computed from the input speed sensor signal.	
VEHICLE SPEED	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from TCM is displayed.	
IDL A/V LEARN	YET/CMPLT	• Displays the condition of Idle Air Volume Learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully.	
SNOW MODE SW	ON/OFF	• Indicates [ON/OFF] condition from snow mode switch signal.	
ENG OIL TEMP	°C or °F	• The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed.	
TRVL AFTER MIL	km or mile	• Distance traveled while MIL is activated.	
A/F S1 HTR (B1)	%	• Air fuel ratio (A/F) sensor 1 heater control value computed by ECM according to the input signals. • The current flow to the heater becomes larger as the value increases.	
A/F S1 HTR (B2)			
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.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	• Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW	ON/OFF	• Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	• Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2	ON/OFF	• Indicates [ON/OFF] condition of stop lamp switch signal.	
DIST SW	ON/OFF	• Indicates [ON/OFF] condition from DISTANCE switch signal.	
CRUISE LAMP	ON/OFF	• Indicates [ON/OFF] condition of CRUISE lamp determined by the ECM according to the input signals.	
BAT CUR SEN	mV	• The signal voltage of battery current sensor is displayed.	

Monitored item	Unit	Description	Remarks
ALT DUTY SIG	ON/OFF	• The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive.	
A/F ADJ-B1	—	• Indicates the correction of factor stored in ECM. The factor is calculated from the difference between the target air-fuel ratio stored in ECM and the air-fuel ratio calculated from A/F sensor 1 signal.	
A/F ADJ-B2			
FAN DUTY	%	• Indicates a command value for cooling fan. The value is calculated by ECM based on input signals.	
AC EVA TEMP	°C or °F	• Indicates A/C evaporator temperature sent from “unified meter and A/C amp.”.	
AC EVA TARGET	°C or °F	• Indicates target A/C evaporator temperature sent from “unified meter and A/C amp.”.	
ALTDUTY	%	• Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	
ATOM PRES SEN	mV	• Always a certain value is displayed. • This item is not efficient for this models.	
BRAKE BST PRES SE	mV	• Always a certain value is displayed. • This item is not efficient for this models.	
VVEL SEN LEARN-B1	V	• Indicates the VVEL learning value.	
VVEL SEN LEARN-B2			
VVEL POSITION SEN-B1	V	• The VVEL control shaft position sensor signal voltage is displayed.	
VVEL POSITION SEN-B2			
VVEL TIM-B1	deg	• Indicates [deg] of VVEL control shaft angle.	
VVEL TIM-B2			
VVEL LEARN	YET/DONE	• Display the condition of VVEL learning YET: VVEL learning has not been performed yet. DONE: VVEL learning has already been performed successfully.	
EVAP LEAK DIAG	YET/CMPLT	• Indicates the condition of EVAP leak diagnosis. YET: EVAP leak diagnosis has not been performed yet. CMPLT: EVAP leak diagnosis has been performed successfully.	
EVAP DIAG READY	ON/OFF	• Indicates the ready condition of EVAP leak diagnosis. ON: Diagnosis has been ready condition. OFF: Diagnosis has not been ready condition.	
THRTL STK CNT B1*	—	—	
SYSTEM 1 DIAGNOSIS A B1	INCMP/CMPLT	• Indicates DTC P219A self-daiagnosis condition.INCMP: Self-diagnosis is incomplete.CMPLT: Self-diagnosis is complete.	

Monitored item	Unit	Description	Remarks
SYSTEM 1 DIAGNOSIS A B2	INCMP/CMPLT	• Indicates DTC P219B self-daiagnosis condition.INCMP: Self-diagnosis is incomplete.CMPLT: Self-diagnosis is complete.	
SYSTEM 1 DIAGNOSIS B B1	ABSENT/ PRSENT	• Indicates DTC P219A self-daiagnosis condition. ABSENT: Self-diagnosis standbyPRSENT: Under self-diagnosis	
SYSTEM 1 DIAGNOSIS B B2	ABSENT/ PRSENT	• Indicates DTC P219B self-daiagnosis condition. ABSENT: Self-diagnosis standbyPRSENT: Under self-diagnosis	
HO2 S2 DIAG1 (B1)	INCMP/CMPLT	• Indicates DTC P0139 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG1 (B2)	INCMP/CMPLT	• Indicates DTC P0159 self-diagnosis (delayed response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG2 (B1)	INCMP/CMPLT	• Indicates DTC P0139 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
HO2 S2 DIAG2 (B2)	INCMP/CMPLT	• Indicates DTC P0159 self-diagnosis (slow response) condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG1 (B1)	INCMP/CMPLT	• Indicates DTC P015A or P015B self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG1 (B2)	INCMP/CMPLT	• Indicates DTC P015C or P015D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG2 (B1)	INCMP/CMPLT	• Indicates DTC P014C or P014D self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG2 (B2)	INCMP/CMPLT	• Indicates DTC P014E or P014F self-diagnosis condition. INCMP: Self-diagnosis is incomplete. CMPLT: Self-diagnosis is complete.	
A/F SEN1 DIAG3 (B1)	ABSNT/ PRSNT	• Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the diagnosis range. PRSNT: The vehicle condition is within the diagnosis range.	
A/F SEN1 DIAG3 (B2)	ABSNT/ PRSNT	• Indicates DTC P014C, P014D, P015A or P015B self-diagnosis condition. ABSNT: The vehicle condition is not within the diagnosis range. PRSNT: The vehicle condition is within the diagnosis range.	

*: The item is indicated, but not used.

NOTE:

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

WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
IDLE AIR VOL LEARN	• THE IDLE AIR VOLUME THAT KEEPS THE ENGINE WITHIN THE SPECIFIED RANGE IS MEMORIZED IN ECM.	When learning the idle air volume
EVAP SYSTEM CLOSE	CLOSE THE EVAP CANISTER VENT CONTROL VALVE IN ORDER TO MAKE EVAP SYSTEM CLOSE UNDER THE FOLLOWING CONDITIONS. • IGN SW ON • ENGINE NOT RUNNING • AMBIENT TEMPERATURE IS ABOVE 0°C (32°F). • NO VACUUM AND NO HIGH PRESSURE IN EVAP SYSTEM • FUEL TANK TEMP. IS MORE THAN 0°C (32°F). • WITHIN 10 MINUTES AFTER STARTING “EVAP SYSTEM CLOSE” • WHEN TRYING TO EXECUTE “EVAP SYSTEM CLOSE” UNDER THE CONDITION EXCEPT ABOVE, CONSULT WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE:** **WHEN STARTING ENGINE, CONSULT MAY DISPLAY “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, EVEN WHEN USING A CHARGED BATTERY.**	When detecting EVAP vapor leak in the EVAP system
FUEL PRESSURE RELEASE	• FUEL PUMP WILL STOP BY TOUCHING “START” DURING IDLING. CRANK A FEW TIMES AFTER ENGINE STALLS.	When releasing fuel pressure from fuel line
SELF-LEARNING CONT	• THE COEFFICIENT OF SELF-LEARNING CONTROL MIXTURE RATIO RETURNS TO THE ORIGINAL COEFFICIENT.	When clearing mixture ratio self-learning value
TARGET IDLE RPM ADJ*	• IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	• IDLE CONDITION	When adjusting target ignition timing
VIN REGISTRATION	• IN THIS MODE, VIN IS REGISTERED IN ECM.	When registering VIN in ECM
CLSD THL POS LEARN	• IGNITION ON AND ENGINE STOPPED.	When learning the throttle valve closed position
VVEL POS SEN ADJ PREP	• USE THIS ITEM ONLY WHEN REPLACING VVEL ACTUATOR SUB ASSEMBLY. • IGNITION ON AND ENGINE STOPPED.	When adjusting VVEL control shaft position sensor

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
VENT CONTROL/V	• Ignition switch: ON (Engine stopped) • Turn solenoid valve ON and OFF with the CONSULT and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connectors • Solenoid valve
ENG COOLANT TEMP	• Engine: Return to the original trouble condition • Change the engine coolant temperature using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector
FUEL INJECTION	• Engine: Return to the original trouble condition • Change the amount of fuel injection using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Air fuel ratio (A/F) sensor 1

TEST ITEM	CONDITION	JUDGEMENT	CHECK ITEM (REMEDY)
FUEL/T TEMP SEN	• Change the fuel tank temperature using CONSULT.		
PURG VOL CONT/V	• Engine: After warming up, run engine at 1,500 rpm. • Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT.	Engine speed changes according to the opening percent.	• Harness and connectors • Solenoid valve
FUEL PUMP RELAY	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay ON and OFF using CONSULT and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connectors • Fuel pump relay
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT.	If trouble symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.
FAN DUTY CONTROL*	• Ignition switch: ON • Change duty ratio using CONSULT.	Cooling fan speed changes.	• Harness and connectors • Cooling fan motor • Cooling fan relay • Cooling fan control module • IPDM E/R
ALTERNATOR DUTY	• Engine: Idle • Change duty ratio using CONSULT.	Battery voltage changes.	• Harness and connectors • IPDM E/R • Alternator
POWER BALANCE	• Engine: After warming up, idle the engine. • A/C switch OFF • Selector lever: P or N • Cut off each injector signal one at a time using CONSULT.	Engine runs rough or dies.	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil

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

DTC WORK SUPPORT MODE

Test Item

Test mode	Test item	Corresponding DTC No.	Reference page
EVAPORATIVE SYSTEM	EVP SML LEAK P0442*/P1442*	—	—
	EVP V/S LEAK P0456/P1456*	P0456	EC-346
	PURG VOL CN/V P1444	P0443	EC-315
	PURG FLOW P0441	P0441	EC-310
A/F SEN1	A/F SEN1 (B1) P1278/P1279	—	—
	A/F SEN1 (B1) P1276	P0130	EC-224
	A/F SEN1 (B2) P1288/P1289	—	—
	A/F SEN1 (B2) P1286	P0150	EC-224
HO2S2	HO2S2 (B1) P1146	P0138	EC-240
	HO2S2 (B1) P1147	P0137	EC-234
	HO2S2 (B1) P0139	P0139	EC-249
	HO2S2 (B2) P1166	P0158	EC-240
	HO2S2 (B2) P1167	P0157	EC-234
	HO2S2 (B2) P0159	P0159	EC-249

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

SRT & P-DTC MODE

SRT STATUS Mode

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

PERMANENT DTC STATUS Mode

How to Display Permanent DTC Status

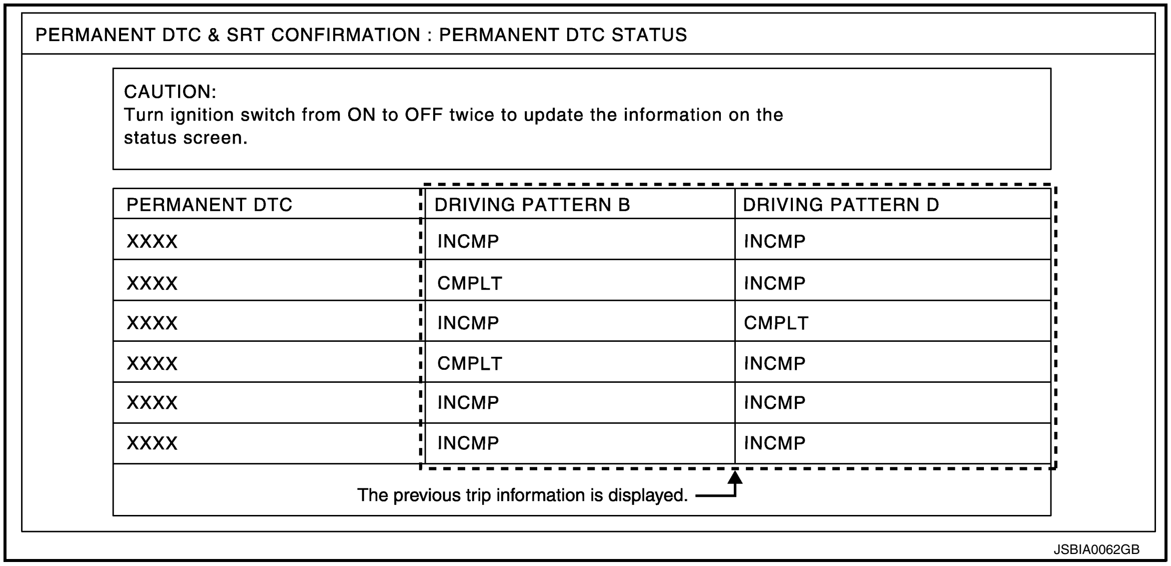
1. Turn ignition switch OFF and wait at 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at 10 seconds.
4. Turn ignition switch ON.

   NOTE:

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

   CAUTION:

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



PERMANENT DTC & SRT CONFIRMATION : PERMANENT DTC STATUS

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

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

The previous trip information is displayed.

JSBIA0062GB

NOTE:

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

SRT WORK SUPPORT Mode

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

PERMANENT DTC WORK SUPPORT Mode

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

NOTE:

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

DTC/CIRCUIT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000010596732

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” in “DATA MONITOR” mode of CONSULT during normal operation of the Engine Control System. When the value in “SPEC” in “DATA MONITOR” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “SPEC” in “DATA MONITOR” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.

The SP value is used to detect malfunctions that may affect the Engine Control System, but will not illuminate the MIL.

The SP value will be displayed for the following three items:

- B/FUEL SCHDL (The fuel injection pulse width programmed into ECM prior to any learned on board correction)
- A/F ALPHA-B1/B2 (The mean value of air-fuel ratio feedback correction factor per cycle)
- MAS A/F SE-B1/B2 (The signal voltage of the mass air flow sensor)

Component Function Check

INFOID:0000000010596733

1.PRECONDITIONING

Make sure that all of the following conditions are satisfied.

TESTING CONDITION

- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (1.003 - 1.064 kg/cm^2, 14.25 - 15.12 psi)
- Atmospheric temperature: 20 - 30°C (68 - 86°F)
- Engine coolant temperature: 75 - 95°C (167 - 203°F)
- Transmission: Warmed-up
  - After the engine is warmed up to normal operating temperature, drive vehicle until “ATF TEMP 1” (A/T fluid temperature sensor signal) indicates more than 60°C (140°F).
- Electrical load: Not applied
  - Rear window defogger switch, air conditioner switch, lighting switch are OFF. Steering wheel is straight ahead.
- Engine speed: Idle

>> GO TO 2.

2.PERFORM SPEC IN DATA MONITOR MODE

With CONSULT

NOTE:

Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.

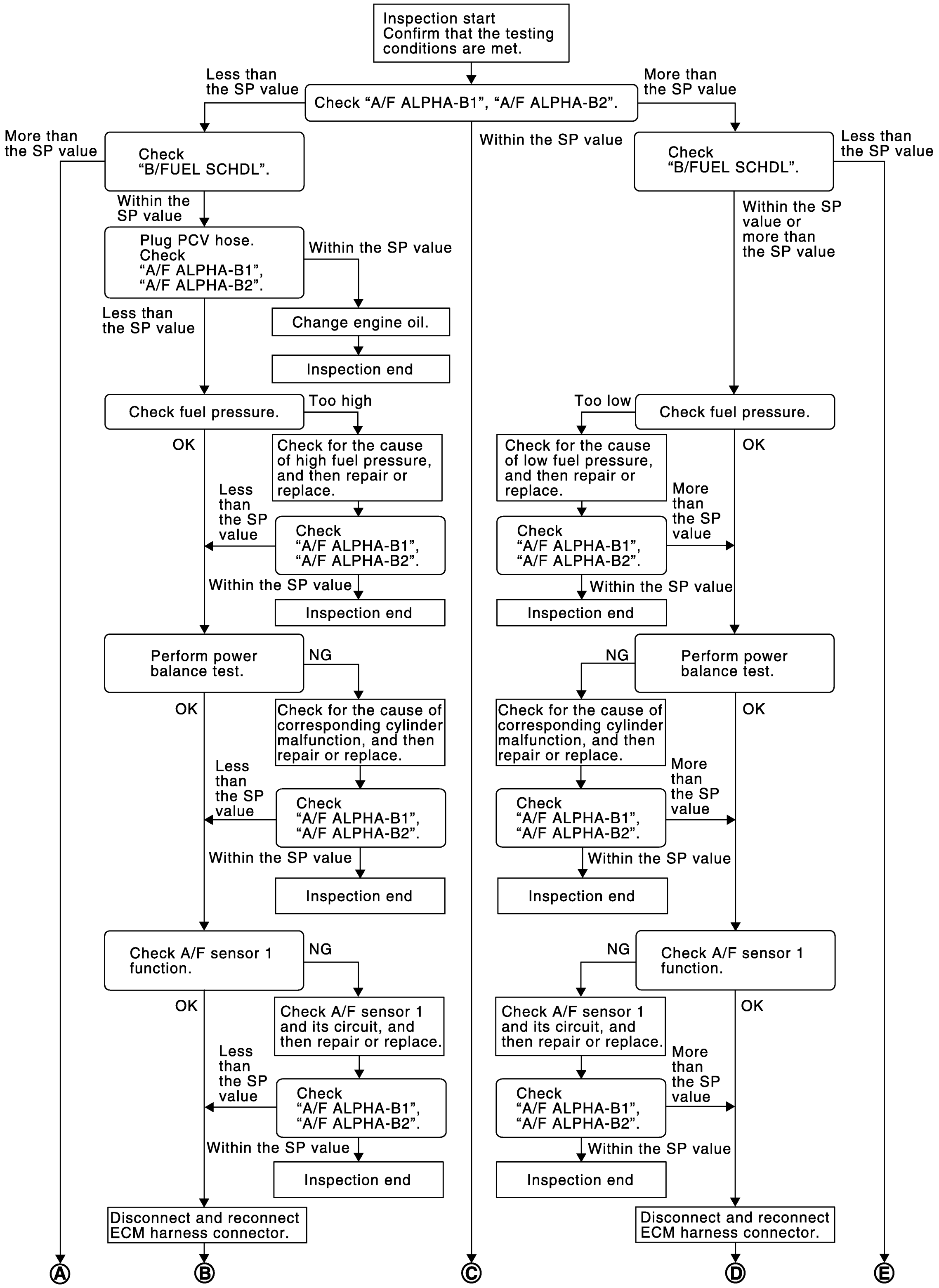
1. Perform EC-14, "BASIC INSPECTION : Special Repair Requirement".
2. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, “A/F ALPHA-B2”, “MAS A/F SE-B1” and “MAS A/F SE-B2” in “SPEC” of “DATA MONITOR” mode with CONSULT.
3. Make sure that monitor items are within the SP value.

Is the measurement value within the SP value?

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

Diagnosis Procedure

OVERALL SEQUENCE


Inspection start
Confirm that the testing conditions are met.
Less than the SP value
More than the SP value
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
More than the SP value
Check "B/FUEL SCHDL".
Within the SP value
Check "B/FUEL SCHDL".
Less than the SP value
Within the SP value
Plug PCV hose. Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Within the SP value
Within the SP value or more than the SP value
Less than the SP value
Change engine oil.
Inspection end
Check fuel pressure.
Too high
Too low
Check fuel pressure.
OK
Check for the cause of high fuel pressure, and then repair or replace.
Check for the cause of low fuel pressure, and then repair or replace.
OK
Less than the SP value
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
More than the SP value
Within the SP value
Within the SP value
Inspection end
Inspection end
Perform power balance test.
NG
NG
Perform power balance test.
OK
Check for the cause of corresponding cylinder malfunction, and then repair or replace.
Check for the cause of corresponding cylinder malfunction, and then repair or replace.
OK
Less than the SP value
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
More than the SP value
Within the SP value
Within the SP value
Inspection end
Inspection end
Check A/F sensor 1 function.
NG
NG
Check A/F sensor 1 function.
OK
Check A/F sensor 1 and its circuit, and then repair or replace.
Check A/F sensor 1 and its circuit, and then repair or replace.
OK
Less than the SP value
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
More than the SP value
Within the SP value
Within the SP value
Inspection end
Inspection end
Disconnect and reconnect ECM harness connector.
Disconnect and reconnect ECM harness connector.
Ⓐ
Ⓑ
Ⓒ
Ⓓ
Ⓔ

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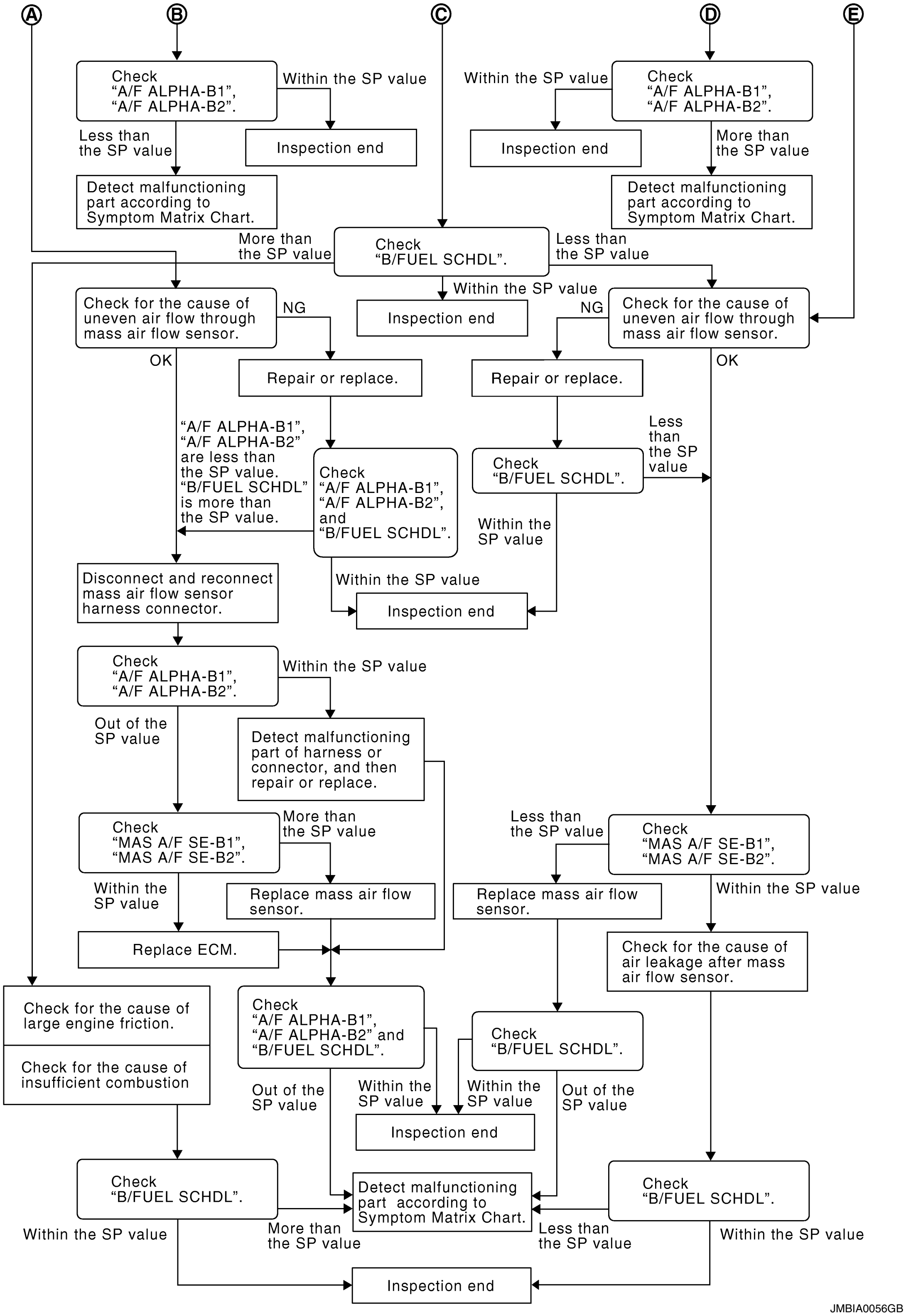
A
B
C
D
E
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Within the SP value
Inspection end
Less than the SP value
Detect malfunctioning part according to Symptom Matrix Chart.
Within the SP value
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Inspection end
More than the SP value
Detect malfunctioning part according to Symptom Matrix Chart.
More than the SP value
Check "B/FUEL SCHDL".
Less than the SP value
Within the SP value
Inspection end
Check for the cause of uneven air flow through mass air flow sensor.
NG
Repair or replace.
OK
NG
Check for the cause of uneven air flow through mass air flow sensor.
Repair or replace.
OK
"A/F ALPHA-B1", "A/F ALPHA-B2" are less than the SP value. "B/FUEL SCHDL" is more than the SP value.
Check "A/F ALPHA-B1", "A/F ALPHA-B2", and "B/FUEL SCHDL".
Check "B/FUEL SCHDL".
Less than the SP value
Within the SP value
Within the SP value
Inspection end
Disconnect and reconnect mass air flow sensor harness connector.
Check "A/F ALPHA-B1", "A/F ALPHA-B2".
Within the SP value
Out of the SP value
Detect malfunctioning part of harness or connector, and then repair or replace.
Check "MAS A/F SE-B1", "MAS A/F SE-B2".
More than the SP value
Replace mass air flow sensor.
Within the SP value
Replace ECM.
Less than the SP value
Check "MAS A/F SE-B1", "MAS A/F SE-B2".
Replace mass air flow sensor.
Within the SP value
Check for the cause of air leakage after mass air flow sensor.
Check for the cause of large engine friction.
Check for the cause of insufficient combustion
Check "A/F ALPHA-B1", "A/F ALPHA-B2" and "B/FUEL SCHDL".
Out of the SP value
Within the SP value
Check "B/FUEL SCHDL".
Within the SP value
Out of the SP value
Inspection end
Check "B/FUEL SCHDL".
Within the SP value
More than the SP value
Detect malfunctioning part according to Symptom Matrix Chart.
Less than the SP value
Check "B/FUEL SCHDL".
Within the SP value
Inspection end

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DETAILED PROCEDURE

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

With CONSULT

1. Start engine.
2. Confirm that the testing conditions are met. Refer to EC-156, "Component Function Check".
3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and make sure that each indication is within the SP value.

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

Is the measurement value within the SP value?

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

2.CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

3.CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

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

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

Is the measurement value within the SP value?

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

5.CHANGE ENGINE OIL

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

>> INSPECTION END

6.CHECK FUEL PRESSURE

Check fuel pressure. (Refer to EC-628, "Inspection".)

Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> Fuel pressure is too high: Replace “fuel filter and fuel pump assembly” (Refer to FL-6, "Removal and Installation".) and then GO TO 8.
NO-2 >> Fuel pressure is too low: GO TO 7.

7.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly” (Refer to FL-6, "Removal and Installation".) and then GO TO 8.
NO >> Repair or replace and then GO TO 8.

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

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

Is the measurement value within the SP value?

YES >> 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 bellow.

- Ignition coil and its circuit (Refer to EC-516, "Component Function Check".)
- Fuel injector and its circuit (Refer to EC-506, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to EM-16, "Inspection".)

Is the inspection result normal?

YES >> Replace fuel injector (Refer to EM-38, "Removal and Installation".) and then GO TO 11.
NO >> Repair or replace malfunctioning part and then GO TO 11.

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

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

Is the measurement value within the SP value?

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

12.CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.

- For DTC P0130, P0150, refer to EC-224, "DTC Logic".
- For DTC P0131, P0151, refer to EC-228, "DTC Logic".
- For DTC P0132, P0152, refer to EC-231, "DTC Logic".
- For DTC P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D, refer to EC-256, "DTC Logic".
- For DTC P2096, P2097, P2098, P2099, refer to EC-471, "DTC Logic".

Are any DTCs detected?

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

13.CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnosis Procedure according to corresponding DTC.

>> GO TO 14.

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

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

Is the measurement value within the SP value?

YES >> 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”, “A/F ALPHA-B2”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-616, "Symptom Table".

17.CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

18.DETECT MALFUNCTIONING PART

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

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

19.CHECK INTAKE SYSTEM

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

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

Is the inspection result normal?

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

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> “B/FUEL SCHDL” is more, “A/F ALPHA-B1”, “A/F ALPHA-B2” are less than the SP value: GO TO 21.

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”, “A/F ALPHA-B2”

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

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-195, "Diagnosis Procedure". Then GO TO 29.
NO >> GO TO 23.

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

Select “MAS A/F SE-B1”, “MAS A/F SE-B2” in “SPEC” of “DATA MONITOR” mode, and make sure that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 24.
NO >> More than the SP value: Replace malfunctioning mass air flow sensor (Refer to EM-27, "Exploded View".), and then GO TO 29.

24.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> GO TO 29.

25.CHECK INTAKE SYSTEM

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

Is the inspection result normal?

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

26.CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

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

27.CHECK “MAS A/F SE-B1”, “MAS A/F SE-B2”

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

Is the measurement value within the SP value?

YES >> GO TO 28.
NO >> Less than the SP value: Replace malfunctioning mass air flow sensor (Refer to EM-27, "Exploded View".), and then GO TO 30.

28.CHECK INTAKE SYSTEM

Check for the cause of air leak after the mass air flow sensor. Refer to the following.
- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge

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

>> GO TO 30.

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

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-616, "Symptom Table".

30. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-616, "Symptom Table".

POWER SUPPLY AND GROUND CIRCUIT

Diagnosis Procedure

INFOID:0000000010596735

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

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

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

ECM		Ground	Continuity
Connector	Terminal		
F101	8	Ground	Existed
M107	123		
	124		
	127		
	128		

3. Also check harness for short to power.

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F103, M116
- Harness for open or short between ECM and ground

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

4.CHECK ECM POWER SUPPLY CIRCUIT-I

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

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F102	53	M107	128	Battery voltage

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between ECM and fuse

A
EC
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J
K
L
M
N
O
P

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

6.CHECK ECM POWER SUPPLY CIRCUIT-II

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

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

Is the inspection result normal?

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

7.CHECK ECM POWER SUPPLY CIRCUIT-III

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

IPDM E/R		Ground	Voltage
Connector	Terminal		
E7	53	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

9.CHECK ECM POWER SUPPLY CIRCUIT-IV

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

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F101	24	M107	128	Battery voltage

Is the inspection result normal?

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

10.CHECK ECM POWER SUPPLY CIRCUIT-V

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
F101	24	E7	69	Existed

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

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

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

12. CHECK 15 A FUSE

1. Disconnect 15 A fuse (No. 50) from IPDM E/R.
2. Check 15 A fuse.

Is the inspection result normal?

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

13. CHECK ECM POWER SUPPLY CIRCUIT-VI

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

ECM		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
M107	125	E7	49	Existed

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

Is the inspection result normal?

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

14. DETECT MALFUNCTIONING PART

Check the following.

- Harness or connectors E106, M6
- Harness for open or short between ECM and IPDM E/R

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

15. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

POWER SUPPLY AND GROUND CIRCUIT (VVEL CONTROL MODULE)

Diagnosis Procedure

INFOID:0000000010596736

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

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

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

VVEL control module		Ground	Continuity
Connector	Terminal		
E14	14	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

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

3.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-I

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

VVEL control module			Voltage
Connector	+	–	
	Terminal	Terminal	
E14	8	14	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.

Is the inspection result normal?

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

4.CHECK VVEL CONTROL MODULE POWER SUPPLY CIRCUIT-II

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

VVEL control module		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E14	8	E7	49	Existed

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

Is the inspection result normal?

YES >> EC-164, "Diagnosis Procedure"
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

U0101 CAN COMM CIRCUIT

Description

INFOID:0000000010596737

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:0000000010596738

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

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

Diagnosis Procedure

INFOID:0000000010596739

Go to LAN-16, "Trouble Diagnosis Flow Chart".

U1001 CAN COMM CIRCUIT

Description

INFOID:0000000010596740

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:0000000010596741

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> EC-170, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596742

Go to LAN-16, "Trouble Diagnosis Flow Chart".

U1003 CAN COMM CIRCUIT

Description

INFOID:0000000010596743

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. ECM and VVEL control module are connected with two communication lines (CAN H line and CAN L line) and transmit/ receive data. ECM shares information and links with the VVEL control module during operation.

DTC Logic

INFOID:0000000010596744

DTC DETECTION LOGIC

NOTE:

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

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to EC-171, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596745

1.CHECK VVEL CAN COMMUNICATION CIRCUIT

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

ECM		VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	
F102	54	E14	24	Existed
	55		11	

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

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connector E13, F40

- Harness for open or short between ECM and VVEL control module

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

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

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

4.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Erase DTC.
4. Perform DTC Confirmation Procedure.
   See EC-171, "DTC Logic".
5. Check DTC.

Is the DTC U1003 displayed again?

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

6.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

U1024 CAN COMM CIRCUIT

Description

INFOID:0000000010596746

CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. ECM and VVEL control module are connected with two communication lines (CAN H line and CAN L line) and transmit/receive data. ECM shares information and links with the VVEL control module during operation.

DTC Logic

INFOID:0000000010596747

DTC DETECTION LOGIC

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

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

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

Diagnosis Procedure

INFOID:0000000010596748

1.CHECK VVEL CAN COMMUNICATION CIRCUIT

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

ECM		VVEL control module		Continuity
Connector	Terminal	Connector	Terminal	
F102	54	E14	24	Existed
	55		11	

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

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connector E13, F40
- Harness for open or short between ECM and VVEL control module

>> Harness for open or short between ECM and VVEL control module

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

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

4.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Erase DTC.
4. Perform DTC Confirmation Procedure.
   See EC-173, "DTC Logic".

Is the DTC U1024 displayed again?

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

6.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P0011, P0021 IVT CONTROL

DTC Logic

INFOID:0000000010596749

DTC DETECTION LOGIC

NOTE:

- **If DTC P0011 or P0021 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to EC-185, "DTC Logic".**
- **If DTC P0011 or P0021 is displayed with DTC P0524, first perform the trouble diagnosis for DTC P0524. Refer to EC-367, "DTC Logic".**

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0011	Intake valve timing control performance (bank 1)	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
P0021	Intake valve timing control performance (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
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.

VHCL SPEED SE	100 - 120 km/h (63 - 75 mph)
ENG SPEED	525 - 2,000 rpm
COOLAN TEMP/S	More than 60°C (140°F)
B/FUEL SCHDL	More than 7.3 msec
Selector lever	D 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 EC-176, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Select “DATA MONITOR” mode with CONSULT.

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

ENG SPEED	1,400 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	D position
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:
Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

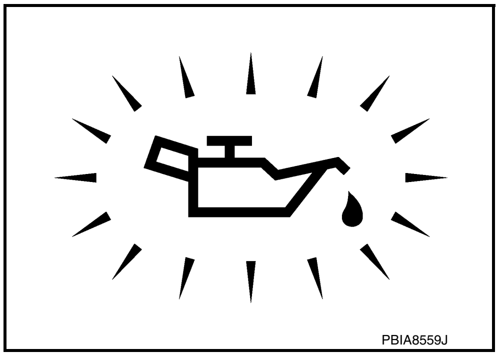
YES >> Go to EC-176, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596750

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 LU-7, "Inspection".
NO >> GO TO 2.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-177, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-300, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor (POS). Refer to EM-122, "Exploded View".

4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-304, "Component Inspection".

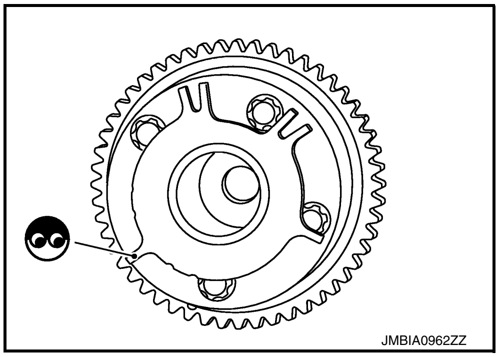
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-51, "Exploded View".

5.CHECK CAMSHAFT (INTAKE)

Check the following.

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



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-51, "Exploded View".

6.CHECK TIMING CHAIN INSTALLATION

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

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

YES >> Check timing chain installation. Refer to EM-52, "Removal and Installation".
NO >> GO TO 7.

7.CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-105, "Inspection".

Is the inspection result normal?

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

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596751

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

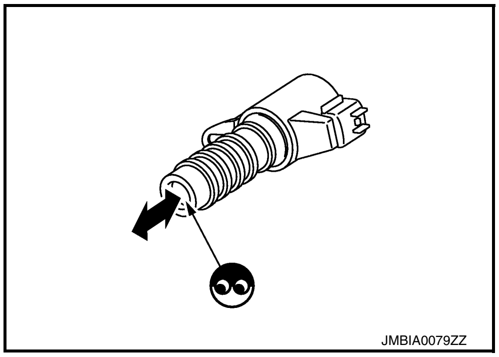
Terminals	Resistance (Ω)
1 and 2	7.0 - 7.7 [at 20°C (68°F)]
1 or 2 and ground	∞ (Continuity should not exist)

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".



2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.
   CAUTION:
   Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
   NOTE:
   Always replace O-ring when intake valve timing control solenoid valve is removed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

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

Description

INFOID:0000000010596752

SYSTEM DESCRIPTION

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

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

DTC Logic

INFOID:0000000010596753

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031	Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit low	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0032	Air fuel ratio (A/F) sensor 1 heater (bank 1) control circuit high	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater
P0051	Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit low	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0052	Air fuel ratio (A/F) sensor 1 heater (bank 2) control circuit high	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10.5 V and 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-180, "Diagnosis Procedure".
NG >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596754

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

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

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0031, P0032	1	F123	4	Ground	Battery voltage
P0051, P0052	2	F124	4		

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0031, P0032	1	F123	3	F101	1	Existed
P0051, P0052	2	F124	3		5	

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

Is the inspection result normal?

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

5.CHECK A/F SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

>> Repair or replace.

Component Inspection

INFOID:0000000010596755

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

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

Terminal	Resistance (Ω)
3 and 4	1.8 - 2.44 [at 25°C (77°F)]
3 and 1, 2	∞ (Continuity should not exist)
4 and 1, 2	

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0037, P0038, P0057, P0058 HO2S2 HEATER

Description

INFOID:0000000010596756

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

DTC Logic

INFOID:0000000010596757

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037	Heated oxygen sensor 2 heater (bank 1) control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0038	Heated oxygen sensor 2 heater (bank 1) control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater
P0057	Heated oxygen sensor 2 heater (bank 2) control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0058	Heated oxygen sensor 2 heater (bank 2) control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 11 V and 16 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st tip DTC detected?

YES >> Go to EC-183, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596758

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 heated oxygen sensor 2 (HO2S2) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between HO2S2 harness connector and ground.

DTC	HO2S2			Ground	Voltage
	Bank	Connector	Terminal		
P0037, P0038	1	F122	2	Ground	Battery voltage
P0057, P0058	2	F121	2		

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between heated oxygen sensor 2 and fuse

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

4.CHECK HO2S2 OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0037, P0038	1	F122	3	F101	17	Existed
P0057, P0058	2	F121	3		33	

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

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-184, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596759

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.

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

Is the inspection result normal?

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

2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

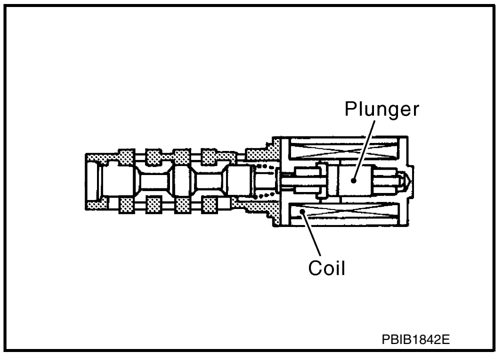
>> INSPECTION END

P0075, P0081 IVT CONTROL SOLENOID VALVE

Description

INFOID:0000000010596760

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:0000000010596761

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075	Intake valve timing control solenoid valve (bank 1) circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve
P0081	Intake valve timing control solenoid valve (bank 2) circuit		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-185, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596762

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

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

DTC	IVT control solenoid valve			Ground	Voltage
	Bank	Connector	Terminal		
P0075	1	F28	2	Ground	Battery voltage
P0081	2	F29	2		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

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

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

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.

DTC	IVT control solenoid valve			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0075	1	F28	1	F101	18	Existed
P0081	2	F29	1		29	

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

Is the inspection result normal?

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

4.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-186, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

5.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596763

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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

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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

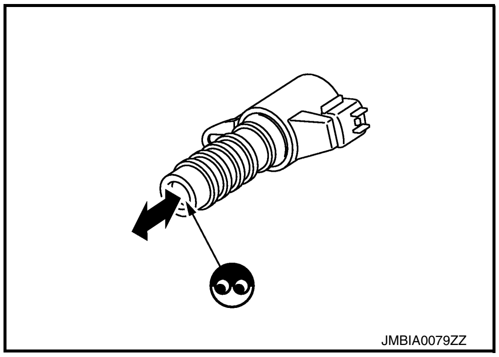
1. Remove intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.

   CAUTION:

   Do not apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.

   NOTE:

   Always replace O-ring when intake valve timing control solenoid valve is removed.


JMBIA0079ZZ

Is the inspection result normal?

YES >> INSPECTION END

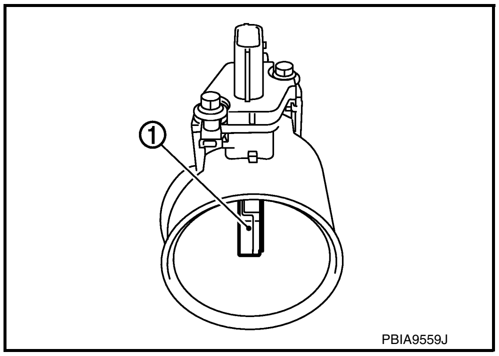
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

P0101, P010B MAF SENSOR

Description

INFOID:0000000010596764

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



DTC Logic

INFOID:0000000010596765

DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0101	MAF SEN/CIRCUIT-B1 (Mass air flow sensor (bank 1) circuit range/performance)	• A high voltage from the sensor is sent to ECM under light load driving condition. • A low voltage from the sensor is sent to ECM under heavy load driving condition.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor (bank 1) • EVAP control system pressure sensor • Intake air leaks • Intake air temperature sensor
P010B	MAF SEN/CIRCUIT-B2 (Mass air flow sensor (bank 2) circuit range/performance)		• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor (bank 2) • EVAP control system pressure sensor • Intake air leaks

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle for at least 5 seconds under the following conditions:
   CAUTION:
   Always drive at a safe speed.

Selector lever	Suitable position
Vehicle speed	40 km/h (25 MPH) or more

NOTE:
- The gear must be fixed while driving the vehicle.
- Keep the accelerator pedal as steady as possible during cruising.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-189, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596766

1.CHECK INTAKE SYSTEM

Check the following items to see the installation condition and the connection condition of the joint.
- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

Is the inspection result normal?

YES >> GO TO 2.
NO >> Reconnect or replace error-detected parts.

2.CHECK MASS AIR FLOW SENSOR POWER SUPPLY CIRCUIT

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

DTC	+			–	Voltage
	Mass air flow sensor				
	Bank	Connector	Terminal		
P0101	1	F31	5	Ground	Battery voltage
P010B	2	F42			

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

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

>> Repair or replace error-detected parts.

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

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

DTC	Mass air flow sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0101	1	F31	4	F102	68	Existed
P010B	2	F42	4		94	

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

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair or replace error-detected parts.

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

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

DTC	Mass air flow sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0101	1	F31	3	F102	77	Existed
P010B	2	F42	3		79	

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

Is the inspection result normal?

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

6.CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor. Refer to EC-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES-1 (DTC P0101 is detected)>>GO TO 8.
YES-2 (DTC P010B is detected)>>GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

8.CHECK MASS AIR FLOW SENSOR (BANK 1)

Check mass air flow sensor (bank 1). Refer to EC-190, "Component Inspection".

Is the inspection result normal?

YES >> Check intermittent Incident. Refer to GI-45, "Intermittent Incident".
NO >> Replace mass air flow sensor (bank 1). Refer to EM-27, "Exploded View".

9.CHECK MASS AIR FLOW SENSOR (BANK 2)

Check mass air flow sensor (bank 2). Refer to EC-190, "Component Inspection".

Is the inspection result normal?

YES >> Check intermittent Incident. Refer to GI-45, "Intermittent Incident".
NO >> Replace mass air flow sensor (bank 2). Refer to EM-27, "Exploded View".

Component Inspection

INFOID:0000000010596767

1.CHECK MASS AIR FLOW SENSOR-I

With CONSULT

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

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

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

Without CONSULT

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.

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

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

Is the inspection result normal?

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

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

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.

- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Intake valve deposits
- Improper specification of intake air system parts

Is the inspection result normal?

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

3.CHECK MASS AIR FLOW SENSOR-II

With CONSULT

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

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

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

Without CONSULT

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

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

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

Is the inspection result normal?

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

4.CHECK MASS AIR FLOW SENSOR-III

With CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

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

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

Without CONSULT

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

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

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

Is the inspection result normal?

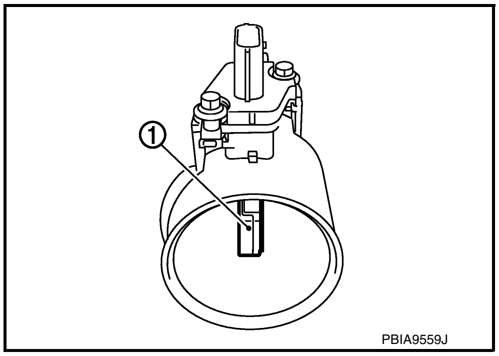
YES >> INSPECTION END
NO >> Clean or replace malfunctioning mass air flow sensor. Refer to EM-27, "Exploded View".

P0102, P0103, P010C, P010D MAF SENSOR

Description

INFOID:0000000010596768

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



DTC Logic

INFOID:0000000010596769

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

Which DTC is detected?

P0102, P010C>>GO TO 2.
P0103, P010D>>GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P0102 AND P010C

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

Is DTC detected?

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

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

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

Is DTC detected?

YES >> Go to EC-195, "Diagnosis Procedure".
NO >> GO TO 4.

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

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

Is DTC detected?

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

Diagnosis Procedure

INFOID:0000000010596770

1.INSPECTION START

Confirm the detected DTC.

Which DTC is detected?

P0102, P010C>>GO TO 2.
P0103, P010D>>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 M95. Refer to Ground Inspection in GI-48, "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.

DTC	MAF sensor			Ground	Voltage
	Bank	Connector	Terminal		
P0102, P0103	1	F31	5	Ground	Battery voltage
P010C, P010D	2	F42	5		

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between mass air flow sensor and ECM
- Harness for open or short between mass air flow sensor and IPDM E/R

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

6.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.

DTC	MAF sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0102, P0103	1	F31	4	F102	68	Existed
P010C, P010D	2	F42	4		94	

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

<u>Is the inspection result normal?</u>

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

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

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

DTC	MAF sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0102, P0103	1	F31	3	F102	77	Existed
P010C, P010D	2	F42	3		79	

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

<u>Is the inspection result normal?</u>

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK MASS AIR FLOW SENSOR

Refer to EC-196, "Component Inspection".

<u>Is the inspection result normal?</u>

YES >> GO TO 9.
NO >> Replace malfunctioning mass air flow sensor. Refer to EM-27, "Exploded View".

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596771

1.CHECK MASS AIR FLOW SENSOR-I

With CONSULT

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

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

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

Without CONSULT

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

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

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

Is the inspection result normal?

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

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

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Intake valve deposits
- Improper specification of intake air system parts

Is the inspection result normal?

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

3.CHECK MASS AIR FLOW SENSOR-II

With CONSULT

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

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

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

Without CONSULT

1. Repair or replace malfunctioning part.

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2. Start engine and warm it up to normal operating temperature.
3. Check the voltage between ECM harness connector terminals under the following conditions.

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

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

Is the inspection result normal?

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

4.CHECK MASS AIR FLOW SENSOR-III

With CONSULT

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

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

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

Without CONSULT

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

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

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace malfunctioning mass air flow sensor. Refer to EM-27, "Exploded View".

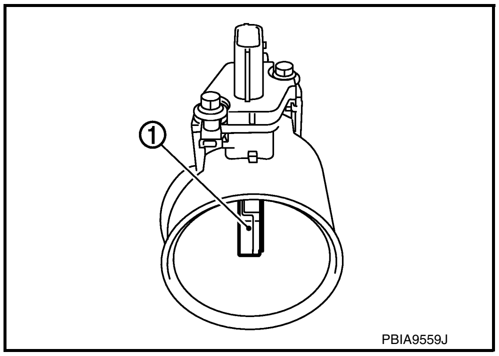
P0111 IAT SENSOR

Description

INFOID:0000000010596776

The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.

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

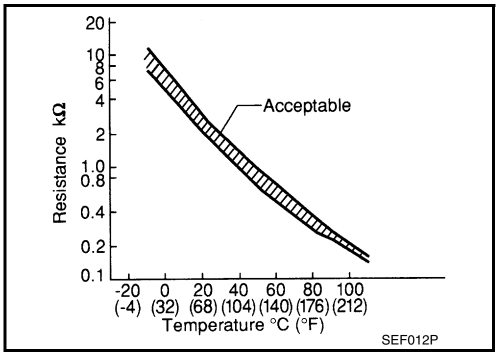


PBIA9559J

<Reference data>

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

*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



SEF012P

DTC Logic

INFOID:0000000010596777

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0111	IAT SENSOR 1 B1 [Intake air temperature (IAT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the IAT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	• Harness or connectors (High or low resistance in the IAT sensor circuit) • IAT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-201, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-201, "Diagnosis Procedure".

3.PRECONDITIONING

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

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

TESTING CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the hood open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-201, "Diagnosis Procedure".
NO >> INSPECTION END

Component Function Check

INFOID:0000000010596778

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-201, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-201, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596779

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

Check intake air temperature sensor. Refer to EC-202, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596780

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

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

Is the inspection result normal?

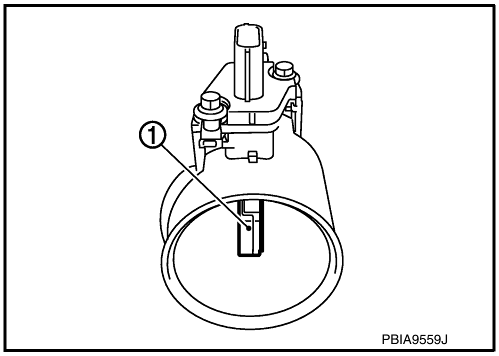
YES >> INSPECTION END

NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

P0112, P0113 IAT SENSOR

Description

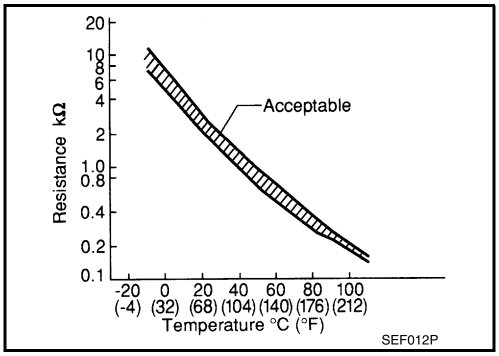
The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases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



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



DTC Logic

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-204, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596783

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (MAF) sensor (intake air temperature sensor is built-into) harness connector.
2. Turn ignition switch ON.
3. Check the voltage between mass air flow sensor (bank 1) harness connector and ground.

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

Is the inspection result normal?

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

3.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

MAF sensor (bank 1)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F31	1	F102	68	Existed

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

Is the inspection result normal?

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

4.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-204, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

5.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596784

1.CHECK INTAKE AIR TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

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

Is the inspection result normal?

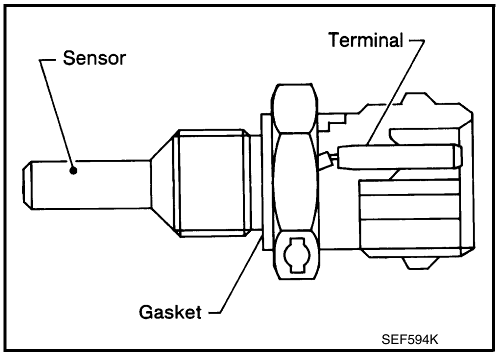
YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

P0116 ECT SENSOR

Description

INFOID:0000000010596785

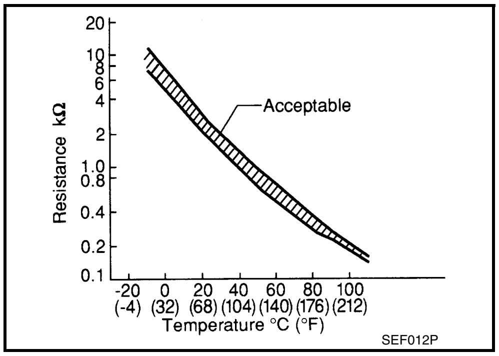
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



DTC Logic

INFOID:0000000010596786

DTC DETECTION LOGIC

NOTE:

If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-209, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0116	ECT SEN/CIRC [Engine coolant temperature (ECT) sensor circuit range/performance]	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, FTT sensor, and EOT sensor) shows that the voltage signal of the ECT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	• Harness or connectors (High or low resistance in the ECT sensor circuit) • ECT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-207, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-208, "Diagnosis Procedure".

3.PRECONDITIONING

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

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

TEST CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the hood open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-208, "Diagnosis Procedure".
NO >> INSPECTION END

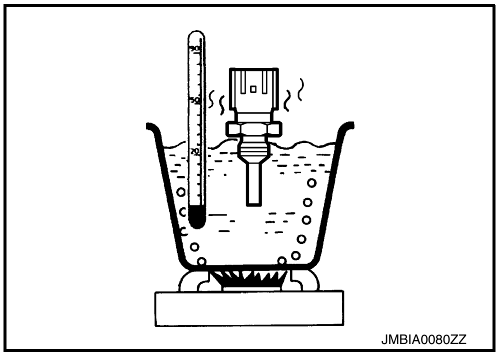
Component Function Check

INFOID:0000000010596787

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect ECT sensor harness connector.
3. Remove ECT sensor. Refer to CO-24, "Exploded View".
4. Check resistance between ECT sensor terminals by heating with hot water as shown in the figure.

Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.37 - 2.63
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260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Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-208, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-208, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596788

1.CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR

Check ECT sensor. Refer to EC-208, "Component Inspection".

Is the inspection result normal?

OK >> GO TO 2.
NG >> Replace ECT sensor. Refer to CO-24, "Exploded View".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

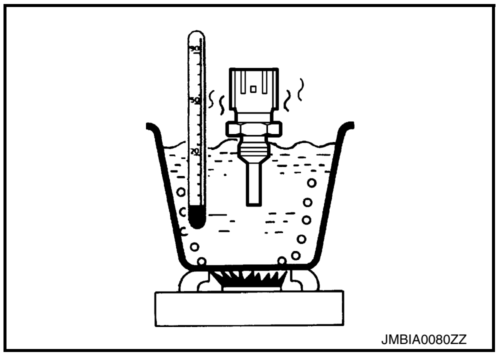
>> **INSPECTION END**

Component Inspection

INFOID:0000000010596789

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor. Refer to CO-24, "Exploded View".
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.37 - 2.63
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

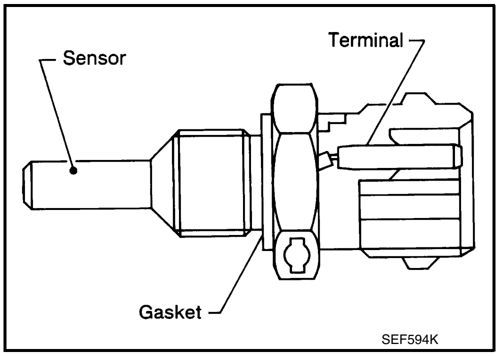
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

P0117, P0118 ECT SENSOR

Description

INFOID:0000000010596790

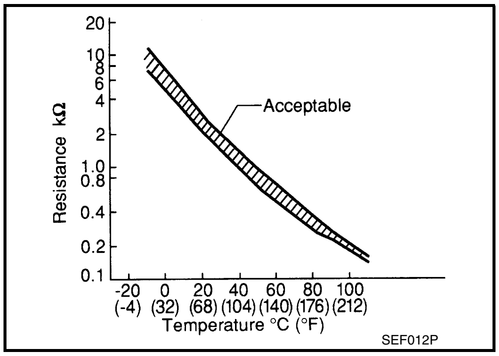
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



DTC Logic

INFOID:0000000010596791

DTC DETECTION LOGIC

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to EC-210, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596792

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
F17	1	Ground	Approx. 5

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F109, F110
- Harness for open or short between engine coolant temperature sensor and ECM

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

4.CHECK ECT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
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	
F17	2	F102	84	Existed

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

Is the inspection result normal?

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

5.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-211, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

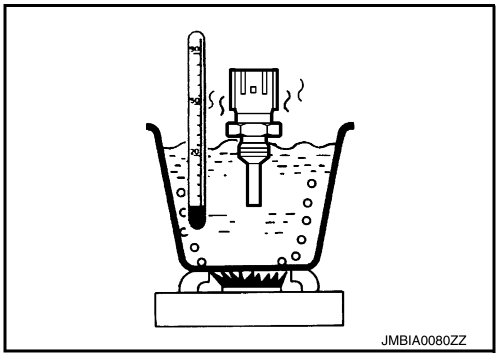
>> INSPECTION END

Component Inspection

INFOID:0000000010596793

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor. Refer to CO-24, "Exploded View".
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature °C (°F)	20 (68)	2.37 - 2.63
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END

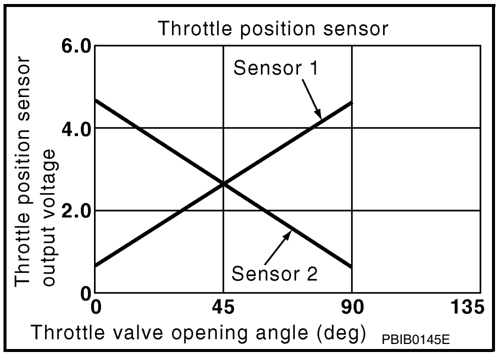
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

P0122, P0123, P0227, P0228 TP SENSOR

Description

INFOID:0000000010596794

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



DTC Logic

INFOID:0000000010596795

DTC DETECTION LOGIC

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

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

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is DTC detected?

YES >> Go to EC-213, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596796

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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.

DTC	Electric throttle control actuator			Ground	Voltage (V)
	Bank	Connector	Terminal		
P0122, P0123	1	F6	6	Ground	Approx. 5
P0227, P0228	2	F27	1		

Is the inspection result normal?

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

3.CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0122, P0123	1	F6	3	F101	40	Existed
P0227, P0228	2	F27	4		48	

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

Is the inspection result normal?

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

4.CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0122, P0123	1	F6	5	F101	34	Existed
P0227, P0228	2	F27	3		35	

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

Is the inspection result normal?

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

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-214, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-214, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596797

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F101	30 [TP sensor 1 (bank 1)]	40	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36
				Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40		Fully released	Less than 4.75
				Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48		Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

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

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-214, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010596798

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

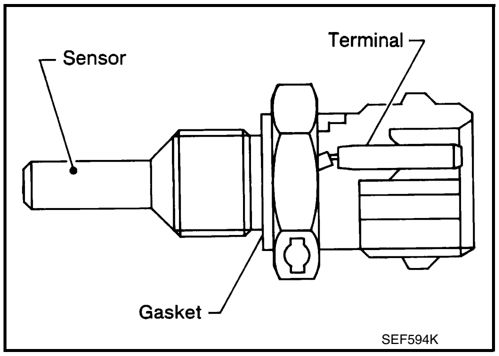
>> END

P0125 ECT SENSOR

Description

INFOID:0000000010596799

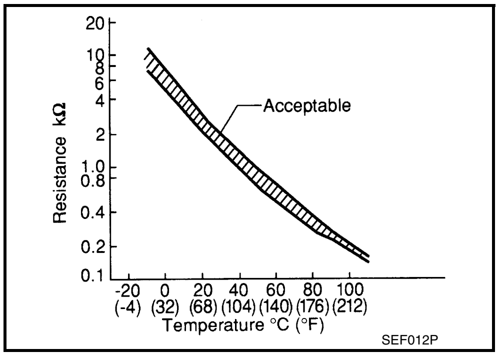
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The 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	2.37 - 2.63
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

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



DTC Logic

INFOID:0000000010596800

DTC DETECTION LOGIC

NOTE:

If DTC P0125 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117 or P0118. Refer to EC-209, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125	Insufficient engine coolant temperature for closed loop fuel control	• Voltage sent to ECM from the sensor is not practical, even when some time has passed after starting the engine. • Engine coolant temperature is insufficient for closed loop fuel control.	• Harness or connectors (High resistance in the circuit) • Engine coolant temperature sensor • Thermostat

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR FUNCTION

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT.
3. Check that “COOLAN TEMP/S” is above -10°C (14°F).

Is the temperature above -10°C (14°F)?

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

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for 65 minutes at idle speed.
   If "COOLAN TEMP/S" increases to more than -10°C (14°F) within 65 minutes, stop engine because the test result will be OK.
   CAUTION:
   Be careful not to overheat engine.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-217, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596801

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-217, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

3.CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm the engine coolant does not flow.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace thermostat. Refer to CO-22, "Removal and Installation".

4.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

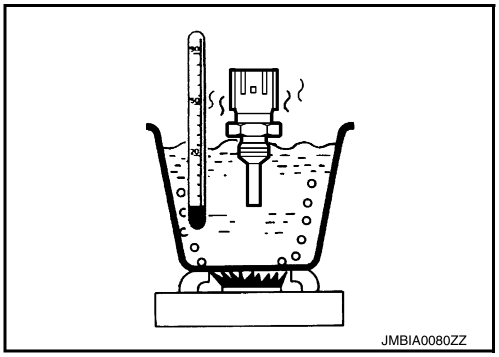
Component Inspection

INFOID:0000000010596802

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine coolant temperature sensor harness connector.
3. Remove engine coolant temperature sensor. Refer to CO-24, "Exploded View".

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



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.37 - 2.63
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

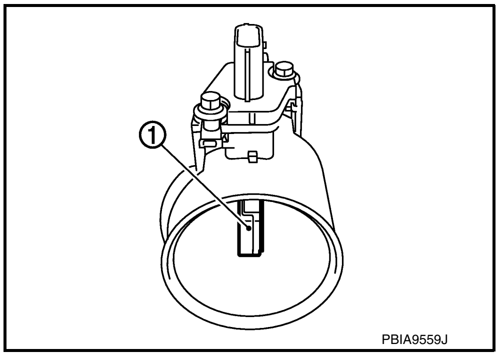
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

P0127 IAT SENSOR

Description

INFOID:0000000010596803

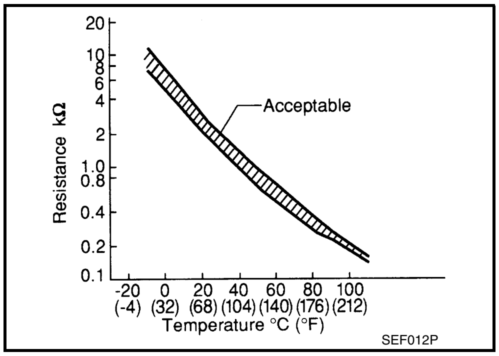
The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases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



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 67 (Intake air temperature sensor) and 68 (Sensor ground).



DTC Logic

INFOID:0000000010596804

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127	Intake air temperature too high	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signal from engine coolant temperature sensor.	• Harness or connectors (The sensor circuit is open or shorted) • Intake air temperature sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:
This test may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Wait until engine coolant temperature is less than 96°C (205°F)
- Turn ignition switch ON.
- Select “DATA MONITOR” mode with CONSULT.
- Check the engine coolant temperature.
- If the engine coolant temperature is not less than 96°C (205°F), turn ignition switch OFF and cool down engine.

NOTE:
Perform the following steps before engine coolant temperature is above 96°C (205°F).

2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-220, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596805

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-220, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596806

1.CHECK INTAKE AIR TEMPERATURE (IAT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect mass air flow sensor (bank 1) harness connector.
3. Check resistance between mass air flow sensor (bank 1) terminals as follows.

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1). Refer to EM-27, "Exploded View".

P0128 THERMOSTAT FUNCTION

DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0128 is displayed with DTC P0300, P0301, P0302, P0303, P0304, P0305 or P0306, first perform the trouble diagnosis for P0300, P0301, P0302, P0303, P0304, P0305, P0306. Refer to EC-288.

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.

This is due to a leak in the seal or the thermostat being stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128	Thermostat function	The engine coolant temperature does not reach to specified temperature even though the engine has run long enough.	• Thermostat • Leakage from sealing portion of thermostat • Engine coolant temperature sensor

DTC CONFIRMATION PROCEDURE

NOTE:

Never refuel before and during the following procedure.

1.PRECONDITIONING-I

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

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

>> GO TO 2.

2.PRECONDITIONING-II

With CONSULT

1. Turn ignition switch ON.
2. Check the following conditions:

Ambient temperature	−10°C (14°F) or more
A/C switch	OFF
Blower fan switch	OFF

3. Select “DATA MONITOR” mode of “ENGINE” using CONSULT.
4. Check the following conditions:

COOLAN TEMP/S	−10°C – 52°C (14 – 126°F)

Is the condition satisfied?

YES >> GO TO 3.

NO >> 1. Satisfy the condition.
2. GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Start engine.
2. Drive the vehicle until the following condition is satisfied.

   CAUTION:

   Always drive vehicle at safe speed.

- **STEP 1**

  Drive the vehicle under the conditions instructed below until the difference between “COOLAN TEMP/S” and “FUEL T/TMP SE” becomes at least 25°C (45°F).

COOLAN TEMP/S	71°C (159°F) or less
FUEL T/TMP SE	Less than the value calculated by subtracting 25°C (45°F) from “COOLAN TEMP/S”.*

*: Example

COOLAN TEMP/S	FUEL T/TMP SE
70°C (158°F)	45°C (113°F) or less
65°C (149°F)	40°C (104°F) or less
60°C (140°F)	35°C (95°F) or less

- **STEP 2**

  Drive the vehicle at 50 km/h (32 MPH) or more with the difference between “COOLAN TEMP/S” and “FUEL T/TMP SE” maintained at 25°C (45°F) or more.

  NOTE:

  Keep the accelerator pedal as steady as possible during cruising.
- **STEP 3**

  Drive the vehicle at 50 km/h (32 MPH) or more until “COOLAN TEMP/S” increases by 6°C (11°F).

  NOTE:

  Keep the accelerator pedal as steady as possible during cruising.

Is the condition satisfied?

YES >> GO TO 4.
NO >> GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Drive the vehicle until the following condition is satisfied.

COOLAN TEMP/S	71°C (159°F) or more

CAUTION:

Always drive vehicle at safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-222, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596808

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-222, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

2.CHECK THERMOSTAT

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace thermostat. Refer to CO-22, "Removal and Installation".

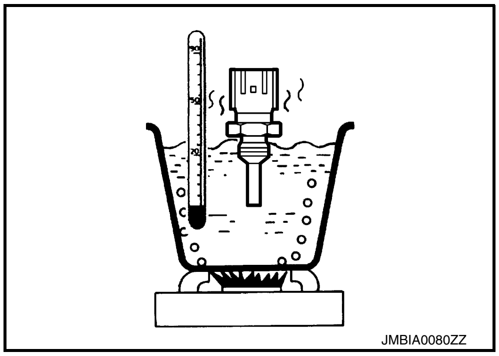
Component Inspection

INFOID:0000000010596809

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

3. Remove engine coolant temperature sensor. Refer to CO-24, "Exploded View".
4. Check resistance between engine coolant temperature sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature °C (°F)	20 (68)	2.37 - 2.63
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

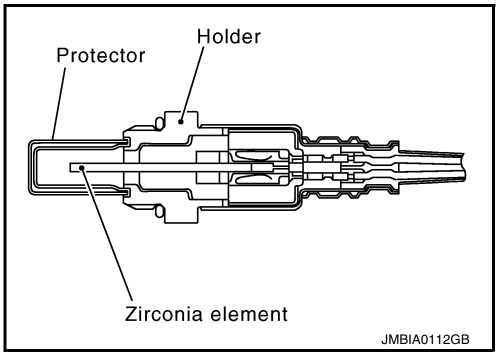
P0130, P0150 A/F SENSOR 1

Description

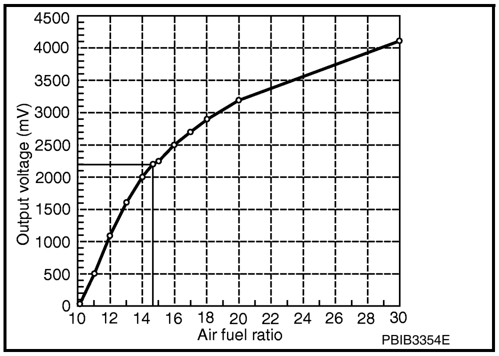
INFOID:0000000010596810

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

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



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



DTC Logic

INFOID:0000000010596811

DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible Cause
P0130	Air fuel ratio (A/F) sensor 1 (bank 1) circuit	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V.	
P0150	Air fuel ratio (A/F) sensor 1 (bank 2) circuit	A)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in a range other than approx. 2.2 V.	
		B)	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 2.2 V.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Let engine idle for 2 minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-226, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> Without CONSULT: GO TO 7.

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

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

Does the indication fluctuate around 2.2 V?

YES >> GO TO 4.
NO >> Go to EC-226, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-I

1. Select “A/F SEN1 (B1) P1276” (for DTC P0130) or “A/F SEN1 (B2) P1286” (for DTC P0150) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT.
2. Touch “START”.
3. When the following conditions are met, “TESTING” will be displayed on the CONSULT screen.

ENG SPEED	1,100 - 3,200 rpm
VHCL SPEED SE	More than 64 km/h (40 mph)
B/FUEL SCHDL	1.0 - 8.0 msec
Selector lever	D position

If “TESTING” is not displayed after 20 seconds, retry from step 2.

CAUTION:

Always drive vehicle at a safe speed.

Is “TESTING” displayed on CONSULT screen?

YES >> GO TO 5.
NO >> Check A/F sensor 1 function again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-II

Release accelerator pedal fully.

NOTE:

Never apply brake when releasing the accelerator pedal.

Which does “TESTING” change to?

COMPLETED>>GO TO 6.
OUT OF CONDITION>>Retry DTC CONFIRMATION PROCEDURE. GO TO 4.

6.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B-III

Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-226, "Diagnosis Procedure".

7.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to EC-226, "Component Function Check".

NOTE:

Use component function check to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Go to EC-226, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596812

1.PERFORM COMPONENT FUNCTION CHECK

With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever to D position, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (30 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   Never apply brake when releasing the accelerator pedal.
4. Repeat steps 2 and 3 for five times.
5. Stop the vehicle and turn ignition switch OFF.
6. Turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 and 3 for five times.
10. Stop the vehicle and connect GST to the vehicle.
11. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-226, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596813

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

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

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F123	4	Ground	Battery voltage
P0150	2	F124	4		

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F123	1	F102	57	Existed
			2		61	
P0150	2	F124	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0130	1	F123	1	Ground	Not existed
			2		
P0150	2	F124	1		
			2		

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

5. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

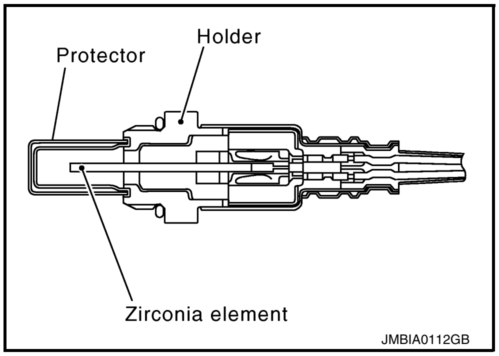
P0131, P0151 A/F SENSOR 1

Description

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

The sensor is capable of precise measurement λ = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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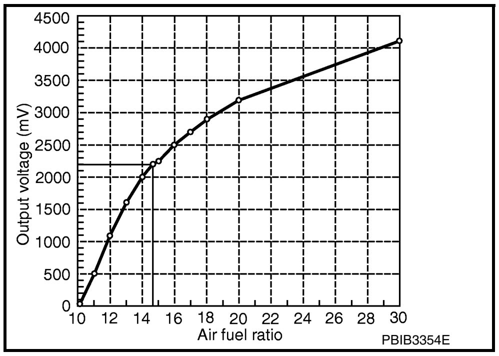
Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



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DTC Logic

DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0131	Air fuel ratio (A/F) sensor 1 (bank 1) circuit low voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0151	Air fuel ratio (A/F) sensor 1 (bank 2) circuit low voltage		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

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

Is the indication constantly approx. 0 V?

YES >> Go to EC-229, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Maintain the following conditions for about 20 consecutive seconds.

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

   NOTE:
   - **Keep the accelerator pedal as steady as possible during cruising.**
   - **If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 1.**
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-229, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596816

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

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

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F123	4	Ground	Battery voltage
P0150	2	F124	4		

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F123	1	F102	57	Existed
			2		61	
P0150	2	F124	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0130	1	F123	1	Ground	Not existed
			2		
P0150	2	F124	1		
			2		

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

5. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

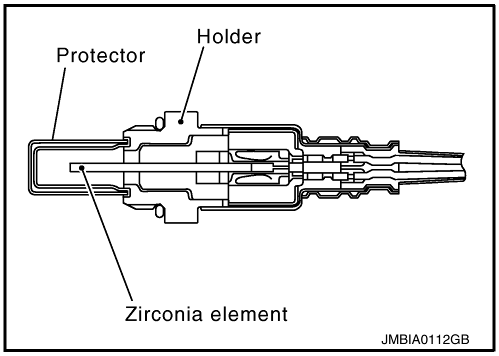
P0132, P0152 A/F SENSOR 1

Description

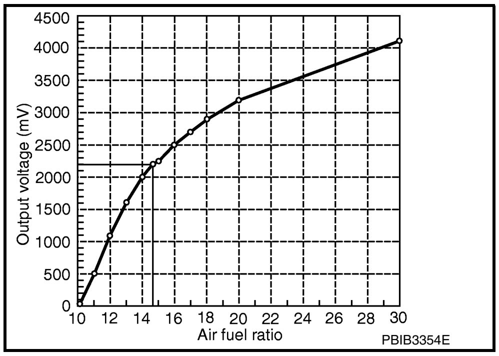
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement λ = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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



DTC Logic

DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0132	Air fuel ratio (A/F) sensor 1 (bank 1) circuit high voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0152	Air fuel ratio (A/F) sensor 1 (bank 2) circuit high voltage		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

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

>> GO TO 2.

2.CHECK A/F SENSOR FUNCTION

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

Is the indication constantly approx. 5V?

YES >> Go to EC-232, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Restart engine.
5. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Maintain the following conditions for about 20 consecutive seconds.

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

NOTE:
- **Keep the accelerator pedal as steady as possible during cruising.**
- **If this procedure is not completed within 1 minute after restarting engine at step 4, return to step 1.**

7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-232, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596819

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

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

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P0130	1	F123	4	Ground	Battery voltage
P0150	2	F124	4		

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0130	1	F123	1	F102	57	Existed
			2		61	
P0150	2	F124	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0130	1	F123	1	Ground	Not existed
			2		
P0150	2	F124	1		
			2		

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

5. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

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

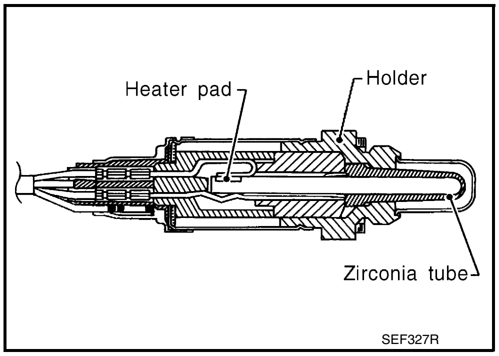
>> INSPECTION END

P0137, P0157 HO2S2

Description

INFOID:0000000010596820

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



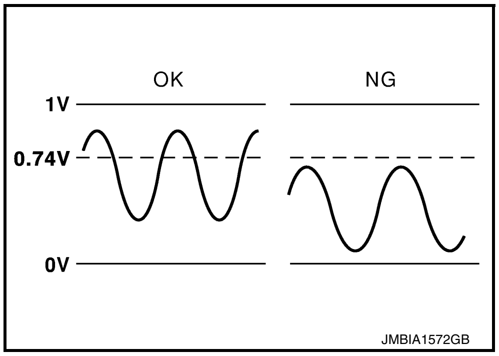
SEF327R

DTC Logic

INFOID:0000000010596821

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel-cut.



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

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

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

2.PRECONDITIONING

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

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

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1147” (for DTC P0137) or “HO2S2 (B2) P1167” (for DTC P0157) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
11. Start engine and follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-236, "Diagnosis Procedure".
CAN NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-235, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-236, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596822

1.PERFORM COMPONENT FUNCTION CHECK-I

Without CONSULT

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F102	76	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure.
P0157		80			

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F102	76	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure.
P0157		80			

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F102	76	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.74 V at least once during this procedure.
P0157		80			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-236, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596823

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to EC-262, "DTC Logic".
NO >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F122	1	F102	84	Existed
P0157	2	F121	1			

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

Is the inspection result normal?

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F122	4	F102	76	Existed
P0157	2	F121	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0137	1	F122	4	Ground	Not existed
P0157	2	F121	4		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P0137	1	F102	76	Ground	Not existed
P0157	2		80		

3. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-238, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596824

1.INSPECTION START

Do you have CONSULT?

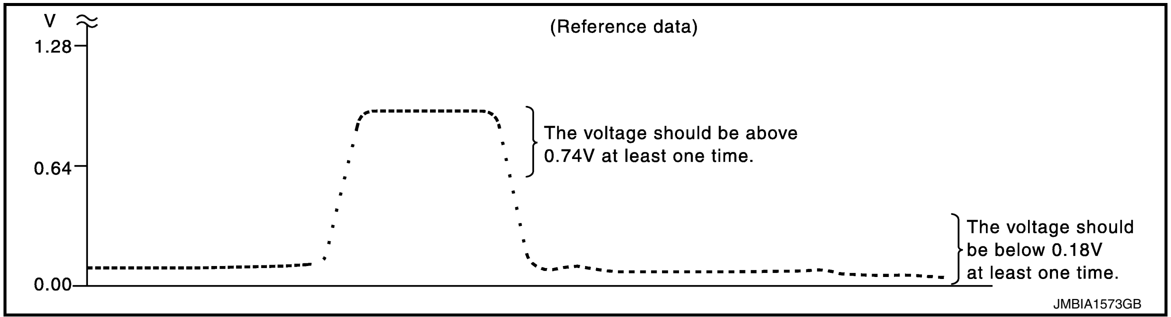
Do you have CONSULT?

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

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

4.CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)] 80 [HO2S2 (bank 2)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0138, P0158 HO2S2

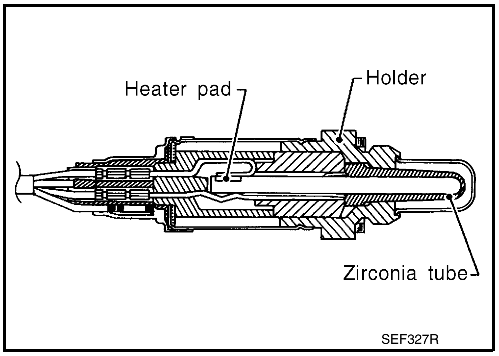
Description

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

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



SEF327R

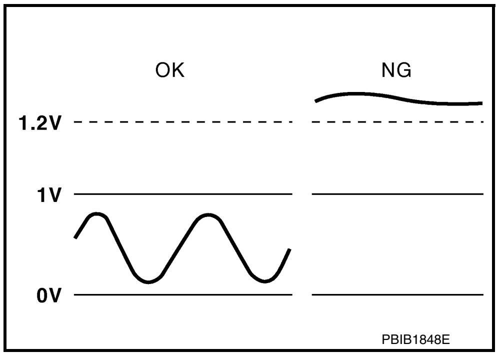
DTC Logic

DTC DETECTION LOGIC

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

MALFUNCTION A

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



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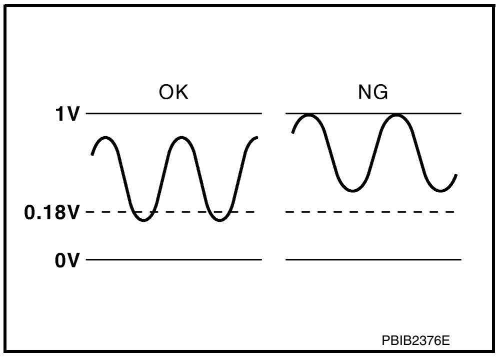
MALFUNCTION B

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



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DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0138	Heated oxygen sensor 2 (bank 1) circuit high voltage	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0158	Heated oxygen sensor 2 (bank 2) circuit high voltage	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2
		B)	The minimum voltage from the sensor is not reached to the specified voltage.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

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

Is 1st trip DTC detected?

YES >> Go to EC-243, "Diagnosis Procedure".
NO-1 >> With CONSULT: GO TO 3.
NO-2 >> Without CONSULT: GO TO 5.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

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

1. Select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1146” (for DTC P0138) or “HO2S2 (B2) P1166” (for DTC P0158) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
11. Start engine and follow the instruction of CONSULT display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-243, "Diagnosis Procedure".
CON NOT BE DIAGNOSED>>GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

1. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).

2. Perform DTC confirmation procedure again.

>> GO TO 3.

5.PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

Perform component function check. Refer to EC-242, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-243, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596827

1.PERFORM COMPONENT FUNCTION CHECK-I

⊗**Without CONSULT**

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F102	76	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be below 0.18 V at least once during this procedure.
P0158		80			

Is the inspection result normal?

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

2.PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F102	76	84	Keeping engine at idle for 10 minutes	The voltage should be below 0.18 V at least once during this procedure.
P0158		80			

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F102	76	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be below 0.18 V at least once during this procedure.
P0158		80			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-243, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596828

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-240, "DTC Logic".

Which malfunction is detected?

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

2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between HO2S2 harness connector and ECM harness connector.

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F122	1	F102	84	Existed
P0158	2	F121	1			

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

Is the inspection result normal?

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F122	4	F102	76	Existed
P0158	2	F121	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0138	1	F122	4	Ground	Not existed
P0158	2	F121	4		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P0138	1	F102	76	Ground	Not existed
P0158	2		80		

3. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

Is the inspection result normal?

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

6.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-246, "Component Inspection".

Is the inspection result normal?

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

7.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

9.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace ground connection.

10.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-266, "DTC Logic".
NO >> GO TO 11.

11.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F122	1	F102	84	Existed
P0158	2	F121	1			

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

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

12. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F122	4	F102	76	Existed
P0158	2	F121	4		80	

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

DTC	HO2S2			ECM		Ground	Continuity
	Bank	Connector	Terminal	Connector	Terminal		
P0138	1	F122	4	F102	76	Ground	Not existed
P0158	2	F121	4		80		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

13. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-242, "Component Function Check".

Is the inspection result normal?

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

14. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

15. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596829

1. INSPECTION START

Do you have CONSULT?

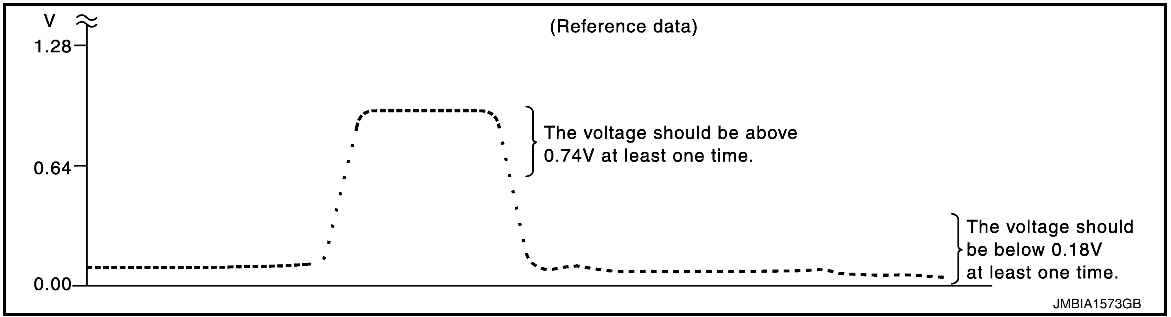
Do you have CONSULT?

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

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.
7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is −25%.

Is the inspection result normal?

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

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

4.CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0139, P0159 HO2S2

Description

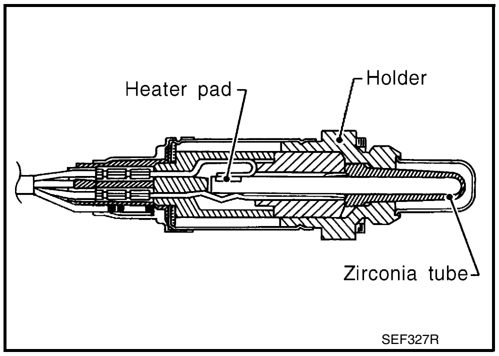
INFOID:0000000010596830

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

Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.

This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.

Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.

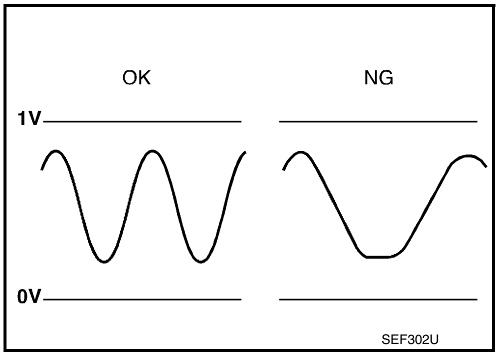


DTC Logic

INFOID:0000000010596831

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than specified during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139	Heated oxygen sensor 2 (bank 1) circuit slow response	The switching time between rich and lean of a heated oxygen sensor 2 signal delays more than the specified time computed by ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel system • EVAP system • Intake air system
P0159	Heated oxygen sensor 2 (bank 2) circuit slow response		

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 7.

2.PRECONDITIONING

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

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

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
9. Drive the vehicle in a proper gear at 60 km/h (38MPH) and maintain the speed.
   CAUTION:
   Always drive vehicle at a safe speed.
10. Release the accelerator pedal fully at least 5 seconds.
    CAUTION:
    - **Enable the engine brake.**
    - **Always drive carefully.**
    - **Never apply brake when releasing the accelerator pedal.**
11. Repeat step 9 and 10 at least 8 times.
12. Check the following item of “DATA MONITOR”.

DTC	Data monitor item	Status
P0139	HO2 S2 DIAG1 (B1)	CMPLT
	HO2 S2 DIAG2 (B1)	
P0159	HO2 S2 DIAG1 (B2)	
	HO2 S2 DIAG2 (B2)	

Is “CMPLT” displayed on CONSULT screen?

YES >> GO TO 6.
NO-1: “CMPLT” is not displayed on DIAG 1>>Perform DTC confirmation procedure again.
NO-2: “CMPLT” is not displayed on DIAG 2>>GO TO 4.

4.PERFORM DTC WORK SUPPORT

1. Open engine hood.
2. Select “HO2S2 (B1) P0139” or “HO2S2 (B2) P0159” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT.
3. Start engine and follow the instruction of CONSULT display.
   NOTE:
   It will take at most 10 minutes until “COMPLETED” is displayed.

Is “COMPLETED” displayed on CONSULT screen?

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

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 3.

6.PERFORM SELF-DIAGNOSIS

With CONSULT

Perform ECM self-diagnosis.

Is DTC “P0139” or “P0159” detected?

YES >> Proceed to EC-252, "Diagnosis Procedure".
NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-251, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-252, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596832

1.PERFORM COMPONENT FUNCTION CHECK-I

⊗**Without CONSULT**

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F102	76	84	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.96 V for 1 second during this procedure.
P0159		80			

Is the inspection result normal?

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

2.PERFORM COMPONENT FUNCTION CHECK-II

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F102	76	84	Keeping engine at idle for 10 minutes	A change of voltage should be more than 0.96 V for 1 second during this procedure.
P0159		80			

Is the inspection result normal?

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

3.PERFORM COMPONENT FUNCTION CHECK-III

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

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F102	76	84	Coasting from 80 km/h (50 MPH) in D position	A change of voltage should be more than 0.96 V for 1 second during this procedure.
P0159		80			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-252, "Diagnosis Procedure".

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

2.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-262, "DTC Logic" or EC-266, "DTC Logic".
NO >> GO TO 3.

3.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F122	1	F102	84	Existed
P0159	2	F121	1			

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

Is the inspection result normal?

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

4.CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F122	4	F102	76	Existed
P0159	2	F121	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0139	1	F122	4	Ground	Not existed
P0159	2	F121	4		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P0139	1	F102	76	Ground	Not existed
P0159	2		80		

3. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-253, "Component Inspection".

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596834

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

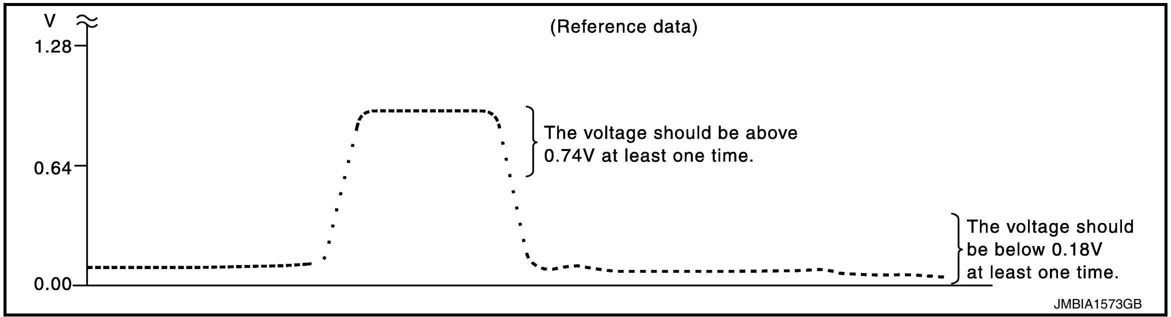
YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK HEATED OXYGEN SENSOR 2

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT.

7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.74 V at least once when the “FUEL INJECTION” is +25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is –25%.

Is the inspection result normal?

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

3.CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

4.CHECK HEATED OXYGEN SENSOR 2-II

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

5.CHECK HEATED OXYGEN SENSOR 2-III

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

ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F102	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.74 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

Is the inspection result normal?

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

6.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P014C, P014D, P014E, P014F, P015A, P015B, P015C, P015D A/F SENSOR 1

DTC Logic

INFOID:0000000010596835

DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P014C	Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response	• The response time of a A/F sensor 1 signal delays more than the specified time computed by ECM.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P014D			
P015A	Air fuel ratio (A/F) sensor 1 (bank 1) circuit delayed response		
P015B			
P014E	Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response		
P014F			
P015C	Air fuel ratio (A/F) sensor 1 (bank 2) circuit delayed response		
P015D			

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

TESTING CONDITION:

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

Do you have CONSULT?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
6. Let engine idle for 1 minute.
7. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
8. Fully release accelerator pedal and then let engine idle for about 1 minute.
9. Check the items status of “DATA MONITOR” as follows.
   NOTE:
   If “PRSNT” changed to “ABSNT”, refer to EC-226, "Component Function Check".

DTC	Data monitor item	Status
• P014C • P014D • P015A • P015B	A/F SEN1 DIAG3 (B1)	PRSNT
• P014E • P014F • P015C • P015D	A/F SEN1 DIAG3 (B2)	

Is “PRSNT” displayed on CONSULT screen?

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

3.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

Perform DTC confirmation procedure-1 again.

Is “PRSNT” displayed on CONSULT screen?

YES >> GO TO 4.
NO >> Refer to EC-226, "Component Function Check".

4.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Wait for about 20 seconds at idle.
2. Check the items status of “DATA MONITOR” as follows.
   NOTE:
   If “CMPLT” changed to “INCMP”, refer to EC-226, "Component Function Check".

DTC	Data monitor item	Status
• P014C • P014D • P015A • P015B	A/F SEN1 DIAG1 (B1)	CMPLT
	A/F SEN1 DIAG2 (B1)	
• P014E • P014F • P015C • P015D	A/F SEN1 DIAG1 (B2)	
	A/F SEN1 DIAG2 (B2)	

Is “CMPLT” displayed on CONSULT screen?

YES >> GO TO 5.
NO >> Refer to EC-226, "Component Function Check".

5.PERFORM SELF-DIAGNOSIS

With CONSULT

Check the “SELF-DIAG RESULT”.

Is any DTC detected?

YES >> Proceed to EC-258, "Diagnosis Procedure".
NO >> INSPECTION END

6.CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

With GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Calculate the total value of “Short term fuel trim” and “Long term fuel trim” indications.

Is the total percentage within ±15%?

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

7.DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

8.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. 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. Increase the engine speed up to about 3,600 rpm and keep it for 10 seconds.
7. Fully release accelerator pedal and then let engine idle for about 1 minute.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-258, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596836

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

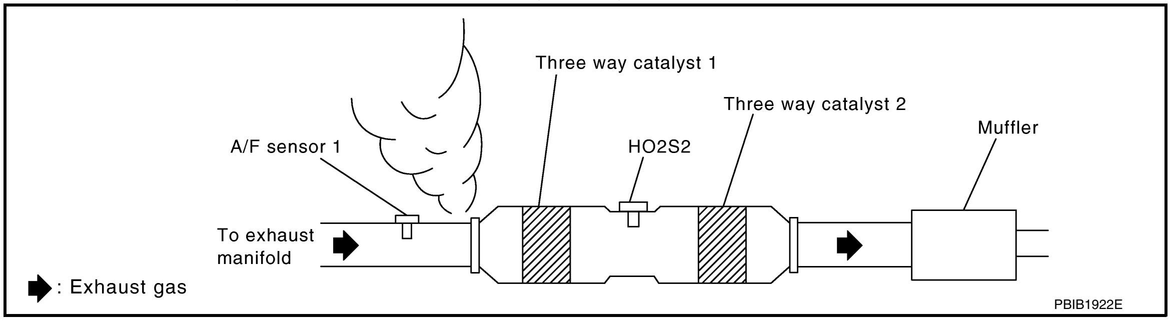
2.RETIGHTEN A/F SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to EM-34, "Exploded View".

>> GO TO 3.

3.CHECK EXHAUST GAS LEAK

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



Is exhaust gas leak detected?

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

4.CHECK FOR INTAKE AIR LEAK

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

Is intake air leak detected?

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

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-262, "DTC Logic" or EC-266, "DTC Logic".
NO >> GO TO 6.

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

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
• P014C • P014D • P015A • P015B	1	F123	4	Ground	Battery voltage
• P014E • P014F • P015C • P015D	2	F124	4		

Is the inspection result normal?

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

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

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

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
• P014C • P014D • P015A • P015B	1	F123	1	F8	57	Existed
			2		61	
• P014E • P014F • P015C • P015D	2	F124	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
• P014C • P014D • P015A • P015B	1	F123	1	Ground	Not existed
			2		
• P014E • P014F • P015C • P015D	2	F124	1		
			2		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
• P014C • P014D • P015A • P015B	1	F102	57	Ground	Not existed
			61		
• P014E • P014F • P015C • P015D	2		65		
			66		

5. Also check harness for short to power.

Is the inspection result normal?

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

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

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

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

10.CHECK MASS AIR FLOW SENSOR

Check both mass air flow sensor (bank 1 and bank 2).
Refer to EC-190, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning mass air flow sensor. Refer to EM-27, "Exploded View".

11.CHECK PCV VALVE

Refer to EC-527, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace PCV valve. Refer to EM-48, "Exploded View".

12.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

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

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

Replace malfunctioning air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

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

>> INSPECTION END

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000010596837

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too lean), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0171	Fuel injection system too lean (bank 1)	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leaks • A/F sensor 1 • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection
P0174	Fuel injection system too lean (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-263, "Diagnosis Procedure".
NO >> Check exhaust and intake air leak visually.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-263, "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.
3. Maintain the following conditions for at least 10 consecutive minutes.
   Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

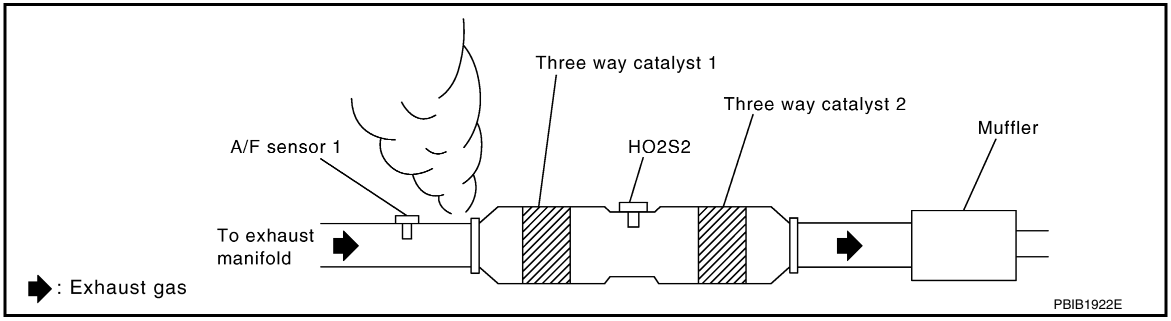
YES >> Go to EC-263, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596838

1.CHECK EXHAUST GAS LEAK

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



Is exhaust gas leak detected?

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

2.CHECK FOR INTAKE AIR LEAK

1. Listen for an intake air leak after the mass air flow sensor.
2. Check PCV hose connection.

Is intake air leak detected?

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

3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0171	1	F123	1	F102	57	Existed
			2		61	
P0174	2	F124	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0171	1	F123	1	Ground	Not existed
			2		
P0174	2	F124	1		
			2		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P0171	1	F102	57	Ground	Not existed
			61		
P0174	2		65		
			66		

6. Also check harness for short to power.

Is the inspection result normal?

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

4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-628, "Inspection".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-628, "Inspection".

At idling: Approximately 350 kPa (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”. Refer to FL-6, "Removal and Installation".
NO >> Repair or replace.

6.CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT.
   For specification, refer to EC-631, "Mass Air Flow Sensor".

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in Service $01 with GST.
   For specification, refer to EC-631, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 7.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-195, "Diagnosis Procedure".

7.CHECK FUNCTION OF FUEL INJECTOR

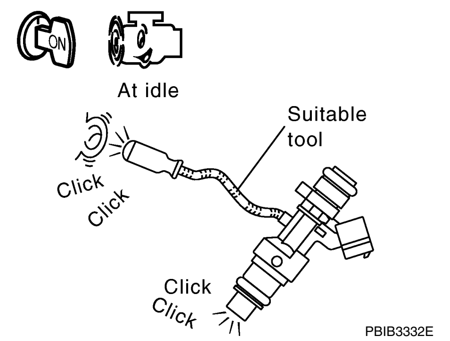
With CONSULT

1. Start engine.

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

Without CONSULT

1. Start engine and let it idle.
2. Listen to each fuel injector operating sound.



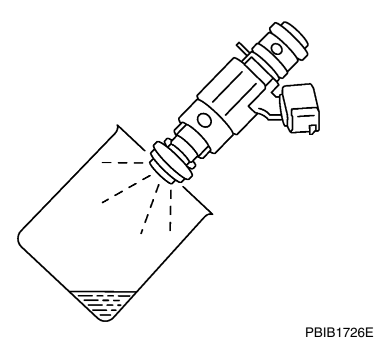
Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-506, "Diagnosis Procedure".

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-38, "Removal and Installation". Keep fuel hose and all fuel injectors connected to fuel tube.
5. For DTC P0171, reconnect fuel injector harness connectors on bank 1. For DTC P0174, reconnect fuel injector harness connectors on bank 2.
6. Disconnect all ignition coil harness connectors.
7. Prepare pans or saucers under each fuel injector.
8. Crank engine for about 3 seconds. For DTC P0171, make sure that fuel sprays out from fuel injectors on bank 1. For DTC P0174, make sure that fuel sprays out from fuel injectors on bank 2.



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. (Refer to EM-38, "Removal and Installation".) Always replace O-ring with new ones.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000010596839

DTC DETECTION LOGIC

With the Air/Fuel Mixture Ratio Self-Learning Control, the actual mixture ratio can be brought closely to the theoretical mixture ratio based on the mixture ratio feedback signal from A/F sensor 1. The ECM calculates the necessary compensation to correct the offset between the actual and the theoretical ratios.
In case the amount of the compensation value is extremely large (the actual mixture ratio is too rich), the ECM judges the condition as the fuel injection system malfunction and illuminates the MIL (2 trip detection logic).

Sensor	Input signal to ECM	ECM function	Actuator
A/F sensor 1	Density of oxygen in exhaust gas (Mixture ratio feedback signal)	Fuel injection control	Fuel injector

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0172	Fuel injection system too rich (bank 1)	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• A/F sensor 1 • Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor
P0175	Fuel injection system too rich (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

NOTE:
When depressing accelerator pedal three fourths (3/4) or more, the control system does not start the engine. Do not depress accelerator pedal too much.

Does engine start?

YES >> Go to EC-267, "Diagnosis Procedure".
NO >> Remove spark plugs and check for fouling, etc. Refer to EM-48, "Exploded View".

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 10 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-267, "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.
3. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)

CAUTION:

Always drive vehicle at a safe speed.

4. Check 1st trip DTC.

Is 1st trip DTC detected?

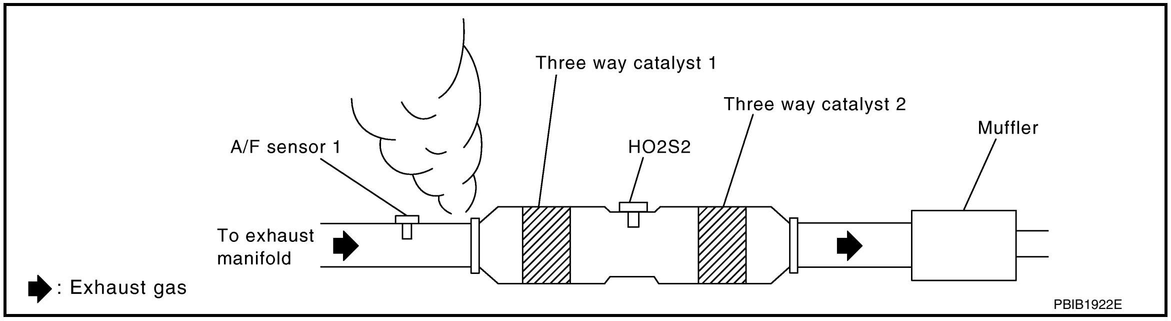
YES >> Go to EC-267, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596840

1.CHECK EXHAUST GAS LEAK

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



Is exhaust gas leak detected?

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

2.CHECK FOR INTAKE AIR LEAK

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

Is intake air leak detected?

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

3.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0172	1	F123	1	F102	57	Existed
			2		61	
P0175	2	F124	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0172	1	F123	1	Ground	Not existed
			2		
P0175	2	F124	1		
			2		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P0172	1	F102	57	Ground	Not existed
			61		
P0175	2		65		
			66		

6. Also check harness for short to power.

Is the inspection result normal?

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

4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-628, "Inspection".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-628, "Inspection".

At idling: Approximately 350 kPa (3.57 kg/cm^2, 51 psi)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace “fuel filter and fuel pump assembly”. Refer to FL-6, "Removal and Installation".

5.CHECK MASS AIR FLOW SENSOR

With CONSULT

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT.
   For specification, refer to EC-631, "Mass Air Flow Sensor".

With GST

1. Install all removed parts.
2. Check mass air flow sensor signal in “Service $01” with GST.
   For specification, refer to EC-631, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 6.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-195, "Diagnosis Procedure".

6.CHECK FUNCTION OF FUEL INJECTOR

With CONSULT

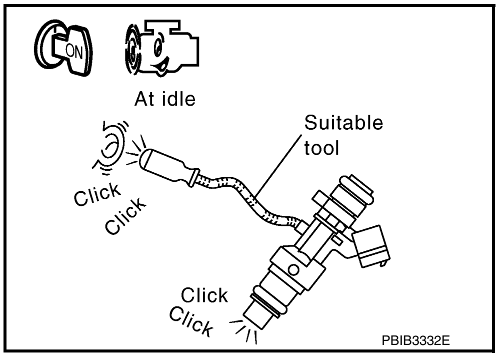
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Start engine and let it idle.

2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> GO TO 7.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-506, "Diagnosis Procedure".

7. CHECK FUEL INJECTOR

1. Remove fuel injector assembly. Refer to EM-38, "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 injector.
6. Crank engine for about 3 seconds.
   Make sure fuel that does not drip from fuel injector.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace the fuel injectors from which fuel is dripping. (Refer to EM-38, "Removal and Installation".) Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

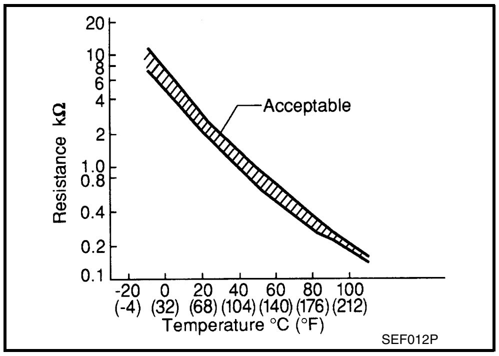
P0181 FTT SENSOR

Description

INFOID:0000000010596841

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

<Reference data>



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

*: These data are reference values and are measured between ECM terminals 106 (Fuel tank temperature sensor) and 128 (ECM ground).

DTC Logic

INFOID:0000000010596842

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0181	FTT SENSOR [Fuel tank temperature (FTT) sensor circuit range/ performance]	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from ECT sensor and intake air temperature sensor.	• Harness or connectors (The FTT sensor circuit is open or shorted) • FTT sensor
		B)	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the FTT sensor is higher/ lower than that of other temperature sensors when the engine is started with its cold state.	• Harness or connectors (High or low resistance in the FTT sensor circuit) • FTT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

YES >> GO TO 7.
NO >> GO TO 2.

2.PRECONDITIONING

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

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-272, "Diagnosis Procedure".

NO >> GO TO 4.

4.CHECK ENGINE COOLANT TEMPERATURE

1. Select “COOLAN TEMP/S” in “DATA MONITOR” with CONSULT.
2. Check “COOLAN TEMP/S” value.

“COOLAN TEMP/S” less than 60°C (140°F)?

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

5.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Cool engine down until “COOLAN TEMP/S” is less than 60°C (140°F).
2. Wait at least 10 seconds.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-272, "Diagnosis Procedure".
NO >> GO TO 6.

6.PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to EC-272, "Component Function Check".

NOTE:

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-272, "Diagnosis Procedure".

7.PRECONDITIONING

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

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

TEST CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 8.

8.PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between –10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the hood open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

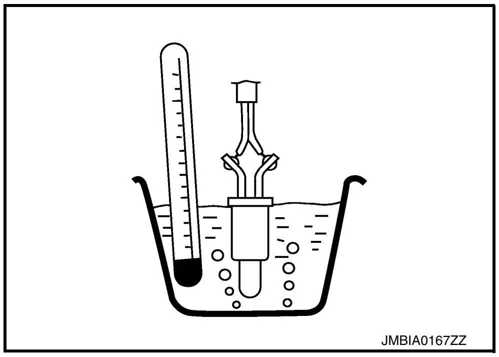
YES >> Proceed to EC-272, "Diagnosis Procedure".
NO >> INSPECTION END

Component Function Check

INFOID:0000000010596843

1.CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
4. Check resistance between “fuel level sensor unit and fuel pump” terminals by heating with hot water as shown in the figure.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Terminals	Condition		Resistance (kΩ)
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
		50 (122)	0.79 - 0.90

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-272, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-272, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596844

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-270, "DTC Logic".

Which malfunction is detected?

YES >> GO TO 2.
NO >> GO TO 7.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to MWI-58, "Component Function Check".

3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Turn ignition switch ON.
4. Check the voltage between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage (V)
Connector	Terminal		
B22	4	Ground	Approx. 5

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M7, B1
- Harness for open or short between ECM and “fuel level sensor unit and fuel pump”

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

5.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect “unified meter and A/C amp.” harness connector.
3. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and “unified meter and A/C amp.” harness connector.

Fuel level sensor unit and fuel pump		Unified meter and A/C amp.		Continuity
Connector	Terminal	Connector	Terminal	
B22	5	M67	58	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 M7, B1
- Harness for open or short between “fuel level sensor unit and fuel pump” and “unified meter and A/C amp.”

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

7.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-273, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace “fuel level sensor unit and fuel pump”. Refer to FL-6, "Removal and Installation".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

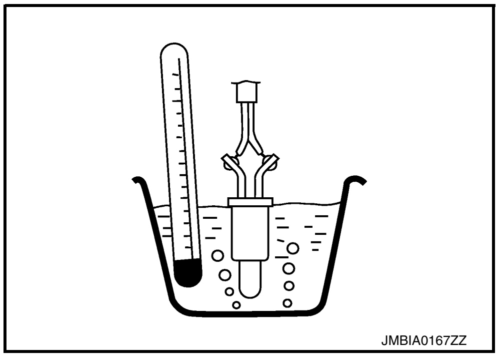
>> INSPECTION END

Component Inspection

INFOID:0000000010596845

1.CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
4. Check resistance between “fuel level sensor unit and fuel pump” terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
		50 (122)	0.79 - 0.90

Is the inspection result normal?

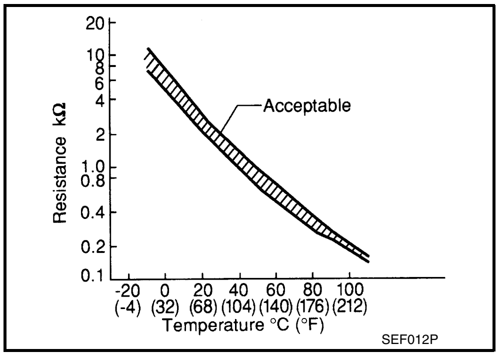
YES >> INSPECTION END
NO >> Replace “fuel level sensor unit and fuel pump”. Refer to FL-6, "Removal and Installation".

P0182, P0183 FTT SENSOR

Description

INFOID:0000000010596846

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



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 106 (Fuel tank temperature sensor) and 128 (ECM ground).

DTC Logic

INFOID:0000000010596847

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182	Fuel tank temperature sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Fuel tank temperature sensor
P0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

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

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

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

Is 1st trip DTC detected?

YES >> Go to EC-274, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596848

1.INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-270, "DTC Logic".

Which malfunction is detected?

YES >> GO TO 2.
NO >> GO TO 7.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to MWI-58, "Component Function Check".

3.CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Turn ignition switch ON.
4. Check the voltage between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage (V)
Connector	Terminal		
B22	4	Ground	Approx. 5

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M7, B1
- Harness for open or short between ECM and “fuel level sensor unit and fuel pump”

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

5.CHECK FUEL TANK TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect “unified meter and A/C amp.” harness connector.
3. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and “unified meter and A/C amp.” harness connector.

Fuel level sensor unit and fuel pump		Unified meter and A/C amp.		Continuity
Connector	Terminal	Connector	Terminal	
B22	5	M67	58	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 M7, B1
- Harness for open or short between “fuel level sensor unit and fuel pump” and “unified meter and A/C amp.”

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

7.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-276, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace “fuel level sensor unit and fuel pump”. Refer to FL-6, "Removal and Installation".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

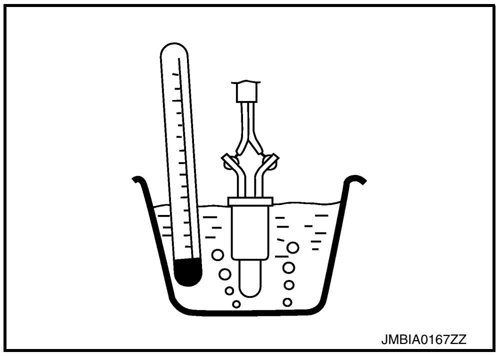
>> INSPECTION END

Component Inspection

INFOID:0000000010596849

1.CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Remove fuel level sensor unit. Refer to FL-6, "Removal and Installation".
4. Check resistance between “fuel level sensor unit and fuel pump” terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
4 and 5	Temperature [°C (°F)]	20 (68)	2.3 - 2.7
		50 (122)	0.79 - 0.90

Is the inspection result normal?

YES >> INSPECTION END

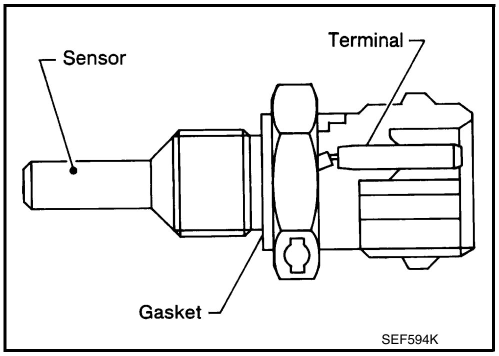
NO >> Replace “fuel level sensor unit and fuel pump”. Refer to FL-6, "Removal and Installation".

P0196 EOT SENSOR

Description

INFOID:0000000010596850

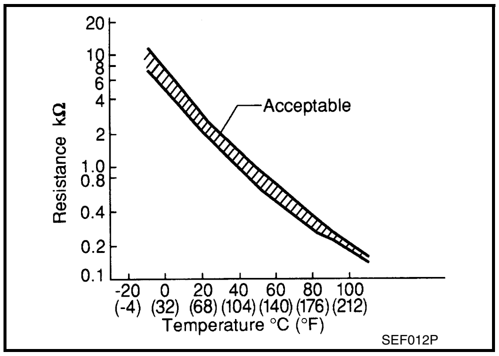
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance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



<Reference data>

Engine oil temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153

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



DTC Logic

INFOID:0000000010596851

DTC DETECTION LOGIC

NOTE:

If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197 or P0198. Refer to EC-281, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition		Possible cause
P0196	EOT SENSOR [Engine oil temperature (EOT) sensor range/performance	A)	Rationally incorrect voltage from the sensor is sent to ECM, compared with the voltage signals from engine coolant temperature sensor and intake air temperature sensor.	• Harness or connectors (The EOT sensor circuit is open or shorted) • EOT sensor
		B)	The comparison result of signals transmitted to ECM from each temperature sensor (IAT sensor, ECT sensor, EOT sensor, and FTT sensor) shows that the voltage signal of the EOT sensor is higher/lower than that of other temperature sensors when the engine is started with its cold state.	• Harness or connectors (High or low resistance in the EOT sensor circuit) • EOT sensor

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Is it necessary to erase permanent DTC?

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

2.PRECONDITIONING

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

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

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

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for 5 minutes and 10 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-280, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Select “DATA MONITOR” mode with CONSULT.
2. Check that “COOLAN TEMP/S” indicates above 80°C (176°F).
   If it is above 80°C (176°F), go to the following steps.
   If it is below 80°C (176°F), warm engine up until “COOLAN TEMP/S” indicates more than 80°C (176°F). Then perform the following steps.
3. Turn ignition switch OFF and soak the vehicle in a cool place.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Turn ignition switch ON.
   NOTE:
   Do not turn ignition switch OFF until step 10.
7. Select “DATA MONITOR” mode with CONSULT.
8. Check the following.

COOLAN TEMP/S	Below 40°C (104°F)
INT/A TEMP SE	Below 40°C (104°F)
Difference between “COOLAN TEMP/S” and “INT/A TEMP SE”	Within 6°C (11°F)

   If they are within the specified range, perform the following steps.
   If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.
   NOTE:
   - **Do not turn ignition switch OFF.**
   - **If it is supposed to need a long period of time, do not deplete the battery.**
9. Start engine and let it idle for 5 minutes.
10. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-280, "Diagnosis Procedure".
NO >> GO TO 5.

5.PERFORM COMPONENT FUNCTION CHECK (FOR MALFUNCTION B)

Perform component function check. Refer to EC-279, "Component Function Check".

NOTE:
Use the component function check to check the overall function of the EOT sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END

NO >> Proceed to EC-280, "Diagnosis Procedure".

6.PRECONDITIONING

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

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

TEST CONDITION:

- **Before performing the following procedure, do not add fuel.**
- **Before performing the following procedure, check that fuel level is between 1/4 and 4/4.**
- **Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.**

>> GO TO 7.

7.PERFORM DTC CONFIRMATION PROCEDURE B

1. Start engine and let it idle for 60 minutes.
2. Move the vehicle to a cool place.
   NOTE:
   Cool the vehicle in an environment of ambient air temperature between −10°C (14°F) and 35°C (95°F).
3. Turn ignition switch OFF and soak the vehicle for 12 hours.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   The vehicle must be cooled with the hood open.
4. Start engine and let it idle for 5 minutes or more.
   CAUTION:
   Never turn ignition switch OFF during idling.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

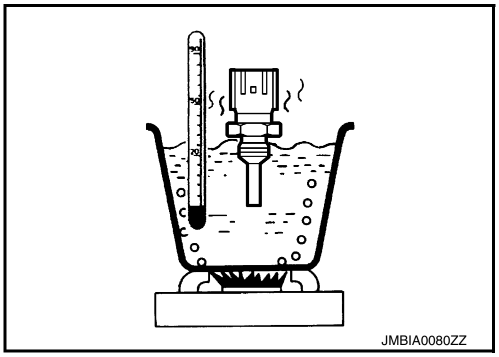
YES >> Proceed to EC-280, "Diagnosis Procedure".
NO >> INSPECTION END

Component Function Check

INFOID:0000000010596852

1.CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR

1. Turn ignition switch OFF.
2. Disconnect EOT sensor harness connector.
3. Remove EOT sensor. Refer to EM-44, "Exploded View".
4. Check resistance between EOT sensor terminals by heating with hot water as shown in the figure.



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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Proceed to EC-280, "Diagnosis Procedure".

2.CHECK INTERMITTENT INCIDENT

Check intermittent incident. Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Proceed to EC-280, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596853

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

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

2.CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-280, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View".

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

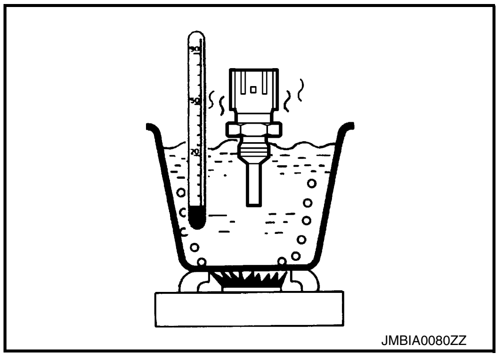
>> INSPECTION END

Component Inspection

INFOID:0000000010596854

1.CHECK ENGINE OIL TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine oil temperature sensor harness connector.
3. Remove engine oil temperature sensor. Refer to EM-44, "Exploded View".
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.



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

Is the inspection result normal?

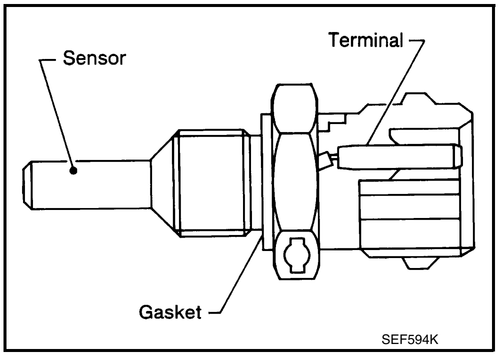
YES >> INSPECTION END
NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View".

P0197, P0198 EOT SENSOR

Description

INFOID:0000000010596855

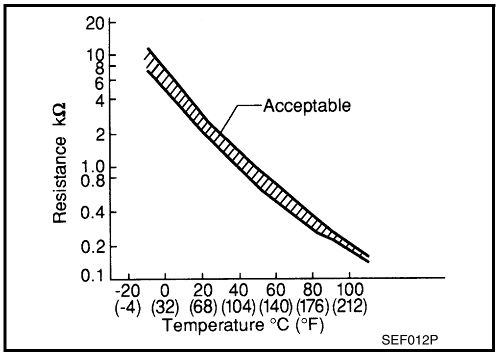
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance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



<Reference data>

Engine oil temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260
110 (230)	0.6	0.143 - 0.153

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



DTC Logic

INFOID:0000000010596856

DTC DETECTION LOGIC

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P0197	Engine oil 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 oil temperature sensor
P0198	Engine oil temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 5 seconds.
2. Check 1st trip DTC.

<u>Is 1st trip DTC detected?</u>

YES >> Go to EC-282, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596857

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK EOT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect engine oil temperature (EOT) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between EOT sensor harness connector and ground.

EOT sensor		Ground	Voltage (V)
Connector	Terminal		
F38	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK EOT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EOT sensor harness connector and ECM harness connector.

EOT sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F38	2	F102	84	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-282, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View".

5.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

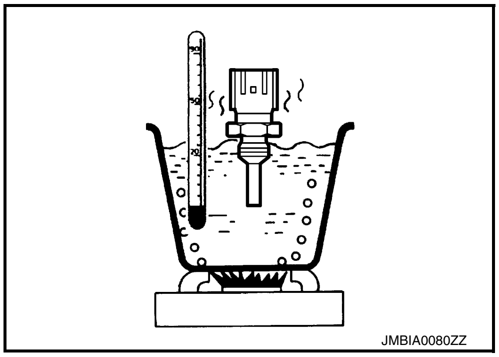
Component Inspection

INFOID:0000000010596858

1.CHECK ENGINE OIL TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine oil temperature sensor harness connector.
3. Remove engine oil temperature sensor. Refer to EM-44, "Exploded View".

4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.1 - 2.9
		50 (122)	0.68 - 1.00
		90 (194)	0.236 - 0.260

Is the inspection result normal?

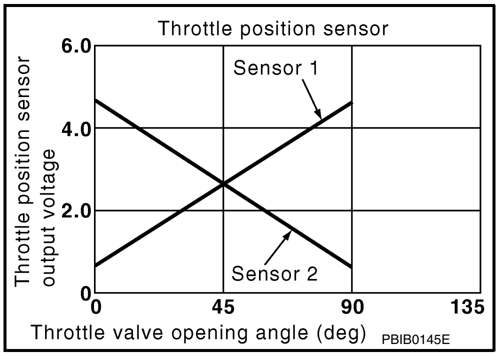
YES >> INSPECTION END
NO >> Replace engine oil temperature sensor. Refer to EM-44, "Exploded View".

P0222, P0223, P2132, P2133 TP SENSOR

Description

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls throttle valve opening angle in response to driving conditions via the throttle control motor.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P0222, P0223, P2132 or P2133 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222	Throttle position sensor 1 (bank 1) circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	• Harness or connectors (TP sensor 1 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1)
P0223	Throttle position sensor 1 (bank 1) circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	
P2132	Throttle position sensor 1 (bank 2) circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	
P2133	Throttle position sensor 1 (bank 2) circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-285, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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.

DTC	Electric throttle control actuator			Ground	Voltage (V)
	Bank	Connector	Terminal		
P0222, P0223	1	F6	6	Ground	Approx. 5
P2132, P2133	2	F27	1		

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

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.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0222, P0223	1	F6	3	F101	40	Existed
P2132, P2133	2	F27	4		48	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0222, P0223	1	F6	4	F101	30	Existed
P2132, P2133	2	F27	2		31	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-286, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-286, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596862

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F101	30 [TP sensor 1 (bank 1)]	40	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36
				Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40		Fully released	Less than 4.75
				Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48		Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-286, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010596863

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic

INFOID:0000000010596864

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor (POS) signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
Crankshaft position sensor (POS)	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the 1st trip, when a misfire condition occurs that can damage the three way catalyst (TWC) due to overheating, the MIL will blink.
   When a misfire condition occurs, the ECM monitors the CKP sensor signal every 200 engine revolutions for a change.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will turn off.
   If another misfire condition occurs that can damage the TWC on a second trip, the MIL will blink.
   When the misfire condition decreases to a level that will not damage the TWC, the MIL will remain illuminating.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only illuminate when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300	Multiple cylinder misfires detected	Multiple cylinders misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector circuit is open or shorted • Fuel injector • Intake air leak • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • A/F sensor 1 • Incorrect PCV hose connection
P0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	
P0305	No. 5 cylinder misfire detected	No. 5 cylinder misfires.	
P0306	No. 6 cylinder misfire detected	No. 6 cylinder misfires.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and let it idle for about 15 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-289, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and drive the vehicle under similar conditions to (1st trip) Freeze Frame Data for a certain time. Refer to the table below.
   Hold the accelerator pedal as steady as possible.
   Similar conditions to (1st trip) Freeze Frame Data mean that the following conditions should be satisfied at the same time.
   CAUTION:
   Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

Engine speed	Engine speed in the freeze frame data ± 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
Base fuel schedule	Base fuel schedule in the freeze frame data × (1 ± 0.1)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70 °C (158 °F), T should be lower than 70 °C (158 °F).
	When the freeze frame data shows higher than or equal to 70 °C (158 °F), T should be higher than or equal to 70 °C (158 °F).

Driving time varies according to the engine speed in the freeze frame data.

Engine speed	Time
Around 1,000 rpm	Approximately 10 minutes
Around 2,000 rpm	Approximately 5 minutes
More than 3,000 rpm	Approximately 3.5 minutes

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-289, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596865

1.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

Is intake air leak detected?

YES >> Discover air leak location and repair.
NO >> GO TO 2.

2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 3.
YES-2 >> Without CONSULT: GO TO 4.
NO >> Repair or replace it.

3.PERFORM POWER BALANCE TEST

With CONSULT

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.

3. Make sure that each circuit produces a momentary engine speed drop.

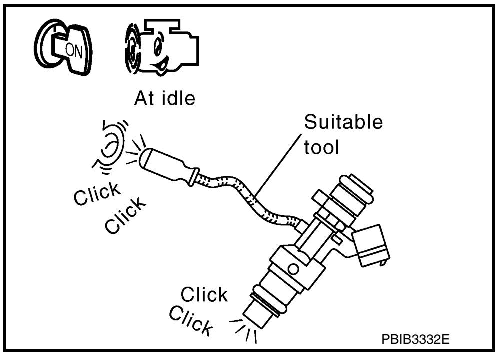
Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 4.

4.CHECK FUNCTION OF FUEL INJECTOR-I

1. Start engine and let it idle.
2. Listen to each fuel injector operation sound.

Clicking sound should be heard.



Is the inspection result normal?

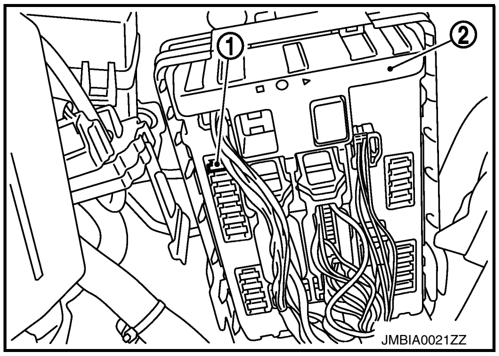
YES >> GO TO 5.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-506, "Diagnosis Procedure".

5.CHECK FUNCTION OF IGNITION COIL-I

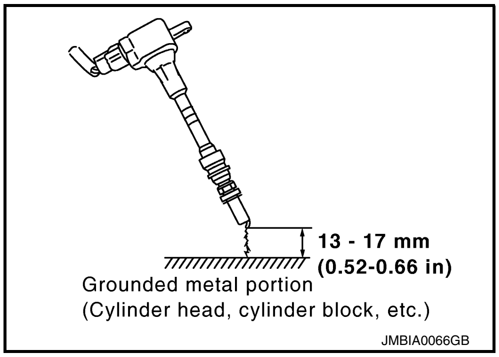
CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.



8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for about 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

NOTE:

When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 6.

6.CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

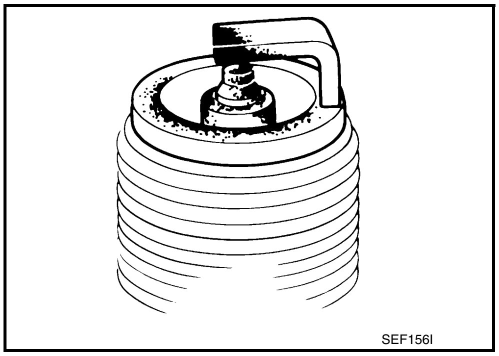
YES >> GO TO 7.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-516, "Diagnosis Procedure".

7.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). (Refer to EM-23, "Removal and Installation".) For spark plug type, refer to EM-24, "Inspection".
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). (Refer to EM-23, "Removal and Installation".) For spark plug type, refer to EM-24, "Inspection".

9.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-16, "Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10.CHECK FUEL PRESSURE

1. Install all removed parts.
2. Release fuel pressure to zero. Refer to EC-628, "Inspection".
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-628, "Inspection".

At idle: Approximately 350 kPa (3.57 kg/cm^2, 51 psi)

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace “fuel filter and fuel pump assembly”. Refer to FL-6, "Removal and Installation".
NO >> Repair or replace.

12.CHECK IDLE SPEED AND IGNITION TIMING

For procedure, refer to EC-14, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to EC-631, "Idle Speed" and EC-631, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Follow the EC-14, "BASIC INSPECTION : Special Repair Requirement".

13.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding A/F sensor 1 harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

A/F sensor 1			ECM		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F123	1	F102	57	Existed
		2		61	
2	F124	1		65	
		2		66	

5. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

A/F sensor 1			Ground	Continuity
Bank	Connector	Terminal		
1	F123	1	Ground	Not existed
		2		
2	F124	1		
		2		

ECM			Ground	Continuity
Bank	Connector	Terminal		
1	F102	57	Ground	Not existed
		61		
2		65		
		66		

6. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 14.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

14.CHECK A/F SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace (malfunctioning) A/F sensor 1. Refer to EM-34, "Exploded View".

15.CHECK MASS AIR FLOW SENSOR

With CONSULT

Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT.
For specification, refer to EC-631, "Mass Air Flow Sensor".

With GST

Check mass air flow sensor signal in Service $01 with GST.
For specification, refer to EC-631, "Mass Air Flow Sensor".

Is the measurement value within the specification?

YES >> GO TO 16.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-195, "Diagnosis Procedure".

16.CHECK SYMPTOM TABLE

Check items on the rough idle symptom in EC-616, "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 EC-143, "On Board Diagnosis Function" or EC-146, "CONSULT Function".

>> GO TO 18.

18.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0327, P0328, P0332, P0333 KS

Description

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

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detected condition	Possible cause
P0327	Knock sensor (bank 1) circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor
P0328	Knock sensor (bank 1) circuit high input	An excessively high voltage from the sensor is sent to ECM.	
P0332	Knock sensor (bank 2) circuit low input	An excessively low voltage from the sensor is sent to ECM.	
P0333	Knock sensor (bank 2) circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-294, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 ECM harness connector.
2. Check the continuity between knock sensor harness connector and ECM harness connector.

DTC	Knock sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0327, P0328	1	F203	2	F102	72	Existed
P0332, P0333	2	F202	2			

3. 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 F9, F201
- Harness for open or short between knock sensor and ECM

>> Repair open circuit or short to power in harness or connectors.

4.CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between knock sensor harness connector and ECM harness connector.

DTC	Knock sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0327, P0328	1	F203	1	F102	73	Existed
P0332, P0333	2	F202	1		69	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F9, F201
- Harness for open or short between ECM and knock sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK KNOCK SENSOR

Refer to EC-295, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning knock sensor. Refer to EM-122, "Exploded View".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596869

1.CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as per the following.
   NOTE:

It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Terminals	Resistance (kΩ)
1 and 2	Approx. 532 - 588 [at 20°C (68°F)]

CAUTION:

Do not use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

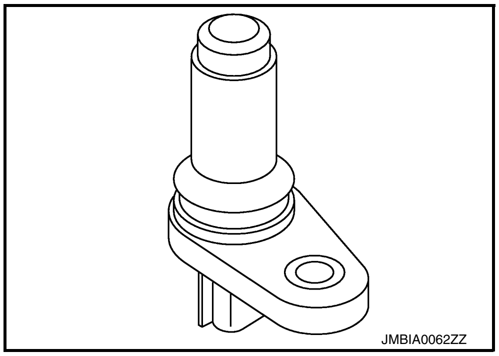
YES >> INSPECTION END

NO >> Replace malfunctioning knock sensor. Refer to EM-122, "Exploded View".

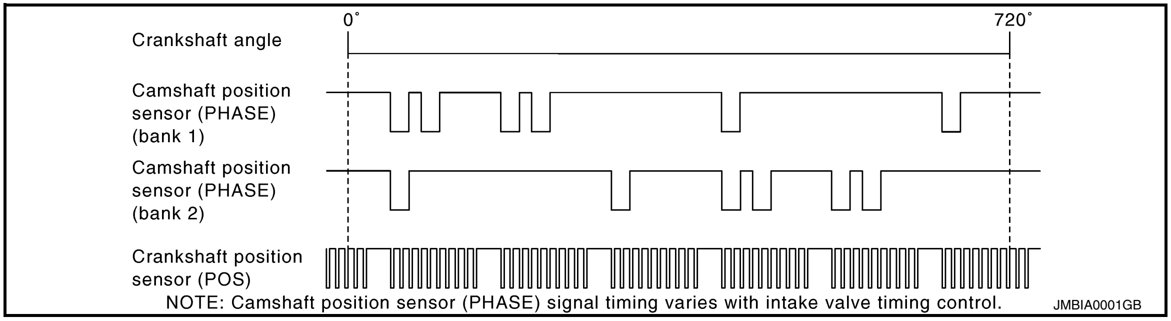
P0335 CKP SENSOR (POS)

Description

INFOID:0000000010596870



The crankshaft position sensor (POS) is located on the cylinder block facing the gear teeth (cogs) of the signal plate. It detects the fluctuation of the engine revolution.
The sensor consists of a permanent magnet and Hall IC.
When the engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
The ECM receives the voltage signal and detects the fluctuation of the engine revolution.
ECM receives the signals as shown in the figure.


Crankshaft angle
0˚
720˚
Camshaft position sensor (PHASE) (bank 1)
Camshaft position sensor (PHASE) (bank 2)
Crankshaft position sensor (POS)
JMBIA0001GB

NOTE: Camshaft position sensor (PHASE) signal timing varies with intake valve timing control.

DTC Logic

INFOID:0000000010596871

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position sensor (POS) circuit	• The crankshaft position sensor (POS) signal is not detected by the ECM during the first few seconds of engine cranking. • The proper pulse signal from the crankshaft position sensor (POS) is not sent to ECM while the engine is running. • The crankshaft position sensor (POS) signal is not in the normal pattern during engine running.	• Harness or connectors [CKP sensor (POS) circuit is open or shorted.] (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) • Crankshaft position sensor (POS) • Accelerator pedal position sensor • EVAP control system pressure sensor • Refrigerant pressure sensor • Brake booster pressure sensor. • Signal plate

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-298, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596872

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
F2	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3.CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT-II

1. Turn ignition switch ON.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F2	1	F101	46	Existed

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
	46	CKP sensor (POS)	F2	

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
M107	103	APP sensor	E112 (Without ICC)	6
			E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
		Refrigerant pressure sensor	E77	3

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.

- EVAP control system pressure sensor (Refer to EC-334, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-478, "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. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

8.CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F2	2	F101	47	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CKP sensor (POS) harness connector and ECM harness connector.

CKP sensor (POS)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F2	3	F101	37	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-300, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace crankshaft position sensor (POS). Refer to EM-122, "Exploded View".

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. Refer to EM-122, "Exploded View".

12.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

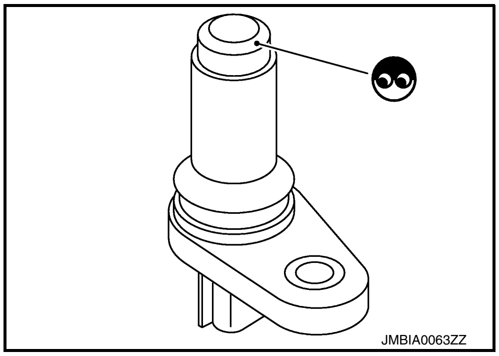
INFOID:0000000010596873

1.CHECK CRANKSHAFT POSITION SENSOR (POS)-I

1. Turn ignition switch OFF.
2. Loosen the fixing bolt of the sensor.
3. Disconnect crankshaft position sensor (POS) harness connector.
4. Remove the sensor. Refer to EM-122, "Exploded View".
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor (POS). Refer to EM-122, "Exploded View".



2.CHECK CRANKSHAFT POSITION SENSOR (POS)-II

Check resistance between crankshaft position sensor (POS) terminals as follows.

Terminals (Polarity)	Resistance (Ω)
1 (+) - 2 (-)	Except 0 or ∞ [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

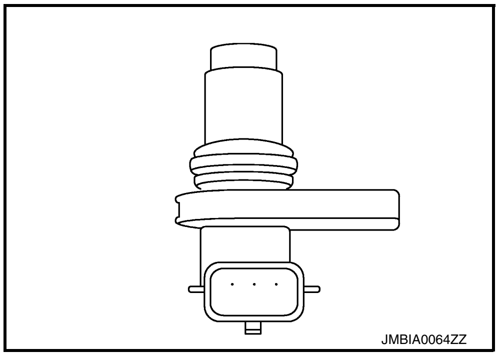
Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace crankshaft position sensor (POS). Refer to EM-122, "Exploded View".

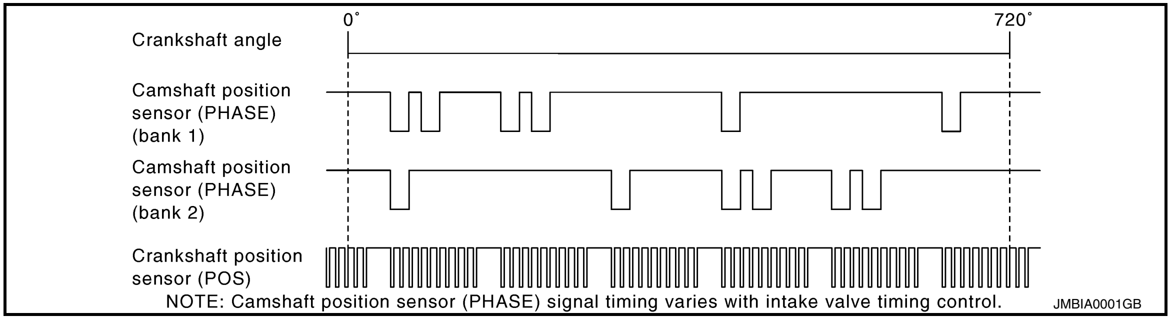
P0340, P0345 CMP SENSOR (PHASE)

Description

INFOID:0000000010596874



The camshaft position sensor (PHASE) senses the retraction of camshaft (INT) to identify a particular cylinder. The camshaft position sensor (PHASE) senses the piston position.
When the crankshaft position sensor (POS) system becomes inoperative, the camshaft position sensor (PHASE) provides various controls of engine parts instead, utilizing timing of cylinder identification signals.
The sensor consists of a permanent magnet and Hall IC.
When engine is running, the high and low parts of the teeth cause the gap with the sensor to change.
The changing gap causes the magnetic field near the sensor to change.
Due to the changing magnetic field, the voltage from the sensor changes.
ECM receives the signals as shown in the figure.


0˚
720˚
Crankshaft angle
Camshaft position sensor (PHASE) (bank 1)
Camshaft position sensor (PHASE) (bank 2)
Crankshaft position sensor (POS)
JMBIA0001GB

NOTE: Camshaft position sensor (PHASE) signal timing varies with intake valve timing control.

DTC Logic

INFOID:0000000010596875

DTC DETECTION LOGIC

NOTE:

If DTC P0340 or P0345 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position sensor (PHASE) (bank 1) circuit	• The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. • The cylinder No. signal is not sent to ECM during engine running. • The cylinder No. signal is not in the normal pattern during engine running.	• Harness or connectors [CMP sensor (PHASE) (bank 1) circuit is open or shorted.] • Camshaft position sensor (PHASE) (bank 1) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery
P0345	Camshaft position sensor (PHASE) (bank 2) circuit		• Harness or connectors [CMP sensor (PHASE) (bank 2) circuit is open or shorted.] • Camshaft position sensor (PHASE) (bank 2) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

1. Start engine and let it idle for at least 5 seconds.
   If engine does not start, crank engine for at least 2 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-302, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

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 EC-302, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596876

1.CHECK STARTING SYSTEM

Turn ignition switch to START position.

Does the engine turn over? Does the starter motor operate?

YES >> GO TO 2.
NO >> Check starting system. (Refer to EC-9, "Work Flow".)

2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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.

DTC	CMP sensor (PHASE)			Ground	Voltage (V)
	Bank	Connector	Terminal		
P0340	1	F5	1	Ground	Approx. 5
P0345	2	F18	1		

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F109, F110
- Harness for open or short between CMP sensor (PHASE) and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK CMP SENSOR (PHASE) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

DTC	CMP sensor (PHASE)			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F5	2	F102	96	Existed
P0345	2	F18	2		92	

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 F109, F110
- Harness for open or short between CMP sensor (PHASE) and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between CMP sensor (PHASE) harness connector and ECM harness connector.

DTC	CMP sensor (PHASE)			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F5	3	F102	59	Existed
P0345	2	F18	3		63	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F109, F110
- Harness for open or short between CMP sensor (PHASE) and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-304, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-51, "Exploded View".

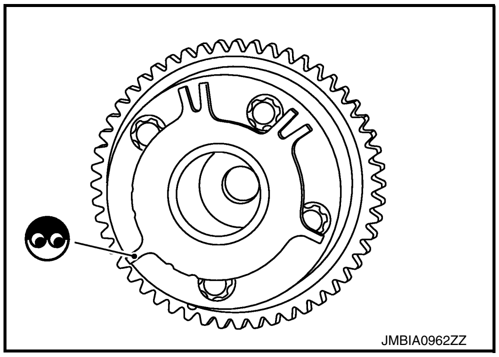
10.CHECK CAMSHAFT (INTAKE)

Check the following.

- Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end

Is the inspection result normal?

YES >> GO TO 11.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-51, "Exploded View".



11.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

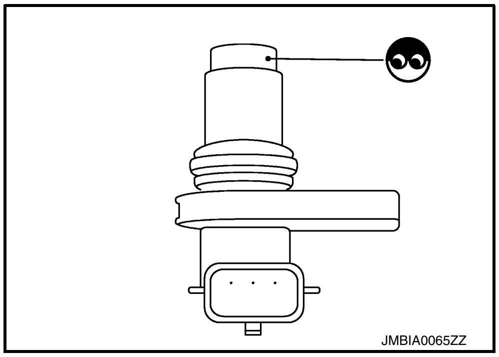
INFOID:0000000010596877

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. Refer to EM-51, "Exploded View".
5. Visually check the sensor for chipping.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-51, "Exploded View".



2.CHECK CAMSHAFT POSITION SENSOR (PHASE)-II

Check resistance camshaft position sensor (PHASE) terminals as follows.

Terminals (Polarity)	Resistance (Ω)
1 (+) - 2 (-)	Except 0 or ∞ [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-51, "Exploded View".

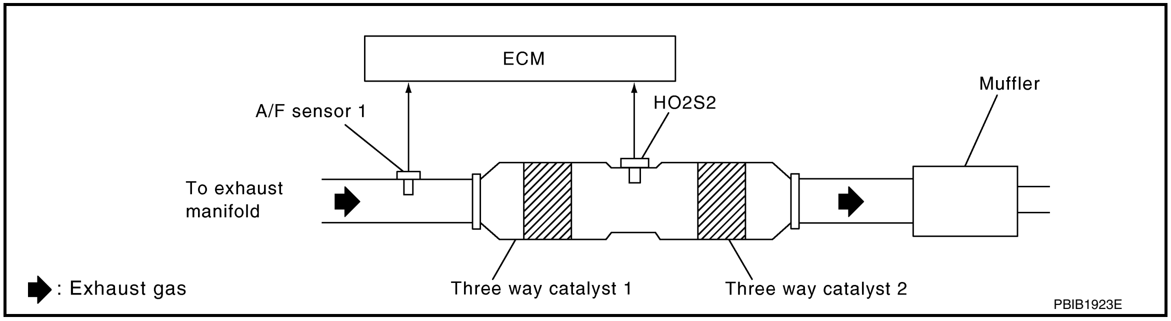
P0420, P0430 THREE WAY CATALYST FUNCTION

DTC Logic

INFOID:0000000010596878

DTC DETECTION LOGIC

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.
A three way catalyst 1 with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst 1 malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420	Catalyst system efficiency below threshold (bank 1)	• Three way catalyst (manifold) does not 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
P0430	Catalyst system efficiency below threshold (bank 2)		

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 7.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Do not hold engine speed for more than the specified minutes below.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
7. Let engine idle for 1 minute.

8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT.
11. Rev engine up to about 2,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of “CATALYST”.

Which is displayed on CONSULT 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 about 2,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).

Does the indication change to “CMPLT”?

YES >> GO TO 6.
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 3.

6.PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-307, "Diagnosis Procedure".
NO >> INSPECTION END

7.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-306, "Component Function Check".

NOTE:

Use component function check to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-307, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596879

1.PERFORM COMPONENT FUNCTION CHECK

⊗**Without CONSULT**

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Open engine hood.
6. Check the voltage between ECM harness connector terminals under the following condition.

DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0420	F102	76 [HO2S2 (bank 1)]	84	Keeping engine speed at 2,500 rpm constant under no load	The voltage fluctuation cycle takes more than 5 seconds. • 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0
P0430		80 [HO2S2 (bank 2)]			

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-307, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596880

1.CHECK EXHAUST SYSTEM

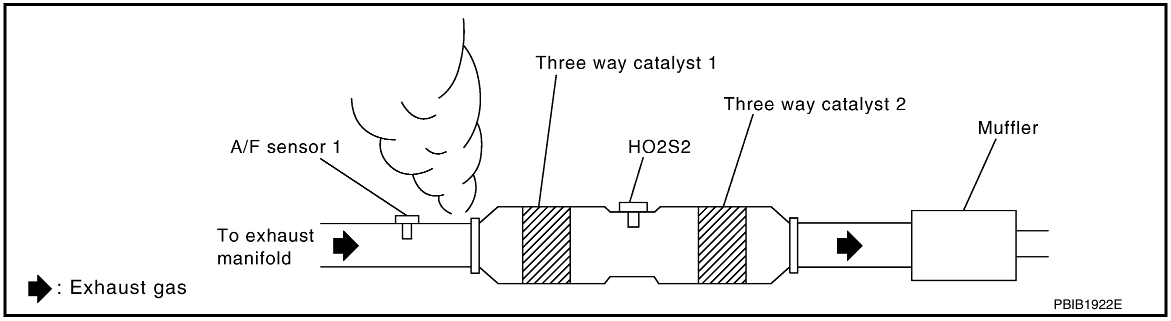
Visually check exhaust tubes and muffler for dents.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace.

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 1.



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 IDLE SPEED AND IGNITION TIMING

For procedure, refer to EC-14, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to EC-631, "Idle Speed" and EC-631, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-14, "BASIC INSPECTION : Special Repair Requirement".

5.CHECK FUEL INJECTORS

1. Stop engine and then turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F102	81	M107	128	Battery voltage
	82			
	85			
	86			
	89			
	90			

Is the inspection result normal?

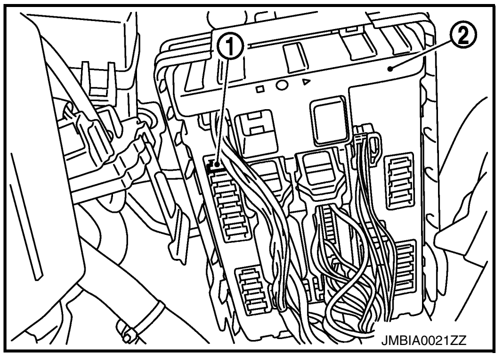
YES >> GO TO 6.
NO >> Perform EC-506, "Diagnosis Procedure".

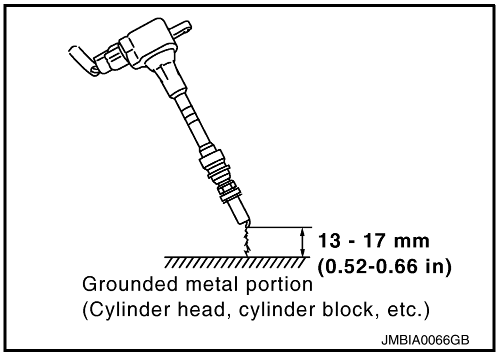
6.CHECK FUNCTION OF IGNITION COIL-I

CAUTION:

Perform the following procedure in a place where with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-23, "Removal and Installation".
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:

- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

NOTE:
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 7.

7.CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.

2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for about 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

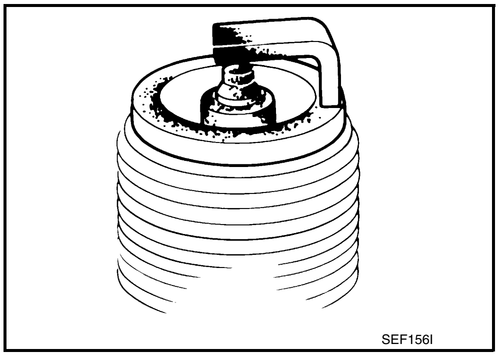
YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-516, "Diagnosis Procedure".

8.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-24, "Inspection".
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-23, "Removal and Installation".

10.CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to EM-38, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.
6. Check that fuel does not drip from fuel injector.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping. Refer to EM-38, "Removal and Installation".
NO >> GO TO 11.

11.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace three way catalyst assembly. Refer to EM-34, "Removal and Installation".
NO >> Repair or replace harness or connector.

P0441 EVAP CONTROL SYSTEM

DTC Logic

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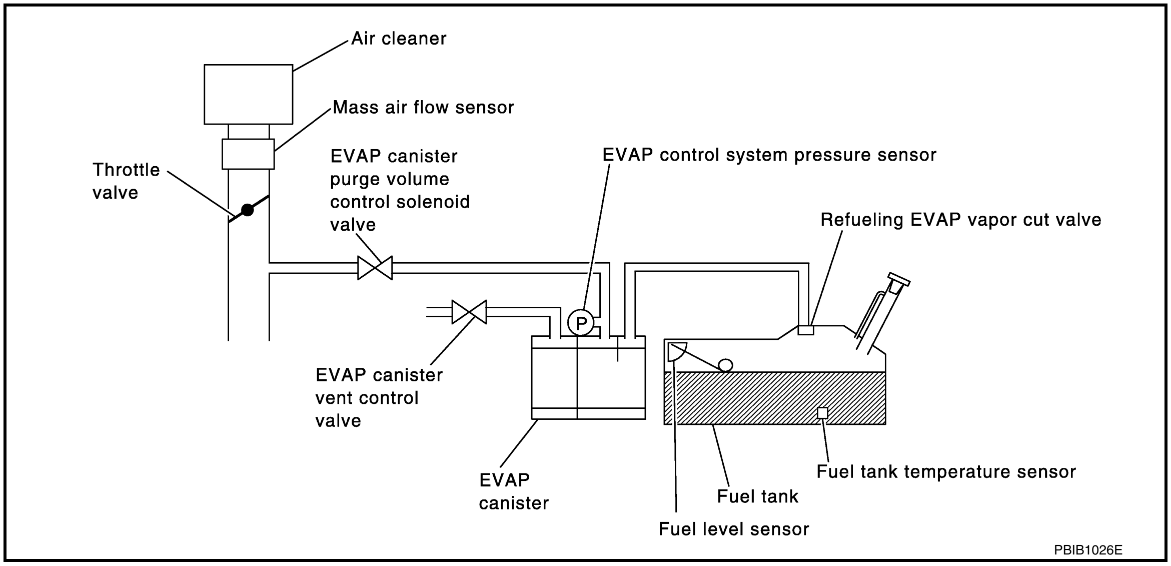
DTC DETECTION LOGIC

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.


Air cleaner
Mass air flow sensor
Throttle valve
EVAP canister purge volume control solenoid valve
EVAP control system pressure sensor
Refueling EVAP vapor cut valve
P
EVAP canister vent control valve
EVAP canister
Fuel tank
Fuel tank temperature sensor
Fuel level sensor
PBIB1026E

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441	EVAP control system incorrect purge flow	EVAP control system does not operate properly, EVAP control system has a leak between intake manifold and EVAP control system pressure sensor.	• EVAP canister purge volume control solenoid valve stuck closed • EVAP control system pressure sensor and the circuit • Loose, disconnected or improper connection of rubber tube • Blocked rubber tube • Cracked EVAP canister • EVAP canister purge volume control solenoid valve circuit • Accelerator pedal position sensor • Blocked purge port • EVAP canister vent control valve

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 6.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT.
7. Touch “START”.

Is “COMPLETED” displayed on CONSULT screen?

YES >> GO TO 5.
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, “TESTING” will be displayed on the CONSULT screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take at least 35 seconds.)

Selector lever	Suitable position
VHCL SPEED SE	32 - 120 km/h (20 - 75 mph)
ENG SPEED	500 - 3,000 rpm
B/FUEL SCHDL	1.3 - 9.0 msec
COOLAN TEMP/S	More than 0°C (32°F)

CAUTION:
Always drive vehicle at a safe speed.

Is “COMPLETED” displayed on CONSULT screen?

YES >> GO TO 5.
NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 3.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-312, "Diagnosis Procedure".

6.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-311, "Component Function Check".

NOTE:
Use component function check to check the overall monitoring function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-312, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596882

1.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT

1. Lift up drive wheels.

2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and wait at least 70 seconds.
7. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM		
Connector	+	–
	Terminal	Terminal
M107	102 (EVAP control system pressure sensor signal)	112

8. Check EVAP control system pressure sensor value at idle speed and note it.
9. Establish and maintain the following conditions for at least 1 minute.

Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Gear position	Any position other than P, N or R

10. Verify that EVAP control system pressure sensor value stays 0.1 V less than the value at idle speed (measured at step 8) for at least 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-312, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596883

1.CHECK EVAP CANISTER

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 2.
YES-2 >> Without CONSULT: GO TO 3.
NO >> Replace EVAP canister. Refer to FL-16, "Removal and Installation".

2.CHECK PURGE FLOW

With CONSULT

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port.
2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.
4. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check vacuum existence.

PURG VOL C/V	Vacuum
100%	Existed
0%	Not existed

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

3.CHECK PURGE FLOW

Without CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve at EVAP service port and install vacuum gauge. For the location of EVAP service port, refer to EC-97, "System Diagram".
4. Start engine and let it idle.
   Do not depress accelerator pedal even slightly.
5. Check vacuum gauge indication before 60 seconds passed after starting engine.

Vacuum should not exist.

6. Revving engine up to 2,000rpm after 100 seconds passed after starting engine.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4.CHECK EVAP PURGE LINE

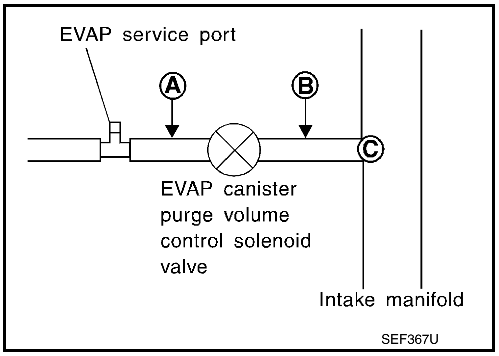
1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
   Refer to EC-97, "System Diagram".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair it.

5.CHECK EVAP PURGE HOSE AND PURGE PORT

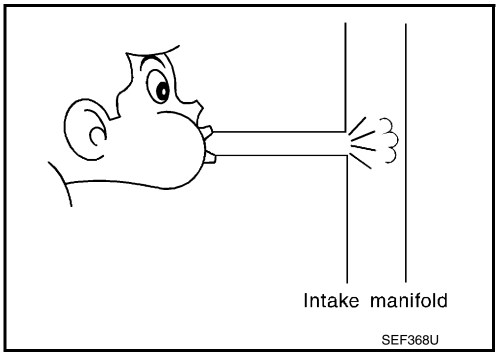
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.
2. Blow air into each hose and EVAP purge port **C**.



3. Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 6.
YES-2 >> Without CONSULT: GO TO 7.
NO >> Repair or clean hoses and/or purge port.



6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 8.

NO >> GO TO 7.

7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-318, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

8.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

9.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-335, "DTC Logic" for DTC P0452, EC-340, "DTC Logic" for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

10.CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Clean the rubber tube using an air blower.

11.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace EVAP canister vent control valve. Refer to FL-15, "Exploded View".

12.CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-97, "System Diagram".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace it.

13.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

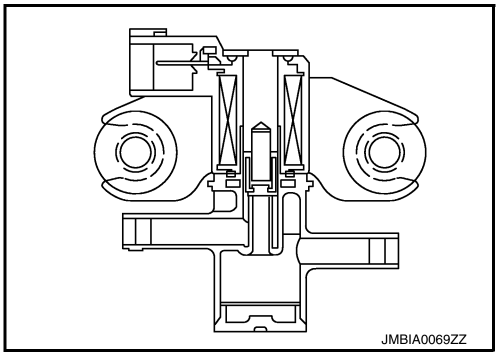
>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000010596884

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.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DTC Logic

INFOID:0000000010596885

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0443	EVAP canister purge volume control solenoid valve	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	• EVAP control system pressure sensor • EVAP canister purge volume control solenoid valve (The valve is stuck open.) • EVAP canister vent control valve • EVAP canister • Hoses (Hoses are connected incorrectly or clogged.)

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

Do you have CONSULT

YES >> GO TO 2.
NO >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT.
7. Touch “START”.
8. Start engine and let it idle until “TESTING” on CONSULT changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.
9. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT screen?

OK >> INSPECTION END
NG >> Go to EC-316, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 20 seconds.
6. Check 1st trip DTC.

Is 1st trip DTC displayed?

YES >> Go to EC-316, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596886

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		
F7	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister purge volume control solenoid valve harness connector and ECM harness connector.

EVAP canister purge volume control solenoid valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F7	2	F101	21	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F104, F105
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 7.
YES-2 >> Without CONSULT: GO TO 8.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

7.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Start engine.
4. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 9.
NO >> GO TO 8.

8.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-318, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

9.CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Clean the rubber tube using an air blower.

10.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

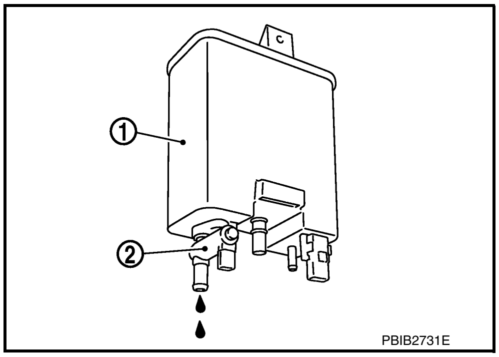
YES >> GO TO 11.
NO >> Replace EVAP canister vent control valve. Refer to FL-15, "Exploded View".

11.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to FL-16, "Removal and Installation".

2. Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from the EVAP canister?

YES >> GO TO 12.
NO >> GO TO 14.

12.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13.DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

14.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

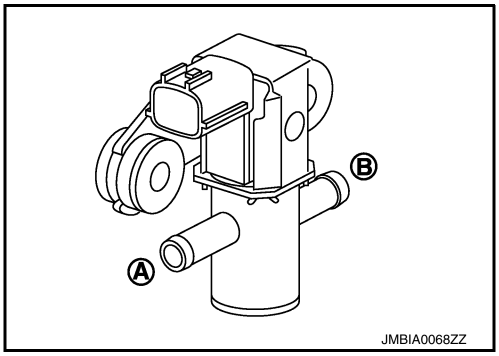
Component Inspection

INFOID:0000000010596887

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Start engine.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.
6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.

4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

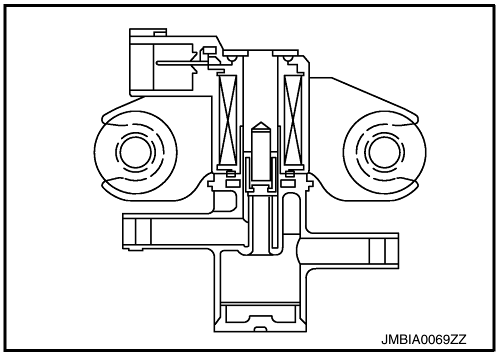
YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000010596888

The EVAP canister purge volume control solenoid valve is used to control the flow rate of fuel vapor from the EVAP canister. The EVAP canister purge volume control solenoid valve is moved by ON/OFF pulses from the ECM. The longer the ON pulse, the greater the amount of fuel vapor that will flow through the valve.



DTC Logic

INFOID:0000000010596889

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444	EVAP canister purge volume control solenoid valve circuit open	An excessively low voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is open or shorted.) • EVAP canister purge volume control solenoid valve
P0445	EVAP canister purge volume control solenoid valve circuit shorted	An excessively high voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is shorted.) • EVAP canister purge volume control solenoid valve

DTC CONFIRMATION PROCEDURE

1.CONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-320, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596890

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		
F7	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M116, F103
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
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	
F7	2	F101	21	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 5.
YES-2 >> Without CONSULT: GO TO 6.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F104, F105
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

YES >> GO TO 7.
NO >> GO TO 6.

6.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-322, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

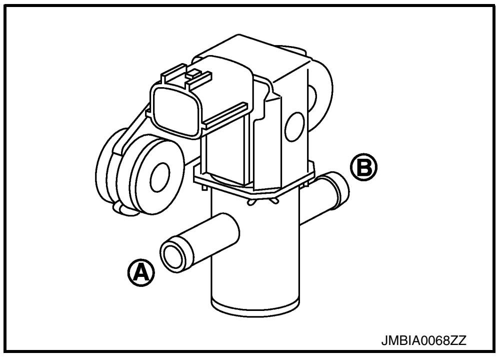
Component Inspection

INFOID:0000000010596891

1.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Start engine.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT.
6. Touch “Qd” and “Qu” on CONSULT screen to adjust “PURG VOL C/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

Without CONSULT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

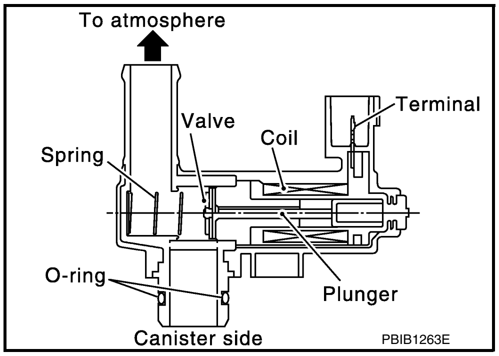
YES >> INSPECTION END
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

P0447 EVAP CANISTER VENT CONTROL VALVE

Description

INFOID:0000000010596892

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows "EVAP Control System" diagnosis.



DTC Logic

INFOID:0000000010596893

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447	EVAP canister vent control valve circuit open	An improper voltage signal is sent to ECM through EVAP canister vent control valve.	• Harness or connectors (The valve circuit is open or shorted.) • EVAP canister vent control valve

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-323, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596894

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT

1. Turn ignition switch OFF and then ON.
2. Select "VENT CONTROL/V" in "ACTIVE TEST" mode with CONSULT.

3. Touch “ON/OFF” on CONSULT screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister vent control valve harness connector.
3. Turn ignition switch ON.
4. Check the voltage between EVAP canister vent control valve harness connector and ground.

EVAP canister vent control valve		Ground	Voltage
Connector	Terminal		
B253	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness connectors F103, M116
- Harness connectors M117, B201
- Harness for open or short between EVAP canister vent control valve and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK EVAP CANISTER VENT CONTROL VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP canister vent control valve harness connector and ECM harness connector.

EVAP canister vent control valve		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B253	2	M107	121	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 B201, M117
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

A EC C D E F G H I J K L M N O P

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean the rubber tube using an air blower.

8.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

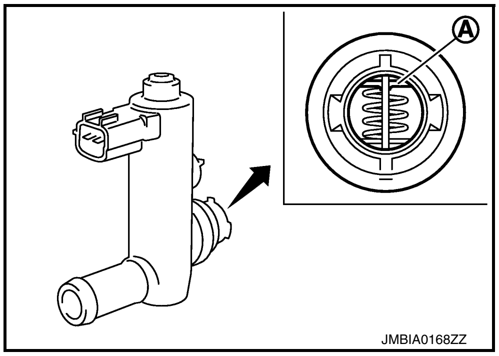
>> INSPECTION END

Component Inspection

INFOID:0000000010596895

1.CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister. Refer to FL-16, "Removal and Installation".
3. Check portion (A) of EVAP canister vent control valve for rust.



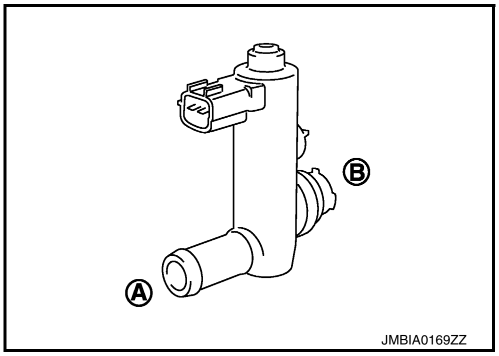
Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".
NO >> GO TO 2.

2.CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time.
   Make sure that new O-ring is installed properly.



Condition VENT CONT/V	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
   Make sure that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

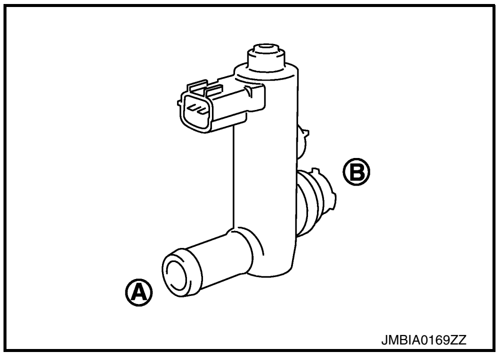
Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

3.CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
3. Check air passage continuity and operation delay time.
   Make sure that new O-ring is installed properly.



Condition VENT CONT/V	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
   Make sure that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

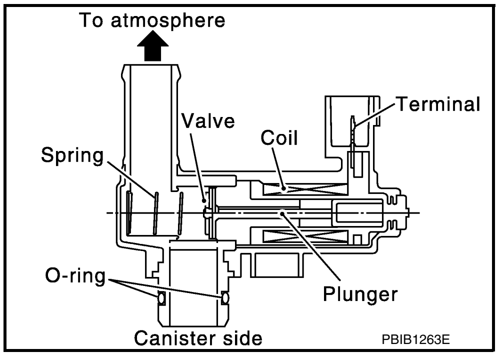
YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

P0448 EVAP CANISTER VENT CONTROL VALVE

Description

INFOID:0000000010596896

The EVAP canister vent control valve is located on the EVAP canister and is used to seal the canister vent.
This solenoid valve responds to signals from the ECM. When the ECM sends an ON signal, the coil in the solenoid valve is energized. A plunger will then move to seal the canister vent. The ability to seal the vent is necessary for the on board diagnosis of other evaporative emission control system components.
This solenoid valve is used only for diagnosis, and usually remains opened.
When the vent is closed, under normal purge conditions, the evaporative emission control system is depressurized and allows “EVAP Control System” diagnosis.



PBIB1263E

DTC Logic

INFOID:0000000010596897

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0448	EVAP canister vent control valve close	EVAP canister vent control valve remains closed under specified driving conditions.	• EVAP canister vent control valve • EVAP control system pressure sensor and the circuit • Blocked rubber tube to EVAP canister vent control valve • EVAP canister is saturated with water

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

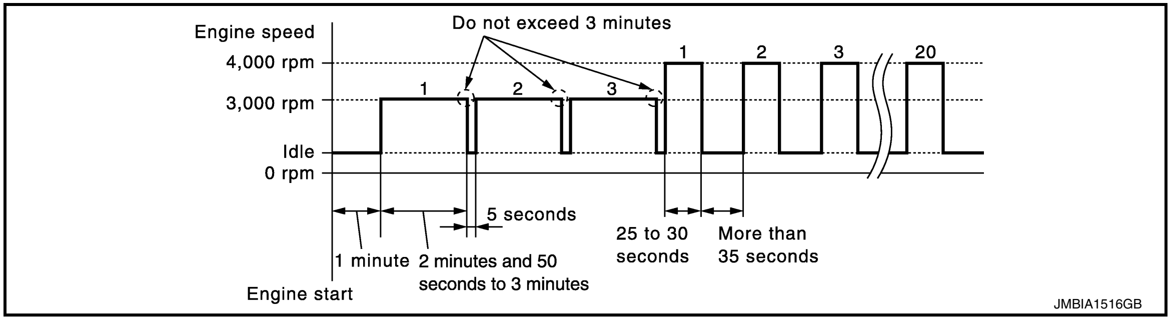
If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and let it idle for at least 1 minute.
4. Repeat next procedures five times.
- Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes.
  Do not exceed 2 minutes.
- Fully released accelerator pedal and keep engine idle for about 5 seconds.
5. Repeat next procedure 27 times.
- Quickly increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 25 to 30 seconds.

- Fully released accelerator pedal and keep engine idle for at least 35 seconds.



6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-328, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596898

1.CHECK RUBBER TUBE

1. Turn ignition switch OFF.
2. Disconnect rubber tube connected to EVAP canister vent control valve.
3. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Clean rubber tube using an air blower.

2.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-329, "Component Inspection".

Is the inspection result normal?

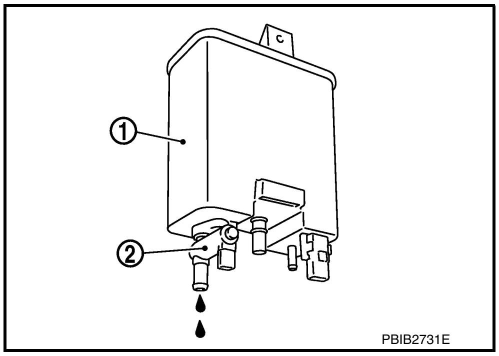
YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached. Refer to FL-15, "Exploded View".
2. Check if water will drain from the EVAP canister (1).

Does water drain from EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.



4.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

6.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

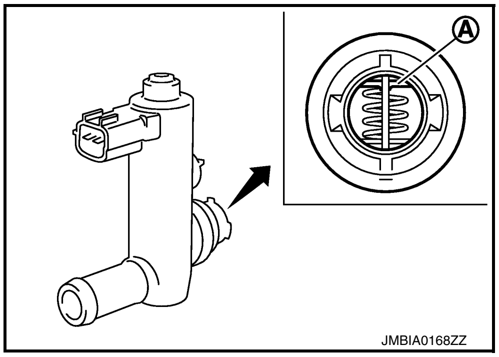
INFOID:0000000010596899

1.CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister. Refer to FL-16, "Removal and Installation".
3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".
NO >> GO TO 2.



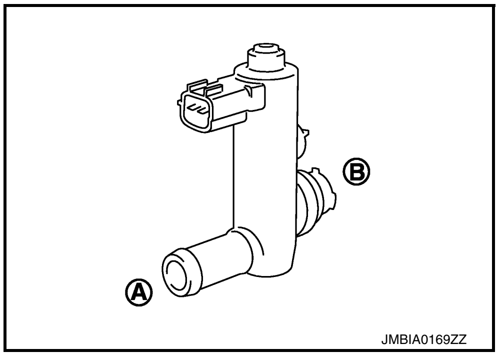
2.CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time.
   Make sure that new O-ring is installed properly.

Condition VENT CONT/V	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.



Without CONSULT

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
   Make sure that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

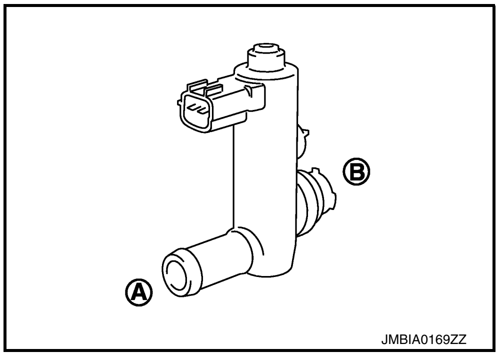
Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

3.CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
3. Check air passage continuity and operation delay time.
   Make sure that new O-ring is installed properly.



Condition VENT CONT/V	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
   Make sure that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.

Is the inspection result normal?

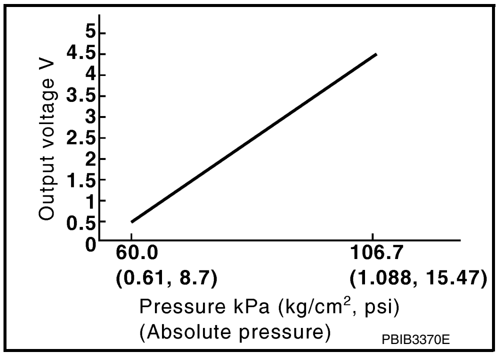
YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

INFOID:0000000010596900

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



DTC Logic

INFOID:0000000010596901

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0451	EVAP control system pressure sensor performance	ECM detects a sloshing signal from the EVAP control system pressure sensor	• Harness or connectors (EVAP control system pressure sensor circuit is shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) • EVAP control system pressure sensor • Crankshaft position sensor (POS) • Accelerator pedal position sensor • Refrigerant pressure sensor • Brake booster pressure sensor

DTC CONFIRMATION PROCEDURE

NOTE:

Never remove fuel filler cap during DTC confirmation procedure.

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

With CONSULT>>GO TO 2.
Without CONSULT>>GO TO 5.

2.PERFORM DTC CONFIRMATION PROCEDURE-1

With CONSULT

1. Start engine and let it idle for at least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-332, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-2

With CONSULT

1. Select “EVAP DIAG READY” in “DATA MONITOR” mode of “ENGINE”.
2. Let it idle until “OFF” of “EVAP DIAG READY” changes to “ON”.
   NOTE:
   It will take at most 2 hours until “OFF” of “EVAP DIAG READY” changes to “ON”.
3. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON.
5. Select “EVAP LEAK DIAG” in “DATA MONITOR” mode of “ECM”.
6. Check that “EVAP LEAK DIAG” indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 4.
YET >> 1. Perform DTC CONFIRMATION PROCEDURE again.
  2. GO TO 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-3

With CONSULT
Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-332, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM DTC CONFIRMATION PROCEDURE-4

With GST

1. Start engine and let it idle for at least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-332, "Diagnosis Procedure".
NO >> GO TO 6.

6.PERFORM DTC CONFIRMATION PROCEDURE-5

With GST

1. Let it idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-332, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596902

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor harness connector.

2. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
B252	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 4.

4.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
	46	CKP sensor (POS)	F2	1
M107	103	APP sensor	E112 (Without ICC)	6
			E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
		Refrigerant pressure sensor	E77	3

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair short to ground or short to power in harness or connectors.

5.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning component.

6.CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 7.

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

8.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596903

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector. Refer to FL-15, "Exploded View".
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M107	102	112	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Never apply below -93.3 kPa (-0.952 kg/cm^2, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm^2, 14.69 psi).**

Is the inspection result normal?

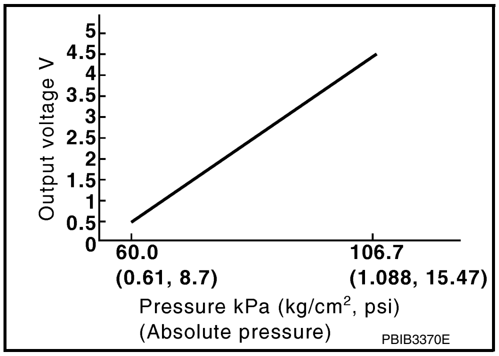
YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

INFOID:0000000010596904

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



DTC Logic

INFOID:0000000010596905

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) • EVAP control system pressure sensor • Crankshaft position sensor (POS) • Accelerator pedal position sensor • Refrigerant pressure sensor • Brake booster pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “DATA MONITOR” mode with CONSULT.
7. Make sure that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM		
Connector	+	–
	Terminal	Terminal
M107	106 (Fuel tank temperature sensor signal)	128 (ECM ground)

3. Make sure that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-336, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596906

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
B252	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 4.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B252	3	M107	107	Existed

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M117, B201
- Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
	46	CKP sensor (POS)	F2	1
M107	103	APP sensor	E112 (Without ICC)	6
			E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
		Refrigerant pressure sensor	E77	3

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair short to ground or short to power in harness or connectors.

7.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 9.

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

10.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND

SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B252	1	M107	112	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B252	2	M107	102	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

14.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-339, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

15.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596907

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector. Refer to FL-15, "Exploded View".
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M107	102	112	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Never apply below -93.3 kPa (-0.952 kg/cm^2, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm^2, 14.69 psi).**

Is the inspection result normal?

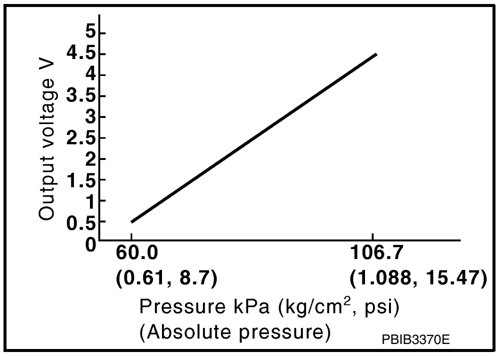
YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

INFOID:0000000010596908

The EVAP control system pressure sensor detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.



DTC Logic

INFOID:0000000010596909

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (EVAP control system pressure sensor circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (APP sensor 2 circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) (Brake booster pressure sensor circuit is shorted) • EVAP control system pressure sensor • Crankshaft position sensor (POS) • Accelerator pedal position sensor • Refrigerant pressure sensor • Brake booster pressure sensor • EVAP canister vent control valve • EVAP canister • Rubber hose from EVAP canister vent control valve to vehicle frame

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Select “DATA MONITOR” mode with CONSULT.

7. Make sure that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals as per the following.

ECM		
Connector	+	–
	Terminal	Terminal
M107	106 (Fuel tank temperature sensor signal)	128 (ECM ground)

3. Make sure that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-341, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596910

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check sensor harness connector for water.

Water should not exist.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between EVAP control system pressure sensor harness connector and ground.

EVAP control system pressure sensor		Ground	Voltage (V)
Connector	Terminal		
B252	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 4.

4.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B252	3	M107	107	Existed

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M117, B201
- Harness for open between ECM and EVAP control system pressure sensor

>> Repair open circuit.

6.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
	46	CKP sensor (POS)	F2	1
M107	103	APP sensor	E112 (Without ICC)	6
			E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
	111	Refrigerant pressure sensor	E77	3

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair short to ground or short to power in harness or connectors.

7.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-478, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 20.
NO >> GO TO 9.

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

10.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B252	1	M107	112	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B252	2	M107	102	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 13.

13.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B201, M117
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

14.CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Clean the rubber tube using an air blower, repair or replace rubber tube.

15.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-325, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP canister vent control valve. Refer to FL-16, "Removal and Installation".

16.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-344, "Component Inspection".

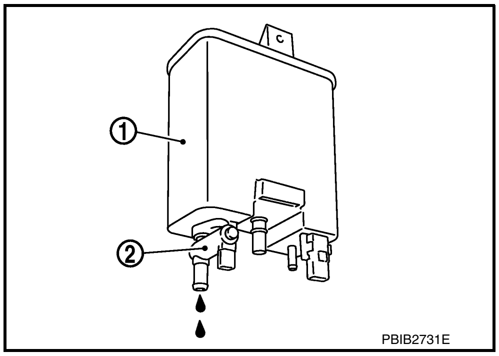
Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

17.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to FL-16, "Removal and Installation".
2. Check if water will drain from the EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from EVAP canister?

YES >> GO TO 18.
NO >> GO TO 20.

18.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 20.
NO >> GO TO 19.

19.DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

20.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596911

1.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector. Refer to FL-15, "Exploded View".
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.

ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M107	102	112	Not applied	1.8 - 4.8
			-26.7 (-0.272, -3.87)	2.1 to 2.5 lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Never apply below -93.3 kPa (-0.952 kg/cm^2, -13.53 psi) or pressure over 101.3 kPa (1.033 kg/cm^2, 14.69 psi).**

Is the inspection result normal?

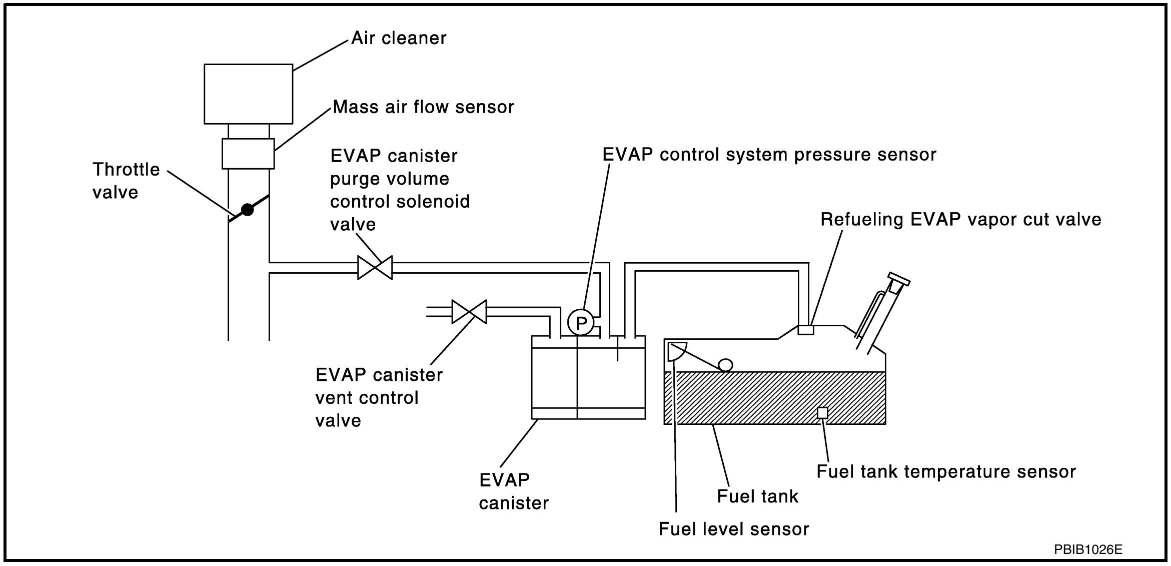
YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

P0456 EVAP CONTROL SYSTEM

DTC Logic

DTC DETECTION LOGIC

This diagnosis detects leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure caused by decrease of fuel temperature in the fuel tank after turning ignition switch OFF.
If ECM judges that there are no leaks, the diagnosis will be OK.


Air cleaner
Mass air flow sensor
Throttle valve
EVAP canister purge volume control solenoid valve
EVAP control system pressure sensor
Refueling EVAP vapor cut valve
P
EVAP canister vent control valve
EVAP canister
Fuel tank
Fuel tank temperature sensor
Fuel level sensor
PBIB1026E

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456	Evaporative emission control system very small leak (negative pressure check)	• EVAP system has a very small leak. • EVAP system does not operate properly.	• Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or fails to close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks • Fuel level sensor and the circuit • Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.**
- **If the fuel filler cap is not tightened properly, the MIL may illuminate.**
- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 4.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Turn ignition switch ON and select “EVAP DIAG READY” in “DATA MONITOR” mode with CONSULT.
2. Start engine and wait at idle until “OFF” of “EVAP DIAG READY” changes to “ON”.
   NOTE:
   It will take at most 2 hours until “OFF” of “EVAP DIAG READY” changes to “ON”.
3. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
4. Turn ignition switch ON and select “EVAP LEAK DIAG” in “DATA MONITOR” mode with CONSULT.
5. Check that “EVAP LEAK DIAG” indication.

Which is displayed on CONSULT?

CMPLT >> GO TO 3.
YET >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 1.

3.PERFORM COMPONENT FUNCTION CHECK-II

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-347, "Diagnosis Procedure".
NO >> INSPECTION END

4.PERFORM DTC CONFIRMATION PROCEDURE

With GST

1. Start engine and wait engine idle for at least 2 hours.
2. Turn ignition switch OFF and wait at least 90 minutes.
   NOTE:
   Never turn ignition switch ON during 90 minutes.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-347, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596913

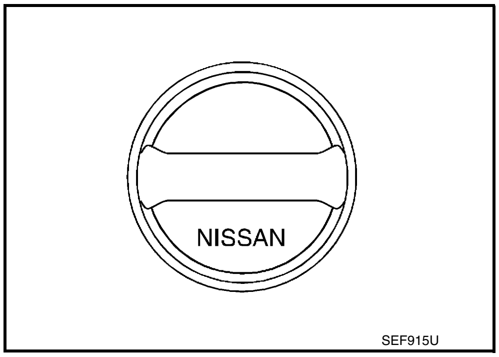
1.CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace with genuine NISSAN fuel filler cap. Refer to FL-11, "Exploded View".



2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. Then retighten until ratcheting sound is heard.

3.CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filler cap with a genuine one. Refer to FL-11, "Exploded View".

5.CHECK FOR EVAP LEAK

Refer to EC-629, "Inspection".

Is there any leak in EVAP line?

YES >> Repair or replace.
NO >> GO TO 6.

6.CHECK EVAP CANISTER VENT CONTROL VALVE

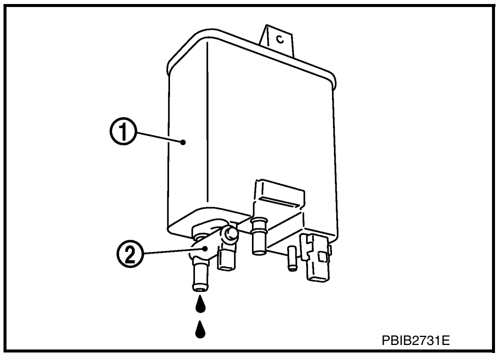
Check the following.

- EVAP canister vent control valve is installed properly.
  Refer to FL-16, "Removal and Installation".
- EVAP canister vent control valve.
  Refer to FL-16, "Removal and Installation".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace EVAP canister vent control valve and O-ring. Refer to FL-16, "Removal and Installation".

7.CHECK IF EVAP CANISTER IS SATURATED WITH WATER



1. Remove EVAP canister (1) with EVAP canister vent control valve (2) and EVAP control system pressure sensor attached. Refer to FL-16, "Removal and Installation".
2. Check if water will drain from EVAP canister.

Does water drain from the EVAP canister?

YES >> GO TO 8.
NO-1 >> With CONSULT: GO TO 10.
NO-2 >> Without CONSULT: GO TO 11.

8.CHECK EVAP CANISTER

Weigh the EVAP canister assembly with the EVAP canister vent control valve and EVAP control system pressure sensor attached.
The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES-1 >> With CONSULT: GO TO 10.
YES-2 >> Without CONSULT: GO TO 11.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister. Refer to FL-16, "Removal and Installation".

10.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT
1. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
2. Start engine and let it idle.
3. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT screen to increase “PURG VOL C/V” opening to 100%.
5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

11.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT
1. Start engine and warm it up to normal operating temperature.
2. Stop engine.
3. Disconnect vacuum hose connected to EVAP service port and EVAP canister purge volume control solenoid valve from EVAP service port.
4. Start engine and let it idle for at least 80 seconds.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-97, "System Diagram".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or reconnect the hose.

13.CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-318, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP canister purge volume control solenoid valve. Refer to FL-14, "Hydraulic Layout".

14.CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-273, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel level sensor unit. Refer to FL-6, "Removal and Installation".

15.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-334, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor. Refer to FL-15, "Exploded View".

16.CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-97, "System Diagram".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Repair or reconnect the hose.

17.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 18.

18.CHECK EVAP/ORVR LINE

Check EVAP/ORVR line between EVAP canister and fuel tank for clogging, kinks, looseness and improper connection. For location, refer to EC-522, "Description".

Is the inspection result normal?

YES >> GO TO 19.
NO >> Repair or replace hoses and tubes.

19.CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 20.
NO >> Repair or replace hose, tube or filler tube.

20.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 21.
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

21.CHECK FUEL LEVEL SENSOR

Refer to MWI-60, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 22.
NO >> Replace fuel level sensor unit. Refer to FL-6, "Removal and Installation".

22.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

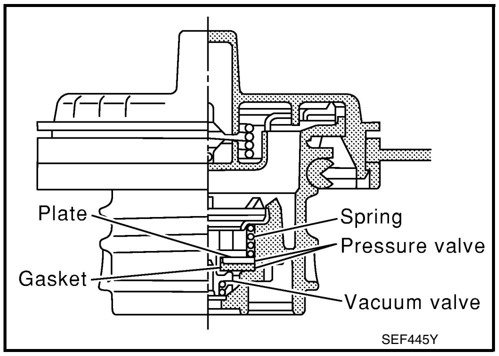
>> INSPECTION END

Component Inspection

INFOID:0000000010596914

1.CHECK FUEL TANK VACUUM RELIEF VALVE

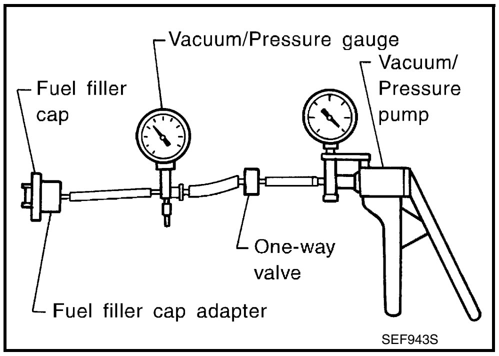
1. Turn ignition switch OFF.
2. Remove fuel filler cap. Refer to FL-11, "Exploded View".
3. Wipe clean valve housing.



4. Check valve opening pressure and vacuum.

Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)**

Vacuum: **–6.0 to –3.3 kPa (–0.061 to –0.034 kg/cm^2, –0.87 to –0.48 psi)**



Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE FUEL FILLER CAP

Replace fuel filler cap. Refer to FL-11, "Exploded View".

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END

P0460 FUEL LEVEL SENSOR

Description

The fuel level sensor is mounted in the fuel level sensor unit.
The sensor detects a fuel level in the fuel tank and transmits a signal to the “unified meter and A/C amp.”. The “unified meter and A/C amp.” sends the fuel level sensor signal to the ECM via the CAN communication line.
It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic

DTC DETECTION LOGIC

NOTE:

- **If DTC P0460 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0460 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".**

When the vehicle is parked, the fuel level in the fuel tank is naturally stable. It means that output signal of the fuel level sensor does not change. If ECM senses sloshing signal from the sensor, fuel level sensor malfunction is detected.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0460	Fuel level sensor circuit noise	Even though the vehicle is parked, a signal being varied is sent from the fuel level sensor to ECM.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Unified meter and A/C amp. • Fuel level sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait maximum of 2 consecutive minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-352, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to MWI-58, "Component Function Check".

2.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0461 FUEL LEVEL SENSOR

Description

INFOID:0000000010596918

The fuel level sensor is mounted in the fuel level sensor unit.
The sensor detects a fuel level in the fuel tank and transmits a signal to the “unified meter and A/C amp.”. The “unified meter and A/C amp.” sends the fuel level sensor signal to the ECM via the CAN communication line.
It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic

INFOID:0000000010596919

DTC DETECTION LOGIC

NOTE:

- **If DTC P0461 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0461 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".**

Driving long distances naturally affect fuel gauge level.
This diagnosis detects the fuel gauge malfunction of the gauge not moving even after a long distance has been driven.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0461	Fuel level sensor circuit range/performance	The output signal of the fuel level sensor does not change within the specified range even though the vehicle has been driven a long distance.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Unified meter and A/C amp. • Fuel level sensor

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-354, "Component Function Check".
Use component function check to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-355, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596920

1.PRECONDITIONING

WARNING:
When performing the following procedure, always observe the handling of the fuel. Refer to FL-6, "Removal and Installation".
TESTING CONDITION:
Before starting component function check, preparation of draining fuel and refilling fuel is required.

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 3.

2.PERFORM COMPONENT FUNCTION CHECK

With CONSULT
NOTE:
Start from step 10, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.

2. Release fuel pressure from fuel line, refer to EC-628, "Inspection".
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-6, "Removal and Installation".
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT.
9. Touch “ON” and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check “FUEL LEVEL SE” output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check “FUEL LEVEL SE” output voltage and note it.
13. Confirm whether the voltage changes more than 0.03V during step 7 to 10 and 10 to 12.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-355, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

⊗**Without CONSULT**
NOTE:
Start from step 8, if it is possible to confirm that the fuel cannot be drained by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) in advance.

1. Prepare a fuel container and a spare hose.
2. Release fuel pressure from fuel line. Refer to EC-628, "Inspection".
3. Remove the fuel feed hose on the fuel level sensor unit. Refer to FL-6, "Removal and Installation".
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-355, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596921

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to MWI-58, "Component Function Check".

2.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0462, P0463 FUEL LEVEL SENSOR

Description

INFOID:0000000010596922

The fuel level sensor is mounted in the fuel level sensor unit.
The sensor detects a fuel level in the fuel tank and transmits a signal to the “unified meter and A/C amp.”. The “unified meter and A/C amp.” sends the fuel level sensor signal to the ECM via the CAN communication line.
It consists of two parts, one is mechanical float and the other is variable resistor. Fuel level sensor output voltage changes depending on the movement of the fuel mechanical float.

DTC Logic

INFOID:0000000010596923

DTC DETECTION LOGIC

NOTE:

- **If DTC P0462 or P0463 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P0462 or P0463 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607.Refer to EC-377, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462	Fuel level sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The sensor circuit is open or shorted) • Unified meter and A/C amp. • Fuel level sensor
P0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at ignition switch ON.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-356, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596924

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to MWI-58, "Component Function Check".

2.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0500 VSS

Description

INFOID:0000000010596925

ECM receives vehicle speed signals from two different paths via CAN communication line: One is from the ABS actuator and electric unit (control unit) via the combination unit and the other is from TCM.

DTC Logic

INFOID:0000000010596926

DTC DETECTION LOGIC

NOTE:

- If DTC P0500 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.
- If DTC P0500 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".

DTC No.	Trouble diagnosis (Trouble diagnosis content)	DTC detecting condition	Possible cause
P0500	VEH SPEED SEN/CIRC (Vehicle speed sensor)	At 20 km/h (13 MPH), ECM detects the following status continuously for 5 seconds or more: The difference between a vehicle speed calculated by a output speed sensor transmitted from TCM to ECM via CAN communication and the vehicle speed indicated on the combination meter exceeds 15km/h (10 MPH).	• Harness or connector (The CAN communication line is open or shorted.) • Combination meter • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • Output speed sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC CONFIRMATION PROCEDURE has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is 10 V or more at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Shift the selector lever to D range and wait at least for 2 seconds.
3. Drive the vehicle at least 5 seconds at 20 km/h (13 MPH) or more.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-358, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596927

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)

Check DTC with ABS actuator and electric unit (control unit). Refer to BRC-30, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble shooting relevant to DTC indicated.

3.CHECK DTC WITH COMBINATION METER

Check DTC with combination meter. Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Perform trouble shooting relevant to DTC indicated.

4.CHECK OUTPUT SPEED SENSOR

Check output speed sensor. Refer to TM-82, "Diagnosis Procedure".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace or replace error-detected parts.

5.CHECK WHEEL SENSOR

Check wheel sensor. Refer to BRC-56, "Diagnosis Procedure".

Is the inspection result normal?

YES >> Check intermittent incident. Refer to GI-45, "Intermittent Incident".
NO >> Replace or replace error-detected parts.

P0506 ISC SYSTEM

Description

INFOID:0000000010596928

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000010596929

DTC DETECTION LOGIC

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	• Electric throttle control actuator • Intake air leak

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform EC-21, "IDLE AIR VOLUME LEARNING : Description", before conducting DTC Confirmation Procedure.
TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.**
- **Always perform the test at a temperature above −10°C(14°F).**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Restart engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-360, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596930

1.CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Discover air leak location and repair.
NO >> GO TO 2.

2.REPLACE ECM

1. Stop engine.
2. Replace ECM. Refer to EC-39, "Component Parts Location".
3. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P0507 ISC SYSTEM

Description

INFOID:0000000010596931

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor (POS) detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000010596932

DTC DETECTION LOGIC

NOTE:
If DTC P0507 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	• Electric throttle control actuator • Intake air leak • PCV system

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

If the idle speed is out of the specified value, perform EC-21, "IDLE AIR VOLUME LEARNING : Description", before conducting DTC Confirmation Procedure.
TESTING CONDITION:
- **Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.**
- **Always perform the test at a temperature above −10°C(14°F).**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and run it for at least 1 minute at idle speed.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-362, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596933

1.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace.

2.CHECK INTAKE AIR LEAK

1. Start engine and let it idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Discover air leak location and repair.
NO >> GO TO 3.

3.REPLACE ECM

1. Stop engine.
2. Replace ECM. Refer to EC-39, "Component Parts Location".
3. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P050A, P050B, P050E COLD START CONTROL

Description

INFOID:0000000011003091

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Description

INFOID:0000000011003092

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition	Possible cause
P050A	COLD START CONTROL (Cold start idle air control system performance)	ECM does not control engine idle speed properly when engine is started with pre-warming up condition.	• Lack of intake air volume • Fuel injection system • ECM
P050B	COLD START CONTROL (Cold start ignition timing performance)	ECM does not control ignition timing properly when engine is started with pre-warming up condition.	
P050E	COLD START CONTROL (Cold start engine exhaust temperature too low)	The temperature of the catalyst inlet does not rise to the proper temperature when the engine is started with pre-warming up condition.	

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P050A, P050B, or P050E is displayed with other DTC, first perform the confirmation procedure (trouble diagnosis) for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-576, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT.
4. Check the indication of “COOLAN TEMP/S”.

With GST

Follow the procedure “With CONSULT” above.

Is the value of “COOLAN TEMP/S” between 4°C (39°F) and 36°C (97°F)?

YES >> GO TO 4.
NO-1 [If it is below 4°C (39°F)]>>Warm up the engine until the value of “COOLAN TEMP/S” reaches 4°C (39°F) or more. Retry from step 1.

NO-2 [If it is above 36°C (97°F)]>>Cool engine down to less than 36°C (97°F). Retry from step 1.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT

1. Set the select lever in N range.
2. Start the engine and warm up in idle with the value of “COOLAN TEMP/S” between –10°C (14°F) and 40°C (104°F) for more than 15 seconds.
3. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT” above.

Is 1st trip DTC detected?

YES >> Go to EC-365, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000011003093

1.CHECK DTC PRIORITY

If DTC P050A, P050B, or P050E is displayed with other DTC, first perform the confirmation procedure (trouble diagnosis) for other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-576, "DTC Index".
NO >> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-21, "IDLE AIR VOLUME LEARNING : Description".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 3.
NO >> Follow the instruction of Idle Air Volume Learning.

3.CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.

- Crushed intake air passage
- Intake air passage clogging
- Clogging of throttle body

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace malfunctioning part

4.CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-262, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Go to EC-263, "Diagnosis Procedure" for DTC P0171, P0174.

5.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-364, "DTC Description".

Is the 1st trip DTC P050A, P050B, or P050E displayed again?

YES >> GO TO 6.
NO >> INSPECTION END

6.REPLACE ECM

1. Replace ECM.
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P0524 ENGINE OIL PRESSURE

DTC Logic

INFOID:0000000010596937

DTC DETECTION LOGIC

NOTE:

If DTC P0524 is displayed with DTC P0075 or P0081, first perform the trouble diagnosis for DTC P0075, P0081. Refer to EC-185, "DTC Logic"

DTC No.	Trouble diagnosis name	Detecting condition	Possible cause
P0524	Engine oil pressure too low	Engine oil pressure is low because there is a gap between angle of target and phase-control angle.	• Engine oil pressure or level too low • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Intake valve control solenoid valve • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING-I

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is between 10 V and 16 V at idle.

>> GO TO 2.

2.PRECONDITIONING-II

Check oil level and oil pressure. Refer to LU-7, "Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to LU-7, "Inspection".

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	More than 1,700 rpm
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:

Always drive at a safe speed.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

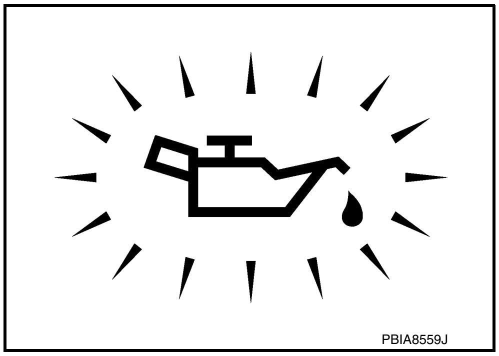
YES >> Go to EC-368, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596938

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 LU-7, "Inspection".
NO >> GO TO 2.

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-177, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

3.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-300, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor (POS). Refer to EM-122, "Exploded View".

4.CHECK CAMSHAFT POSITION SENSOR (PHASE)

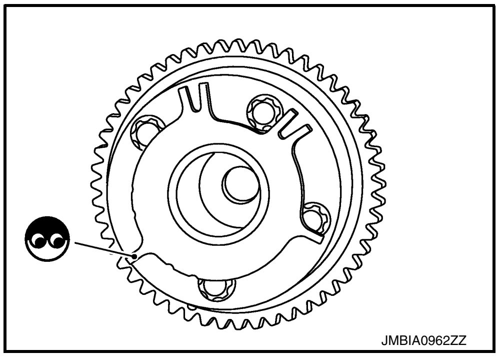
Refer to EC-304, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor (PHASE). Refer to EM-51, "Exploded View".

5.CHECK CAMSHAFT (INTAKE)

Check the following.
- Accumulation of debris to the signal plate of camshaft front end
- Chipping signal plate of camshaft front end



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft front end or replace camshaft. Refer to EM-51, "Exploded View".

6.CHECK TIMING CHAIN INSTALLATION

Check service records for any recent repairs that may cause timing chain misaligned.

Are there any service records that may cause timing chain misaligned?

YES >> Check timing chain installation. Refer to EM-52, "Removal and Installation".
NO >> GO TO 7.

7.CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-105, "Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean lubrication line.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596939

1.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.
3. Check resistance between intake valve timing control solenoid valve terminals as per the following.

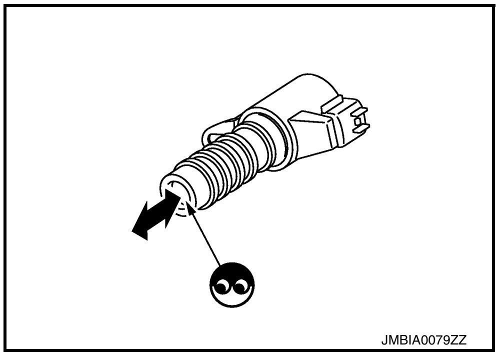
Terminals	Resistance (Ω)
1 and 2	7.0 - 7.7 [at 20°C (68°F)]
1 or 2 and ground	∞ (Continuity should not exist)

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

2.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".
2. Provide 12 V DC between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Make sure that the plunger moves as shown in the figure.
   CAUTION:
   Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
   NOTE:
   Always replace O-ring when intake valve timing control solenoid valve is removed.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning intake valve timing control solenoid valve. Refer to EM-51, "Exploded View".

P0550 PSP SENSOR

Description

INFOID:0000000010596940

Power steering pressure (PSP) sensor is installed to the power steering high-pressure tube and detects a power steering load.
This sensor is a potentiometer which transforms the power steering load into output voltage, and emits the voltage signal to the ECM. The ECM controls the electric throttle control actuator and adjusts the throttle valve opening angle to increase the engine speed and adjusts the idle speed for the increased load.

DTC Logic

INFOID:0000000010596941

DTC DETECTION LOGIC

NOTE:

If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550	Power steering pressure sensor circuit	An excessively low or high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Power steering pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-370, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596942

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect power steering pressure (PSP) sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between PSP sensor harness connector and ground.

PSP sensor		Ground	Voltage (V)
Connector	Terminal		
F35	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between PSP sensor harness connector and ECM harness connector.

PSP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F35	1	F102	96	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground short to power in harness or connectors.

4.CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between PSP sensor harness connector and ECM harness connector.

PSP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F35	2	F102	87	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK PSP SENSOR

Refer to EC-371, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace PSP sensor. Refer to ST-52, "2WD : Exploded View" (2WD models) or ST-53, "AWD : Exploded View" (AWD models).

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010596943

1.CHECK POWER STEERING PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and let it idle.
4. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F102	87	96	Steering wheel	Being turned	0.5 - 4.5
				Not being turned	0.4 - 0.8

Is the inspection result normal?

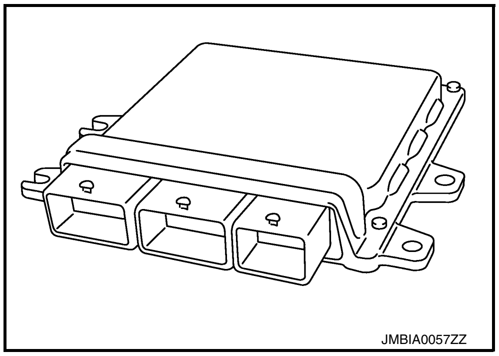
YES >> INSPECTION END
NO >> Replace power steering pressure sensor. Refer to ST-52, "2WD : Exploded View" (2WD models) or ST-53, "AWD : Exploded View" (AWD models).

P0603 ECM POWER SUPPLY

Description

INFOID:0000000010596948

Battery voltage is supplied to the ECM even when the ignition switch is turned OFF for the ECM memory function of the DTC memory, the air-fuel ratio feedback compensation value memory, the idle air volume learning value memory, etc.



DTC Logic

INFOID:0000000010596949

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0603	ECM power supply circuit	ECM back up RAM system does not function properly.	• Harness or connectors [ECM power supply (back up) circuit is open or shorted.] • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Turn ignition switch OFF and wait at least 5 minutes.
3. Turn ignition switch ON and wait at least 10 seconds.
4. Repeat steps 2 and 3 for five times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-373, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596950

1.CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the voltage between ECM harness connector terminals as per the following.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F102	93	M107	128	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- 15 A fuse (No. 50)
- IPDM E/R harness connector E7
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace harness or connectors.

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. **Perform DTC Confirmation Procedure.**
   See EC-373, "DTC Logic".

Is the 1st trip DTC P0603 displayed again?

YES >> GO TO 5.
NO >> INSPECTION END

5.REPLACE ECM

1. Replace ECM.
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

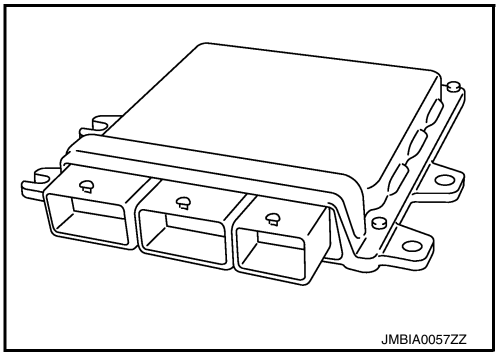
>> INSPECTION END

P0605 ECM

Description

INFOID:0000000010596951

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.



DTC Logic

INFOID:0000000010596952

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605	Engine control module	A)	ECM calculation function is malfunctioning.	• ECM
		B)	ECM EEP-ROM system is malfunctioning.	
		C)	ECM self shut-off function is malfunctioning.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-376, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-376, "Diagnosis Procedure".
NO >> GO TO 4.

4.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Turn ignition switch OFF, wait at least 10 seconds, and then turn it ON.
3. Repeat step 2 for 32 times.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-376, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596953

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. **Perform DTC Confirmation Procedure.**
   See EC-375, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

YES >> GO TO 2.
NO >> INSPECTION END

2.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P0607 ECM

Description

INFOID:0000000010596954

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:0000000010596955

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0607	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-377, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596956

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-377, "DTC Logic".
4. Check DTC.

Is the DTC P0607 displayed again?

YES >> GO TO 2.
NO >> INSPECTION END

2.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

>> INSPECTION END

P0643 SENSOR POWER SUPPLY

DTC Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0643	Sensor power supply circuit short	ECM detects that the voltage of power source for sensor is excessively low or high.	• Harness or connectors (APP sensor 1 circuit is shorted.) (TP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 1) circuit is shorted.] [Manifold absolute pressure (MAP) sensor circuit is shorted.] (PSP sensor circuit is shorted.) [CMP sensor (PHASE) (bank 2) circuit is shorted.] [Battery current sensor circuit is shorted.] • Accelerator pedal position sensor • Throttle position sensor • Camshaft position sensor (PHASE) (bank 1) • Manifold absolute pressure (MAP) sensor • Power steering pressure sensor • Camshaft position sensor (PHASE) (bank 2) • Battery current sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-378, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
E112 (Without ICC) E116 (With ICC)	5	Ground	Approx. 5

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	Name	Connector	Terminal
F101	43	Electric throttle control actuator (bank 2)	F27	1
	44	Electric throttle control actuator (bank 1)	F6	6
F102	60	CMP sensor (PHASE) (bank 1)	F5	1
		Manifold absolute pressure (MAP) sensor	F50	1
		PSP sensor	F35	3
	64	CMP sensor (PHASE) (bank 2)	F18	1
		Battery current sensor	E21	1
M107	99	APP sensor	E112 (Without ICC) E116 (With ICC)	5

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.

- Camshaft position sensor (PHASE) (bank 1) (Refer to EC-304, "Component Inspection".)
- Power steering pressure sensor (Refer to EC-371, "Component Inspection".)
- Camshaft position sensor (PHASE) (bank 2) (Refer to EC-304, "Component Inspection".)
- Battery current sensor (Refer to EC-427, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5.CHECK TP SENSOR

Refer to EC-214, "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. Refer to EM-29, "Removal and Installation".
2. Go to EC-214, "Special Repair Requirement".

>> INSPECTION END

7.CHECK APP SENSOR

Refer to EC-478, "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. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P0850 PNP SWITCH

Description

INFOID:0000000010596959

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM. ECM detects the position because the continuity of the line (the ON signal) exists.

DTC Logic

INFOID:0000000010596960

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850	Park/neutral position switch	The signal of the park/neutral position (PNP) signal does not change during driving after the engine is started.	• Harness or connectors [The park/neutral position (PNP) signal circuit is open or shorted.] • TCM

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 5.

2.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 3.

3.CHECK PNP SIGNAL

With CONSULT

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT. Then check the “P/N POSI SW” signal under the following conditions.

Position (Selector lever)	Known-good signal
N or P position	ON
Except above position	OFF

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-382, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT.
2. Start engine and warm it up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.

ENG SPEED	1,400 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)

B/FUEL SCHDL	2.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-382, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-382, "Component Function Check".

NOTE:

Use component function check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-382, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596961

1.PERFORM COMPONENT FUNCTION CHECK

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	109	128	Selector lever	P or N	Battery voltage
				Except above	Approx. 0

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-382, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596962

1.CHECK DTC WITH TCM

Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.
NO >> Check DTC with BCM. Refer to BCS-40, "SIGNAL BUFFER : CONSULT Function (BCM - SIGNAL BUFFER)".

3.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/T assembly harness connector and ECM harness connector.

A/T assembly		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F51	9	M107	109	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 F40, E13
- Harness connectors E106, M6
- Harness for open or short between A/T assembly and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

P100A, P100B VVEL SYSTEM

DTC Logic

INFOID:0000000010596963

DTC DETECTION LOGIC

NOTE:

- If DTC P100A or P100B is displayed with DTC P1090 or P1093, first perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-397, "DTC Logic".
- If DTC P100A or P100B is displayed with DTC P0101 or P010B, first perform the trouble diagnosis for DTC P0101 or P010B. Refer to EC-188, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P100A	VVEL response malfunction (bank 1)	Actual event response to target is poor.	• Harness or connectors (VVEL actuator motor circuit is open or shorted.) • VVEL actuator motor • VVEL actuator sub assembly • VVEL ladder assembly • VVEL control module
P100B	VVEL response malfunction (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine.
2. Depress the accelerator pedal rapidly half or more under no load conditions, and then release it.
3. Wait at idle for 5 seconds or more.
4. Repeat steps 2 to 3 for three times.
5. Check 1st trip DTC.

Is DTC detected?

YES >> Go to EC-384, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596964

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.VVEL ACTUATOR MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect VVEL control module harness connector.
2. Disconnect VVEL actuator motor harness connector.
3. Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

DTC No.	VVEL control module			VVEL actuator motor		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P100A	1	E14	12	F48	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P100B	2		2	F49	1	Existed
					2	Not existed
			15		1	Not existed
					2	Existed

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL actuator motor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK VVEL ACTUATOR MOTOR

Refer to EC-386, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace.

7.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> GO TO 8.

8.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure. See EC-384, "DTC Logic".

Is the DTC P100A or P100B displayed again?

YES >> GO TO 9.

NO >> INSPECTION END

9.CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-386, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

11.CHECK VVEL LADDER ASSEMBLY

Refer to EM-105, "Inspection".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY

1. Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly. Refer to EM-113, "Disassembly and Assembly" and EM-95, "Exploded View".
2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

13.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000010596965

1.CHECK VVEL ACTUATOR MOTOR

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor harness connector.
3. Check resistance between VVEL actuator motor terminals as follows.

VVEL actuator motor	Resistance
Terminal	
1 and 2	16 Ω or less

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:0000000010596966

1.CHECK VVEL ACTUATOR SUB ASSEMBLY

1. Turn ignition switch OFF.

2. Remove VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-387, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010596967

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P1087, P1088 VVEL SYSTEM

DTC Logic

INFOID:0000000010596968

DTC DETECTION LOGIC

NOTE:

If DTC P1087 or P1088 is displayed with DTC P1090 or P1093.
Perform the trouble diagnosis for DTC P1090 or P1093. Refer to EC-393, "DTC Logic".

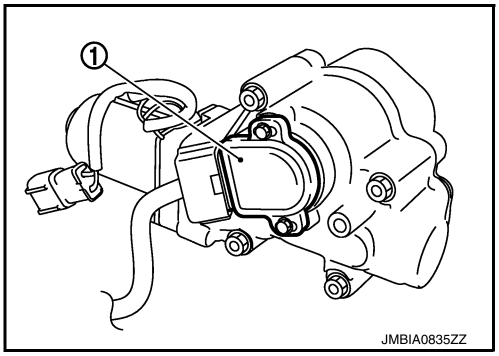
DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1087	VVEL small event angle malfunction (bank 1)	The event angle of VVEL control shaft is always small.	• Harness or connectors (VVEL actuator motor circuit is open or shorted.) • VVEL actuator motor • VVEL actuator sub assembly • VVEL ladder assembly • VVEL control module
P1088	VVEL small event angle malfunction (bank 2)		

P1089, P1092 VVEL CONTROL SHAFT POSITION SENSOR

Description

INFOID:0000000010596969

VVEL control shaft position sensor (1) is placed on VVEL actuator sub assembly and detects the control shaft position angle.
A magnet is pressed into the arm on the edge of control shaft.
The magnetic field changes as the magnet rotates together with the arm resulting in the output voltage change of the sensor.
VVEL control module detects the actual position angle through the voltage change and sends the signal to ECM.



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DTC Logic

INFOID:0000000010596970

DTC DETECTION LOGIC

NOTE:
If DTC P1089 or P1092 is displayed with DTC P1608, first perform the trouble diagnosis for DTC P1608.
Refer to EC-465, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1089	VVEL control shaft position sensor (bank 1) circuit	• An excessively low voltage from the sensor is sent to VVEL control module. • An excessively high voltage from the sensor is sent to VVEL control module. • Rationally incorrect voltage is sent to VVEL control module compared with the signals from VVEL control shaft position sensor 1 and VVEL control shaft position sensor 2.	• Harness or connectors (VVEL control shaft position sensor circuit is open or shorted.) • VVEL control shaft position sensor • VVEL control module
P1092	VVEL control shaft position sensor (bank 2) circuit		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-389, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596971

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect VVEL control shaft position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

DTC No.	VVEL control shaft position sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P1089	1	F46	3	Ground	Approx. 5
			6		
P1092	2	F47	3		
			6		

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK VVEL CONTROL SHAFT POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect VVEL control module harness connector.
3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1089	1	F46	2	E14	4	Existed
			5		17	
P1092	2	F47	2		6	
			5		19	

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.VVEL CONTROL SHAFT POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

DTC No.	VVEL control shaft position sensor			VVEL control module		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1089	1	F46	1	E14	3	Existed
			4		16	
P1092	2	F47	1		5	
			4		18	

2. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace.

9.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-389, "DTC Logic".

Is the DTC P1089 or P1092 displayed again?

YES >> GO TO 11.
NO >> INSPECTION END

11.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-391, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010596972

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P1090, P1093 VVEL ACTUATOR MOTOR

Description

INFOID:0000000010596973

The VVEL actuator motor rotates the control shaft according to the control signal from the VVEL control module. The VVEL control module judges whether the VVEL actuator motor controls the angle properly by the VVEL control shaft position sensor signal.

DTC Logic

INFOID:0000000010596974

DTC DETECTION LOGIC

NOTE:

If DTC P1090 or P1093 is displayed with DTC P1091, first perform the trouble diagnosis for DTC P1091. Refer to EC-397, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1090	VVEL system performance (bank 1)	• Event angle difference between the actual and the target is detected. • Abnormal current is sent to VVEL actuator motor.	• Harness or connectors (VVEL actuator motor circuit is open or shorted.) • VVEL actuator motor • VVEL actuator sub assembly • VVEL ladder assembly • VVEL control module
P1093	VVEL system performance (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 10 second.
2. Keep the engine speed at about 3,500 rpm for at least 10 seconds under no load.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-393, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596975

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.VVEL ACTUATOR MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect VVEL control module harness connector.
2. Disconnect VVEL actuator motor harness connector.
3. Check the continuity between VVEL control module harness connector and VVEL actuator motor harness connector.

DTC No.	VVEL control module			VVEL actuator motor		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1090	1	E14	12	F48	1	Existed
					2	Not existed
			25		1	Not existed
					2	Existed
P1093	2		2	F49	1	Existed
					2	Not existed
			15		1	Not existed
					2	Existed

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL actuator motor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK VVEL ACTUATOR MOTOR

Refer to EC-395, "Component Inspection (VVEL ACTUATOR MOTOR)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-396, "Special Repair Requirement".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace.

7.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> GO TO 8.

8.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-393, "DTC Logic".

Is the DTC P1090 or P1093 displayed again?

YES >> GO TO 9.
NO >> INSPECTION END

9.CHECK VVEL ACTUATOR SUB ASSEMBLY

Refer to EC-395, "Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EC-39, "Component Parts Location".
2. Go to EC-396, "Special Repair Requirement".

>> INSPECTION END

11.CHECK VVEL LADDER ASSEMBLY

Refer to EM-105, "Inspection".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.REPLACE CYLINDER HEAD, VVEL LADDER ASSEMBLY AND VVEL ACTUATOR SUB ASSEMBLY

1. Replace cylinder head, VVEL ladder assembly and VVEL actuator sub assembly. Refer to EM-113, "Disassembly and Assembly" and EM-95, "Exploded View".
2. Go to EC-396, "Special Repair Requirement".

>> INSPECTION END

13.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR MOTOR)

INFOID:0000000010596976

1.CHECK VVEL ACTUATOR MOTOR

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor harness connector.
3. Check resistance between VVEL actuator motor terminals as follows.

VVEL actuator motor	Resistance
Terminal	
1 and 2	16 Ω or less

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-396, "Special Repair Requirement".

>> INSPECTION END

Component Inspection (VVEL ACTUATOR SUB ASSEMBLY)

INFOID:0000000010596977

1.CHECK VVEL ACTUATOR SUB ASSEMBLY

1. Turn ignition switch OFF.
2. Remove VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
3. Turn the ball screw shaft to check that it works smoothly.

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-396, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010596978

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P1091 VVEL ACTUATOR MOTOR RELAY

Description

INFOID:0000000010596979

Power supply for the VVEL actuator motor is provided to the VVEL control module via VVEL actuator motor relay. VVEL actuator motor relay is ON/OFF controlled by the VVEL control module. In addition, when the VVEL actuator motor relay cannot be controlled by the VVEL control module for some reason, it ON/OFF controlled by ECM.

DTC Logic

INFOID:0000000010596980

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1091	VVEL actuator motor relay circuit	• VVEL control module detects the VVEL actuator motor relay is stuck OFF. • VVEL control module detects the VVEL actuator motor relay is stuck ON.	• Harness or connectors (VVEL actuator motor relay circuit is open or shorted.) (Abort circuit is open or shorted.) • VVEL actuator motor relay • VVEL control module • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 seconds.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and wait at least 1 seconds.
4. Check DTC.

Is DTC detected?

YES >> Go to EC-397, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596981

1.VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect VVEL actuator motor relay.
3. Check the voltage between VVEL actuator motor relay harness connector and ground.

VVEL actuator motor relay		Ground	Voltage
Connector	Terminal		
E16	1	Ground	Battery voltage
	5		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.

- 50 A fusible link (letter N)
- Harness for open or short between VVEL actuator motor relay and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.VVEL ACTUATOR MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect VVEL control module harness connector.
2. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module		VVEL actuator motor relay		Continuity
Connector	Terminal	Connector	Terminal	
E14	23	E16	2	Existed

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.VVEL ACTUATOR MOTOR RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between VVEL actuator motor relay harness connector and VVEL control module harness connector.

VVEL control module			VVEL actuator motor relay		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	E14	13	E16	3	Existed
2		1			

2. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK VVEL ACTUATOR MOTOR RELAY

Refer to EC-399, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".

6.CHECK ABORT CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between VVEL control module harness connector and ECM harness connector.

VVEL control module		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E14	21	F101	28	Existed

3. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 7.

7.DETECT MALFUNCTIONING PART

Check the following.

- Harness connector E13, F40
- Harness for open or short between ECM and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair or replace.

9.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> GO TO 10.

10.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-397, "DTC Logic".

Is the DTC P1091 displayed again?

YES >> GO TO 11.
NO >> INSPECTION END

11.REPLACE ECM

1. Replace ECM. Refer to EC-39, "Component Parts Location".
2. Go to EC-17, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (ECM) : Description".

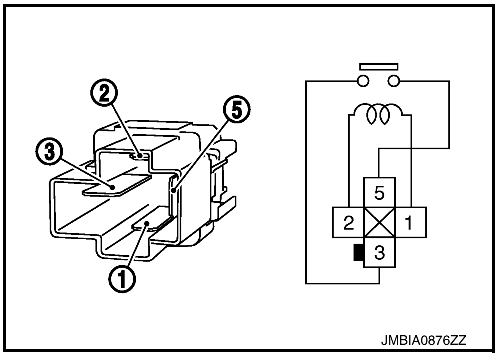
>> INSPECTION END

Component Inspection

INFOID:0000000010596982

1.CHECK VVEL ACTUATOR MOTOR RELAY

1. Turn ignition switch OFF.
2. Remove VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".
3. Check the continuity between VVEL actuator motor relay terminals under the following conditions.



Terminal	Condition	Continuity
3 and 5	12 V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace VVEL actuator motor relay. Refer to EC-39, "Component Parts Location".

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

INFOID:0000000010596983

DTC DETECTION LOGIC

NOTE:
DTC P1148 or P1168 is displayed with DTC for A/F sensor 1.
When the DTC is detected, perform the trouble diagnosis of DTC corresponding to A/F sensor 1.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148	Closed loop control function (bank 1)	The closed loop control function for bank 1 does not operate even when vehicle is being driven in the specified condition.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 • A/F sensor 1 heater
P1168	Closed loop control function (bank 2)	The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition.	

P1211 TCS CONTROL UNIT

Description

INFOID:0000000010596984

The malfunction information related to TCS is transferred via the CAN communication line from “ABS actuator and electric unit (control unit)” to ECM.
Be sure to erase the malfunction information such as DTC not only for “ABS actuator and electric unit (control unit)” but also for ECM after TCS related repair.

DTC Logic

INFOID:0000000010596985

DTC DETECTION LOGIC

Freeze frame data is not stored in the ECM for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1211	TCS control unit	ECM receives malfunction information from “ABS actuator and electric unit (control unit)”.	• ABS actuator and electric unit (control unit) • TCS related parts

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> EC-401, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596986

Go to BRC-5, "Work Flow".

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000010596987

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:0000000010596988

DTC DETECTION LOGIC

NOTE:

- **If DTC P1212 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1212 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "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 cannot receive the information from “ABS actuator and electric unit (control unit)” continuously.	• Harness or connectors (The CAN communication line is open or shorted.) • ABS actuator and electric unit (control unit) • Dead (Weak) battery

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-402, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596989

Go to BRC-5, "Work Flow".

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000010596990

DTC DETECTION LOGIC

NOTE:

- **If DTC P1217 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1217 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".**

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.

When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over temperature (Overheat)	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant was not added to the system using the proper filling method. • Engine coolant is not within the specified range.	• Harness or connectors (The cooling fan circuit is open or shorted.) • IPDM E/R • Cooling fan control module • Cooling fan motor • Radiator hose • Radiator • Radiator cap • Water pump • Thermostat

CAUTION:

When a malfunction is indicated, always replace the coolant. Refer to CO-7, "Draining" and CO-8, "Refilling". Also, replace the engine oil. Refer to LU-9, "Draining" and LU-9, "Refilling".

1. **Fill radiator with coolant up to specified level with a filling speed of 2 liters per minute. Always use coolant with the proper mixture ratio. Refer to MA-11, "Anti-Freeze Coolant Mixture Ratio".**
2. **After refilling coolant, run engine to ensure that no water-flow noise is emitted.**

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-403, "Component Function Check".

NOTE:

Use component function check to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-404, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010596991

1.PERFORM COMPONENT FUNCTION CHECK-I

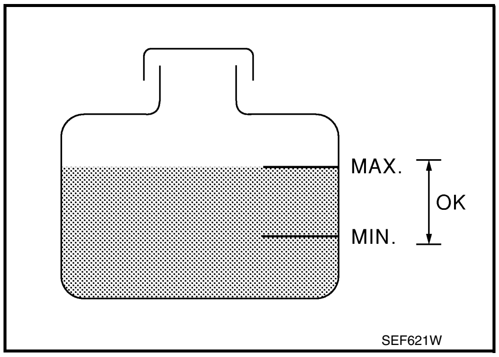
WARNING:

Never remove the radiator cap when the engine is hot. Serious burns could be caused by high pressure fluid escaping from the radiator.

Wrap a thick cloth around cap. Carefully remove the cap by turning it a quarter turn to allow built-up pressure to escape. Then turn the cap all the way off.

Check the coolant level in the reservoir tank and radiator.

Allow engine to cool before checking coolant level.



Is the coolant level in the reservoir tank and/or radiator below the proper range?

YES >> Go to EC-404, "Diagnosis Procedure".
NO >> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK-II

Confirm whether customer filled the coolant or not.

Did customer fill the coolant?

YES >> Go to EC-404, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

With CONSULT

1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT

Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-404, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010596992

1.CHECK COOLING FAN OPERATION

With CONSULT

1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT

1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description".
2. Make sure that cooling fan operates.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-500, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-7, "Inspection".

Is leakage detected?

YES >> GO TO 3.
NO >> GO TO 4.

3.CHECK COOLING SYSTEM FOR LEAK-II

Check the following for leak.

- Hose
- Radiator
- Water pump

>> Repair or replace malfunctioning part.

4.CHECK RADIATOR TANK CAP

Check radiator cap. Refer to CO-11, "RADIATOR CAP : Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace radiator tank cap. Refer to CO-13, "Exploded View".

5.CHECK THERMOSTAT

Check thermostat. Refer to CO-23, "Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat. Refer to CO-22, "Removal and Installation".

6.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-211, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor. Refer to CO-24, "Exploded View".

7.CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	MA-11, "Anti-Freeze Coolant Mixture Ratio"	
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-7, "Inspection"
	4	• Radiator cap	• Pressure tester	107 kPa (1.1 kg/cm^2, 16 psi) (Limit)	CO-11, "RADIATOR CAP : Inspection"
ON*2	5	• Coolant leaks	• Visual	No leaks	CO-7, "Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-23, "Inspection"
ON*1	7	• Cooling fan	• CONSULT	Operating	EC-500, "Component Function Check"
OFF	8	• Combustion gas leak	• Color checker chemical tester 4 Gas analyzer	Negative	—
ON*3	9	• Coolant temperature gauge	• Visual	Gauge less than 3/4 when driving	—
		• Coolant overflow to reservoir tank	• Visual	No overflow during driving and idling	CO-7, "Inspection"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-7, "Inspection"
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-118, "Inspection"
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-131, "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

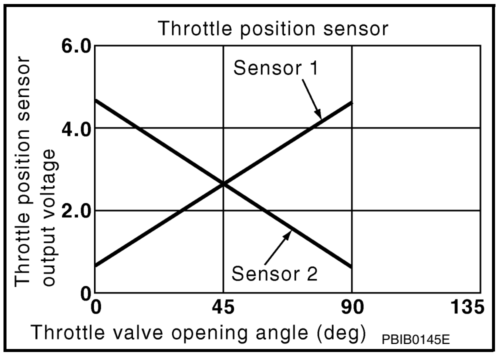
P1225, P1234 TP SENSOR

Description

INFOID:0000000010596993

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.

The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.



DTC Logic

INFOID:0000000010596994

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225	Closed throttle position learning performance (bank 1)	Closed throttle position learning value is excessively low.	• Electric throttle control actuator (TP sensor 1 and 2)
P1234	Closed throttle position learning performance (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

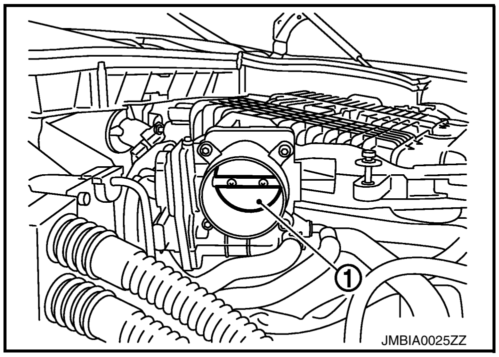
YES >> Go to EC-407, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010596995

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to EM-27, "Removal and Installation".



3. Check if foreign matter is caught between the throttle valve (1) and the housing.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-408, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010596996

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

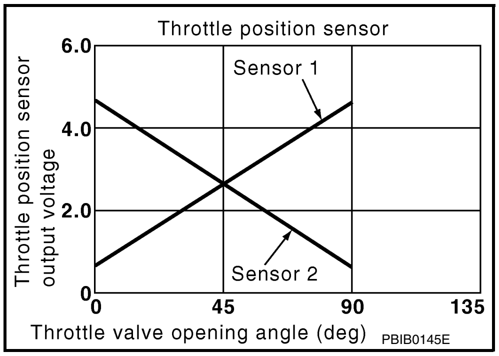
>> END

P1226, P1235 TP SENSOR

Description

INFOID:0000000010596997

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.



DTC Logic

INFOID:0000000010596998

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226	Closed throttle position learning performance (bank 1)	Closed throttle position learning is not performed successfully, repeatedly.	• Electric throttle control actuator (TP sensor 1 and 2)
P1235	Closed throttle position learning performance (bank 2)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Repeat steps 2 and 3 for 32 times.
5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-415, "Diagnosis Procedure".
NO >> INSPECTION END

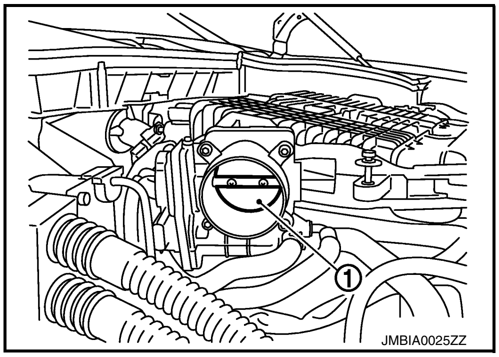
Diagnosis Procedure

INFOID:0000000010596999

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to EM-27, "Removal and Installation".

3. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-410, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597000

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000010597001

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:0000000010597002

DTC DETECTION LOGIC

NOTE:

If DTC P1233 or P2101 is displayed with DTC P1238, P1290, P2100 or 2119, first perform the trouble diagnosis for DTC P1238, P2119 or P1290, P2100. Refer to EC-418, "DTC Logic" or EC-423, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1233	Electric throttle control performance (bank 2)	Electric throttle control function does not operate properly.	• Harness or connectors (Throttle control motor circuit is open or shorted) • Electric throttle control actuator
P2101	Electric throttle control performance (bank 1)		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-411, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597003

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check the voltage between ECM harness connector terminals as per the following.

DTC	ECM				Condition		Voltage (V)
	+		–				
	Connector	Terminal	Connector	Terminal			
P1233	F102	52	M107	128	Ignition switch	OFF	Approx. 0
						ON	Battery voltage
P2101	F101	3				OFF	Approx. 0
						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

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E7.
4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E7	70	F101	25	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Check the continuity between IPDM E/R harness connector and ECM harness connector.

DTC	IPDM E/R		ECM		Continuity
	Connector	Terminal	Connector	Terminal	
P1233	E7	54	F102	52	Existed
P2101			F101	3	

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 E13, F40
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK FUSE

1. Disconnect 15 A fuse (No. 51) from IPDM E/R.
2. Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace 15 A fuse.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
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.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1233	2	F27	5	F102	49	Existed
					50	Not existed
			6		49	Not existed
					50	Existed
P2101	1	F6	1	F101	2	Existed
					4	Not existed
			2		2	Not existed
					4	Existed

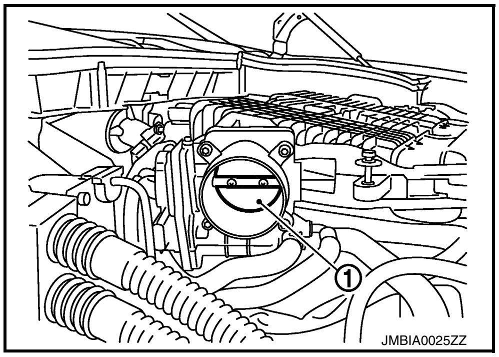
5. Also check harness for short to ground and short to power.

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. Refer to EM-27, "Removal and Installation".
2. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 11.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

11.CHECK THROTTLE CONTROL MOTOR

Refer to EC-414, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 13.

12.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "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. Refer to EM-29, "Removal and Installation".
2. Go to EC-414, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000010597004

1.CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Check resistance between electric throttle control actuator terminals as per the following.

Electric throttle control actuator		Resistance (Ω)
Bank	Terminals	
1	1 and 2	Approx. 1 - 15 [at 25°C (77°F)]
2	5 and 6	

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-414, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597005

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

P1236, P2118 THROTTLE CONTROL MOTOR

Description

INFOID:0000000010597006

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:0000000010597007

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1236	Throttle control motor (bank 2) circuit short	ECM detects short in both circuits between ECM and throttle control motor.	• Harness or connectors (Throttle control motor circuit is shorted.) • Electric throttle control actuator (Throttle control motor)
P2118	Throttle control motor (bank 1) circuit short		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-415, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597008

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1236	2	F27	5	F102	49	Existed
					50	Not existed
			6		49	Not existed
					50	Existed
P2118	1	F6	1	F101	2	Existed
					4	Not existed
			2		2	Not existed
					4	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 EC-416, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 5.

4.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "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 malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-417, "Special Repair Requirement".

>> INSPECTION END

Component Inspection

INFOID:0000000010597009

1.CHECK THROTTLE CONTROL MOTOR

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Check resistance between electric throttle control actuator terminals as per the following.

Electric throttle control actuator		Resistance (Ω)
Bank	Terminals	
1	1 and 2	Approx. 1 - 15 [at 25°C (77°F)]
2	5 and 6	

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-417, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597010

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

INFOID:0000000010597011

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position and feeds the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle properly in response to driving condition via the throttle control motor.

DTC Logic

INFOID:0000000010597012

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1238	Electric throttle control actuator (bank 2)	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.	
P2119	Electric throttle control actuator (bank 1)	A)	Electric throttle control actuator does not function properly due to the return spring malfunction.	
		B)	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C)	ECM detect the throttle valve is stuck open.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position and wait at least 3 seconds.
3. Shift selector lever to P position.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON and wait at least 1 second.
6. Shift selector lever to D position and wait at least 3 seconds.
7. Shift selector lever to P position.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to EC-419, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to D position and wait at least 3 seconds.
3. Shift selector lever to P position.
4. Start engine and let it idle for 3 seconds.

5. Check DTC.

Is DTC detected?

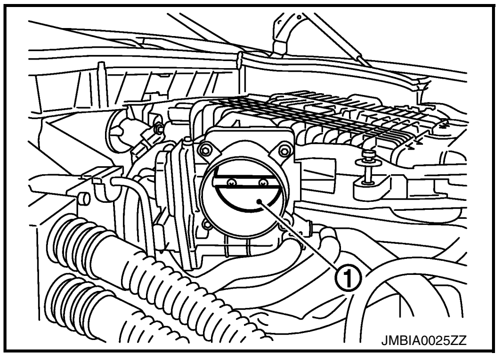
YES >> Go to EC-419, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597013

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct. Refer to EM-27, "Removal and Installation".
3. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside, and then perform throttle valve closed position learning. Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-410, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597014

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

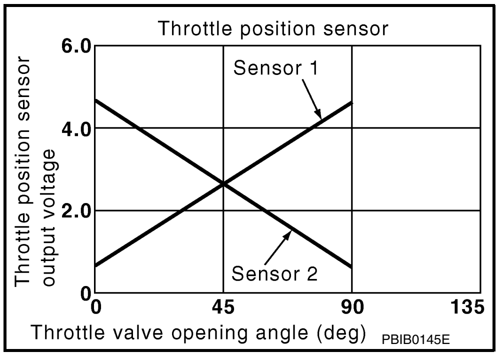
>> END

P1239, P2135 TP SENSOR

Description

INFOID:0000000010597015

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc. The throttle position sensor responds to the throttle valve movement.
The throttle position sensor has two sensors. These sensors are a kind of potentiometer which transform the throttle valve position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls throttle valve opening angle in response to driving conditions via the throttle control motor.



DTC Logic

INFOID:0000000010597016

DTC DETECTION LOGIC

NOTE:
If DTC P1239 or P2135 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1239	Throttle position sensor (bank 2) circuit range/ performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	• Harness or connector (TP sensor 1 or 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1 or 2)
P2135	Throttle position sensor (bank 1) circuit range/ performance		

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-420, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597017

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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.

DTC	Electric throttle control actuator			Ground	Voltage (V)
	Bank	Connector	Terminal		
P1239	2	F27	1	Ground	Approx. 5
P2135	1	F6	6		

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE POSITION SENSOR 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.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1239	2	F27	4	F101	48	Existed
P2135	1	F6	3		40	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1239	2	F27	2	F101	31	Existed
			3		35	
P2135	1	F6	4		30	
			5		34	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK THROTTLE POSITION SENSOR

Refer to EC-422, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".

2. EC-422, "Special Repair Requirement".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597018

1.CHECK THROTTLE POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".
4. Turn ignition switch ON.
5. Set selector lever to D position.
6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
F101	30 [TP sensor 1 (bank 1)]	40	Accelerator pedal	Fully released	More than 0.36
				Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48		Fully released	More than 0.36
				Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40		Fully released	Less than 4.75
				Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48		Fully released	Less than 4.75
				Fully depressed	More than 0.36

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator. Refer to EM-29, "Removal and Installation".
2. Go to EC-422, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597019

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description"

>> END

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:0000000010597020

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:0000000010597021

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1290	Throttle control motor relay circuit open (bank 2)	ECM detects a voltage of power source for throttle control motor is excessively low.	• Harness or connectors (Throttle control motor relay circuit is open) • Throttle control motor relay
P2100	Throttle control motor relay circuit open (bank 1)		
P2103	Throttle control motor relay circuit short	ECM detect the throttle control motor relay is stuck ON.	• Harness or connectors (Throttle control motor relay circuit is shorted) • Throttle control motor relay

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8 V.

Which DTC is detected?

P1290, P2100>>GO TO 2.
P2103 >> GO TO 3.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P1290 AND P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-423, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-423, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597022

1.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.

3. Disconnect IPDM E/R harness connector E7.
4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E7	70	F101	25	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

3.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT

1. Check the continuity between IPDM E/R sensor harness connector and ECM harness connector.

DTC	IPDM E/R		ECM		Continuity
	Connector	Terminal	Connector	Terminal	
P1290	E7	54	F102	52	Existed
P2100			F101	3	
P2103			F101	3	
			F102	52	

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 E13, F40
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK FUSE

1. Disconnect 15 A fuse (No. 51) from IPDM E/R.
2. Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 15A fuse.

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
NO >> Repair or replace harness or connectors.

P1550 BATTERY CURRENT SENSOR

Description

INFOID:0000000010597023

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12, "System Description".

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:0000000010597024

DTC DETECTION LOGIC

NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1550	Battery current sensor circuit range/performance	The output voltage of the battery current sensor remains within the specified range while engine is running.	• Harness or connectors (Battery current sensor circuit is open or shorted.) • Battery current sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-425, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597025

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	2	F102	95	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 F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	3	F102	91	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 F40, E13

- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY CURRENT SENSOR

Refer to EC-427, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

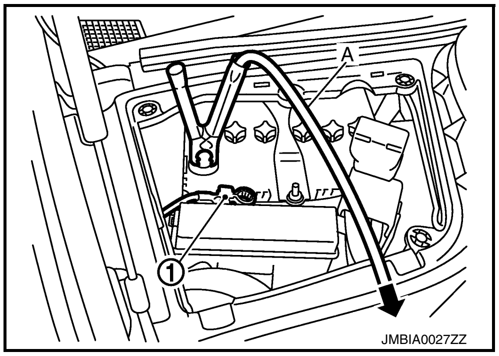
Component Inspection

INFOID:0000000010597026

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).

⬅: To body ground



4. Install jumper cable (A) between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1551, P1552 BATTERY CURRENT SENSOR

Description

INFOID:0000000010597027

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12, "System Description".

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:0000000010597028

DTC DETECTION LOGIC

NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1551	Battery current sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (Battery current sensor circuit is open or shorted.) • Battery current sensor
P1552	Battery current sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V with ignition switch ON

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-428, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597029

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connection.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	2	F102	95	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 F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	3	F102	91	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 F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY CURRENT SENSOR

Refer to EC-436, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

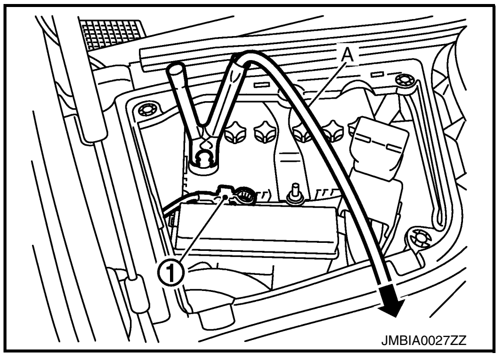
>> INSPECTION END

Component Inspection

INFOID:0000000010597030

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).



⬅: To body ground

4. Install jumper cable (A) between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1553 BATTERY CURRENT SENSOR

Description

INFOID:0000000010597031

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12, "System Description".

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:0000000010597032

DTC DETECTION LOGIC

NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1553	Battery current sensor performance	The signal voltage transmitted from the sensor to ECM is higher than the amount of the maximum power generation.	• Harness or connectors (Battery current sensor circuit is open or shorted.) • Battery current sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-431, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597033

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	2	F102	95	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 F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	3	F102	91	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 F40, E13

- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY CURRENT SENSOR

Refer to EC-436, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

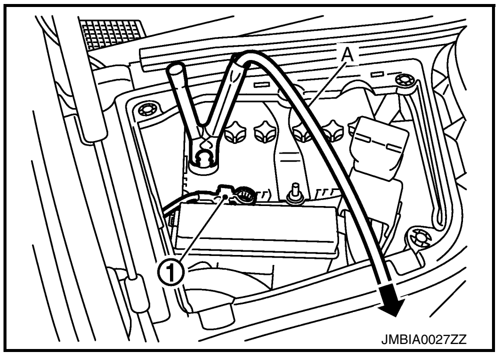
Component Inspection

INFOID:0000000010597034

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).

⬅: To body ground



4. Install jumper cable (A) between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1554 BATTERY CURRENT SENSOR

Description

INFOID:0000000010597035

The power generation voltage variable control enables fuel consumption to be decreased by reducing the engine load which is caused by the power generation of the generator. The battery current sensor is installed to the battery cable at the negative terminal. The sensor measures the charging/discharging current of the battery. Based on the sensor signal, ECM judges whether or not the power generation voltage variable control is performed. When performing the power generation voltage variable control, ECM calculates the target power generation voltage based on the sensor signal. And ECM sends the calculated value as the power generation command value to IPDM E/R. For the details of the power generation voltage variable control, refer to CHG-12, "System Description".

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then battery discharge may occur.

DTC Logic

INFOID:0000000010597036

DTC DETECTION LOGIC

NOTE:

If DTC P1554 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1554	Battery current sensor performance	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	• Harness or connectors (Battery current sensor circuit is open or shorted.) • Battery current sensor

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-434, "Component Function Check".

NOTE:

Use component function check to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-435, "Diagnosis Procedure".

Component Function Check

INFOID:0000000010597037

1.PRECONDITIONING

TESTING CONDITION:

- **Before performing the following procedure, confirm that battery voltage is more than 12.8 V at idle.**
- **Before performing the following procedure, confirm that all load switches and A/C switch are turned OFF.**

>> GO TO 2.

2.PERFORM COMPONENT FUNCTION CHECK

With CONSULT

1. Start engine and let it idle.
2. Select “BAT CUR SEN” in “DATA MONITOR” mode with CONSULT.
3. Check “BAT CUR SEN” indication for 10 seconds.
   “BAT CUR SEN” should be above 2,300 mV at least once.

Without CONSULT

1. Start engine and let it idle.

2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Above 2.3 at least once

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-435, "Diagnosis Procedure"

Diagnosis Procedure

INFOID:0000000010597038

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect battery current sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between battery current sensor harness connector and ground.

Battery current sensor		Ground	Voltage (V)
Connector	Terminal		
E21	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness connectors.

4.CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	2	F102	95	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 F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK BATTERY CURRENT SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between battery current sensor harness connector and ECM harness connector.

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E21	3	F102	91	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 F40, E13
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK BATTERY CURRENT SENSOR

Refer to EC-436, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace battery negative cable assembly.

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

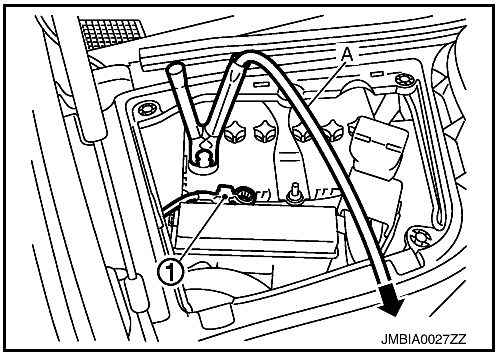
>> INSPECTION END

Component Inspection

INFOID:0000000010597039

1.CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).



⬅: To body ground

4. Install jumper cable (A) between battery negative terminal and body ground.
5. Turn ignition switch ON.
6. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F102	91 (Battery current sensor signal)	95	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1564 ASCD STEERING SWITCH

Description

INFOID:0000000010597040

ASCD steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to EC-77, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000010597041

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ASCD steering switch	• An excessively high voltage signal from the ASCD steering switch is sent to ECM. • ECM detects that input signal from the ASCD steering switch is out of the specified range. • ECM detects that the ASCD steering switch is stuck ON.	• Harness or connectors (The switch circuit is open or shorted.) • ASCD steering switch • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Check DTC.

Is DTC detected?

YES >> Go to EC-438, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597042

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT

1. Turn ignition switch ON.
2. Select “MAIN SW”, “CANCEL SW”, “RESUME/ACC SW” and “SET SW” in “DATA MONITOR” mode with CONSULT.
3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
		Released	OFF
RESUME/ACC SW	RESUME/ACCELERATE switch	Pressed	ON
		Released	OFF
SET SW	SET/COAST switch	Pressed	ON
		Released	OFF

Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M107	101 (ASCD steering switch signal)	108	MAIN switch: Pressed	Approx. 0
			CANCEL switch: Pressed	Approx. 1
			SET/COAST switch: Pressed	Approx. 2
			RESUME/ACCELERATE switch: Pressed	Approx. 3
			All ASCD steering switches: Released	Approx. 4

Is the inspection result normal?

YES >> GO TO 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 M303.
4. Check the continuity between combination switch and ECM harness connector.

Combination switch	ECM		Continuity
Terminal	Connector	Terminal	
16	M107	108	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

Combination switch	ECM		Continuity
Terminal	Connector	Terminal	
13	M107	101	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK ASCD STEERING SWITCH

Refer to EC-440, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD steering switch. Refer to ST-16, "Exploded View".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597043

1.CHECK ASCD STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector M303.
3. Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance (Ω)
Connector	Terminals		
M303	13 and 16	MAIN switch: Pressed	Approx. 0
		CANCEL switch: Pressed	Approx. 250
		SET/COAST switch: Pressed	Approx. 660
		RESUME/ACCELERATE switch: Pressed	Approx. 1,480
		All ASCD steering switches: Released	Approx. 4,000

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD steering switch. Refer to ST-16, "Exploded View".

P1564 ICC STEERING SWITCH

Description

INFOID:0000000010597044

ICC steering switch has variant values of electrical resistance for each button. ECM reads voltage variation of switch, and determines which button is operated.
Refer to CCS-18, "System Description" for the ICC function.

DTC Logic

INFOID:0000000010597045

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564	ICC steering switch	- An excessively high voltage signal from the ICC steering switch is sent to ECM. - ECM detects that input signal from the ICC steering switch is out of the specified range. - ECM detects that the ICC steering switch is stuck ON.	- Harness or connectors (The switch circuit is open or shorted.) - ICC steering switch - ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 10 seconds.
2. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
3. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press LDP/DCA switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. Check DTC.

Is DTC detected?

YES >> Go to EC-441, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597046

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK ICC STEERING SWITCH CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M107	101 (ICC steering switch signal)	108	MAIN switch: Pressed	Approx. 0
			LDP/DCA switch: Pressed	Approx. 0.8
			CANCEL switch: Pressed	Approx. 1.6
			DISTANCE switch: Pressed	Approx. 2.2
			SET/COAST switch: Pressed	Approx. 2.9
			RESUME/ACCELERATE switch: Pressed	Approx. 3.4
			All ICC steering switches: Released	Approx. 4.0

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 3.

3.CHECK ICC STEERING SWITCH GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect combination switch harness connector M303.
4. Check the continuity between combination switch and ECM harness connector.

Combination switch	ECM		Continuity
Terminal	Connector	Terminal	
16	M107	108	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK ICC STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between combination switch and ECM harness connector.

Combination switch	ECM		Continuity
Terminal	Connector	Terminal	
13	M107	101	Existed

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.
- Combination switch (spiral cable)

- Harness for open and short between ECM and combination switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK ICC STEERING SWITCH

Refer to EC-443, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ICC steering switch. Refer to CCS-177, "Exploded View".

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597047

1.CHECK ICC STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector M303.
3. Check resistance between combination switch harness connector terminals under the following conditions.

Combination switch		Condition	Resistance (Ω)
Connector	Terminals		
M303	13 and 16	MAIN switch: Pressed	Approx. 0
		LDP/DCA switch: Pressed	Approx. 270
		CANCEL switch: Pressed	Approx. 620
		DISTANCE switch: Pressed	Approx. 1,100
		SET/COAST switch: Pressed	Approx. 1,810
		RESUME/ACCELERATE switch: Pressed	Approx. 2,990
		All ICC steering switches: Released	Approx. 5,420

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC steering switch. Refer to CCS-177, "Exploded View".

P1568 ICC FUNCTION

DTC Logic

INFOID:0000000010597048

DTC DETECTION LOGIC

NOTE:

- **If DTC P1568 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1568 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".**
- **If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1568	ICC function	ECM detects a difference between signals from ICC sensor integrated unit is out of specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • ICC sensor integrated unit • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Step 4 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Press MAIN switch on ICC steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Press SET/COAST switch.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-444, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597049

1.REPLACE ICC SENSOR INTEGRATED UNIT

1. Replace ICC sensor integrated unit. Refer to CCS-174, "Removal and Installation".
2. Perform CCS-12, "ACTION TEST : Description".
3. Check DTC of ICC sensor integrated unit. Refer to CCS-38, "Diagnosis Description".

>> INSPECTION END

P1572 ASCD BRAKE SWITCH

Description

INFOID:0000000010597050

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).
Refer to EC-77, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000010597051

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
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.) • Stop lamp switch • ASCD brake switch • Incorrect stop lamp switch installation • Incorrect ASCD brake switch installation • ECM
		B)	ASCD brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION A

1. Start engine (VDC switch OFF).
2. Press MAIN switch and make sure that CRUISE lamp illuminates.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-446, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-446, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597052

1.CHECK OVERALL FUNCTION-I

With CONSULT

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	126 (ASCD brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
			Brake pedal	Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

With CONSULT

Select “BRAKE SW2” and check indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW2	Brake pedal	Slightly depressed	ON
		Fully released	OFF

☒ Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	122 (Stop lamp switch signal)	128	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 8.

3.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD brake switch		Ground	Voltage
Connector	Terminal		
E109	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

5.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E109	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK ASCD BRAKE SWITCH

Refer to EC-449, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace ASCD brake switch. Refer to BR-20, "Exploded View".

8.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E110	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10A fuse (No. 7)
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110	2	M107	122	Existed

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connectors E103, M2
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK STOP LAMP SWITCH

Refer to EC-449, "Component Inspection (Stop Lamp Switch)"

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

13.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000010597053

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch. Refer to BR-20, "Exploded View".

Component Inspection (Stop Lamp Switch)

INFOID:0000000010597054

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

P1572 ICC BRAKE SWITCH

Description

INFOID:0000000010597055

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).
Refer to CCS-18, "System Description" for the ICC function.

DTC Logic

INFOID:0000000010597056

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".**
- **This self-diagnosis has the one trip detection logic. When malfunction A is detected, DTC is not stored in ECM memory. And in that case, 1st trip DTC and 1st trip freeze frame data are displayed. 1st trip DTC is erased when ignition switch is turned OFF. And even when malfunction A is detected in two consecutive trips, DTC is not stored in ECM memory.**

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P1572	ICC brake switch	A)	ON signals from the stop lamp switch and the ICC brake switch are sent to ECM at the same time.	• Harness or connectors (The stop lamp switch circuit is shorted.) • Harness or connectors (The ICC brake switch circuit is shorted.) • Stop lamp switch • ICC brake switch • ICC brake hold relay • Incorrect stop lamp switch installation • Incorrect ICC brake switch installation • ECM
		B)	ICC brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:

The procedure for malfunction B is not described. It takes an extremely long time to complete the procedure for malfunction B. By performing the procedure for malfunction A, the condition that causes malfunction B can be detected.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Press MAIN switch and make sure that CRUISE lamp illuminates.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-451, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

Vehicle speed	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-451, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597057

1.CHECK OVERALL FUNCTION-I

With CONSULT

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	126 (ICC brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
			Brake pedal	Fully released	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

With CONSULT

Select “BRAKE SW2” and check indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW2	Brake pedal	Slightly depressed	ON
		Fully released	OFF

Without CONSULT

Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	122 (Stop lamp switch signal)	128	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

Is the inspection result normal?

YES >> GO TO 17.
NO >> GO TO 11.

3.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E111	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 4.

4.CHECK ICC BRAKE HOLD RELAY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake hold relay harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake hold relay harness connector and ground.

ICC brake hold relay		Ground	Voltage
Connector	Terminal		
E50	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 6.
NO >> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ICC brake hold relay and fuse

>> Repair open circuit or short to ground in harness or connectors.

6.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Check the continuity between ICC brake hold relay harness connector and ICC brake switch harness connector.

ICC brake hold relay		ICC brake switch		Continuity
Connector	Terminal	Connector	Terminal	
E50	4	E111	1	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 in harness or connectors.

7.CHECK ICC BRAKE HOLD RELAY

Refer to EC-456, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace ICC brake hold relay. Refer to EC-39, "Component Parts Location".

8.CHECK ICC 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 ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E111	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E106, M6
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK ICC BRAKE SWITCH

Refer to EC-455, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

11.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Disconnect ICC brake hold relay harness connector.
4. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E110	1	Ground	Battery voltage

5. Check the voltage between ICC brake hold relay harness connector and ground.

ICC brake hold relay		Ground	Voltage
Connector	Terminal		
E50	7	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)
- Harness for open or short between battery and stop lamp switch
- Harness for open or short between battery and ICC brake hold relay

>> Repair open circuit or short to ground in harness or connectors.

13.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110	2	M107	122	Existed

3. Check the continuity between ICC brake hold relay harness connector and ECM harness connector.

ICC brake hold relay		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E50	6	M107	122	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 14.

14.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103, M2
- Harness for open or short between ECM and stop lamp switch
- Harness for open or short between ECM and ICC brake hold relay

>> Repair open circuit, short to ground or short to power in harness or connectors.

15.CHECK STOP LAMP SWITCH

Refer to EC-455, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

16.CHECK ICC BRAKE HOLD RELAY

Refer to EC-456, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Replace ICC brake hold relay. Refer to EC-39, "Component Parts Location".

17.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000010597058

1.CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

Component Inspection (Stop Lamp Switch)

INFOID:0000000010597059

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

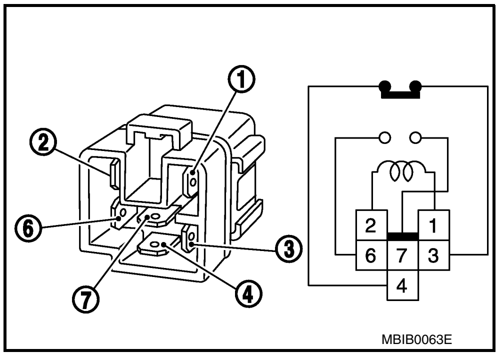
YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

Component Inspection (ICC Brake Hold Relay)

INFOID:0000000010597060

1.CHECK ICC BRAKE HOLD RELAY

1. Turn ignition switch OFF.
2. Remove ICC brake hold relay. Refer to EC-39, "Component Parts Location".
3. Check the continuity between ICC brake hold relay terminals under the following conditions.



Terminals	Condition	Continuity
3 and 4	12V direct current supply between terminals 1 and 2	Not existed
	No current supply	Existed
6 and 7	12V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake hold relay. Refer to EC-39, "Component Parts Location".

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000010597061

The ECM receives two vehicle speed signals via the CAN communication line. One is sent from “unified meter and A/C amp.”, and the other is from TCM (Transmission control module). The ECM uses these signals for ASCD control. Refer to EC-77, "System Description" for ASCD functions.

DTC Logic

INFOID:0000000010597062

DTC DETECTION LOGIC

NOTE:

- **If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-358, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ASCD vehicle speed sensor	The difference between the two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • Unified meter and A/C amp. • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-457, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597063

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-30, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace.

3.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

>> INSPECTION END

P1574 ICC VEHICLE SPEED SENSOR

Description

INFOID:0000000010597064

The ECM receives two vehicle speed signals via CAN communication line. One is sent from “unified meter and A/C amp.”, and the other is from TCM (Transmission control module). The ECM uses these signals for ICC control. Refer to CCS-18, "System Description" for ICC functions.

DTC Logic

INFOID:0000000010597065

DTC DETECTION LOGIC

NOTE:

- **If DTC P1574 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1574 is displayed with DTC P0500, first perform the trouble diagnosis for DTC P0500. Refer to EC-358, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-375, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-377, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ICC vehicle speed sensor	The difference between the two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • Unified meter and A/C amp. • ABS actuator and electric unit (control unit) • Wheel sensor • TCM • ECM

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.
3. Check DTC.

Is DTC detected?

YES >> Go to EC-459, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597066

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to TM-63, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-30, "CONSULT Function".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace.

3.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Check combination meter function.
Refer to MWI-42, "CONSULT Function (METER/M&A)".

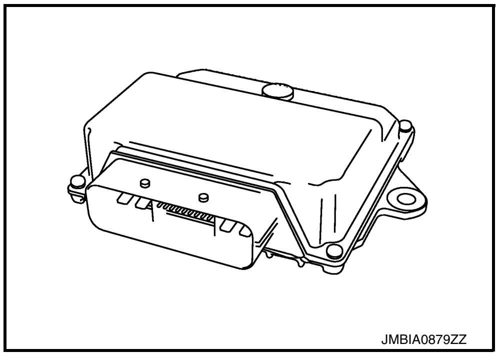
>> INSPECTION END

P1606 VVEL CONTROL MODULE

Description

INFOID:0000000010597067

The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.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DTC Logic

INFOID:0000000010597068

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1606	VVEL control module	• VVEL control module calculation function is malfunctioning. • VVEL EEP-ROM system is malfunctioning.	• VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-461, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597069

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-461, "DTC Logic".

Is the DTC P1606 displayed again?

YES >> GO TO 2.
NO >> INSPECTION END

2.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

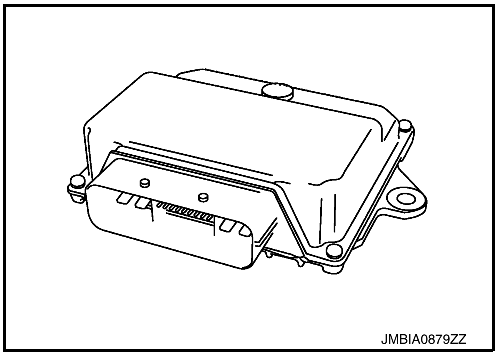
>> INSPECTION END

P1607 VVEL CONTROL MODULE

Description

INFOID:0000000010597070

The VVEL control module consists of a microcomputer and connectors for signal input and output and for power supply. The VVEL control module controls VVEL system.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DTC Logic

INFOID:0000000010597071

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1607	VVEL control module circuit	• The internal circuit of the VVEL control module is malfunctioning.	• VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-463, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597072

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-463, "DTC Logic".

Is the DTC P1607 displayed again?

YES >> GO TO 2.
NO >> INSPECTION END

2.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".

2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> INSPECTION END

P1608 VVEL SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000010597073

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1608	VVEL sensor power supply circuit	VVEL control module detects a voltage of power source for sensor is excessively low or high.	• Harness or connectors (VVEL control shaft position sensor power supply circuit is open or shorted.) • VVEL control shaft position sensor • VVEL control module

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-465, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597074

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect VVEL control shaft position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between VVEL control shaft position sensor harness connector and ground.

VVEL control shaft position sensor			Ground	Voltage (V)
Bank	Connector	Terminal		
1	F46	3	Ground	Approx. 5
		6		
2	F47	3		
		6		

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 3.

3.CHECK VVEL CONTROL SHAFT POSITION SENSOR POWER SUPPLY CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect VVEL control module harness connector.
3. Check the continuity between VVEL control shaft position sensor harness connector and VVEL control module harness connector.

VVEL control shaft position sensor			VVEL control module		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F46	3	E14	9	Existed
		6		22	
2	F47	3		7	
		6		20	

4. Also check harness for short to ground and power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F40, E13
- Harness for open or short between VVEL control shaft position sensor and VVEL control module

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or replace.

6.REPLACE VVEL CONTROL MODULE

1. Replace VVEL control module. Refer to EC-39, "Component Parts Location".
2. Go to EC-18, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT (VVEL CONTROL MODULE) : Description".

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace.

8.REPLACE VVEL ACTUATOR SUB ASSEMBLY

1. Replace VVEL actuator sub assembly. Refer to EM-95, "Exploded View".
2. Go to EC-466, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597075

1.PERFORM VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT

Refer to EC-23, "VVEL CONTROL SHAFT POSITION SENSOR ADJUSTMENT : Description".

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P1805 BRAKE SWITCH

Description

Brake switch signal is applied to the ECM through the stop lamp switch when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.

DTC Logic

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805	Brake switch	A brake switch signal is not sent to ECM for extremely long time while the vehicle is being driven.	• Harness or connectors (Stop lamp switch circuit is open or shorted.) • Stop lamp switch

DTC CONFIRMATION PROCEDURE

1.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Fully depress the brake pedal for at least 5 seconds.
3. Erase the DTC.
4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-468, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.
2. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E110	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 7)

- Harness for open or short between stop lamp switch and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect stop lamp switch harness connector.
2. Disconnect ECM harness connector.
3. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E110	2	M107	122	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.

- Fuse block (J/B) connector E103, M2
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK STOP LAMP SWITCH

Refer to EC-469, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

7.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000010597079

1.CHECK STOP LAMP SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK STOP LAMP SWITCH-II

1. Adjust stop lamp switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between stop lamp switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Not existed
		Slightly depressed	Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace stop lamp switch. Refer to BR-20, "Exploded View".

P2096, P2097, P2098, P2099 A/F SENSOR 1

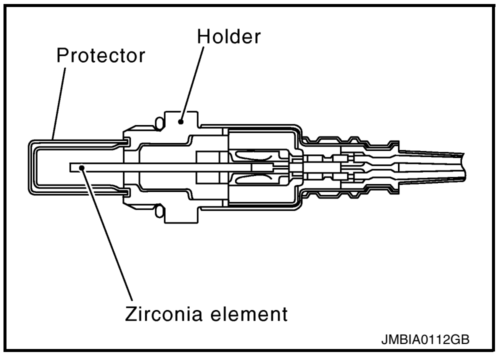
Description

INFOID:0000000010597080

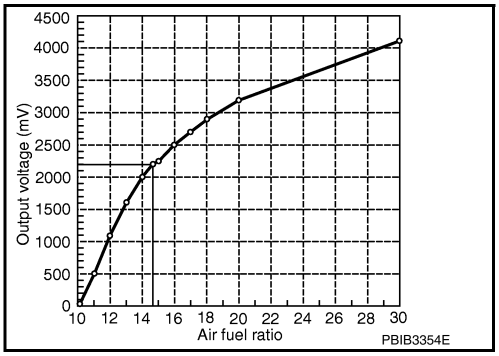
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement λ = 1, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



Therefore, the A/F sensor 1 is able to indicate air fuel ratio by this electrode layer of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of about 800°C (1,472°F).



DTC Logic

INFOID:0000000010597081

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name (Trouble diagnosis content)	DTC detecting condition	Possible Cause
P2096	POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too lean bank 1)	The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period.	• A/F sensor 1 (bank 1) • A/F sensor 1 heater • Heated oxygen sensor 2 (bank 1) • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks
P2097	POST CAT FUEL TRIM SYS B1 (Post catalyst fuel trim system too rich bank 1)	The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period.	
P2098	POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too lean bank 2)	The output voltage computed by ECM from the A/F sensor 1 signal is shifts to the lean side for a specified period.	• A/F sensor 1 (bank 2) • A/F sensor 1 heater • Heated oxygen sensor 2 (bank 2) • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks
P2099	POST CAT FUEL TRIM SYS B2 (Post catalyst fuel trim system too rich bank 2)	The A/F signal computed by ECM from the A/F sensor 1 signal is shifts to the rich side for a specified period.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
6. Let engine idle for 1 minute.
7. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-472, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597082

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace ground connection.

2.RETIGHTEN A/F SENSOR 1 AND HEATED OXYGEN SENSOR 2

Loosen and retighten the A/F sensor 1 and heated oxygen sensor 2. Refer to EM-34, "Exploded View".

>> GO TO 3.

3.CHECK FOR EXHAUST GAS LEAK

1. Start engine and run it at idle.
2. Listen for an exhaust gas leak before the three way catalyst 2.

Is exhaust gas detected?

YES >> Repair or replace.
NO >> GO TO 4.

4.CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

YES >> Repair or replace.
NO >> GO TO 5.

5.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-263, "Diagnosis Procedure" or EC-267, "Diagnosis Procedure".
NO >> GO TO 6.

6.CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Check harness connector for water.

Water should not exit.

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace harness connector.

7.CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between A/F sensor 1 harness connector and ground.

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P2096 P2097	1	F123	4	Ground	Battery voltage
P2098 P2099	2	F124	4		

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- IPDM E/R harness connector E7
- 15 A fuse (No. 46)
- Harness for open or short between A/F sensor 1 and fuse

>> Repair or replace harness or connectors.

9.CHECK A/F SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between A/F sensor 1 harness connector and ECM harness connector.

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P2096 P2097	1	F123	1	F102	57	Existed
			2		61	
P2098 P2099	2	F124	1		65	
			2		66	

4. Check the continuity between A/F sensor 1 harness connector and ground, or ECM harness connector and ground.

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P2096 P2097	1	F123	1	Ground	Not existed
			2		
P2098 P2099	2	F124	1		
			2		

DTC	ECM			Ground	Continuity
	Bank	Connector	Terminal		
P2096 P2097	1	F102	57	Ground	Not existed
			61		
P2098 P2099	2		65		
			66		

5. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK A/F SENSOR 1 HEATER

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 13.

11.CHECK HEATED OXYGEN SENSOR 2

Refer to EC-181, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace malfunctioning heated oxygen sensor 2. Refer to EM-34, "Exploded View".

12.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Repair or replace.

13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1. Refer to EM-34, "Exploded View".

CAUTION:

- **Discard any A/F sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new A/F sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

Do you have CONSULT?

YES >> GO TO 14.
NO >> GO TO 15.

14.CONFIRM A/F ADJUSTMENT DATA

With CONSULT

1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT.
3. Make sure that “0.000” is displayed on CONSULT screen.

Is “0.000” displayed?

YES >> INSPECTION END
NO >> GO TO 15.

15.CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".

Do you have CONSULT?

YES >> GO TO 16.
NO >> INSPECTION END

16.CONFIRM A/F ADJUSTMENT DATA

With CONSULT

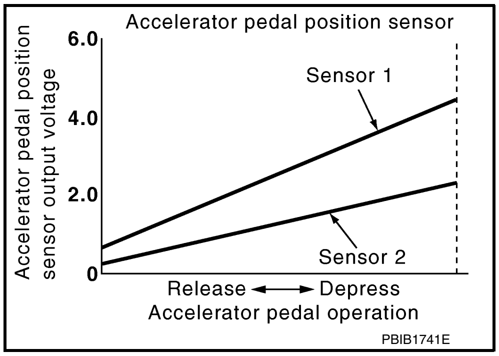
1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT.
3. Make sure that “0.000” is displayed on CONSULT screen.

>> INSPECTION END

P2122, P2123 APP SENSOR

Description

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



DTC Logic

DTC DETECTION LOGIC

NOTE:

If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122	Accelerator pedal position sensor 1 circuit low input	An excessively low voltage from the APP sensor 1 is sent to ECM.	• Harness or connectors (APP sensor 1 circuit is open or shorted.) • Accelerator pedal position sensor (APP sensor 1)
P2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-476, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
E112 (Without ICC) E116 (With ICC)	5	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK APP SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112 (Without ICC)	4	M107	100	Existed
E116 (With ICC)	1			

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 M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112 (Without ICC)	3	M107	97	Existed
E116 (With ICC)	4			

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 M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK APP SENSOR

Refer to EC-478, "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. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

10.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597086

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	97 (APP sensor 1)	100	Accelerator pedal	Fully released	0.45 - 1.0
				Fully depressed	4.2 - 4.8
	98 (APP sensor 2)	104		Fully released	0.22 - 0.50
				Fully depressed	2.1 - 2.5

Is the inspection result normal?

YES >> INSPECTION END

NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-479, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597087

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

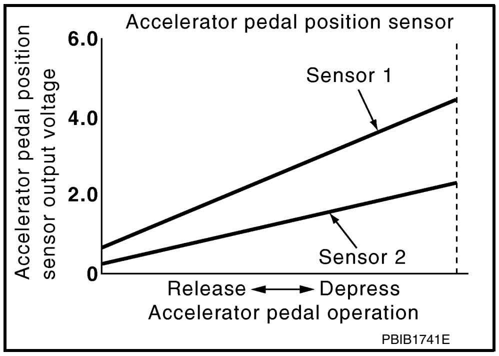
Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P2127, P2128 APP SENSOR

Description

INFOID:0000000010597088



The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.

DTC Logic

INFOID:0000000010597089

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.) [CKP sensor (POS) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) (Brake booster pressure sensor circuit is shorted) • Crankshaft position sensor (POS) • EVAP control system pressure sensor • Refrigerant pressure sensor • Brake booster pressure sensor
P2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-481, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597090

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
E112 (Without ICC)	6	Ground	Approx. 5
E116 (With ICC)	3		

Is the inspection result normal?

YES >> GO TO 7.
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	
E112 (Without ICC)	6	M107	103	Existed
E116 (With ICC)	3			

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit.

5.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
	46	CKP sensor (POS)	F2	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
M107	103	APP sensor	E112 (Without ICC)	6
			E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
		Refrigerant pressure sensor	E77	3

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair short to ground or short to power in harness or connectors.

6.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-334, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace malfunctioning component.

7.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	
E112 (Without ICC) E116 (With ICC)	2	M107	104	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

9.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	
E112 (Without ICC)	1	M107	98	Existed
E116 (With ICC)	6			

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

11.CHECK APP SENSOR

Refer to EC-483, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-484, "Special Repair Requirement".

>> INSPECTION END

13.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597091

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	97 (APP sensor 1)	100	Accelerator pedal	Fully released	0.45 - 1.0
				Fully depressed	4.2 - 4.8
	98 (APP sensor 2)	104		Fully released	0.22 - 0.50
				Fully depressed	2.1 - 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-489, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P2138 APP SENSOR

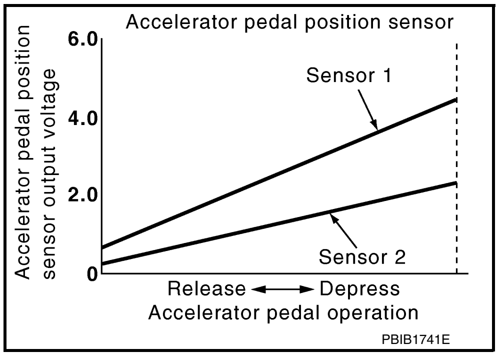
Description

INFOID:0000000010597093

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.

Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signal to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.

Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



DTC Logic

INFOID:0000000010597094

DTC DETECTION LOGIC

NOTE:

If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-378, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal position sensor circuit range/ performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	• Harness or connectors (APP sensor 2 circuit is open or shorted.) [CKP sensor (POS) circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) (Brake booster pressure sensor circuit is shorted) • Crankshaft position sensor (POS) • EVAP control system pressure sensor • Brake booster pressure sensor • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:

Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and let it idle for 1 second.
2. Check DTC.

Is DTC detected?

YES >> Go to EC-486, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
E112 (Without ICC) E116 (With ICC)	5	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Turn ignition switch ON.
2. Check the voltage between APP sensor harness connector and ground.

APP sensor		Ground	Voltage (V)
Connector	Terminal		
E112 (Without ICC)	6	Ground	Approx. 5
E116 (With ICC)	3		

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 5.

5.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	
E112 (Without ICC)	6	M107	103	Existed
E116 (With ICC)	3			

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit.

7.CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F101	45	Brake booster pressure sensor	E48	1
	46	CKP sensor (POS)	F2	1
M107	103	APP sensor	E112 (Without ICC)	6
			E116 (With ICC)	3
	107	EVAP control system pressure sensor	B252	3
		Refrigerant pressure sensor	E77	3

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair short to ground or short to power in harness or connectors.

8.CHECK COMPONENTS

Check the following.

- Crankshaft position sensor (POS) (Refer to EC-300, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-334, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-529, "Diagnosis Procedure".)

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace malfunctioning component.

9.CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between APP sensor harness connector and ECM harness connector.

Without ICC

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112	4	M107	100	Existed
	2		104	

With ICC

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E116	1	M107	100	Existed
	2		104	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 11.
NO >> GO TO 10.

10.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

11.CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between APP sensor harness connector and ECM harness connector.

Without ICC

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112	3	M107	97	Existed
	1		98	

With ICC

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E116	4	M107	97	Existed
	6		98	

2. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 12.

12.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M6, E106
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

13.CHECK APP SENSOR

Refer to EC-489, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 14.

14.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-489, "Special Repair Requirement".

>> INSPECTION END

15.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597096

1.CHECK ACCELERATOR PEDAL POSITION SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	97 (APP sensor 1)	100	Accelerator pedal	Fully released	0.45 - 1.0
				Fully depressed	4.2 - 4.8
	98 (APP sensor 2)	104		Fully released	0.22 - 0.50
				Fully depressed	2.1 - 2.5

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly. Refer to ACC-3, "Removal and Installation".
2. Go to EC-489, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000010597097

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-20, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-20, "THROTTLE VALVE CLOSED POSITION LEARNING : Description".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-21, "IDLE AIR VOLUME LEARNING : Description".

>> END

P219A, P219B AIR FUEL RATIO

DTC Description

INFOID:0000000011003097

DTC DETECTION LOGIC

DTC No.	CONSULT screen terms (Trouble diagnosis content)	DTC detecting condition	Possible cause
P219A	AIR FUEL RATIO IMBALANCE B1 (Air-fuel ratio imbalance bank 1)	ECM detects a lean/rich air fuel ratio state in any cylinder for a specified length of time.	• Fuel injector • Exhaust gas leaks • Incorrect fuel pressure • Mass air flow sensor • Intake air leaks • Lack of fuel • Incorrect PCV hose connection • Improper spark plug • Insufficient compression • The fuel injector circuit is open or shorted • ignition coil • The ignition signal circuit is open or shorted
P219B	AIR FUEL RATIO IMBALANCE B2 (Air-fuel ratio imbalance bank 2)		

FAIL-SAFE

Not applicable

DTC CONFIRMATION PROCEDURE

1.CHECK DTC PRIORITY

If DTC P219A, or P219B is displayed with other DTC, first perform the confirmation procedure (trouble diagnosis) for the other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-576, "DTC Index".
NO >> GO TO 2.

2.PRECONDITIONING - 1

If DTC Confirmation Procedure has been previously conducted, always perform the following before conducting the next test.

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

NOTE:
Before performing the following procedure, confirm that battery voltage is 11 V or more at idle.

>> GO TO 3.

3.PRECONDITIONING - 2

1. Turn ignition switch ON.
2. Clear the mixture ratio self-learning value. Refer to EC-24, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description".

Will CONSULT be used?

YES >> GO TO 4.
NO >> GO TO 7.

4.PERFORM DTC CONFIRMATION PROCEDURE - 1

1. Turn ignition switch ON.
2. Select “COOLAN TEMP/S” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
3. Start engine.
4. Make sure that “COOLAN TEMP/S” indicates more than 65°C (149°F).

>> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE - 2

With CONSULT

1. Select “SYSTEM 1 DIAGNOSIS B B1”, “SYSTEM 1 DIAGNOSIS A B1”, “SYSTEM 1 DIAGNOSIS B B2”, “SYSTEM 1 DIAGNOSIS A B2” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.
   CAUTION:
   - **Always drive vehicle at a safe speed.**

ENG SPEED	1,200 – 1,800rpm
COOLAN TEMP/S	More than 65°C (149°F)
B/FUEL SCHDL	8 – 11 msec
Selector lever	D position
• SYSTEM 1 DIAGNOSIS B B1 • SYSTEM 1 DIAGNOSIS B B2	PRSENT

NOTE:
- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during crusing.

3. Check “SYSTEM 1 DIAGNOSIS A B1” or “SYSTEM 1 DIAGNOSIS A B2” indication.

Is “CMPLT” displayed?

YES >> GO TO 6.
NO >> GO TO 3.

6.PERFORM DTC CONFIRMATION PROCEDURE - 3

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-491, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-45, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

7.PERFORM DTC CONFIRMATION PROCEDURE - 4

Without CONSULT

1. Start the engine and warm it up to normal operating temperature.
2. Drive vehicle under the following conditions for at least 5 consecutive seconds.
   CAUTION:
   - **Always drive vehicle at a safe speed.**

Engine speed	1,200 – 1,800rpm
Calculated load value	45 – 62 %
Selector lever	D position

NOTE:
- Drive the vehicle at approximately 88 km/h (55MPH) allows easy diagnosis.
- Keep the accelerator pedal as possible during crusing.

3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Proceed to EC-491, "Diagnosis Procedure".
NO-1 >> To check malfunction symptom before repair: Refer to GI-45, "Intermittent Incident".
NO-2 >> Confirmation after repair: INSPECTION END

Diagnosis Procedure

INFOID:0000000011003098

1.CHECK DTC PRIORITY

If DTC P219A, or P219B is displayed with other DTC, first perform the confirmation procedure (trouble diagnosis) for the other DTC.

Is applicable DTC detected?

YES >> Perform diagnosis of applicable. Refer to EC-576, "DTC Index".
NO >> GO TO 2.

2.CHECK FOR INTAKE AIR LEAK

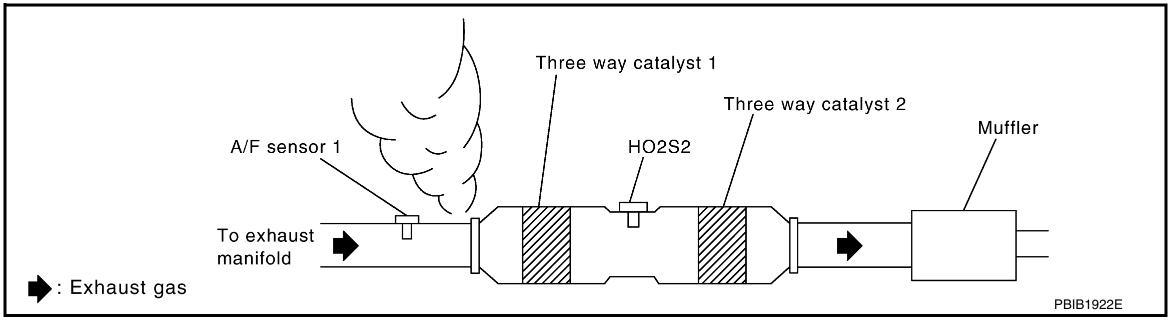
1. Stop engine and check the following for connection.
- Air duct
- Vacuum hoses
- PCV hose
- Intake air passage between air duct to intake manifold
2. Start engine and let it idle.
3. Listen for an intake air leak after the mass air flow sensor.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace error-detected parts.

3.CHECK EXHAUST GAS LEAK

1. Stop engine and visually check exhaust tube, three way catalyst and muffler for dents connection.
2. Start engine and let it idle.
3. Listen for an exhaust gas leak before three way catalyst (manifold).



Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace error-detected parts.

4.CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-628, "Inspection".
2. Check fuel pressure. Refer to EC-628, "Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 10.

5.CHECK MASS AIR FLOW SENSOR

With CONSULT
Check “MASS AIR FLOW” in “DATA MONITOR” mode of “ENGINE” using CONSULT.
For specification, refer to EC-631, "Mass Air Flow Sensor".
With GST
Check mass air flow sensor signal in Service $01 using GST.
For specification, refer to EC-631, "Mass Air Flow Sensor".

Is the inspection result normal?

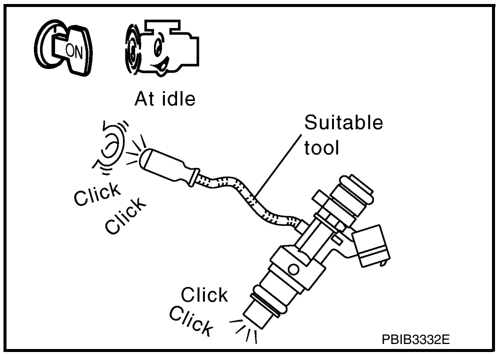
YES >> GO TO 6.
NO >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-189, "Diagnosis Procedure".

6.CHECK FUNCTION OF FUEL INJECTOR - 1

With CONSULT
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode of “ENGINE” using CONSULT.
3. Check that each circuit produces a momentary engine speed drop.

☒Without CONSULT

1. Let engine idle.
2. Listen to each fuel injector operating sound.



Clicking noise should be heard.

Is the inspection result normal?

YES >> GO TO 7.

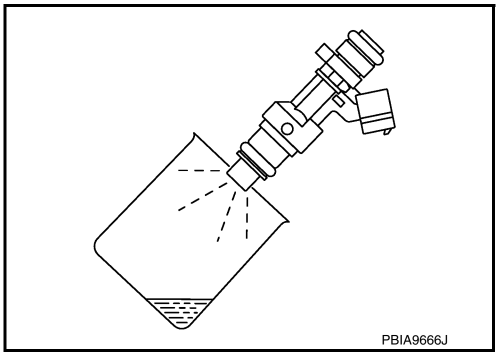
NO >> Perform trouble diagnosis for fuel injector, refer to EC-506, "Component Function Check".

7.CHECK FUNCTION OF FUEL INJECTOR - 2

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

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-38, "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 approximately 3 seconds.



- **Fuel should be sprayed evenly for each fuel injector.**
- **Fuel must not drip from the tip of fuel injector.**

Is the inspection result normal?

YES >> GO TO 8.

NO >> Replace fuel injector. Refer to EM-38, "Removal and Installation".

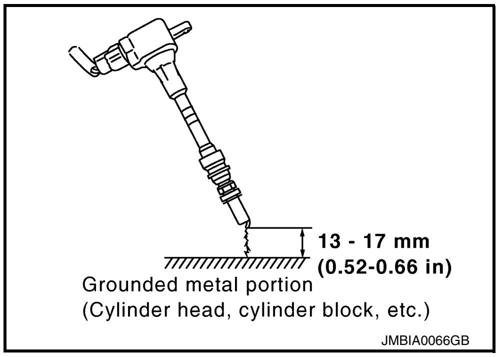
8.CHECK FUNCTION OF IGNITION COIL - 1

CAUTION:

Perform the following steps in a well-ventilated area with no combustibles.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse from IPDM E/R to release fuel pressure.
   NOTE:
   CONSULT must not be used to release fuel pressure. It develops again during the following steps, if released by using CONSULT.
3. Start the engine.
4. After an engine stall, crank the engine two or three times to release all the fuel pressure.
5. Turn ignition switch OFF.
6. Disconnect all the harness connectors of ignition coil to prevent electric discharge from occurring in ignition coil.
7. Remove ignition coil assembly and spark plug of cylinder. Refer to EM-48, "Removal and Installation".
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. Allow a 13 – 17mm (0.52 – 0.66 in) spacing between spark plug and grounded metal portion as shown in the figure to fix the ignition coil with a rope or an equivalent.
11. Crank the engine for approximately 3 seconds to see if sparking occurs between spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:

- **The discharge voltage becomes 20 kV or higher. Therefore, always stay away from the spark plug and ignition coil at least 50 cm (19.7 in) during the inspection.**
- **Leaving a space of more than 17mm (0.66 in) may damage the ignition coil.**

NOTE:

When the gap is less than 13 mm (0.52 in), a the spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 11.

9.CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-16, "Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10.DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

YES >> Replace fuel filter and fuel pump assembly. Refer to FL-6, "Removal and Installation".
NO >> Repair or replace error-detected parts.

11.CHECK FUNCTION OF IGNITION COIL - 2

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

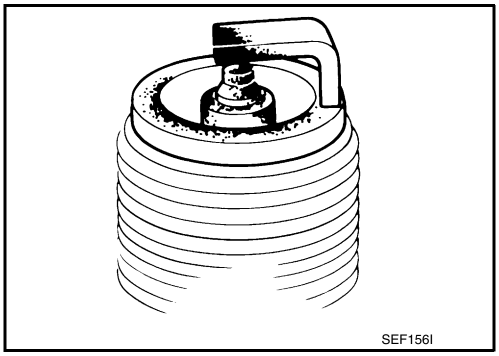
Spark should be generated.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-516, "Component Function Check".

12.CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.



Is the inspection result normal?

YES >> 1. Repair or clean spark plug. Refer to EM-48, "Removal and Installation".
2. GO TO 13.
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-147, "Spark Plug".

13.CHECK FUNCTION OF IGNITION COIL - 3

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-147, "Spark Plug".

ASCD BRAKE SWITCH

Description

INFOID:0000000010597098

When the brake pedal is depressed, ASCD brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).
Refer to EC-77, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000010597099

1.CHECK ASCD BRAKE SWITCH FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M107	126 (ASCD brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
			Brake pedal	Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-496, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597100

1.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ASCD brake switch harness connector and ground.

ASCD brake switch		Ground	Voltage
Connector	Terminal		
E109	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E103
- 10 A fuse (No. 3)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground in harness or connectors.

3.CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ASCD brake switch harness connector and ECM harness connector.

ASCD brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E109	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E106, M6
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK ASCD BRAKE SWITCH

Refer to EC-497, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace ASCD brake switch. Refer to BR-20, "Exploded View".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000010597101

1.CHECK ASCD BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH-II

1. Adjust ASCD brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch. Refer to BR-20, "Exploded View".

ASCD INDICATOR

Description

INFOID:0000000010597102

ASCD operation status is indicated by two indicators (CRUISE and SET) and CRUISE lamp in combination meter.
CRUISE indicator is displayed to indicated that ASCD system is ready for operation when MAIN switch on ASCD steering switch is turned ON.
SET indicator is displayed when the following conditions are met.

- CRUISE indicator is displayed.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET indicator is displayed during ASCD control.
Refer to EC-77, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000010597103

1.CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE LAMP	• Ignition switch: ON	• MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
SET LAMP	• MAIN switch: ON • When vehicle speed is 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 EC-499, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597104

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-136, "Removal and Installation".
NO >> Repair or replace.

COOLING FAN

Description

INFOID:0000000010597105

COOLING FAN CONTROL MODULE

Cooling fan control module receives ON/OFF pulse duty signal from IPDM E/R. Corresponding to this ON/OFF pulse duty signal, cooling fan control module sends cooling fan motor operating voltage to cooling fan motor. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

COOLING FAN MOTOR

Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module. The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

Component Function Check

INFOID:0000000010597106

1.CHECK COOLING FAN FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that cooling fan speed varies according to the percentage.

Without CONSULT

1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PCS-9, "Diagnosis Description".
2. Make sure that cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-500, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597107

1.CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect cooling fan control module harness connector E37.
3. Turn ignition switch ON.
4. Check the voltage between cooling fan control module harness connector and ground.

Cooling fan control module		Ground	Voltage
Connector	Terminal		
E37	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> GO TO 7.

2.CHECK COOLING FAN CONTROL MODULE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between cooling fan control module harness connector and ground.

Cooling fan control module		Ground	Continuity
Connector	Terminal		
E37	1	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair open circuit or short to power in harness or connectors.

3.CHECK IPDM E/R GROUND CIRCUIT

1. Disconnect IPDM E/R harness connectors E5, E6.
2. Check the continuity between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Continuity
Connector	Terminal		
E5	12	Ground	Existed
E6	41		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair open circuit or short to power in harness or connectors.

4.CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

1. Disconnect IPDM E/R harness connector E9.
2. Check the continuity between IPDM E/R harness connector and cooling fan control module harness connector.

IPDM E/R		Cooling fan control module		Continuity
Connector	Terminal	Connector	Terminal	
E9	97	E37	2	Existed

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK COOLING FAN CONTROL MODULE OUTPUT SIGNAL CIRCUIT

1. Reconnect all harness connectors disconnected.
2. Disconnect cooling fan control module harness connectors E301, E302.
3. Turn ignition switch ON.
4. Check the voltage between cooling fan control module harness connector and ground.

Cooling fan control module		Ground	Voltage
Connector	Terminal		
E301	4	Ground	Battery voltage
E302	6		

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace cooling fan control module. Refer to CO-17, "Exploded View".

6.CHECK COOLING FAN MOTORS -1 AND -2

Refer to EC-502, "Component Inspection (Cooling Fan Motor)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace cooling fan motor. Refer to CO-17, "Exploded View".

7.CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect cooling fan relay.
3. Turn ignition switch ON.
4. Check the voltage between cooling fan relay harness connector and ground.

Cooling fan relay		Ground	Voltage
Connector	Terminal		
E17	2	Ground	Battery voltage
	3		

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.

- 10A fuse (No. 42)
- IPDM E/R harness connector E7
- 50A fusible link (letter F)
- Harness for open or short between cooling fan relay and fuse
- Harness for open or short between cooling fan relay and battery

>> Repair open circuit, short to ground or short to power in harness or connectors.

9.CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Check the continuity between cooling fan relay harness connector and ground.

Cooling fan relay		Ground	Continuity
Connector	Terminal		
E17	1	Ground	Existed

3. Check the continuity between cooling fan relay harness connector and cooling fan control module harness connector.

Cooling fan relay		Cooling fan control module		Continuity
Connector	Terminal	Connector	Terminal	
E17	5	E37	3	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK COOLING FAN RELAY

Refer to EC-503, "Component Inspection (Cooling Fan Relay)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace cooling fan relay. Refer to EC-39, "Component Parts Location".

11.CHECK INTERMITTENT INCIDENT

Perform GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
NO >> Repair or replace harness connectors.

Component Inspection (Cooling Fan Motor)

INFOID:0000000010597108

1.CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan control module harness connectors E301, E302.

3. Supply cooling fan control module terminals with battery voltage and check operation.

Cooling fan control module				Operation
Motor	Connector	Terminal		
		(+)	(–)	
1	E301	4	5	Cooling fan operates.
2	E302	6	7	

Is the inspection result normal?

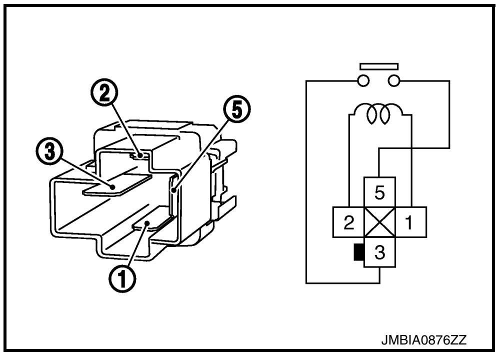
YES >> INSPECTION END
NO >> Replace cooling fan motor. Refer to CO-17, "Exploded View".

Component Inspection (Cooling Fan Relay)

INFOID:0000000010597109

1.CHECK COOLING FAN RELAY

1. Turn ignition switch OFF.
2. Remove cooling fan relay. Refer to EC-39, "Component Parts Location".
3. Check the continuity between cooling fan relay terminals under the following conditions.



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Terminals	Conditions	Continuity
3 and 5	12 V direct current supply between terminals 1 and 2	Existed
	No current supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan relay. Refer to EC-39, "Component Parts Location".

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000010597110

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred via the CAN communication line.

Component Function Check

INFOID:0000000010597111

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Connect CONSULT 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 EC-504, "Diagnosis Procedure".

2.CHECK LIGHTING SWITCH FUNCTION

Check “LOAD SIGNAL” indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Lighting switch	ON at 2nd position	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to EC-504, "Diagnosis Procedure".

3.CHECK HEATER FAN CONTROL SWITCH FUNCTION

Select “HEATER FAN SW” and check indication under the following conditions.

Monitor item	Condition		Indication
HEATER FAN SW	Heater fan control switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-504, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597112

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to EC-504, "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" (Xenon type) or EXL-228, "Work Flow" (Halogen type).

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

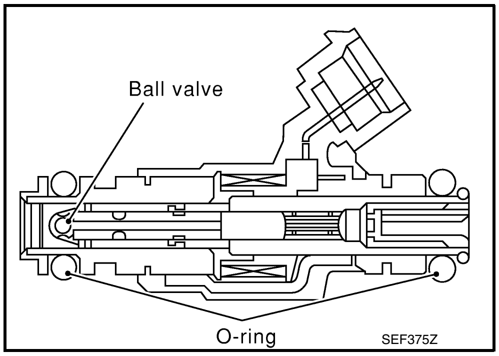
Refer to HAC-4, "Work Flow".

>> INSPECTION END

FUEL INJECTOR

Description

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

1.INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.
NO >> Go to EC-506, "Diagnosis Procedure".

2.CHECK FUEL INJECTOR FUNCTION

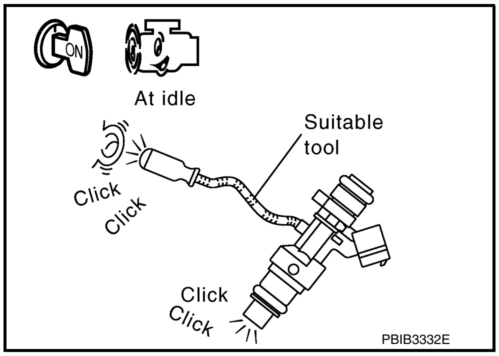
With CONSULT

1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
3. Make sure that each circuit produces a momentary engine speed drop.

Without CONSULT

1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-506, "Diagnosis Procedure".

Diagnosis Procedure

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	F21	1	Ground	Battery voltage
2	F22	1		
3	F23	1		
4	F24	1		
5	F25	1		
6	F26	1		

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E13, F40
- Harness connectors F10, F120
- IPDM E/R harness connector E7
- 10 A fuse (No. 44)
- Harness for open or short between fuel injector and fuse

>> Repair open circuit, 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	F21	2	F102	89	Existed
2	F22	2		85	
3	F23	2		81	
4	F24	2		90	
5	F25	2		86	
6	F26	2		82	

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F109, F110
- Harness connectors F10, F120
- Harness for open or short between fuel injector and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK FUEL INJECTOR

Refer to EC-508, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace malfunctioning fuel injector. Refer to EM-38, "Removal and Installation".

6.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

Component Inspection

INFOID:0000000010597116

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 (Ω)
1 and 2	11.1 - 14.3 [at 10 - 60°C (60 - 140°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector. Refer to EM-38, "Removal and Installation".

FUEL PUMP

Description

INFOID:0000000010597117

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 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.

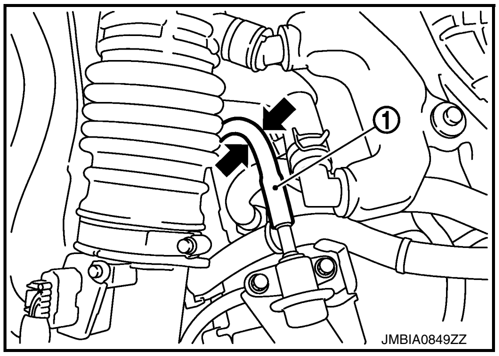
Component Function Check

INFOID:0000000010597118

1.CHECK FUEL PUMP FUNCTION

1. Turn ignition switch ON.
2. Pinch fuel feed hose (1) with two fingers.

Fuel pressure pulsation should be felt on the fuel feed hose for 1 second after ignition switch is turned ON.



Is the inspection result normal?

YES >> INSPECTION END
NO >> EC-509, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597119

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		
F101	22	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

Check the voltage between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Voltage
Connector	Terminal		
E7	77	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 10.

3.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness connectors F104, F105
- Harness for open or short between IPDM E/R and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect “fuel level sensor unit and fuel pump” harness connector.
4. Turn ignition switch ON.
5. Check the voltage between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Voltage
Connector	Terminal		
B22	1	Ground	Battery voltage should exist for 1 second after ignition switch is turned ON.

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 5.

5.CHECK 15A FUSE

1. Turn ignition switch OFF.
2. Disconnect 15A fuse (No. 41) from IPDM E/R.
3. Check 15 A 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 E5.
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	
E5	13	B22	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 E104, B4
- IPDM E/R harness connector E5
- Harness for open or short between IPDM E/R and “fuel level sensor unit and fuel pump”

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check the continuity between “fuel level sensor unit and fuel pump” harness connector and ground.

Fuel level sensor unit and fuel pump		Ground	Continuity
Connector	Terminal		
B22	3	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Repair open circuit or short to power in harness or connectors.

9.CHECK FUEL PUMP

Refer to EC-511, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace fuel pump. Refer to FL-6, "Removal and Installation".

10.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace IPDM E/R. Refer to PCS-35, "Removal and Installation".
NO >> Repair or replace harness or connectors.

Component Inspection

INFOID:0000000010597120

1.CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump” harness connector.
3. Check resistance between “fuel level sensor unit and fuel pump” terminals as follows.

Terminals	Resistance (Ω)
1 and 3	0.2 - 5.0 [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace “fuel level sensor unit and fuel pump”. Refer to FL-6, "Removal and Installation".

ICC BRAKE SWITCH

Description

INFOID:0000000010597121

When the brake pedal is depressed, ICC brake switch is turned OFF and stop lamp switch is turned ON. ECM detects the state of the brake pedal by those two types of input (ON/OFF signal).
Refer to CCS-18, "System Description" for the ICC function.

Component Function Check

INFOID:0000000010597122

1.CHECK ICC BRAKE SWITCH FUNCTION

With CONSULT

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
	Brake pedal	Fully released	ON

Without CONSULT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Condition		Voltage (V)
Connector	+	−			
	Terminal	Terminal			
M107	126 (ICC brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
			Brake pedal	Fully released	Battery voltage

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-512, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597123

1.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E111	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 2.

2.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ICC brake hold relay.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake hold relay harness connector and ground.

ICC brake hold relay		Ground	Voltage
Connector	Terminal		
E50	3	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.

- Fuse block (J/B) connector E103
- 10A fuse (No. 3)
- Harness for open or short between ICC brake hold relay and fuse

>> Repair open circuit or short to ground in harness or connectors.

4.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Check the continuity between ICC brake switch harness connector and ICC brake hold relay harness connector.

ICC brake switch		ICC brake hold relay		Continuity
Connector	Terminal	Connector	Terminal	
E111	1	E50	4	Existed

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK ICC BRAKE HOLD RELAY INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ICC brake hold relay harness connector.
3. Check the continuity between ICC brake hold relay harness connector and brake booster control unit harness connector.

ICC brake hold relay		brake booster control unit		Continuity
Connector	Terminal	Connector	Terminal	
E50	1	B249	47	Existed

4. Check the continuity between ICC brake hold relay harness connector and ground.

ICC brake hold relay		Ground	Continuity
Connector	Terminal		
E50	2	Ground	Existed

5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors B201, M117
- Harness for open or short between ICC brake hold relay and brake booster control unit

>> Repair open circuit, short to ground or short to power in harness or connectors.

7.CHECK ICC BRAKE HOLD RELAY

Refer to EC-456, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace ICC brake hold relay. Refer to BR-20, "Exploded View".

8.CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between ICC brake switch harness connector and ECM harness connector.

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E111	2	M107	126	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 9.

9.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

10.CHECK ICC BRAKE SWITCH

Refer to EC-514, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

11.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000010597124

1.CHECK ICC BRAKE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> GO TO 2.

2.CHECK ICC BRAKE SWITCH-II

1. Adjust ICC brake switch installation. Refer to BR-21, "Inspection and Adjustment".
2. Check the continuity between ICC brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake switch. Refer to BR-20, "Exploded View".

IGNITION SIGNAL

Description

INFOID:0000000010597125

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:0000000010597126

1.INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT: GO TO 2.
YES-2 >> Without CONSULT: GO TO 3.
No >> Go to EC-516, "Diagnosis Procedure".

2.CHECK IGNITION SIGNAL FUNCTION

With CONSULT

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT.
2. Make sure that each circuit produces a momentary engine speed drop.

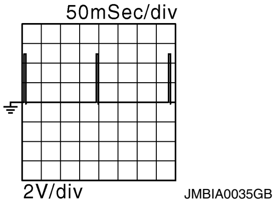
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-516, "Diagnosis Procedure".

3.CHECK IGNITION SIGNAL FUNCTION

Without CONSULT

1. Let engine idle.
2. Read the voltage signal between ECM harness connector terminals under the following conditions with an oscilloscope.

ECM				Voltage signal
+		–		
Connector	Terminal	Connector	Terminal	
F101	11	M107	128	
	12			
	15			
	16			
	19			
	20			

NOTE:

The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-516, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597127

1.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.
2. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
M107	125	128	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-164, "Diagnosis Procedure".

2.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Turn ignition switch ON.
4. Check the voltage between condenser harness connector and ground.

Condenser		Ground	Voltage
Connector	Terminal		
F8	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 3.

3.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E7.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
E7	53	F8	1	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> Go to EC-164, "Diagnosis Procedure".
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E13, F40
- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between condenser harness connector and ground.

Condenser		Ground	Continuity
Connector	Terminal		
F8	2	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair open circuit or short to power in harness or connectors.

6.CHECK CONDENSER

Refer to EC-520, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace condenser.

7.CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

1. Reconnect all harness connectors disconnected.
2. Disconnect ignition coil harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ignition coil harness connector and ground.

Ignition coil			Ground	Voltage
Cylinder	Connector	Terminal		
1	F11	3	Ground	Battery voltage
2	F12	3		
3	F13	3		
4	F14	3		
5	F15	3		
6	F16	3		

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 8.

8.DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F40
- Harness for open or short between ignition coil and harness connector F40

>> Repair or replace harness or connectors.

9.CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

Ignition coil			Ground	Continuity
Cylinder	Connector	Terminal		
1	F11	2	Ground	Existed
2	F12	2		
3	F13	2		
4	F14	2		
5	F15	2		
6	F16	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit or short to power in harness or connectors.

10.CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between ignition coil harness connector and ECM harness connector.

Ignition coil			ECM		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F11	1	F101	20	Existed
2	F12	1		16	
3	F13	1		12	
4	F14	1		11	
5	F15	1		15	
6	F16	1		19	

3. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 12.
NO >> GO TO 11.

11.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors F104, F105
- Harness for open or short between ignition coil and ECM

>> Repair open circuit, short to ground or short to power in harness or connectors.

12.CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-519, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-48, "Removal and Installation".

13.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000010597128

1.CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.

Terminals	Resistance (Ω) [at 25°C (77°F)]
1 and 2	Except 0 or ∞
1 and 3	Except 0
2 and 3	

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-48, "Removal and Installation".

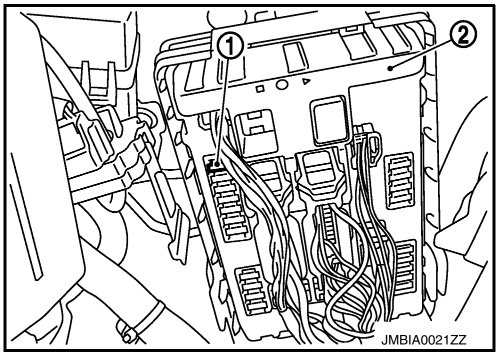
2.CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:

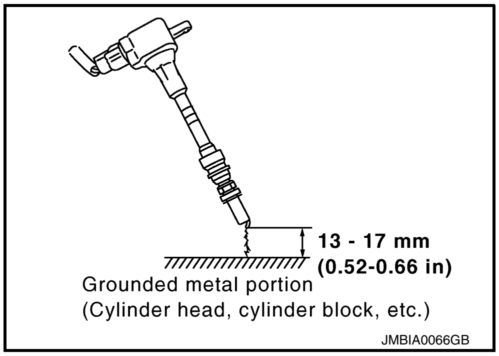
Perform the following procedure in a place where with no combustible objects and good ventilation.

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.
3. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT to release fuel pressure, or fuel pressure applies again during the following procedure.



4. Start engine.
5. After engine stalls, crank it two or three times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked. Refer to EM-23, "Removal and Installation".
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for about three seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm (19.7 in) each other. Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

NOTE:
When the gap is less than 13 mm (0.52 in), spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor. Refer to EM-48, "Removal and Installation".

Component Inspection (Condenser)

INFOID:0000000010597129

1.CHECK CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as per the following.

Terminals	Resistance (MΩ)
1 and 2	Above 1 [at 25°C (77°F)]

Is the inspection result normal?

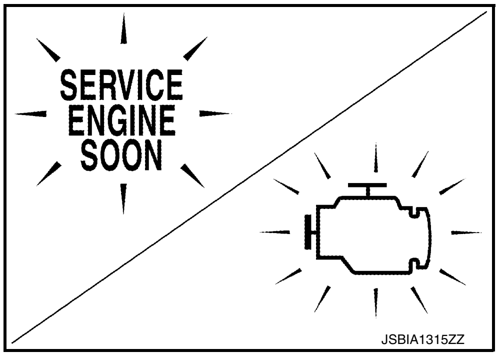
YES >> INSPECTION END
NO >> Replace condenser.

MALFUNCTION INDICATOR LAMP

Description

INFOID:0000000010597130

The Malfunction Indicator Lamp (MIL) is located on the combination meter.
The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.
When the engine is started, the MIL should turn off. If the MIL remains illuminated, the on board diagnostic system has detected an engine system malfunction.
For details, refer to EC-142, "DIAGNOSIS DESCRIPTION : Malfunction Indicator Lamp (MIL)".



Component Function Check

INFOID:0000000010597131

1.CHECK MIL FUNCTION

1. Turn ignition switch ON.
2. Make sure that MIL illuminates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-521, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597132

1.CHECK DTC

Check that DTC UXXXX is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble diagnosis for DTC UXXXX.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace.

3.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

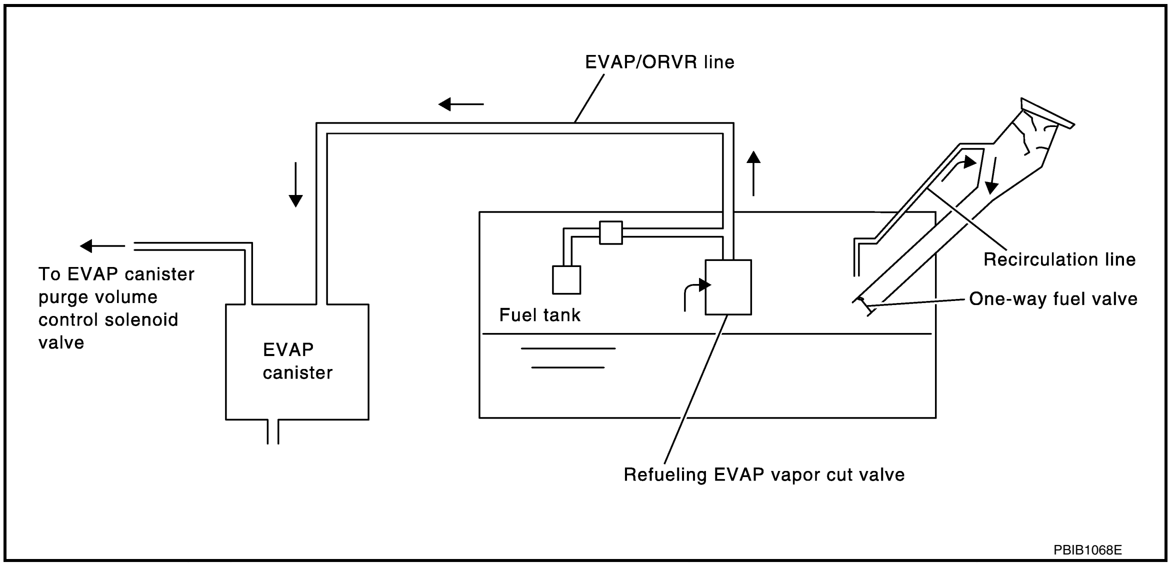
Is the inspection result normal?

YES >> Replace combination meter. Refer to MWI-136, "Removal and Installation".
NO >> Repair or replace.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Description

INFOID:0000000010597133


EVAP/ORVR line
To EVAP canister purge volume control solenoid valve
EVAP canister
Fuel tank
Recirculation line
One-way fuel valve
Refueling EVAP vapor cut valve
PBIB1068E

From the beginning of refueling, the air and vapor inside the fuel tank go through refueling EVAP vapor cut valve and EVAP/ORVR line to the EVAP canister. The vapor is absorbed by the EVAP canister and the air is released to the atmosphere.

When the refueling has reached the full level of the fuel tank, the refueling EVAP vapor cut valve is closed and refueling is stopped because of auto shut-off. The vapor which was absorbed by the EVAP canister is purged during driving.

WARNING:

When conducting inspections below, be sure to observe the following:

- **Put a “CAUTION: FLAMMABLE” sign in workshop.**
- **Never smoke while servicing fuel system. Keep open flames and sparks away from work area.**
- **Always furnish the workshop with a CO_2 fire extinguisher.**

CAUTION:

- **Before removing fuel line parts, carry out the following procedures:**
  - **Put drained fuel in an explosion-proof container and put lid on securely.**
  - **Release fuel pressure from fuel line. Refer to EC-628, "Inspection".**
  - **Disconnect battery ground cable.**
- **Always replace O-ring when the fuel gauge retainer is removed.**
- **Never kink or twist hose and tube when they are installed.**
- **Never tighten hose and clamps excessively to avoid damaging hoses.**
- **After installation, run engine and check for fuel leaks at connections.**
- **Never attempt to top off the fuel tank after the fuel pump nozzle shuts off automatically. Continued refueling may cause fuel overflow, resulting in fuel spray and possibly a fire.**

Component Function Check

INFOID:0000000010597134

1.CHECK ORVR FUNCTION

Check whether the following symptoms are present.

- Fuel odor from EVAP canister is strong.
- Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Are any symptoms present?

YES >> Go to EC-522, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000010597135

1.INSPECTION START

Check whether the following symptoms are present.
A: Fuel odor from EVAP canister is strong.

B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Which symptom is present?

A >> GO TO 2.
B >> GO TO 7.

2.CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to FL-15, "Exploded View".
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.2 kg (4.9 lb).

Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 4.

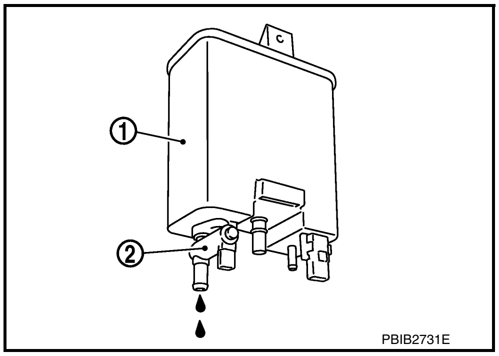
3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

- 2: EVAP canister vent control valve

Does water drain from the EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.



4.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-16, "Removal and Installation".

>> GO TO 5.

5.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose. Refer to FL-14, "Hydraulic Layout".

6.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11, "Exploded View".

7.CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached. Refer to FL-16, "Removal and Installation".
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.2 kg (4.9 lb).

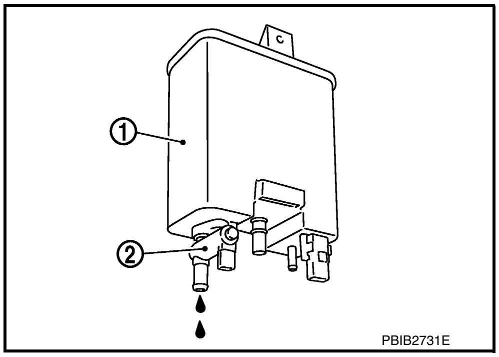
Is the inspection result normal?

YES >> GO TO 8.
NO >> GO TO 9.

8.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from the EVAP canister?

YES >> GO TO 9.
NO >> GO TO 11.

9.REPLACE EVAP CANISTER

Replace EVAP canister with a new one. Refer to FL-16, "Removal and Installation".

>> GO TO 10.

10.DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

11.CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace hoses and tubes.

12.CHECK FILLER NECK TUBE

Check recirculation line for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace filler neck tube.

13.CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace refueling EVAP vapor cut valve with fuel tank. Refer to FL-11, "Exploded View".

14.CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel filler tube.

15.CHECK ONE-WAY FUEL VALVE-I

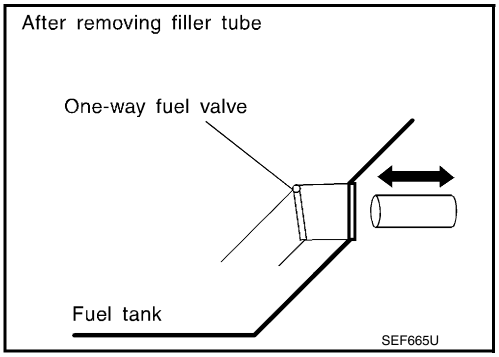
Check one-way valve for clogging.

Is the inspection result normal?

YES >> GO TO 16.
NO >> Repair or replace one-way fuel valve with fuel tank.

16.CHECK ONE-WAY FUEL VALVE-II

1. Make sure that fuel is drained from the tank.
2. Remove fuel filler tube and hose. Refer to FL-11, "Removal and Installation".



3. Check one-way fuel valve for operation as follows.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Do not drop any material into the tank.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.

Component Inspection

INFOID:0000000010597136

1.INSPECTION START

Do you have CONSULT?

Do you have CONSULT?

YES >> GO TO 2.
NO >> GO TO 3.

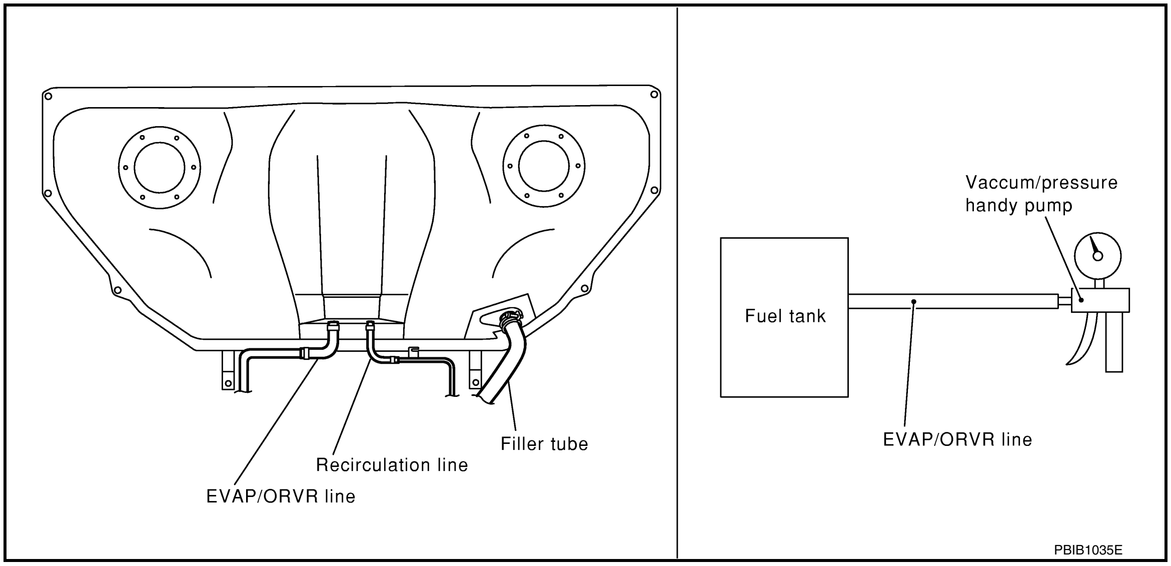
2.CHECK REFUELING EVAP VAPOR CUT VALVE

With CONSULT

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-11, "Removal and Installation".
3. Drain fuel from the tank as follows:
- Remove fuel feed hose located on the fuel gauge retainer.
- Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
- Drain fuel using “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT.
4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^3, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

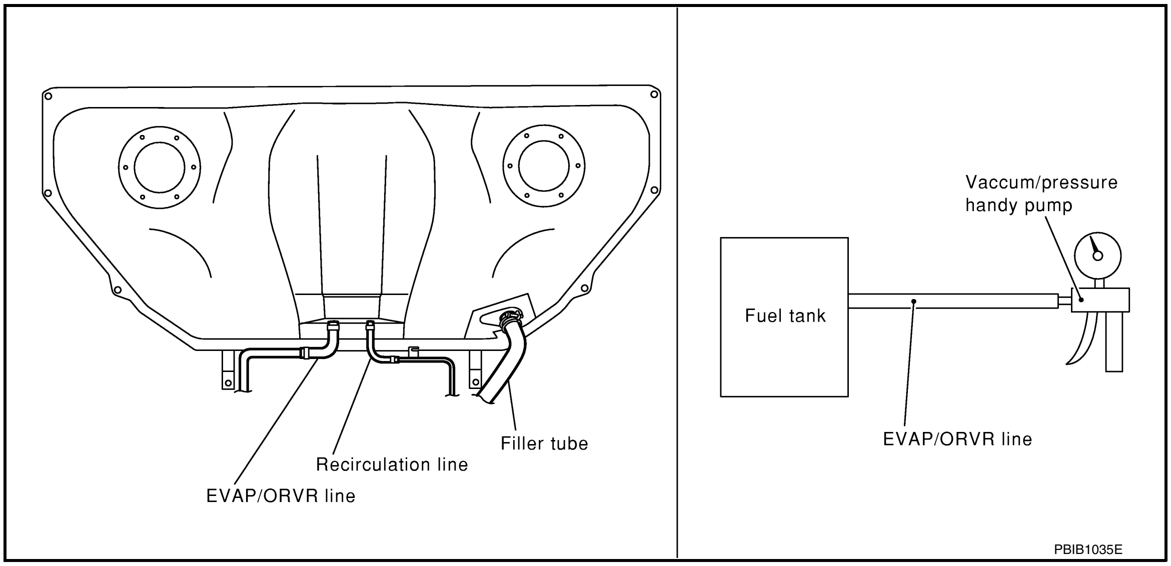
3.CHECK REFUELING EVAP VAPOR CUT VALVE

☒Without CONSULT

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-11, "Removal and Installation".
3. Drain fuel from the tank as follows:
- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container.
4. Check refueling EVAP vapor cut valve for being stuck to close as follows.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as follows.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^3, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



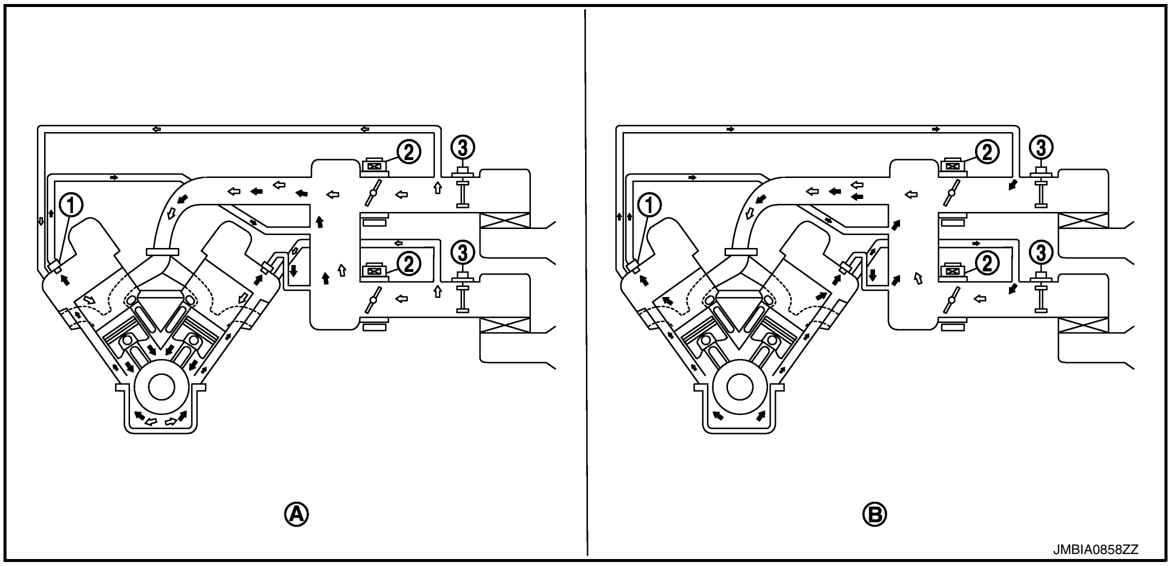
Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

POSITIVE CRANKCASE VENTILATION

Description

INFOID:0000000010597137



1. PCV valve
2. Electric throttle control actuator
3. Mass air flow sensor

A. Normal condition
B. Hi-load condition

⇦ : Fresh air

⬅ : Blow-by air

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.

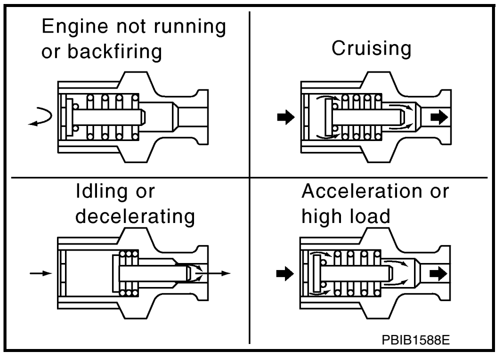
During partial throttle operation of the engine, the intake manifold sucks the blow-by gas through the PCV valve.

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.

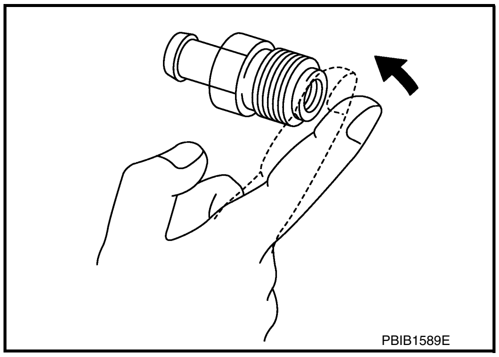


Component Inspection

INFOID:0000000010597138

1.CHECK PCV VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



Is the inspection result normal?

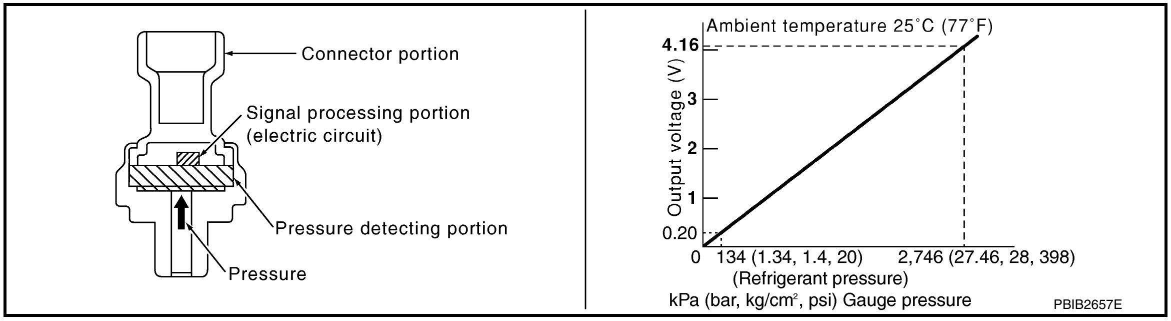
YES >> INSPECTION END
NO >> Replace PCV valve. Refer to EM-48, "Exploded View".

REFRIGERANT PRESSURE SENSOR

Description

INFOID:0000000010597139

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:0000000010597140

1.CHECK REFRIGERANT PRESSURE SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check the voltage between ECM harness connector terminals as per the following.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
M107	105 (Refrigerant pressure sensor signal)	112	1.0 - 4.0

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-529, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597141

1.CHECK GROUND CONNECTION

1. Turn A/C switch and blower fan switch OFF.
2. Turn ignition switch OFF.
3. Check ground connection M95. Refer to Ground Inspection in GI-48, "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 (V)
Connector	Terminal		
E77	3	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 4.
NO >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M6, E106
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

4.CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E77	1	M107	112	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 M6, E106
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

6.CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between refrigerant pressure sensor harness connector and ECM harness connector.

Refrigerant pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E77	2	M107	105	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 M6, E106
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor. Refer to HAC-131, "Removal and Installation".
NO >> Repair or replace.

SNOW MODE SWITCH

Description

INFOID:0000000010597142

The snow mode switch signal is sent to the “unified meter and A/C amp.” from the snow mode switch. The “unified meter and A/C amp.” then sends the signal to the ECM via the CAN communication line.
The snow mode is used for driving or starting the vehicle on snowy roads or slippery areas. If the snow mode is activated, the vehicle speed will not accelerates as quickly as normal to avoid vehicle slip. In other words, ECM controls rapid engine torque change by controlling the electric throttle control actuator operating speed.

Component Function Check

INFOID:0000000010597143

1.CHECK SNOW MODE SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “SNOW MODE SW” in “DATA MONITOR” mode with CONSULT.
3. Check “SNOW MODE SW” indication under the following conditions.

Monitor item	Condition		Indication
SNOW MODE SW	Snow mode switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-531, "Diagnosis Procedure".

2.CHECK SNOW MODE INDICATOR FUNCTION

1. Turn ignition switch ON.
2. Check the snow mode indicator in the snow mode switch under the following condition.

Condition		Snow mode indicator
Snow mode switch	ON	ON
	OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-531, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000010597144

1.CHECK SNOW MODE SWITCH OVERALL FUNCTION

Confirm the malfunctioning circuit (snow mode switch or snow mode indicator). Refer to EC-531, "Component Function Check".

Which circuit is related to the incident?

Snow mode switch>>GO TO 2.
Snow mode indicator>>GO TO 6.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to MWI-42, "CONSULT Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to MWI-4, "Work flow".

3.CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect snow mode switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between snow mode switch harness connector and ground.

Snow mode switch		Ground	Voltage
Connector	Terminal		
M176	1	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 5.
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors E106, M6
- Harness connectors M134, M170
- IPDM E/R harness connector E7
- 10 A fuse (No. 43)
- Harness for open or short between snow mode switch and fuse.

>> Repair open circuit, short to ground or short to power in harness or connectors.

5.CHECK SNOW MODE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect “unified meter and A/C amp.” harness connector.
3. Check the continuity between snow mode switch harness connector and “unified meter and A/C amp.” harness connector.

Snow mode switch		Unified meter and A/C amp.		Continuity
Connector	Terminal	Connector	Terminal	
M176	4	M66	23	Existed

4. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connector.

6.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connection M95. Refer to Ground Inspection in GI-48, "Circuit Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace ground connection.

7.CHECK SNOW MODE INDICATOR LAMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between snow mode switch harness connector and ground.

Snow mode switch		Ground	Continuity
Connector	Terminal		
M176	2	Ground	Existed

2. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit or short to power in harness or connectors.

8.CHECK SNOW MODE SWITCH

Refer to EC-533, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.

NO >> Replace snow mode switch. Refer to IP-12, "Exploded View".

9.CHECK INTERMITTENT INCIDENT

Refer to GI-45, "Intermittent Incident".

>> INSPECTION END

Component Inspection

INFOID:0000000010597145

1.CHECK SNOW MODE SWITCH-I

1. Turn ignition switch OFF.
2. Disconnect snow mode switch harness connector.
3. Check the continuity between snow mode switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 4	Snow mode switch	ON	Existed
		OFF	Not Existed

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace snow mode switch. Refer to IP-12, "Exploded View".

2.CHECK SNOW MODE SWITCH-II

Check the continuity between snow mode switch terminals under the following conditions.

Terminals (Polarity)	Continuity
2 (+) - 4 (–)	Existed
4 (+) - 2 (–)	Not Existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace snow mode switch. Refer to IP-12, "Exploded View".

ECU DIAGNOSIS INFORMATION

ECM

Reference Value

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- The following table includes information (items) inapplicable to this vehicle. For information (items) applicable to this vehicle, refer to CONSULT display items.
- Numerical values in the following table are reference values.
- These values are input/output values that ECM receives/transmits and may differ from actual operations.
  Example:
  The ignition timing shown by the timing light may differ from the ignition timing displayed on the data monitor. This occurs because the timing light shows a value calculated by ECM according to signals received from the cam shaft position sensor and other sensors related to ignition timing.

For outlines of following items, refer to EC-146, "CONSULT Function".

CONSULT MONITOR ITEM

Monitor Item	Condition		Values/Status
ENG SPEED	• Run engine and compare CONSULT value with the tachometer indication.		Almost the same speed as the tachometer indication
MAS A/F SE-B1	See EC-156, "Description".		
MAS A/F SE-B2	See EC-156, "Description".		
B/FUEL SCHDL	See EC-156, "Description".		
A/F ALPHA-B1	See EC-156, "Description".		
A/F ALPHA-B2	See EC-156, "Description".		
COOLAN TEMP/S	• Ignition switch: ON		Indicates engine coolant temperature
A/F SEN1 (B1)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 2.2 V
HO2S2 (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		0 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 (B2)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		0 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ←→ RICH
HO2S2 MNTR (B2)	• Revving engine from idle up to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ←→ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.45 - 1.00 V
		Accelerator pedal: Fully depressed	4.4 - 4.8 V

Monitor Item	Condition		Values/Status
ACCEL SEN 2*1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.45 - 1.00 V
		Accelerator pedal: Fully depressed	4.3 - 4.8 V
TP SEN 1-B1	• Ignition switch: ON (Engine stopped) • Selector lever: D	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
TP SEN 2-B1*1	• Ignition switch: ON (Engine stopped) • Selector lever: D	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
FUEL T/TMP SE	• Ignition switch: ON		Indicates fuel tank temperature
INT/A TEMP SE	• Ignition switch: ON		Indicates intake air temperature
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 - 4.8 V
FUEL LEVEL SE	• Ignition switch: ON		Depending on fuel level of fuel tank
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON
P/N POSI SW	• Ignition switch: ON	Selector lever: P or N	ON
		Selector 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 • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
INJ PULSE-B2	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec
IGN TIMING	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	7° BTDC
		2,000 rpm	25° - 45° BTDC
CAL/LD VALUE	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	5% - 35%
		2,500 rpm	5% - 35%

Monitor Item	Condition		Values/Status
MASS AIRFLOW	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 6.0 g/s
		2,500 rpm	7.0 - 20.0 g/s
PURG VOL C/V	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
		2,000 rpm	—
INT/V TIM (B1)	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	– 5 - 5°CA
		2,000 rpm	Approx. 0 - 30°CA
INT/V TIM (B2)	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	– 5 - 5°CA
		2,000 rpm	Approx. 0 - 30°CA
INT/V SOL (B1)	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 0 - 50%
INT/V SOL (B2)	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 0 - 50%
TP SEN 1-B2	• Ignition switch: ON (Engine stopped) • Selector lever: D	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
TP SEN 2-B2*1	• Ignition switch: ON (Engine stopped) • Selector lever: D	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
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 second after turning ignition switch: ON • Engine running or cranking		ON
	• Except above		OFF
VENT CONT/V	• Ignition switch: ON		OFF
THRTL RELAY	• Ignition switch: ON		ON
HO2S2 HTR (B1)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
HO2S2 HTR (B2)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
I/P PULLY SPD	• Vehicle speed: More than 20 km/h (12 MPH)		Almost the same speed as the tachometer indication
VEHICLE SPEED	• Turn drive wheels and compare CONSULT value with the speedometer indication.		Almost the same speed as the speedometer indication

Monitor Item	Condition		Values/Status
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
SNOW MODE SW	• Ignition switch: ON	Snow mode switch: Pressed	ON
		Snow mode switch: Released	OFF
ENG OIL TEMP	• Engine: After warming up		More than 70°C (158°F)
TRVL AFTER MIL	• Ignition switch: ON	Vehicle has traveled after MIL has illuminated.	0 - 65,535 km (0 - 40,723 miles)
A/F S1 HTR (B1)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
A/F S1 HTR (B2)	• Engine: After warming up, idle the engine (More than 140 seconds after starting engine)		4 - 100%
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0 V
VHCL SPEED SE	• Turn drive wheels and compare CONSULT 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 (ICC/ASCD brake switch)	• Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON
DIST SW	• Ignition switch: ON	DISTANCE switch: Pressed	ON
		DISTANCE switch: Released	OFF
CRUISE LAMP	• Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged*2 • Selector lever: P or N • Air conditioner switch: OFF • No load		Approx. 2,600 - 3,500 mV
ALT DUTY	• Engine: Idle		0 - 80%
ATOM PRES SEN	• This item is displayed but is not applicable to this model.		
BRAKE BST PRES SE	• This item is displayed but is not applicable to this model.		
VVEL POSITION SEN-B1	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	Approx. 0.25 - 1.40 V
		When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V

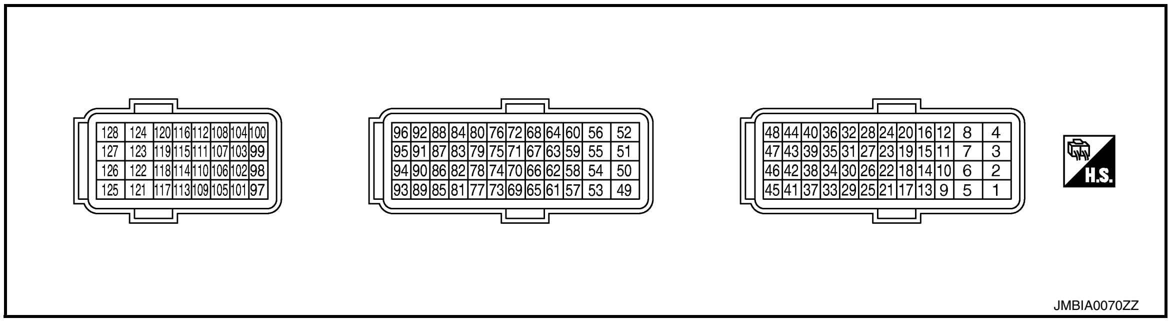
Monitor Item	Condition		Values/Status
VVEL POSITION SEN-B2	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	Approx. 0.25 - 1.40 V
		When revving engine up to 2,000 rpm quickly	Approx. 0.25 - 4.75 V
VVEL TIM-B1	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	Approx. 0 - 20 deg
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg
VVEL TIM-B2	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	Approx. 0 - 20 deg
		When revving engine up to 2,000 rpm quickly	Approx. 0 - 90 deg
VVEL LEARN	• Ignition switch: OFF → ON (After warming up)	VVEL learning has not been performed yet.	YET
		VVEL learning has already been performed successfully.	DONE
VVEL SEN LEARN-B1	• VVEL learning has already been performed successfully		Approx. 0.30 - 0.80 V
VVEL SEN LEARN-B2	• VVEL learning has already been performed successfully		Approx. 0.30 - 0.80 V
A/F ADJ-B1	• Engine: Running		–0.330 - 0.330
A/F ADJ-B2	• Engine: Running		–0.330 - 0.330
FAN DUTY	• Engine: Running		0 - 100%
ALT DUTY SIG	• Power generation voltage variable control: Operating		ON
	• Power generation voltage variable control: Not operating		OFF
EVAP LEAK DIAG	• Ignition switch: ON		Depending on condition of EVAP leak diagnosis
EVAP DIAG READY	• Ignition switch: ON (READY)		Depending on ready condition of EVAP leak diagnosis
THRTL STK CNT B1	• This item is displayed but is not applicable to this model.		
SYSTEM 1 DIAGNOSIS A B1	DTC P219A self-diagnosis is incomplete.		INCMP
	DTC P219A self-diagnosis is complete.		CMPLT
SYSTEM 1 DIAGNOSIS A B2	DTC P219B self-diagnosis is incomplete.		INCMP
	DTC P219B self-diagnosis is complete.		CMPLT
SYSTEM 1 DIAGNOSIS B B1	DTC P219A self-diagnosis is on standby.		ABSENT
	DTC P219A self-diagnosis is under diagnosis.		PRSENT
SYSTEM 1 DIAGNOSIS B B2	DTC P219B self-diagnosis is on standby.		ABSENT
	DTC P219B self-diagnosis is under diagnosis.		PRSENT
HO2 S2 DIAG1 (B1)	• DTC P0139 self-diagnosis (delayed response) has not been performed yet.		INCMP
	• DTC P0139 self-diagnosis (delayed response) has already been performed successfully.		CMPLT
HO2 S2 DIAG1 (B2)	• DTC P0159 self-diagnosis (delayed response) has not been performed yet.		INCMP
	• DTC P0159 self-diagnosis (delayed response) has already been performed successfully.		CMPLT
HO2 S2 DIAG2 (B1)	• DTC P0139 self-diagnosis (slow response) has not been performed yet.		INCMP
	• DTC P0139 self-diagnosis (slow response) has already been performed successfully.		CMPLT
HO2 S2 DIAG2 (B2)	• DTC P0159 self-diagnosis (slow response) has not been performed yet.		INCMP
	• DTC P0159 self-diagnosis (slow response) has already been performed successfully.		CMPLT

Monitor Item	Condition	Values/Status
A/F SEN1 DIAG1 (B1)	DTC P015A and P015B self-diagnosis incomplete.	INCMP
	DTC P015A and P015B self-diagnosis is complete.	CMPLT
A/F SEN1 DIAG1 (B2)	DTC P015C and P015D self-diagnosis incomplete.	INCMP
	DTC P015C and P015D self-diagnosis is complete.	CMPLT
A/F SEN1 DIAG2 (B1)	DTC P014C and P014D self-diagnosis incomplete.	INCMP
	DTC P014C and P014D self-diagnosis is complete.	CMPLT
A/F SEN1 DIAG2 (B2)	DTC P014E and P014F self-diagnosis incomplete.	INCMP
	DTC P014E and P014F self-diagnosis is complete.	CMPLT
A/F SEN1 DIAG3 (B1)	The vehicle condition is not within the diagnosis range of DTC P014C, P014D, P015A or P015B.	ABSNT
	The vehicle condition is within the diagnosis range of DTC P014C, P014D, P015A or P015B.	PRSNT
A/F SEN1 DIAG3 (B2)	The vehicle condition is not within the diagnosis range of DTC P014E, P014F, P015C or P015D.	ABSNT
	The vehicle condition is within the diagnosis range of DTC P014E, P014F, P015C or P015D.	PRSNT

*1: Accelerator pedal position sensor 2 signal and throttle position sensor 2 signal are converted by ECM internally. Thus, they differ from ECM terminals voltage signal.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

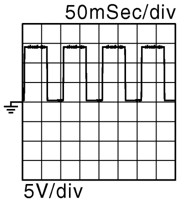
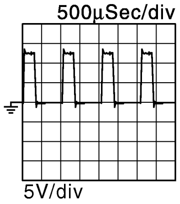
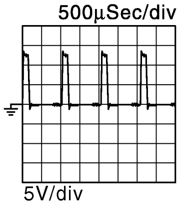
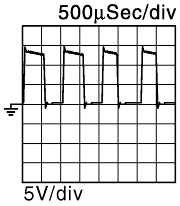
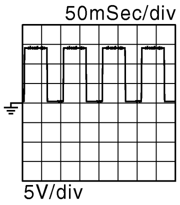
TERMINAL LAYOUT

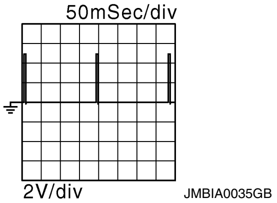
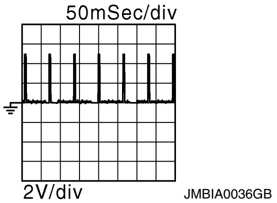
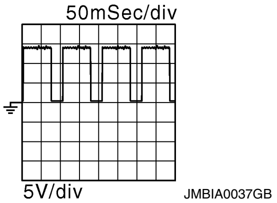
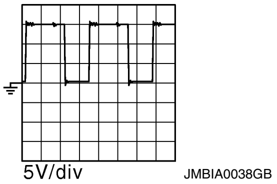


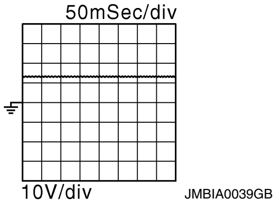
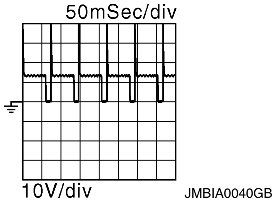
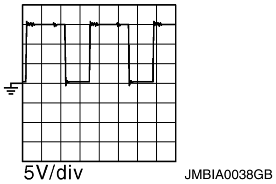
PHYSICAL VALUES

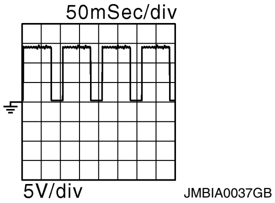
NOTE:

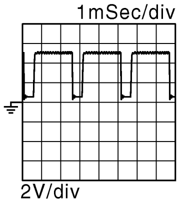
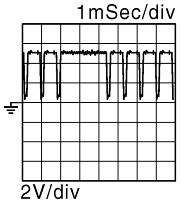
- ECM is located behind the instrument assist lower panel. For this inspection, remove passenger side instrument lower panel.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

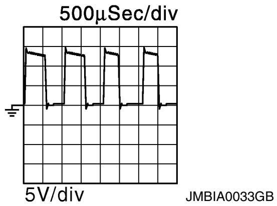
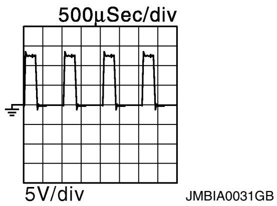
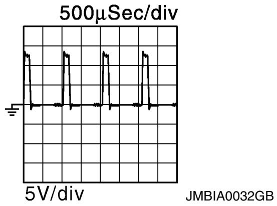
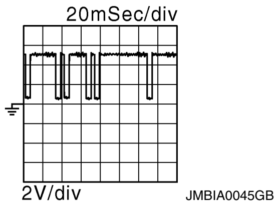
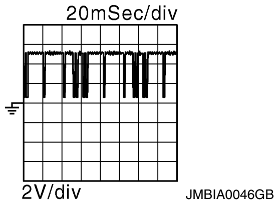
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
1 (W)	128 (B)	A/F sensor 1 heater (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★  JMBIA0030GB
2 (G)	128 (B)	Throttle control motor (Open) (bank 1)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	0 - 14 V★  JMBIA0031GB
				[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	0 - 14 V★  JMBIA0032GB
3 (R)	128 (B)	Throttle control motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
4 (BR)	128 (B)	Throttle control motor (Close) (bank 1)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: In the middle of releasing operation	0 - 14 V★  JMBIA0033GB
5 (W)	128 (B)	A/F sensor 1 heater (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★  JMBIA0030GB
8 (B)	—	ECM ground	—	—	—

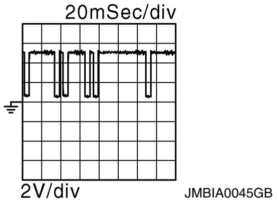
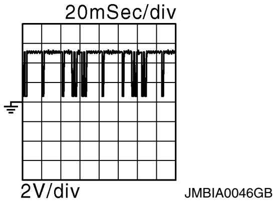
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
11 (GR) 12 (L) 15 (V) 16 (G) 19 (SB) 20 (Y)	128 (B)	Ignition signal No. 4 Ignition signal No. 3 Ignition signal No. 5 Ignition signal No. 2 Ignition signal No. 6 Ignition signal No. 1	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0.1 - 0.4 V★ 
17 (P)	128 (B)	Heated oxygen sensor 2 heater (bank 1)	Output	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	10 V★ 
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
18 (W)	128 (B)	Intake valve timing control solenoid valve (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★ 

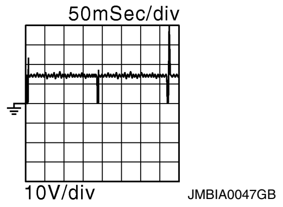
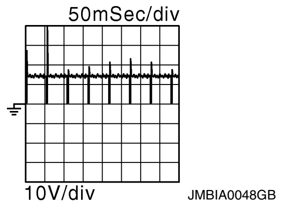
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
21 (GR)	128 (B)	EVAP canister purge volume control solenoid valve	Output	[Engine is running] • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Engine speed: About 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★ 
22 (R)	128 (B)	Fuel pump relay	Output	[Ignition switch: ON] • For 1 second after turning ignition switch ON [Engine is running]	0 - 1.5 V
				[Ignition switch: ON] • More than 1 second after turning ignition switch ON	BATTERY VOLTAGE (11 - 14 V)
24 (P)	128 (B)	ECM relay (Self shut-off)	Output	[Engine is running] [Ignition switch: OFF] • A few seconds after turning ignition switch OFF	0 - 1.5 V
				[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14 V)
25 (O)	128 (B)	Throttle control motor relay	Output	[Ignition switch: ON → OFF]	0 - 1.0 V ↓ BATTERY VOLTAGE (11 - 14 V) ↓ 0 V
				[Ignition switch: ON]	0 - 1.0 V
28 (BR)	128 (B)	VVEL actuator motor relay abort signal [VVEL control module]	Output	[Engine is running] • Warm-up condition • Idle speed	0 V
29 (G)	128 (B)	Intake valve timing control solenoid valve (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000rpm	7 - 12 V★ 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
30 (Y)	40 (R)	Throttle position sensor 1 (bank 1)	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	More than 0.36 V
				[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	Less than 4.75 V
31 (R)	48 (B)	Throttle position sensor 1 (bank 2)	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	More than 0.36 V
				[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	Less than 4.75 V
33 (SB)	128 (B)	Heated oxygen sensor 2 heater (bank 2)	Output	[Engine is running] • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	10 V★ 
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
34 (B)	40 (R)	Throttle position sensor 2 (bank 1)	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	Less than 4.75 V
				[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	More than 0.36 V
35 (W)	48 (B)	Throttle position sensor 2 (bank 2)	Input	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	Less than 4.75 V
				[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	More than 0.36 V
36 (O)	—	Sensor ground [Brake booster pressure sensor]	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
37 (W)	128 (B)	Crankshaft position sensor (POS)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	4.0 - 5.0 V★ 
38 (O)	96 (P)	Manifold absolute pressure (MAP) sensor	Input	[Engine is running] • Warm-up condition • Idle speed	1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.5 V
39 (P)	36 (O)	Brake booster pressure sensor	Input	[Engine is running] • Warm-up condition • Idle speed • Brake pedal: Fully released	1.2 V
				[Engine is running] • Warm-up condition • Idle speed • Brake pedal: Fully depressed	3.0 V
40 (R)	—	Sensor ground [Throttle position sensor (bank 1)]	—	—	—
43 (G)	48 (B)	Sensor power supply [Throttle position sensor (bank 2)]	—	[Ignition switch: ON]	5 V
44 (L)	40 (R)	Sensor power supply [Throttle position sensor (bank 1)]	—	[Ignition switch: ON]	5 V
45 (LG)	36 (O)	Sensor power supply [Brake booster pressure sensor]	—	[Ignition switch: ON]	5 V
46 (R)	128 (B)	Sensor power supply [Crankshaft position sensor (POS)]	—	[Ignition switch: ON]	5 V
47 (Y)	—	Sensor ground [Crankshaft position sensor (POS)]	—	—	—
48 (B)	—	Sensor ground [Throttle position sensor (bank 2)]	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
49 (GR)	128 (B)	Throttle control motor (Close) (bank 2)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: In the middle of releasing operation	0 - 14 V★ 
50 (V)	128 (B)	Throttle control motor (Open) (bank 2)	Output	[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully depressed	0 - 14 V★ 
				[Ignition switch: ON] • Engine stopped • Selector lever: D • Accelerator pedal: Fully released	0 - 14 V★ 
52 (R)	128 (B)	Throttle control motor power supply (bank 2)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
53 (W)	128 (B)	Ignition switch	Input	[Ignition switch: OFF]	0 V
				[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
54 (Y)	—	CAN communication line [VVEL control module]	Input/ output	—	—
55 (LG)	—	CAN communication line [VVEL control module]	Input/ output	—	—
57 (L)	128 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	2.2 V
59 (O)	128 (B)	Camshaft position sensor (PHASE) (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★ 

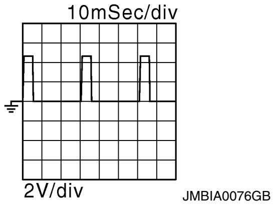
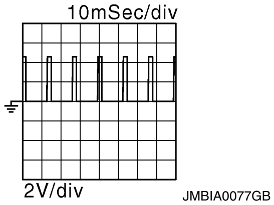
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
60 (G)	128 (B)	Sensor power supply [Camshaft position sensor (PHASE) (bank 1), Manifold absolute pressure (MAP) sensor, Power steering pressure sensor]	—	[Ignition switch: ON]	5 V
61 (R)	128 (B)	A/F sensor 1 (bank 1)	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.8 V Output voltage varies with air fuel ratio.
63 (L)	128 (B)	Camshaft position sensor (PHASE) (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★ 
64 (SB)	128 (B)	Sensor power supply [Camshaft position sensor (PHASE) (bank 2), Battery current sensor]	—	[Ignition switch: ON]	5 V
65 (LG)	128 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	2.2 V
66 (V)	128 (B)	A/F sensor 1 (bank 2)	Input	[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	1.8 V Output voltage varies with air fuel ratio.
67 (P)	128 (B)	Intake air temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.
68 (LG)	—	Sensor ground [Mass air flow sensor (bank 1), Intake air temperature sensor]	—	—	—
69 (W)	128 (B)	Knock sensor (bank 2)	Input	[Engine is running] • Idle speed	2.5 V*1
71 (Y)	128 (B)	Engine coolant temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine coolant temperature.
72 (—)	—	Sensor ground (Knock sensor)	—	—	—
73 (W)	128 (B)	Knock sensor (bank 1)	Input	[Engine is running] • Idle speed	2.5 V*1

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
76 (W)	128 (B)	Heated oxygen sensor 2 (bank 1)	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
77 (SB)	68 (LG)	Mass air flow sensor (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	0.7 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.3 - 1.7 V
78 (G)	84 (B)	Engine oil temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with engine oil temperature.
79 (BR)	94 (Y)	Mass air flow sensor (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	0.7 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.3 - 1.7 V
80 (O)	128 (B)	Heated oxygen sensor 2 (bank 2)	Input	[Engine is running] • Revving engine from idle to 3,000 rpm quickly after the following conditions are met - Engine: after warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
81 (R) 82 (V) 85 (BR) 86 (W) 89 (GR) 90 (O)	128 (B)	Fuel injector No. 3 Fuel injector No. 6 Fuel injector No. 2 Fuel injector No. 5 Fuel injector No. 1 Fuel injector No. 4	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★ 
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★ 
84 (B)	—	Sensor ground (Heated oxygen sensor 2, Engine coolant temperature sensor, Engine oil temperature sensor)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
87 (Y)	96 (P)	Power steering pressure sensor	Output	[Engine is running] • Steering wheel: Being turned	0.5 - 4.5 V
				[Engine is running] • Steering wheel: Not being turned	0.4 - 0.8 V
91 (SB)	95 (G)	Battery current sensor	Input	[Engine is running] • Battery: Fully charged*2 • Idle speed	2.6 - 3.5 V
92 (G)	—	Sensor ground [Camshaft position sensor (PHASE) (bank 2)]	—	—	—
93 (P)	128 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
94 (Y)	—	Sensor ground [Mass air flow sensor (bank 2)]	—	—	—
95 (G)	—	Sensor ground (Battery current sensor)	—	—	—
96 (P)	—	Sensor ground [Camshaft position sensor (PHASE) (bank 1),Manifold absolute pressure (MAP) sensor, Power steering pressure sensor]	—	—	—
97 (R)	100 (W)	Accelerator pedal position sensor 1	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.45 - 1.00 V
				[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	4.2 - 4.8 V
98 (P)*3 (Y)*4	104 (GR)*3 (BR)*4	Accelerator pedal position sensor 2	Input	[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully released	0.22 - 0.50 V
				[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	2.1 - 2.5 V
99 (L)*3 (G)*4	100 (W)	Sensor power supply (Accelerator pedal position sensor 1)	—	[Ignition switch: ON]	5 V
100 (W)	—	Sensor ground (Accelerator pedal position sensor 1)	—	—	—

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
101 (SB)	108 (Y)	ICC steering switch (models with ICC system)	Input	[Ignition switch: ON] • ICC steering switch: OFF	4 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.5 V
				[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3.4 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	2.8 V
				[Ignition switch: ON] • DISTANCE switch: Pressed	2.2 V
				[Ignition switch: ON] • LDP/DCA switch: Pressed	0.8 V
101 (SB)	108 (Y)	ASCD steering switch (models with ASCD system)	Input	[Ignition switch: ON] • ASCD steering switch: OFF	4 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1 V
				[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	2 V
102 (LG)	112 (V)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	1.8 - 4.8 V
103 (G)*3 (L)*4	104 (GR)*3 (BR)*4	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5 V
104 (GR)*3 (BR)*4	—	Sensor ground (Accelerator pedal position sensor 2)	—	—	—
105 (L)	112 (V)	Refrigerant pressure sensor	Input	[Engine is running] • Warm-up condition • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0 V
106 (W)	128 (B)	Fuel tank temperature sensor	Input	[Engine is running]	0 - 4.8 V Output voltage varies with fuel tank temperature.
107 (BG)	112 (V)	Sensor power supply (EVAP control system pressure sensor, Refrigerant pressure sensor)	—	[Ignition switch: ON]	5 V
108 (Y)	—	Sensor ground (ASCD/ICC steering switch)	—	—	—

A
EC
C
D
E
F
G
H
I
J
K
L
M
N
O
P

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
109 (G)	128 (B)	PNP signal	Input	[Ignition switch: ON] • Selector lever: P or N	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON] • Selector lever: Except above	0 V
110 (R)	128 (B)	Engine speed output signal	Output	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	1 V★ 
				[Engine is running] • Engine speed is 2,000 rpm	1 V★ 
112 (V)	—	Sensor ground (EVAP control system pressure sensor, Refrigerant pressure sensor)	—	—	—
113 (P)	—	CAN communication line	Input/ Output	—	—
114 (L)	—	CAN communication line	Input/ Output	—	—
117 (V)	128 (B)	Data link connector	Input/ Output	—	—
121 (LG)	128 (B)	EVAP canister vent control valve	Output	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
122 (P)	128 (B)	Stop lamp switch	Input	[Ignition switch: OFF] • Brake pedal: Fully released	0 V
				[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
123 (B) 124 (B)	—	ECM ground	—	—	—
125 (R)	128 (B)	Power supply for ECM	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
126 (BR)	128 (B)	ICC brake switch (models with ICC system) ASCD brake switch (models with ASCD system)	Input	[Ignition switch: ON] • Brake pedal: Slightly depressed	0 V
				[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)
127 (B) 128 (B)	—	ECM ground	—	—	—

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)
*1: This may vary depending on internal resistance of the tester.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to PG-3, "How to Handle Battery".

*3: Without ICC

*4: With ICC

Wiring Diagram - ENGINE CONTROL SYSTEM -

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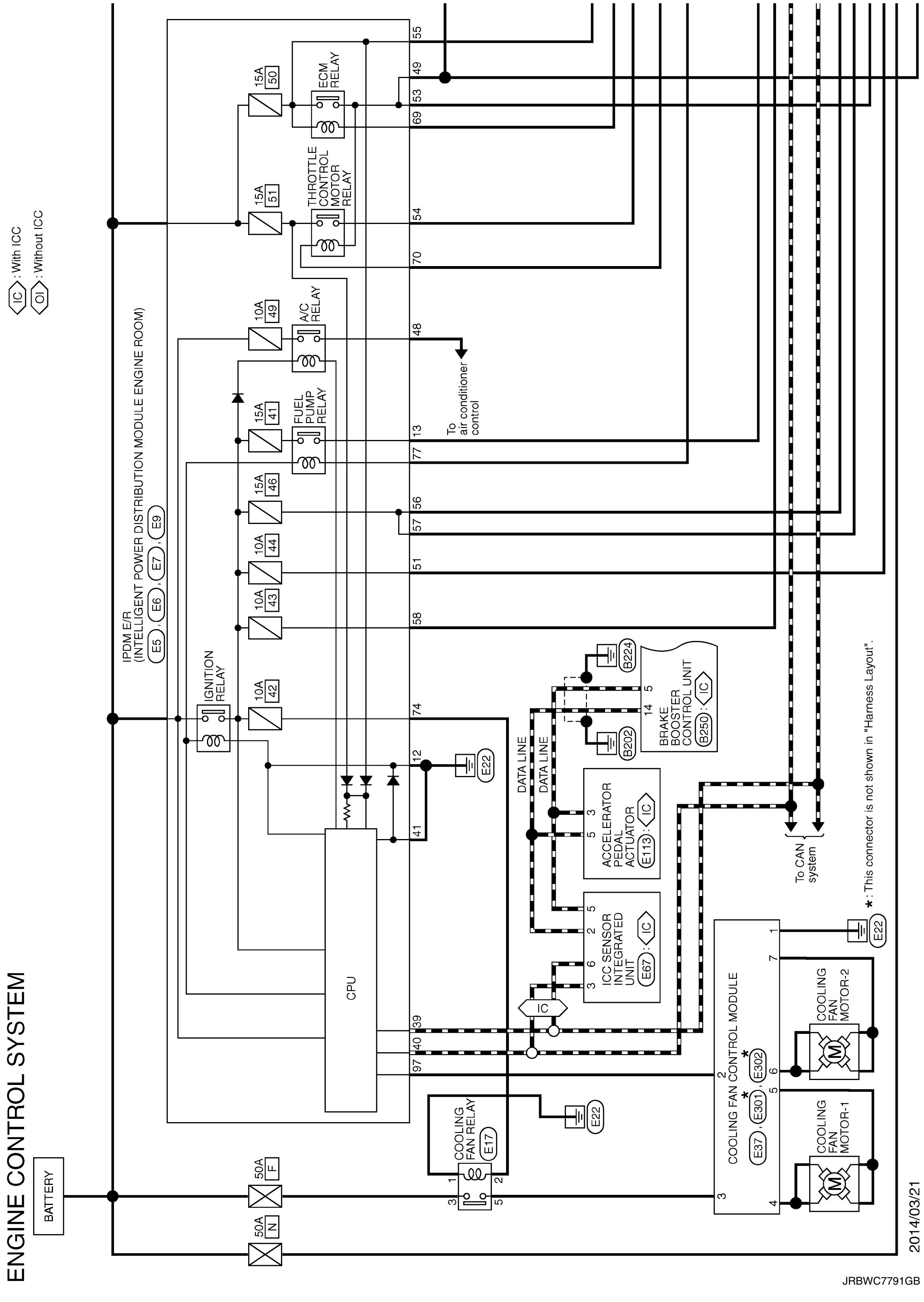
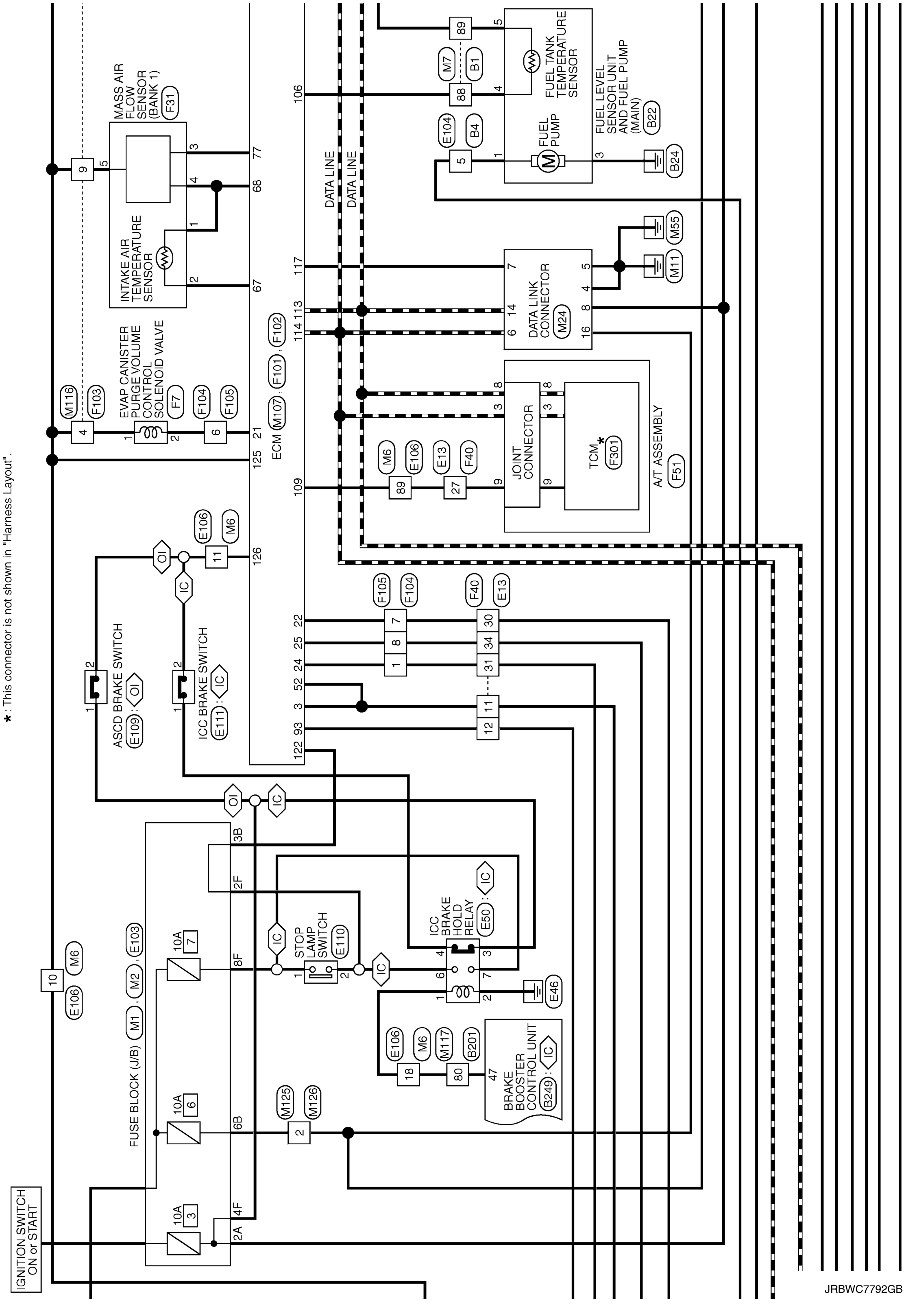
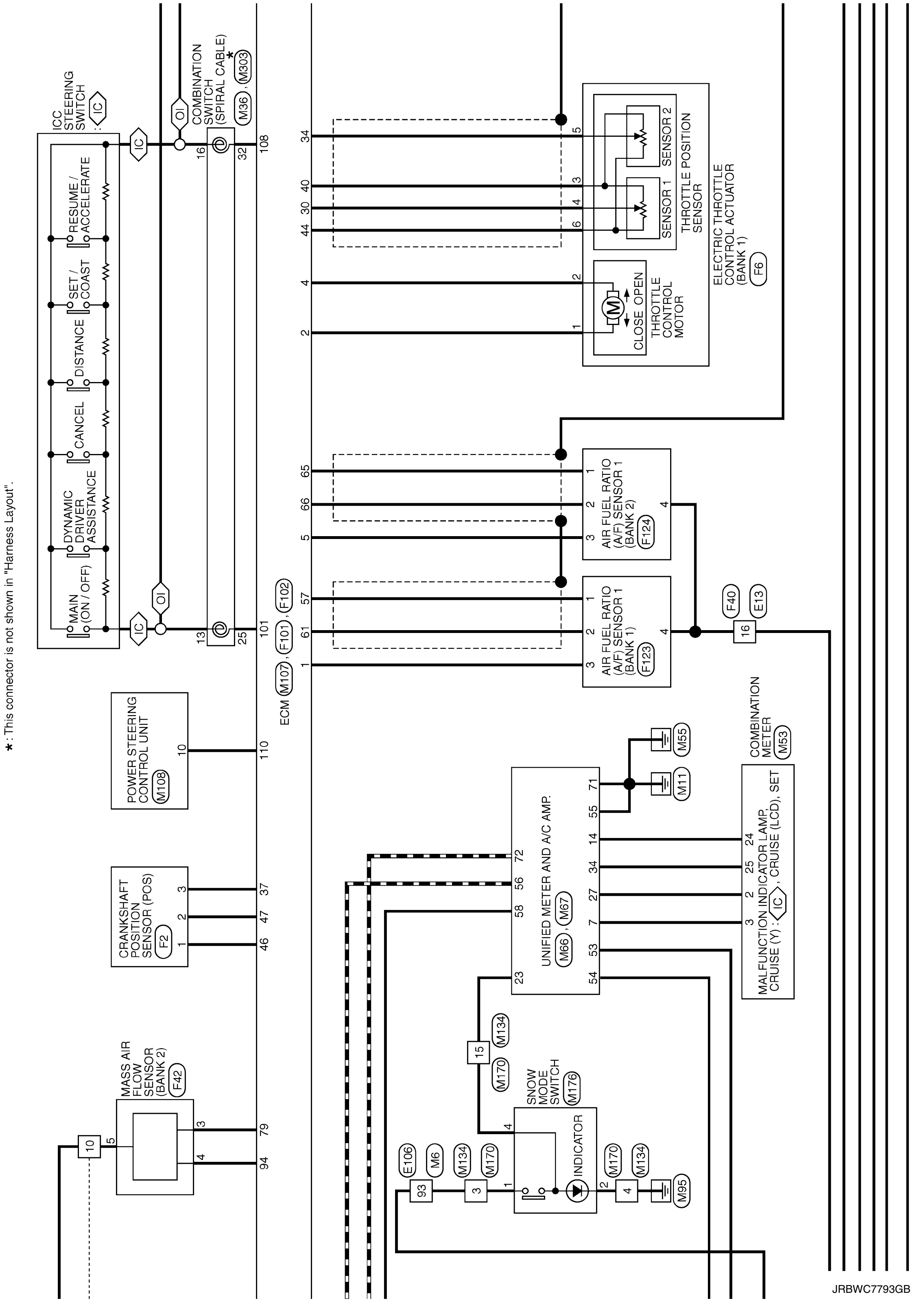
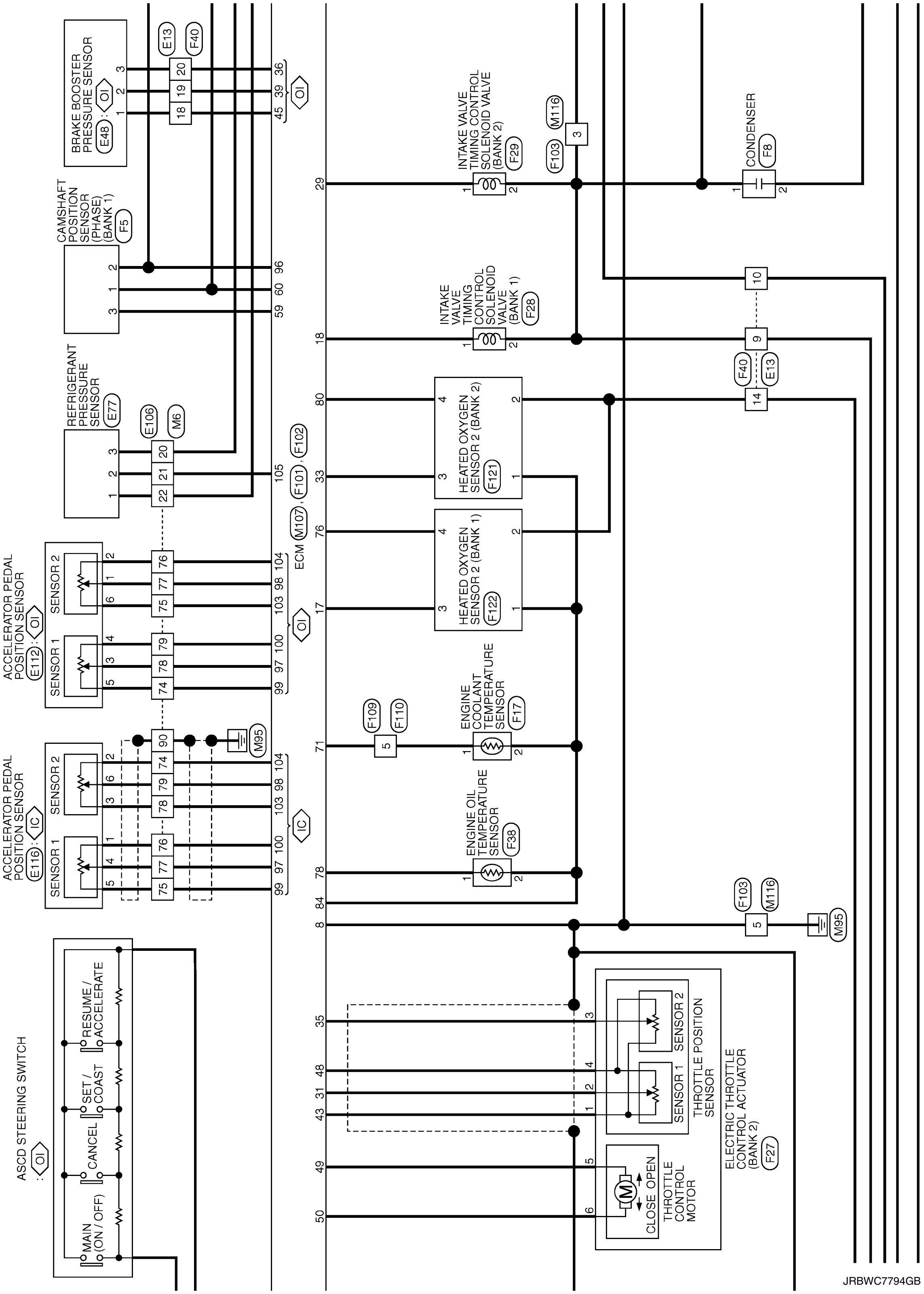
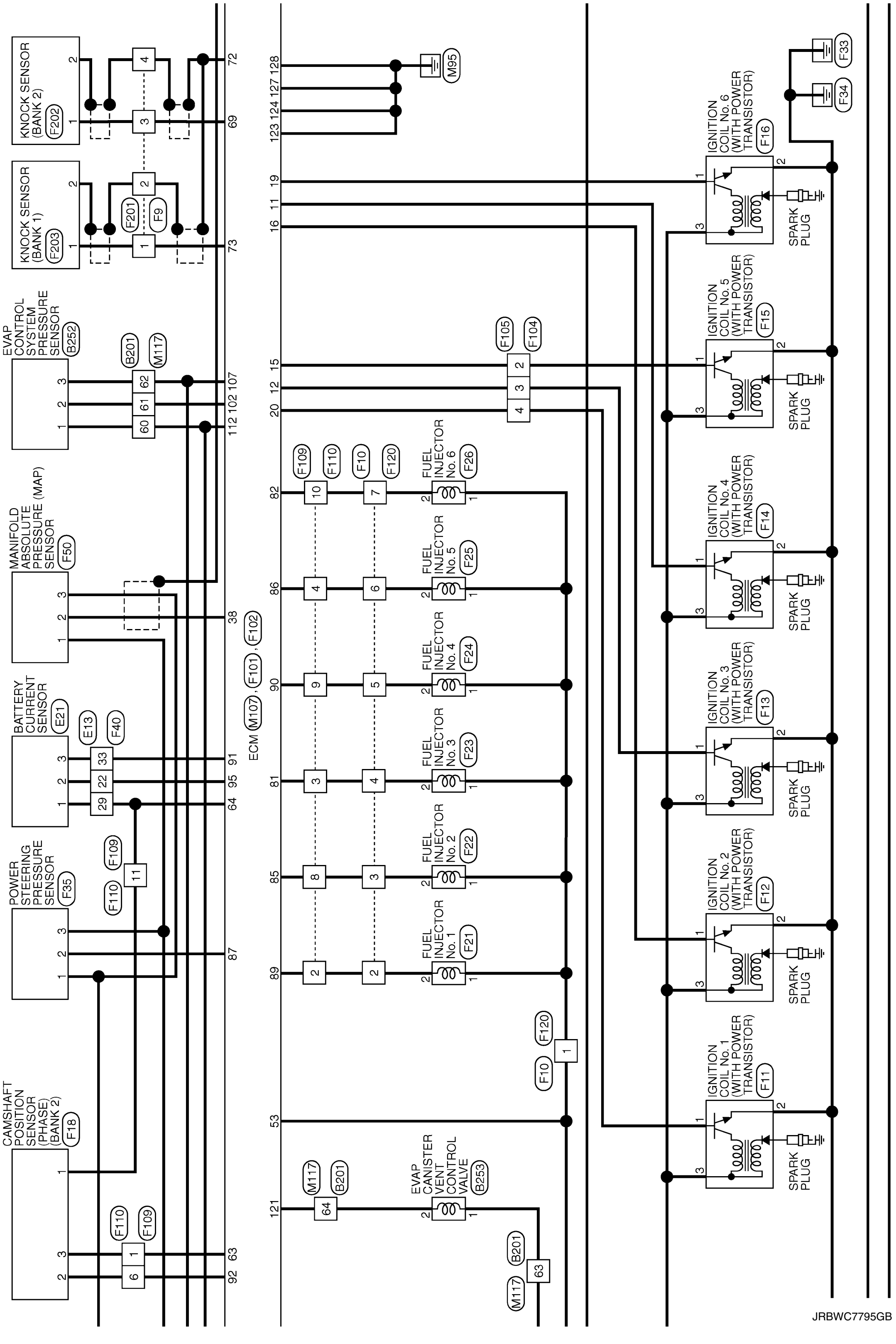
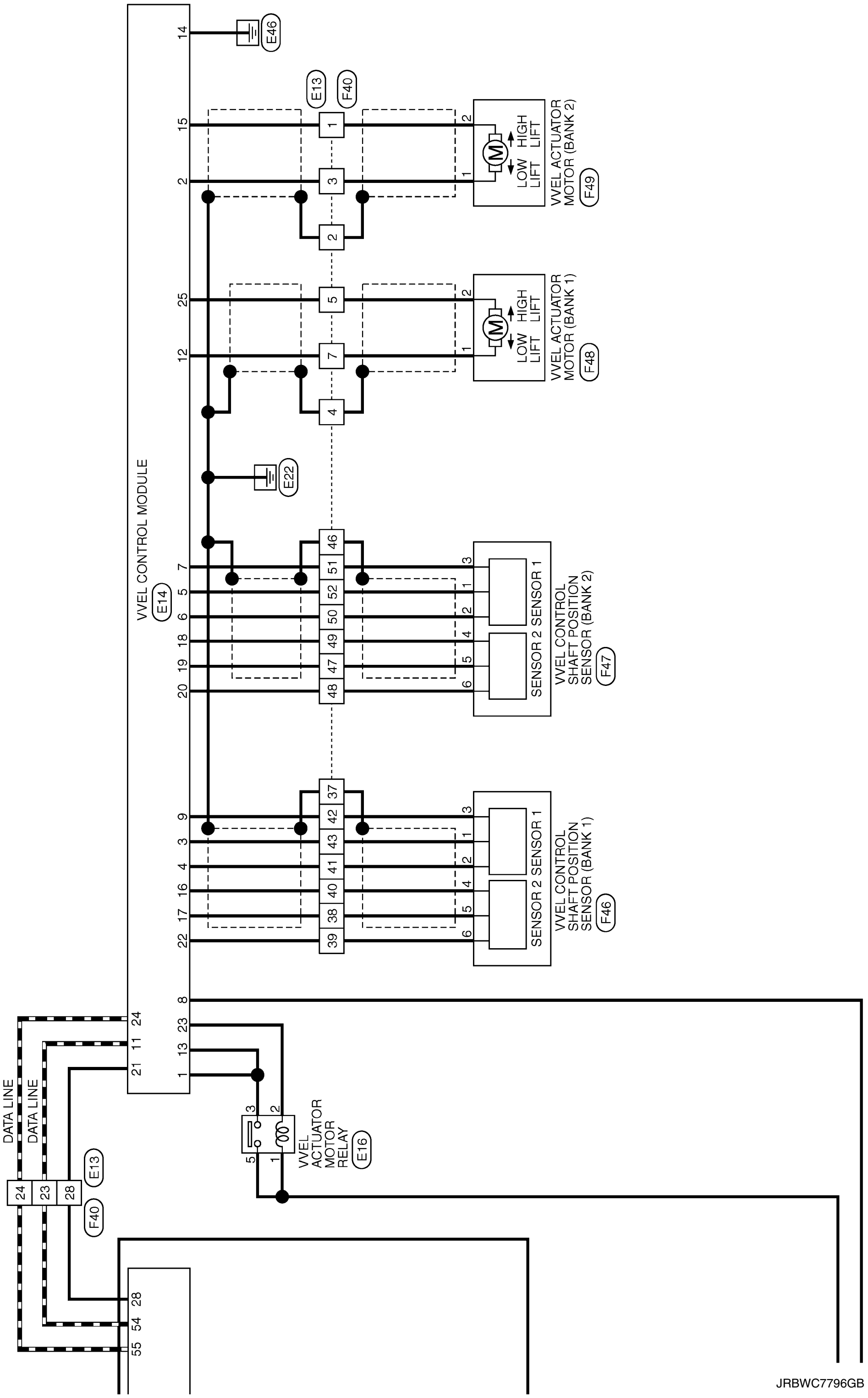



MASS AIR FLOW SENSOR (BANK 1)
F31
INTAKE AIR TEMPERATURE SENSOR
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
F7
M116
F103
F104
F105
ECM
M107
F101
F102
77
68
67
21
125
126
106
117
113
114
109
22
25
24
52
3
93
122
DATA LINE
DATA LINE
FUEL TANK TEMPERATURE SENSOR
FUEL PUMP
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN)
B22
M7
B1
E104
B4
89
88
5
B24
DATA LINK CONNECTOR
M24
M55
M11
JOINT CONNECTOR
TCM *
F301
A/T ASSEMBLY
F51
M6
E106
E13
F40
89
27
E106
M6
11
* : This connector is not shown in "Harness Layout".
ASCD BRAKE SWITCH
E109 : OI
ICC BRAKE SWITCH
E111 : IC
OI
IC
F105
F104
F40
E13
7
8
1
30
34
31
11
12
FUSE BLOCK (J/B)
M1
M2
E103
10
E106
M6
10A
7
10A
6
10A
3
3B
2F
8F
6B
4F
2A
IGNITION SWITCH ON or START
STOP LAMP SWITCH
E110
ICC BRAKE HOLD RELAY
E50 : IC
E46
E106
M6
M117
B201
18
80
47
BRAKE BOOSTER CONTROL UNIT
B249 : IC
M125
M126
2
JRBWC7792GB


*: This connector is not shown in "Harness Layout".
ICC STEERING SWITCH : IC
MAIN (ON / OFF)
DYNAMIC DRIVER ASSISTANCE
CANCEL
DISTANCE
SET / COAST
RESUME / ACCELERATE
IC
OI
COMBINATION SWITCH (SPIRAL CABLE) M36, M303 *
16
32
13
25
108
101
ECM M107, F101, F102
POWER STEERING CONTROL UNIT M108
10
110
CRANKSHAFT POSITION SENSOR (POS) F2
3
2
1
37
47
46
MASS AIR FLOW SENSOR (BANK 2) F42
10
5
3
4
79
94
34
40
30
44
4
2
5
3
4
6
2
1
SENSOR 2
SENSOR 1
THROTTLE POSITION SENSOR
THROTTLE CONTROL MOTOR
CLOSE OPEN
M
ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 1) F6
65
66
5
1
2
3
4
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2) F124
57
61
1
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1) F123
F40
E13
16
M55
M11
71
55
14
34
27
7
53
54
72
56
58
23
UNIFIED METER AND A/C AMP. M66, M67
COMBINATION METER M53
24
25
2
3
MALFUNCTION INDICATOR LAMP, CRUISE (Y) : IC, CRUISE (LCD), SET
15
M134
M170
SNOW MODE SWITCH M176
4
INDICATOR
1
2
E106
M6
M134
M170
93
3
M170
M134
4
M95
JRBWC7793GB


BRAKE BOOSTER PRESSURE SENSOR
E48 : OI
E13
F40
CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
F5
REFRIGERANT PRESSURE SENSOR
E77
E106
M6
ACCELERATOR PEDAL POSITION SENSOR
E112 : OI
SENSOR 1
SENSOR 2
ECM
M107, F101, F102
OI
IC
M95
ACCELERATOR PEDAL POSITION SENSOR
E116 : IC
ASCD STEERING SWITCH
: OI
MAIN (ON / OFF)
CANCEL
SET / COAST
RESUME / ACCELERATE
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
F29
F103
M116
CONDENSER
F8
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
F28
F40
E13
HEATED OXYGEN SENSOR 2 (BANK 2)
F121
HEATED OXYGEN SENSOR 2 (BANK 1)
F122
F109
F110
ENGINE COOLANT TEMPERATURE SENSOR
F17
ENGINE OIL TEMPERATURE SENSOR
F38
F103
M116
M95
SENSOR 2
SENSOR 1
THROTTLE POSITION SENSOR
ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 2)
F27
THROTTLE CONTROL MOTOR
CLOSE
OPEN
M
JRBWC7794GB


KNOCK SENSOR (BANK 2)
F202
KNOCK SENSOR (BANK 1)
F203
F201
F9
EVAP CONTROL SYSTEM PRESSURE SENSOR
B252
B201
M117
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
F50
BATTERY CURRENT SENSOR
E21
E13
F40
POWER STEERING PRESSURE SENSOR
F35
F109
F110
CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)
F18
ECM
M107
F101
F102
72
69
73
107
102
112
38
91
95
64
87
63
92
128
127
124
123
M95
19
11
16
15
12
20
82
86
90
81
85
89
53
121
F105
F104
F10
F120
FUEL INJECTOR No. 6
F26
FUEL INJECTOR No. 5
F25
FUEL INJECTOR No. 4
F24
FUEL INJECTOR No. 3
F23
FUEL INJECTOR No. 2
F22
FUEL INJECTOR No. 1
F21
EVAP CANISTER VENT CONTROL VALVE
B253
IGNITION COIL No. 6 (WITH POWER TRANSISTOR)
F16
IGNITION COIL No. 5 (WITH POWER TRANSISTOR)
F15
IGNITION COIL No. 4 (WITH POWER TRANSISTOR)
F14
IGNITION COIL No. 3 (WITH POWER TRANSISTOR)
F13
IGNITION COIL No. 2 (WITH POWER TRANSISTOR)
F12
IGNITION COIL No. 1 (WITH POWER TRANSISTOR)
F11
SPARK PLUG
F33
F34
JRBWC7795GB

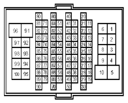


JRBWC7796GB

ENGINE CONTROL SYSTEM

Connector No.	B1
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

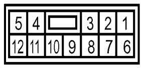
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3	R	–
5	G	–
6	SB	–
7	V	–
8	L	–
11	V	–
12	SB	–
13	LG	–
14	GR	–
15	LG	–
16	R	–
17	W	–
18	SB	–
19	LG	–
20	BR	–
21	SHIELD	–
22	Y	–
24	P	–
27	B	–
28	R	–
29	W	–
30	SHIELD	–
31	SHIELD	–
32	W	–
33	SB	–
34	L	–
35	P	–
36	L	–
37	P	–
38	P	–
39	Y	–
40	SB	–
44	Y	–
45	GR	–
46	LG	–
47	SB	–
48	BG	–
49	R	–
50	L	–
60	P	–
61	L	–
62	SHIELD	–
63	R	–
64	G	–
65	SHIELD	–
66	W	–
67	V	–
68	SB	–
69	SHIELD	–
70	W	–
73	SB	–
74	L	–
75	W	–
76	BR	–
77	R	–
78	P	–
79	GR	–
83	BG	–
85	V	–
86	LG	–
87	Y	–
88	R	–
89	B	–
90	BG	–
91	G	–
92	BR	–
93	G	–
94	SB	–
95	G	–
96	Y	–
98	W	–
99	GR	–

Connector No.	B4
Connector Name	WIRE TO WIRE
Connector Type	NS12FW-CS

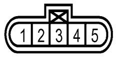
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	B	–
3	G	–
4	SHIELD	–
5	P	–
7	Y	–
8	R	–
9	BR	–
10	BG	–
11	LG	–
12	GR	–

Connector No.	B22
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN)
Connector Type	E05FGY-RS

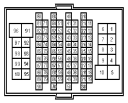
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	W	–
3	B	–
4	R	–
5	B	–

Connector No.	B201
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	R	–
3	GR	–
4	BG	–
7	LG	–
10	W	–
15	SB	–
16	V	–
17	BR	–
26	BR	–
27	L	–
28	Y	–
29	Y	–
30	GR	–
31	R	–
32	BR	–
33	G	–
51	R	–
55	G	–
56	R	–
57	W	–
58	B	–
59	SHIELD	–
60	LG	–
61	W	–
62	BR	–
63	P	–
64	L	–
65	G	–
66	P	–
67	L	–
68	SHIELD	–
69	V	–
70	Y	–
71	SB	–

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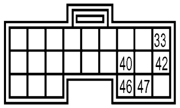
72	W	–
73	BR	–
75	Y	–
80	V	–
81	SB	–
82	LG	–
83	P	–
84	R	–
85	L	–
86	BG	–
87	L	–
88	P	–
91	V	–
92	R	–
94	R	–
95	SB	–
96	G	–
97	G	–
98	R	–
99	P	–
100	L	–

Connector No.	B249
Connector Name	BRAKE BOOSTER CONTROL UNIT
Connector Type	TK24FGY

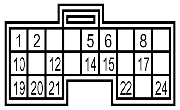
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
33	BR	IGNITION
40	SB	IBA OFF SW
42	G	IGNITION
46	B	GROUND
47	V	BRAKE HOLD RLY DRIVE SIGNAL

Connector No.	B250
Connector Name	BRAKE BOOSTER CONTROL UNIT
Connector Type	TK24FW

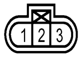
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	BATTERY
2	W	BATTERY
5	P	ITS COMM-L
6	SB	RELEASE SW PWR
8	R	BRAKE PRESSURE SEN PWR
10	G	BOOSTER SOL PWR
12	R	BOOSTER SOL GND
14	L	ITS COMM-H
15	LG	RELEASE SW (NC)
17	L	BRAKE PRESSURE SEN SIGNAL
19	B	GROUND
20	B	GROUND
21	Y	CHIME SIGNAL
22	P	RELEASE SW (NO)
24	BG	BRAKE PRESSURE SEN GND

Connector No.	B252
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Type	E03FGY-RS

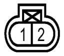
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	–
2	W	–
3	BR	–

Connector No.	B253
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Type	E02FB-RS

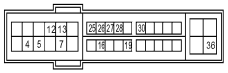
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	L	–

Connector No.	E5
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4-1V

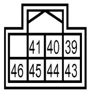
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
4	V	–
5	L	–
7	R	–
12	B/W	–
13	Y	–
16	LG	–
19	W	–
25	G	–
26	R	–
27	BG	–
28	L	–
30	GR	–
36	G	–

Connector No.	E6
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH08FW-NH

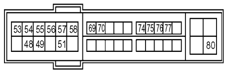
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
39	P	–
40	L	–
41	B/W	–
43	SB	–
44	BR	–
45	G	–
46	R	–

Connector No.	E7
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
48	L	–
49	BG	–
51	Y	–
53	W	–
54	P	–
55	SB	–
56	LG	–
57	G	–
58	V	–
69	BR	–
70	BG	–
74	P	–
75	SB	–

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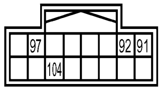
76	Y	–
77	R	–
80	W	–

Connector No.	E9
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH16FW-NH

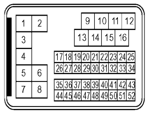
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
91	P	–
92	BG	–
97	V	–
104	LG	–

Connector No.	E13
Connector Name	WIRE TO WIRE
Connector Type	SAA36MB-RS8-SHZ8

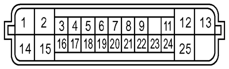
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/Y	–
2	SHIELD	–
3	L/B	–
4	SHIELD	–
5	BR	–
7	G	–
8	W	–
9	W	–
10	Y	–
11	P	–
12	SB	–
13	L	–
14	G	–
15	R	–
16	LG	–
18	Y	–
19	BG	–
20	B	–
21	SB	–
22	W	–
23	L	–
24	G	–
25	LG	–
27	GR	–
28	V	–
29	P	–
30	R	–
31	BR	–
32	Y	–
33	G	–
34	BG	–
37	SHIELD	–
38	L	–
39	P	–
40	R	–
41	W	–
42	LG	–
43	G	–
45	BG	–
46	SHIELD	–
47	W	–
48	BR	–
49	G	–
50	B	–
51	SB	–
52	R	–

Connector No.	E14
Connector Name	VVEL CONTROL MODULE
Connector Type	RH18FB-AJZ8-RH

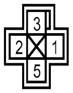
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 2)
2	L/B	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 2)
3	G	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)
4	W	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)]
5	R	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)
6	B	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)]
7	SB	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)]
8	BG	POWER SUPPLY FOR VVEL CONTROL MODULE
9	LG	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)]
11	G	ENGINE COMMUNICATION LINE
12	G	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 1)
13	W	VVEL ACTUATOR MOTOR RELAY POWER SUPPLY (BANK 1)
14	B/W	VVEL CONTROL MODULE GROUND
15	L/Y	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 2)
16	R	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)
17	L	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)]
18	G	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)
19	W	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)]
20	BR	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)]
21	V	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL
22	P	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)]
23	GR	VVEL ACTUATOR MOTOR RELAY
24	L	ENGINE COMMUNICATION LINE
25	BR	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 1)

Connector No.	E16
Connector Name	VVEL ACTUATOR MOTOR RELAY
Connector Type	24347_9F900

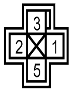
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	GR	–
3	V	–
5	R	–

Connector No.	E17
Connector Name	COOLING FAN RELAY
Connector Type	24347_9F900

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	–
2	P	–
3	W	–
5	R	–

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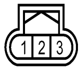
ENGINE CONTROL SYSTEM

Connector No.	E21
Connector Name	BATTERY CURRENT SENSOR
Connector Type	RH03FB

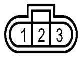
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	W	–
3	G	–

Connector No.	E37
Connector Name	COOLING FAN CONTROL MODULE
Connector Type	SJZ01FGY-SNZ2

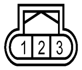
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	–
2	V	–
3	R	–

Connector No.	E48
Connector Name	BRAKE BOOSTER PRESSURE SENSOR
Connector Type	RH03FB

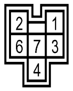
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	AVCC2_MVPRES
2	BG	MVPRES
3	B	GNDA_MVPRES

Connector No.	E50
Connector Name	ICC BRAKE HOLD RELAY
Connector Type	M06FGY-R-US

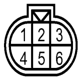
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	–
2	B	–
3	P	–
4	SB	–
6	P	–
7	R	–

Connector No.	E67
Connector Name	ICC SENSOR INTEGRATED UNIT
Connector Type	RS06FB-PR

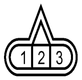
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	IGNITION
2	L	ITS COMM-H
3	L	CAN-H
4	B	GROUND
5	P	ITS COMM-L
6	P	CAN-L

Connector No.	E77
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB

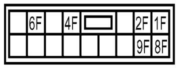
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	–
2	L	–
3	BG	–

Connector No.	E103
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS

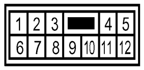
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1F	SB	–
2F	W	–
4F	G	–
6F	BR	–
8F	L	–
9F	R	–

Connector No.	E104
Connector Name	WIRE TO WIRE
Connector Type	NS12MW-CS

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	BR	–
3	L	–
4	SHIELD	–
5	Y	–
7	Y	–
8	R	–
9	BR	–
10	BG	–
11	LG	–
12	GR	–

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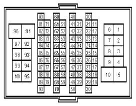
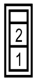
Connector No.	E106
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4



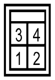
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	W	–
3	B	–
4	GR	–
5	GR	–
8	Y	–
9	BR	–
10	BG	–
11	SB	–
12	BG	–
13	L	–
14	R	–
15	P	–
16	V	–
17	SB	–
18	V	–
20	BG	–
21	L	–
22	V	–
23	G	–
24	P	–
25	Y	–
26	V	–
27	W	–
28	G	–
31	BG	–
32	W	–
33	B	–
34	R	–
35	G	–
36	SHIELD	–
37	V	–
38	BR	–
39	BG	–
41	W	–
42	G	–
43	BR	–
45	W	–
49	L	–
50	P	–
51	L	–
54	BG	–
57	BR	–
59	W	–
60	LG	–
61	G	–
62	SB	–
63	W	–
64	B	–
65	G	–
66	R	–
67	SHIELD	–
68	Y	–
69	LG	–
70	W	–
71	R	–
72	Y	–
73	B	–
74	BR	– [With ICC]
74	L	– [Without ICC]
75	G	– [With ICC]
75	W	– [Without ICC]
76	W	– [With ICC]
76	Y	– [Without ICC]
77	P	– [Without ICC]
77	R	– [With ICC]
78	BR	– [Without ICC]
78	L	– [With ICC]
79	L	– [Without ICC]
79	Y	– [With ICC]
80	SB	–
81	R	–
82	SB	–
83	BG	–
84	G	–
85	L	–
86	P	–
87	V	–
89	GR	–
90	SHIELD	–
91	W	–
92	Y	–
93	V	–
94	LG	–
95	BG	–
96	P	–
97	R	–
98	SHIELD	–
99	L	–
100	P	–

Connector No.	E109
Connector Name	ASCD BRAKE SWITCH
Connector Type	M02FBR-LC



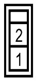
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	SB	–

Connector No.	E110
Connector Name	STOP LAMP SWITCH
Connector Type	M04FW-LC



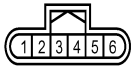
Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	W	–
3	Y	–
4	SB	–

Connector No.	E111
Connector Name	ICC BRAKE SWITCH
Connector Type	M02FBR-LC



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	–
2	SB	–

Connector No.	E112
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	RH06FB



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	Y	–
3	BR	–
4	L	–
5	L	–
6	W	–

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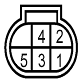
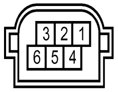
Connector No.	E113
Connector Name	ACCELERATOR PEDAL ACTUATOR
Connector Type	KDZ06FB



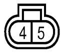
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	IGNITION
2	BG	BATTERY
3	P	ITS COMM-L
4	B/W	GROUND
5	L	ITS COMM-H

Connector No.	E116
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	AAZ06FB1



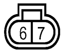
Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	BR	–
3	L	–
4	R	–
5	G	–
6	Y	–

Connector No.	E301
Connector Name	COOLING FAN CONTROL MODULE (COOLING FAN MOTOR-1)
Connector Type	6188-0259



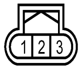
Terminal No.	Color Of Wire	Signal Name [Specification]
4	–	–
5	–	–

Connector No.	E302
Connector Name	COOLING FAN CONTROL MODULE (COOLING FAN MOTOR-2)
Connector Type	6188-0259



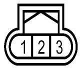
Terminal No.	Color Of Wire	Signal Name [Specification]
6	–	–
7	–	–

Connector No.	F2
Connector Name	CRANKSHAFT POSITION SENSOR (POS)
Connector Type	RH03FB



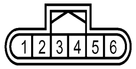
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	Y	–
3	W	–

Connector No.	F5
Connector Name	CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
Connector Type	RH03FB



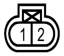
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	P	–
3	O	–

Connector No.	F6
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 1)
Connector Type	RH06FB



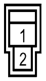
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	MOTOR1-1
2	BR	MOTOR1-2
3	R	GND-A(TPS)
4	Y	TPS1-1
5	B	OUTPUT2(TPS)
6	L	INPUT(TPS)

Connector No.	F7
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	E02FL-RS-LGY



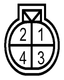
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	GR	–

Connector No.	F8
Connector Name	CONDENSER
Connector Type	M02FW-LC



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	B	–

Connector No.	F9
Connector Name	WIRE TO WIRE
Connector Type	RS04FL-B



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–

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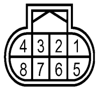
2	SHIELD	–
3	W	–
4	SHIELD	–

Connector No.	F10
Connector Name	WIRE TO WIRE
Connector Type	RH08FB

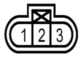
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	GR	–
3	BR	–
4	R	–
5	O	–
6	W	–
7	V	–

Connector No.	F11
Connector Name	IGNITION COIL No. 1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

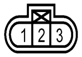
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	–
2	B	–
3	W	–

Connector No.	F12
Connector Name	IGNITION COIL No. 2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

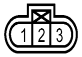
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	B	–
3	W	–

Connector No.	F13
Connector Name	IGNITION COIL No. 3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

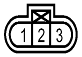
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	B	–
3	W	–

Connector No.	F14
Connector Name	IGNITION COIL No. 4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

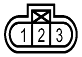
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	–
2	B	–
3	W	–

Connector No.	F15
Connector Name	IGNITION COIL No. 5 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

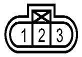
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	–
2	B	–
3	W	–

Connector No.	F16
Connector Name	IGNITION COIL No. 6 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

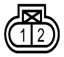
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	–
2	B	–
3	W	–

Connector No.	F17
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	–
2	B	–

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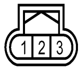
ENGINE CONTROL SYSTEM

Connector No.	F18
Connector Name	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)
Connector Type	RH03FB

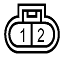
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	–
2	G	–
3	L	–

Connector No.	F21
Connector Name	FUEL INJECTOR No. 1
Connector Type	HS02FGY

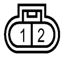
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	GR	–

Connector No.	F22
Connector Name	FUEL INJECTOR No. 2
Connector Type	HS02FGY

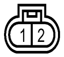
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	BR	–

Connector No.	F23
Connector Name	FUEL INJECTOR No. 3
Connector Type	HS02FGY

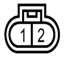
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	R	–

Connector No.	F24
Connector Name	FUEL INJECTOR No. 4
Connector Type	HS02FGY

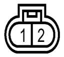
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	O	–

Connector No.	F25
Connector Name	FUEL INJECTOR No. 5
Connector Type	HS02FGY

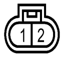
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	W	–

Connector No.	F26
Connector Name	FUEL INJECTOR No. 6
Connector Type	HS02FGY

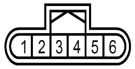
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	V	–

Connector No.	F27
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 2)
Connector Type	RH06FB

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	R	–
3	W	–
4	B	–
5	GR	–
6	V	–

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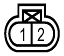
ENGINE CONTROL SYSTEM

Connector No.	F28
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
Connector Type	E02FG-RS-LGY

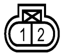
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	R	–

Connector No.	F29
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
Connector Type	E02FG-RS-LGY

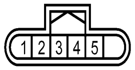
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	R	–

Connector No.	F31
Connector Name	MASS AIR FLOW SENSOR (BANK 1)
Connector Type	RH06FB

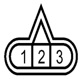
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	–
2	P	–
3	SB	–
4	LG	–
5	Y	–

Connector No.	F35
Connector Name	POWER STEERING PRESSURE SENSOR
Connector Type	RK03FB

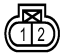
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	–
2	Y	–
3	R	–

Connector No.	F38
Connector Name	ENGINE OIL TEMPERATURE SENSOR
Connector Type	E02FGY-RS

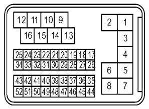
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	B	–

Connector No.	F40
Connector Name	WIRE TO WIRE
Connector Type	SAA36FB-RS8-SHZ8

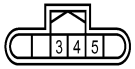
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/Y	–
2	SHIELD	–
3	L/B	–
4	SHIELD	–
5	BR	–
7	G	–
8	W	–
9	W	–
10	G	–
11	R	–
12	P	–
13	L	–
14	LG	–
15	BR	–
16	Y	–
18	LG	–
19	P	–
20	O	–
21	Y	–
22	G	–
23	Y	–
24	LG	–
25	V	–
27	GR	–
28	BR	–
29	L	–
30	R	–
31	P	–
32	W	–
33	SB	–
34	O	–
37	SHIELD	–
38	W	–
39	Y	–
40	G	–
41	B	–
42	GR	–
43	R	–
45	O	–
46	SHIELD	–
47	W/L	–
48	LG	–
49	O/L	–
50	L/Y	–
51	W	–
52	L/G	–

Connector No.	F42
Connector Name	MASS AIR FLOW SENSOR (BANK 2)
Connector Type	RH06FB

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3	BR	–
4	Y	–
5	GR	–

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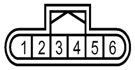
ENGINE CONTROL SYSTEM

Connector No.	F46
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
Connector Type	RH06FB

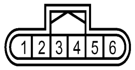
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	VEL/S-R1
2	B	AGND1
3	GR	AVCC1
4	G	VEL/S-R2
5	W	AGND2
6	Y	AVCC2

Connector No.	F47
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
Connector Type	RH06FB

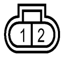
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/G	VEL/S-R1
2	L/Y	AGND3
3	W	AVCC3
4	O/L	VEL/S-L2
5	W/L	AGND4
6	LG	AVCC4

Connector No.	F48
Connector Name	VVEL ACTUATOR MOTOR (BANK 1)
Connector Type	X02FB

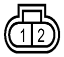
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	BR	–

Connector No.	F49
Connector Name	VVEL ACTUATOR MOTOR (BANK 2)
Connector Type	X02FB

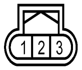
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/B	–
2	L/Y	–

Connector No.	F50
Connector Name	MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
Connector Type	RH03FB

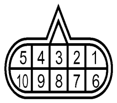
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	POWER
2	O	OUTPUT
3	W	GND

Connector No.	F51
Connector Name	A/T ASSEMBLY
Connector Type	RK10FG-DGY

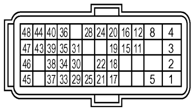
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	IGNITION POWER SUPPLY
2	BR	BATTERY POWER SUPPLY
3	O	CAN-H
4	V	K-LINE
5	B	GROUND
6	Y	IGNITION POWER SUPPLY
7	R	BACK-UP LAMP RELAY
8	LG	CAN-L
9	GR	STARTER RELAY
10	B	GROUND

Connector No.	F101
Connector Name	ECM
Connector Type	RH40FB-RZ8-L-LH-Z

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	A/F SENSOR 1 HEATER (BANK 1)
2	G	THROTTLE CONTROL MOTOR (BANK 1) (OPEN)
3	R	THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (BANK 1)
4	BR	THROTTLE CONTROL MOTOR (BANK 1) (CLOSE)
5	W	A/F SENSOR 1 HEATER (BANK 2)
8	B	ECM GROUND
11	GR	IGNITION SIGNAL #4
12	L	IGNITION SIGNAL #3
15	V	IGNITION SIGNAL #5
16	G	IGNITION SIGNAL #2
17	P	HEATED OXYGEN SENSOR 2 HEATER (BANK 1)
18	W	IVT CONTROL SOLENOID VALVE (BANK 1)
19	SB	IGNITION SIGNAL #6
20	Y	IGNITION SIGNAL #1
21	GR	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
22	R	FUEL PUMP RELAY
24	P	ECM RELAY (SELF SHUT-OFF)
25	O	THROTTLE CONTROL MOTOR RELAY
28	BR	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL (VVEL CONTROL MODULE)
29	G	IVT CONTROL SOLENOID VALVE (BANK 2)
30	Y	THROTTLE POSITION SENSOR 1 (BANK 1)
31	R	THROTTLE POSITION SENSOR 1 (BANK 2)
33	SB	HEATED OXYGEN SENSOR 2 HEATER (BANK 2)
34	B	THROTTLE POSITION SENSOR 2 (BANK 1)
35	W	THROTTLE POSITION SENSOR 2 (BANK 2)
36	O	SENSOR GROUND
37	W	CRANKSHAFT POSITION SENSOR (POS)
38	O	MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
39	P	BRAKE BOOSTER PRESSURE SENSOR
40	R	SENSOR GROUND
43	G	SENSOR POWER SUPPLY
44	L	SENSOR POWER SUPPLY
45	LG	SENSOR POWER SUPPLY
46	R	SENSOR POWER SUPPLY
47	Y	SENSOR GROUND
48	B	SENSOR GROUND

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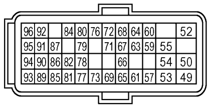
Connector No.	F102
Connector Name	ECM
Connector Type	RH40FBR-RZ8-L-LH-Z

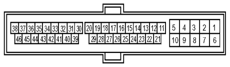
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
49	GR	THROTTLE CONTROL MOTOR (CLOSE) (BANK 2)
50	V	THROTTLE CONTROL MOTOR (OPEN) (BANK 2)
52	R	THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (BANK 2)
53	W	IGNITION SWITCH
54	Y	CAN COMMUNICATION LINE (VVEL CONTROL MODULE)
55	LG	CAN COMMUNICATION LINE (VVEL CONTROL MODULE)
57	L	A/F SENSOR 1 (BANK 1)
59	O	CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
60	G	SENSOR POWER SUPPLY
61	R	A/F SENSOR 1 (BANK 1)
63	L	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)
64	SB	SENSOR POWER SUPPLY
65	LG	A/F SENSOR 1 (BANK 2)
66	V	A/F SENSOR 1 (BANK 2)
67	P	INTAKE AIR TEMPERATURE SENSOR
68	LG	SENSOR GROUND
69	W	KNOCK SENSOR (BANK 2)
71	Y	ENGINE COOLANT TEMPERATURE SENSOR
72	SHIELD	SENSOR GROUND
73	W	KNOCK SENSOR (BANK 1)
76	W	HEATED OXYGEN SENSOR 2 (BANK 1)
77	SB	MASS AIR FLOW SENSOR (BANK 1)
78	G	ENGINE OIL TEMPERATURE SENSOR
79	BR	MASS AIR FLOW SENSOR (BANK 2)
80	O	HEATED OXYGEN SENSOR 2 (BANK 2)
81	R	FUEL INJECTOR #3
82	V	FUEL INJECTOR #6
84	B	SENSOR GROUND
85	BR	FUEL INJECTOR #2
86	W	FUEL INJECTOR #5
87	Y	POWER STEERING PRESSURE SENSOR
89	GR	FUEL INJECTOR #1
90	O	FUEL INJECTOR #4
91	SB	BATTERY CURRENT SENSOR
92	G	SENSOR GROUND
93	P	POWER SUPPLY FOR ECM (BACK-UP)
94	Y	SENSOR GROUND
95	G	SENSOR GROUND
96	P	SENSOR GROUND

Connector No.	F103
Connector Name	WIRE TO WIRE
Connector Type	TK36FW-NS10

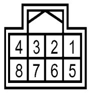
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
2	G	–
3	W	–
4	R	–
5	B	–
9	Y	–
10	GR	–
19	BG	– [Without ICC]
19	O	– [With ICC]
20	Y	–
28	B	–
29	LG	–
31	R	–
33	GR	–
34	B	–
35	L	–
36	P	–
37	Y	–
38	G	–
43	LG	–
44	O	–
45	Y	–
46	V	–

Connector No.	F104
Connector Name	WIRE TO WIRE
Connector Type	TH08FW-NH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	V	–
3	L	–
4	Y	–
6	GR	–
7	R	–
8	O	–

Connector No.	F105
Connector Name	WIRE TO WIRE
Connector Type	TH08MW-NH

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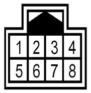
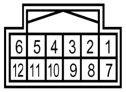


Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	V	–
3	L	–
4	Y	–
6	GR	–
7	R	–
8	O	–

Connector No.	F109
Connector Name	WIRE TO WIRE
Connector Type	TH12FW-NH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	GR	–
3	R	–
4	W	–
5	Y	–
6	G	–
8	BR	–
9	O	–
10	V	–
11	SB	–

Connector No.	F110
Connector Name	WIRE TO WIRE
Connector Type	TH12MW-NH

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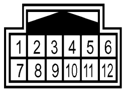

Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	GR	–
3	R	–
4	W	–
5	Y	–
6	G	–
8	BR	–
9	O	–
10	V	–
11	SB	–

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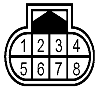
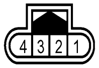
Connector No.	F120
Connector Name	WIRE TO WIRE
Connector Type	RH08MB



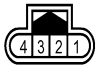
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	GR	–
3	BR	–
4	R	–
5	O	–
6	W	–
7	V	–

Connector No.	F121
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 2)
Connector Type	RH04MB



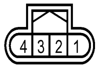
Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	SENSOR(–)
2	LG	HEATER(+)
3	SB	HEATER(–)
4	O	SENSOR(+)

Connector No.	F122
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 1)
Connector Type	RH04MB



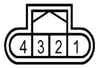
Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	SENSOR(–)
2	R	HEATER(+)
3	P	HEATER(–)
4	W	SENSOR(+)

Connector No.	F123
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
Connector Type	RH04FDGY-P



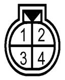
Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	AF(+)
2	R	AF(–)
3	W	HEATER(–)
4	Y	HEATER(+)

Connector No.	F124
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
Connector Type	RH04FDGY-P



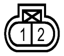
Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	AF(+)
2	V	AF(–)
3	W	HEATER(–)
4	Y	HEATER(+)

Connector No.	F201
Connector Name	WIRE TO WIRE
Connector Type	RS04ML-B



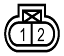
Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	SHIELD	–
3	W	–
4	SHIELD	–

Connector No.	F202
Connector Name	KNOCK SENSOR (BANK 2)
Connector Type	E02FG-RS-LGY



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	SHIELD	–

Connector No.	F203
Connector Name	KNOCK SENSOR (BANK 1)
Connector Type	E02FG-RS-LGY



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	SHIELD	–

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ENGINE CONTROL SYSTEM

Connector No.	F301
Connector Name	TCM
Connector Type	SP10FG

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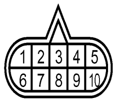
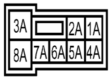


Terminal No.	Color Of Wire	Signal Name [Specification]
1	–	IGNITION POWER SUPPLY
2	–	BATTERY POWER SUPPLY
3	–	CAN-H
4	–	K-LINE
5	–	GROUND
6	–	IGNITION POWER SUPPLY
7	–	BACK-UP LAMP RELAY
8	–	CAN-L
9	–	STARTER RELAY
10	–	GROUND

Connector No.	M1
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FW-M2

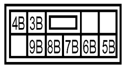
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1A	Y	–
2A	G	–
3A	L	–
4A	R	–
5A	V	–
6A	Y	–
7A	R	–
8A	L	–

Connector No.	M2
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS10FW-CS

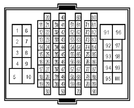
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3B	P	–
4B	G	–
5B	BG	–
6B	Y	–
7B	P	–
8B	R	–
9B	SB	–

Connector No.	M6
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	R	–
3	B	–
4	SHIELD	–
5	G	–
8	Y	–
9	BR	–
10	R	–
11	BR	–
12	BG	–
13	L	–
14	R	–
15	P	–
16	V	–
17	SB	–
18	V	–
20	BG	–
21	L	–
22	W	–
23	P	–
24	BR	–
25	Y	–
26	V	–
27	G	–
28	G	–
31	L	–
32	G	–
33	B	–
34	W	–
35	R	–
36	SHIELD	–
37	V	–
38	BG	–
39	BR	–
41	W	–
42	BG	–
43	BG	–
45	W	–
49	L	–
50	P	–
51	BR	–
54	Y	–
57	G	–
59	W	–
60	L	–
61	G	–
62	SB	–
63	G	–
64	B	–
65	W	–
66	R	–
67	SHIELD	–
68	Y	–
69	GR	–
70	LG	–
71	LG	–
72	Y	–
73	SB	–
74	BR	– [With ICC]
74	L	– [Without ICC]
75	G	–
76	GR	– [Without ICC]
76	W	– [With ICC]
77	P	– [Without ICC]
77	R	– [With ICC]
78	L	– [With ICC]
78	R	– [Without ICC]
79	W	– [Without ICC]
79	Y	– [With ICC]
80	SB	–
81	SB	–
82	SB	–
83	V	–
84	G	–
85	L	–
86	P	–
87	W	–
89	GR	–
90	SHIELD	–
91	W	–
92	Y	–
93	BR	–
94	P	–
95	GR	–
96	W	–
97	L	–
98	SHIELD	–
99	V	–
100	SB	–

Connector No.	M7
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

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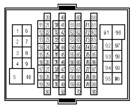

Terminal No.	Color Of Wire	Signal Name [Specification]
3	SB	– [With automatic drive positioner]
3	W	– [Without automatic drive positioner]
5	G	–
6	BG	–
7	W	–
8	B	–
11	V	–
12	SB	–

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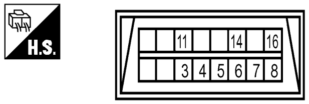
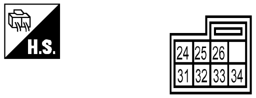
13	LG	–
14	Y	–
15	G	–
16	R	–
17	W	–
18	SB	–
19	LG	–
20	BR	–
21	SHIELD	–
22	Y	–
24	V	–
27	B	–
28	W	–
29	R	–
30	SHIELD	–
31	L	–
32	P	–
33	SB	–
34	L	–
35	P	–
36	L	–
37	P	–
38	P	–
39	Y	–
40	SB	–
44	L	–
45	GR	–
46	LG	–
47	SB	–
48	BG	–
49	R	–
50	L	–
60	P	–
61	L	–
62	SHIELD	–
63	R	–
64	G	–
65	SHIELD	–
66	SB	–
67	V	–
68	LG	–
69	SHIELD	–
70	W	–
73	G	–
74	R	–
75	W	–
76	W	–
77	B	–
78	P	–
79	GR	–
83	BG	–
85	LG	–
86	R	–
87	Y	–
88	W	–
89	BR	–
90	BG	–
91	G	–
92	V	–
93	BR	–
94	V	–
95	G	–
96	Y	–
98	W	–
99	R	–

Connector No.	M24
Connector Name	DATA LINK CONNECTOR
Connector Type	BD16FW



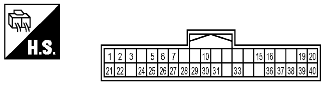
Terminal No.	Color Of Wire	Signal Name [Specification]
3	LG	–
4	B	–
5	B	–
6	L	–
7	V	–
8	G	–
11	SB	–
14	P	–
16	Y	–

Connector No.	M36
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY-1V



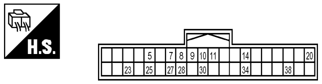
Terminal No.	Color Of Wire	Signal Name [Specification]
24	P	–
25	SB	–
26	B	–
31	L	–
32	Y	–
33	B	–
34	G	–

Connector No.	M53
Connector Name	COMBINATION METER
Connector Type	TH40FW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	BATTERY POWER SUPPLY
2	LG	COMMUNICATION SIGNAL (METER->AMP.)
3	GR	COMMUNICATION SIGNAL (AMP.->METER)
5	B	GROUND
6	P	ALTERNATOR SIGNAL
7	BR	AIR BAG SIGNAL
10	G	SECURITY SIGNAL
15	B	GROUND
16	B	METER CONTROL SWITCH GROUND
19	B	ILL GND
20	R	ILL
21	BG	IGNITION SIGNAL
22	B	GROUND
24	BR	COMMUNICATION SIGNAL (LCD->AMP.)
25	Y	COMMUNICATION SIGNAL (AMP.->LCD)
26	R	VEHICLE SPEED SIGNAL (8-PULSE)
27	V	PARKING BRAKE SWITCH SIGNAL
28	W	BRAKE FLUID LEVEL SWITCH SIGNAL
29	SB	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)
30	G	SEAT BELT BUCKLE SWITCH SIGNAL (PASSENGER SIDE)
31	L	WASHER LEVEL SWITCH SIGNAL
33	B	ILLUMINATION CONTROL SIGNAL
36	LG	SELECT SWITCH SIGNAL
37	SB	ENTER SWITCH SIGNAL
38	L	TRIP A/B RESET SWITCH SIGNAL
39	P	ILLUMINATION CONTROL SWITCH SIGNAL (–)
40	BG	ILLUMINATION CONTROL SWITCH SIGNAL (+)

Connector No.	M66
Connector Name	UNIFIED METER AND A/C AMP.
Connector Type	TH40FW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
5	L	MANUAL MODE SHIFT UP SIGNAL
7	GR	COMMUNICATION SIGNAL (AMP.->METER)
8	L	VEHICLE SPEED SIGNAL (2-PULSE)
9	SB	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)
10	W	MANUAL MODE SIGNAL
11	G	NON-MANUAL MODE SIGNAL
14	BR	COMMUNICATION SIGNAL (LCD->AMP.)
20	L	ION ON/OFF SIGNAL
23	Y	AT SNOW SWITCH SIGNAL
25	V	MANUAL MODE SHIFT DOWN SIGNAL
27	LG	COMMUNICATION SIGNAL (METER->AMP.)
28	R	VEHICLE SPEED SIGNAL (8-PULSE)
30	V	PARKING BRAKE SWITCH SIGNAL
34	Y	COMMUNICATION SIGNAL (AMP.->LCD)
38	P	BLOWER MOTOR CONTROL SIGNAL

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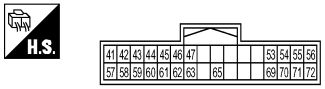
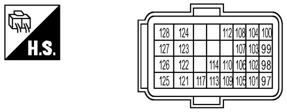
Connector No.	M67
Connector Name	UNIFIED METER AND A/C AMP.
Connector Type	TH32FW-NH



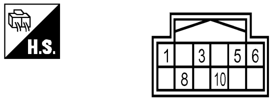
Terminal No.	Color Of Wire	Signal Name [Specification]
41	V	ACC POWER SUPPLY
42	Y	FUEL LEVEL SENSOR SIGNAL
43	R	INTAKE SENSOR SIGNAL
44	LG	IN-VEHICLE SENSOR SIGNAL
45	P	AMBIENT SENSOR SIGNAL
46	BG	SUNLOAD SENSOR SIGNAL
47	G	EXHAUST GAS / OUTSIDE ODOR DETECTING SENSOR SIGNAL
53	G	IGNITION POWER SUPPLY
54	Y	BATTERY POWER SUPPLY
55	B	GROUND
56	L	CAN-H
57	W	BRAKE FLUID LEVEL SWITCH SIGNAL
58	BR	FUEL LEVEL SENSOR GROUND
59	GR	INTAKE SENSOR GROUND
60	L	IN-VEHICLE SENSOR GROUND
61	BR	AMBIENT SENSOR GROUND
62	SB	SUNLOAD SENSOR GROUND
63	R	–
65	BG	ECV SIGNAL
69	L	A/C LAN SIGNAL
70	R	EACH DOOR MOTOR POWER SUPPLY
71	B	GROUND
72	P	CAN-L

Connector No.	M107
Connector Name	ECM
Connector Type	RH24FGY-RZ8-R-LH-Z



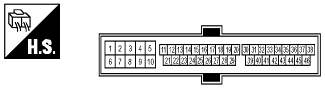
Terminal No.	Color Of Wire	Signal Name [Specification]
97	R	ACCELERATOR PEDAL POSITION SENSOR 1
98	P	ACCELERATOR PEDAL POSITION SENSOR 2 [Without ICC]
98	Y	ACCELERATOR PEDAL POSITION SENSOR 2 [With ICC]
99	G	SENSOR POWER SUPPLY [With ICC]
99	L	SENSOR POWER SUPPLY [Without ICC]
100	W	SENSOR GROUND
101	SB	ASCD/ICC STEERING SWITCH
102	LG	EVAP CONTROL SYSTEM PRESS SENSOR
103	G	SENSOR POWER SUPPLY [Without ICC]
103	L	SENSOR POWER SUPPLY [With ICC]
104	BR	SENSOR GROUND [With ICC]
104	GR	SENSOR GROUND [Without ICC]
105	L	REFRIGERANT PRESS SENSOR
106	W	FUEL TANK TEMPERATURE SENSOR
107	BG	SENSOR POWER SUPPLY
108	Y	SENSOR GROUND
109	G	PNP SIGNAL
110	R	ENGINE SPEED OUTPUT SIGNAL
112	V	SENSOR GROUND
113	P	CAN COMMUNICATION LINE
114	L	CAN COMMUNICATION LINE
117	V	DATA LINK CONNECTOR
121	LG	EVAP CANISTER VENT CONTROL VALVE
122	P	STOP LAMP SWITCH
123	B	ECM GROUND
124	B	ECM GROUND
125	R	POWER SUPPLY FOR ECM
126	BR	ASCD/ICC BRAKE SWITCH
127	B	ECM GROUND
128	B	ECM GROUND

Connector No.	M108
Connector Name	POWER STEERING CONTROL UNIT
Connector Type	TH12FW-NH



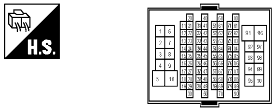
Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	EPS SOL+
3	G	IGN
5	B	EPS SOL-
6	B	GROUND
8	L	VEHICLE SPEED(2P)
10	R	ENG TACHO

Connector No.	M116
Connector Name	WIRE TO WIRE
Connector Type	TK36MW-NS10



Terminal No.	Color Of Wire	Signal Name [Specification]
2	P	–
3	L	–
4	R	–
5	B	–
9	R	–
10	R	–
19	BG	–
20	Y	–
28	B	–
29	LG	–
31	W	–
33	B	–
34	B	–
35	L	–
36	P	–
37	Y	–
38	G	–
43	P	–
44	L	–
45	BR	–
46	BG	–

Connector No.	M117
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4



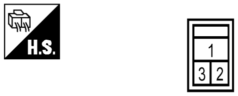
Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	G	–
3	GR	–
4	SB	–
7	W	–
10	W	–
15	SB	–
16	V	–
17	BR	–
26	BR	–
27	LG	–
28	Y	–
29	Y	–
30	V	–
31	R	–
32	BR	–
33	G	–
51	R	–
55	W	–
56	B	–
57	R	–
58	G	–
59	SHIELD	–
60	V	–
61	LG	–
62	BR	–
63	L	–

JRBWC7849GB

ENGINE CONTROL SYSTEM

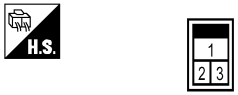
64	LG	–
65	B	–
66	R	–
67	W	–
68	SHIELD	–
69	V	–
70	Y	–
71	SB	–
72	W	–
73	G	–
75	W	–
80	V	–
81	SB	–
82	V	–
83	P	–
84	R	–
85	L	–
86	BG	–
87	L	–
88	P	–
91	V	–
92	G	–
94	G	–
95	W	–
96	G	–
97	Y	–
98	BR	–
99	P	– [Without BOSE audio]
99	V	– [With BOSE audio]
100	L	– [Without BOSE audio]
100	SB	– [With BOSE audio]

Connector No.	M125
Connector Name	WIRE TO WIRE
Connector Type	M03FW-LC



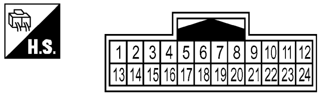
Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	Y	–
3	R	–

Connector No.	M126
Connector Name	WIRE TO WIRE
Connector Type	M03MW-LC



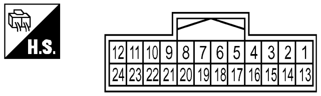
Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	Y	–
3	R	–

Connector No.	M134
Connector Name	WIRE TO WIRE
Connector Type	TH24MW-NH



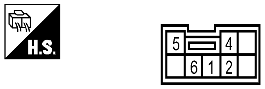
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	R	–
3	BR	–
4	B	–
5	R	–
6	V	–
7	B	–
8	B	–
9	B	–
13	W	–
14	W	–
15	Y	–
16	P	–
17	B	–
18	L	–
19	Y	–
20	L	–

Connector No.	M170
Connector Name	WIRE TO WIRE
Connector Type	TH24FW-NH



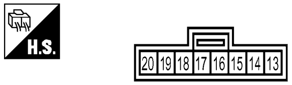
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	R	–
3	BR	–
4	B	–
5	SB	–
6	GR	–
7	V	–
8	BR	–
9	B	–
13	W	–
14	W	–
15	Y	–
16	P	–
17	L	–
18	G	–
19	Y	–
20	R	–

Connector No.	M176
Connector Name	SNOW MODE SWITCH
Connector Type	TK08FW



Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR	–
2	B	–
4	Y	–
5	P	–
6	SB	–

Connector No.	M303
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY



Terminal No.	Color Of Wire	Signal Name [Specification]
13	R	–
14	W	–
15	L	–
16	B	–
17	BR	–
18	Y	–
19	P	–
20	Y	–

JRBWC7850GB

Fail safe

INFOID:0000000010597148

NON DTC RELATED ITEM

Engine operating condition in fail-safe mode	Detected items	Remarks	Reference page
Engine speed will not rise more than 2,500 rpm due to the fuel cut	Malfunction indicator lamp circuit	When there is an open circuit on MIL circuit, the ECM cannot warn the driver by illuminating MIL when there is malfunction on engine control system. Therefore, when electrical controlled throttle and part of ECM related diagnoses are continuously detected as NG for 5 trips, ECM warns the driver that engine control system malfunctions and MIL circuit is open by means of operating the fail-safe function. The fail-safe function also operates when above diagnoses except MIL circuit are detected and demands the driver to repair the malfunction.	EC-521

DTC RELATED ITEM

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>U1003
U1024</td><td>Can communication circuit</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P0011
P0021</td><td>Intake valve timing control</td><td colspan="2">The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.</td></tr>
<tr><td>P0102
P0103
P010C
P010D</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the following condition.
CONSULT displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided (CONSULT display)</td></tr>
<tr><td>Just as ignition switch is turned ON or START</td><td>40°C (104°F)</td></tr>
<tr><td>Approx 4 minutes or more after engine starting</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122
P0123
P0222
P0223
P0227
P0228
P1239
P2132
P2133
P2135</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
Therefore, the acceleration will be poor.</td></tr>
<tr><td>P0500</td><td>Vehicle speed sensor</td><td colspan="2">The cooling fan operates (Highest) while engine is running.</td></tr>
<tr><td>P0524</td><td>Engine oil pressure</td><td colspan="2">The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.
Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td>P0605</td><td>ECM</td><td colspan="2">(When ECM calculation function is malfunctioning:)
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
ECM deactivates ASCD operation.</td></tr>
<tr><td>P0607</td><td>ECM</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 2,500 rpm due to the fuel cut.</td></tr>
<tr><td>P0643</td><td>Sensor power supply</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
</table>

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P1087
P1088</td><td>VVEL control function</td><td colspan="2">VVEL of normal bank is controlled at VVEL angle of abnormal bank.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P1089
P1092</td><td>VVEL control shaft position sensor</td><td colspan="2">VVEL value is maintained at a fixed angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut</td></tr>
<tr><td>P1608</td><td>VVEL control shaft position sensor</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut</td></tr>
<tr><td rowspan="2">P1090
P1093</td><td rowspan="2">VVEL actuator motor</td><td colspan="2">VVEL of normal bank is controlled at VVEL angle of abnormal bank.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P1091</td><td>VVEL actuator motor relay</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td>P1233
P2101</td><td>Electric throttle control function</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1236
P2118</td><td>Throttle control motor</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td rowspan="3">P1238
P2119</td><td rowspan="3">Electric throttle control actuator</td><td colspan="2">(When electric throttle control actuator does not function properly due to the return spring malfunction:)
ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.</td></tr>
<tr><td colspan="2">(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.</td></tr>
<tr><td colspan="2">(When ECM detects the throttle valve is stuck open:)
While the vehicle is being driven, it slows down gradually because of fuel cut. After the vehicle stops, the engine stalls.
The engine can restart in N or P position, and engine speed will not exceed 1,000 rpm or more.</td></tr>
<tr><td>P1290
P2100
P2103</td><td>Throttle control motor relay</td><td colspan="2">ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.</td></tr>
<tr><td>P1606</td><td>VVEL control module</td><td colspan="2">VVEL actuator motor relay is turned off, and VVEL value is become at a minimum angle.
Engine speed will not rise more than 3,500 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="4">P1805</td><td rowspan="4">Brake switch</td><td colspan="2">ECM controls the electric throttle control actuator by regulating the throttle opening to a small range.
Therefore, acceleration will be poor.</td></tr>
<tr><td>Vehicle condition</td><td>Driving condition</td></tr>
<tr><td>When engine is idling</td><td>Normal</td></tr>
<tr><td>When accelerating</td><td>Poor acceleration</td></tr>
<tr><td>P2122
P2123
P2127
P2128
P2138</td><td>Accelerator pedal position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
Therefore, the acceleration will be poor.</td></tr>
</table>

DTC Inspection Priority Chart

INFOID:0000000010597149

If some DTCs are displayed at the same time, perform inspections one by one based on the following priority chart.

Priority	Detected items (DTC)
1	• U0100 U0101 U1001 U1003 CAN communication line • U1024 VVEL CAN communication line • P0102 P0103 P010C P010D Mass air flow sensor • P0111 P0112 P0113 P0127 Intake air temperature sensor • P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P0227 P0228 P1225 P1226 P1234 P1235 P1239 P2132 P2133 P2135 Throttle position sensor • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0196 P0197 P0198 Engine oil temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 P0345 Camshaft position sensor (PHASE) • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0605 P0607 ECM • P0643 Sensor power supply • P0700 TCM • P0705 Transmission range switch • P0850 Park/neutral position (PNP) switch • P1089 P1092 P1608 VVEL control shaft position sensor • P1606 P1607 VVEL control module • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1615 NATS • P1806 Brake booster pressure sensor • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor

Priority	Detected items (DTC)
2	• P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P014C P014D P014E P014F P0150 P0151 P0152 P015A P015B P015C P015D P2096 P2097 P2098 P2099 Air fuel ratio (A/F) sensor 1 • P0137 P0138 P0139 P0157 P0158 P0159 Heated oxygen sensor 2 • P0441 EVAP control system purge flow monitoring • P0443 P0444 P0445 EVAP canister purge volume control solenoid valve • P0447 P0448 EVAP canister vent control valve • P0451 P0452 P0453 EVAP control system pressure sensor • P0550 Power steering pressure sensor • P0603 ECM power supply • P0710 P0717 P0720 P729 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1730 P1734 P2713 P2722 P2731 P2807 A/T related sensors, solenoid valves and switches • P1087 P1088 VVEL system • P1090 P1093 VVEL actuator motor • P1091 VVEL actuator motor relay • P1217 Engine over temperature (OVERHEAT) • P1233 P2101 Electric throttle control function • P1236 P2118 Throttle control motor • P1290 P2100 P2103 Throttle control motor relay • P1805 Brake switch
3	• P0011 P0021 Intake valve timing control • P0101 P010B Mass air flow sensor • P0171 P0172 P0174 P0175 Fuel injection system function • P0300 - P0306 Misfire • P0420 P0430 Three way catalyst function • P0456 EVAP control system (VERY SMALL LEAK) • P0506 P0507 Idle speed control system • P050A P050B P050E Cold start control • P0524 Engine oil pressure • P100A P100B VVEL system • P1148 P1168 Closed loop control • P1211 TCS control unit • P1212 TCS communication line • P1238 P2119 Electric throttle control actuator • P1564 ICC steering switch / ASCD steering switch • P1568 ICC command value • P1572 ICC brake switch / ASCD brake switch • P1574 ICC vehicle speed sensor / ASCD vehicle speed sensor • P219A P219B Air fuel ratio

DTC Index

INFOID:0000000010597150

×:Applicable —: Not applicable

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*4	Reference page
CONSULT GST*2	ECM*3						
U0100	0100	COMMUNICATION ERROR (LOST)	—	1	×	—	TM-69
U0101	0101*5	CAN COMM CIRCUIT	—	1	×	B	EC-169
U1001	1001*5	CAN COMM CIRCUIT	—	1 or 2	—	—	EC-170
U1003	1003	CAN COMM CIRCUIT	—	2	—	—	EC-171
U1024	1024	VVEL CAN COMM CIRCUIT	—	1	×	B	EC-173
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	**Flashing*8**	—	**—**
P0011	0011	INT/V TIM CONT-B1	×	2	×	B	EC-175
P0021	0021	INT/V TIM CONT-B2	×	2	×	B	EC-175

DTC[*1]		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*4]	Reference page
CONSULT GST[*2]	ECM[*3]						
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	B	EC-179
P0032	0032	A/F SEN1 HTR (B1)	—	2	×	B	EC-179
P0037	0037	HO2S2 HTR (B1)	—	2	×	B	EC-182
P0038	0038	HO2S2 HTR (B1)	—	2	×	B	EC-182
P0051	0051	A/F SEN1 HTR (B2)	—	2	×	B	EC-179
P0052	0052	A/F SEN1 HTR (B2)	—	2	×	B	EC-179
P0057	0057	HO2S2 HTR (B2)	—	2	×	B	EC-182
P0058	0058	HO2S2 HTR (B2)	—	2	×	B	EC-182
P0075	0075	INT/V TIM V/CIR-B1	—	2	×	B	EC-185
P0081	0081	INT/V TIM V/CIR-B2	—	2	×	B	EC-185
P0101	0101	MAF SEN/CIRCUIT-B1	—	2	×	B	EC-188
P0102	0102	MAF SEN/CIRCUIT-B1	—	1	×	B	EC-194
P0103	0103	MAF SEN/CIRCUIT-B1	—	1	×	B	EC-194
P010B	010B	MAF SEN/CIRCUIT-B2	—	2	×	B	EC-188
P010C	010C	MAF SEN/CIRCUIT-B2	—	1	×	B	EC-194
P010D	010D	MAF SEN/CIRCUIT-B2	—	1	×	B	EC-194
P0111	0111	IAT SENSOR1 B1	—	2	×	A	EC-200
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	B	EC-203
P0113	0113	IAT SEN/CIRCUIT-B1	—	2	×	B	EC-203
P0116	0116	ECT SEN/CIRC	—	2	×	A	EC-206
P0117	0117	ECT SEN/CIRC	—	1	×	B	EC-209
P0118	0118	ECT SEN/CIRC	—	1	×	B	EC-209
P0122	0122	TP SEN 2/CIRC-B1	—	1	×	B	EC-212
P0123	0123	TP SEN 2/CIRC-B1	—	1	×	B	EC-212
P0125	0125	ECT SENSOR	—	2	×	B	EC-216
P0127	0127	IAT SENSOR-B1	—	2	×	B	EC-219
P0128	0128	THERMSTAT FNCTN	—	2	×	A	EC-221
P0130	0130	A/F SENSOR1 (B1)	—	2	×	A	EC-224
P0131	0131	A/F SENSOR1 (B1)	—	2	×	B	EC-228
P0132	0132	A/F SENSOR1 (B1)	—	2	×	B	EC-231
P0137	0137	HO2S2 (B1)	×	2	×	A	EC-234
P0138	0138	HO2S2 (B1)	×	2	×	A	EC-240
P0139	0139	HO2S2 (B1)	×	2	×	A	EC-249
P014C	014C	A/F SENSOR1 (B1)	×	2	×	A	EC-256
P014D	014D	A/F SENSOR1 (B1)	×	2	×	A	EC-256
P014E	014E	A/F SENSOR1 (B2)	×	2	×	A	EC-256
P014F	014F	A/F SENSOR1 (B2)	×	2	×	A	EC-256
P0150	0150	A/F SENSOR1 (B2)	—	2	×	A	EC-224
P0151	0151	A/F SENSOR1 (B2)	—	2	×	B	EC-228
P0152	0152	A/F SENSOR1 (B2)	—	2	×	B	EC-231
P0157	0157	HO2S2 (B2)	×	2	×	A	EC-234
P0158	0158	HO2S2 (B2)	×	2	×	A	EC-240

DTC[*1]		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*4]	Reference page
CONSULT GST[*2]	ECM[*3]						
P0159	0159	HO2S2 (B2)	×	2	×	A	EC-249
P015A	015A	A/F SENSOR1 (B1)	×	2	×	A	EC-256
P015B	015B	A/F SENSOR1 (B1)	×	2	×	A	EC-256
P015C	015C	A/F SENSOR1 (B2)	×	2	×	A	EC-256
P015D	015D	A/F SENSOR1 (B2)	×	2	×	A	EC-256
P0171	0171	FUEL SYS-LEAN-B1	—	2	×	B	EC-262
P0172	0172	FUEL SYS-RICH-B1	—	2	×	B	EC-266
P0174	0174	FUEL SYS-LEAN-B2	—	2	×	B	EC-262
P0175	0175	FUEL SYS-RICH-B2	—	2	×	B	EC-266
P0181	0181	FTT SENSOR	—	2	×	A and B	EC-270
P0182	0182	FTT SEN/CIRCUIT	—	2	×	B	EC-274
P0183	0183	FTT SEN/CIRCUIT	—	2	×	B	EC-274
P0196	0196	EOT SENSOR	—	2	×	A and B	EC-277
P0197	0197	EOT SEN/CIRC	—	2	×	B	EC-281
P0198	0198	EOT SEN/CIRC	—	2	×	B	EC-281
P0222	0222	TP SEN 1/CIRC-B1	—	1	×	B	EC-284
P0223	0223	TP SEN 1/CIRC-B1	—	1	×	B	EC-284
P0227	0227	TP SEN 2/CIRC-B2	—	1	×	B	EC-212
P0228	0228	TP SEN 2/CIRC-B2	—	1	×	B	EC-212
P0300	0300	MULTI CYL MISFIRE	—	1 or 2	×	B	EC-288
P0301	0301	CYL 1 MISFIRE	—	1 or 2	×	B	EC-288
P0302	0302	CYL 2 MISFIRE	—	1 or 2	×	B	EC-288
P0303	0303	CYL 3 MISFIRE	—	1 or 2	×	B	EC-288
P0304	0304	CYL 4 MISFIRE	—	1 or 2	×	B	EC-288
P0305	0305	CYL 5 MISFIRE	—	1 or 2	×	B	EC-288
P0306	0306	CYL 6 MISFIRE	—	1 or 2	×	B	EC-288
P0327	0327	KNOCK SEN/CIRC-B1	—	2	—	—	EC-294
P0328	0328	KNOCK SEN/CIRC-B1	—	2	—	—	EC-294
P0332	0332	KNOCK SEN/CIRC-B2	—	2	—	—	EC-294
P0333	0333	KNOCK SEN/CIRC-B2	—	2	—	—	EC-294
P0335	0335	CKP SEN/CIRCUIT	—	2	×	B	EC-297
P0340	0340	CMP SEN/CIRC-B1	—	2	×	B	EC-301
P0345	0345	CMP SEN/CIRC-B2	—	2	×	B	EC-301
P0420	0420	TW CATALYST SYS-B1	×	2	×	A	EC-305
P0430	0430	TW CATALYST SYS-B2	×	2	×	A	EC-305
P0441	0441	EVAP PURG FLOW/MON	×	2	×	A	EC-310
P0443	0443	PURG VOLUME CONT/V	—	2	×	A	EC-315
P0444	0444	PURG VOLUME CONT/V	—	2	×	B	EC-320
P0445	0445	PURG VOLUME CONT/V	—	2	×	B	EC-320
P0447	0447	VENT CONTROL VALVE	—	2	×	B	EC-323
P0448	0448	VENT CONTROL VALVE	—	2	×	B	EC-327
P0451	0451	EVAP SYS PRES SEN	—	2	×	A	EC-331

DTC*1		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group*4	Reference page
CONSULT GST*2	ECM*3						
P0452	0452	EVAP SYS PRES SEN	—	2	×	B	EC-335
P0453	0453	EVAP SYS PRES SEN	—	2	×	B	EC-340
P0456	0456	EVAP VERY SML LEAK	×*7	2	×	A	EC-346
P0460	0460	FUEL LEV SEN SLOSH	—	2	×	A	EC-352
P0461	0461	FUEL LEVEL SENSOR	—	2	×	B	EC-354
P0462	0462	FUEL LEVL SEN/CIRC	—	2	×	B	EC-356
P0463	0463	FUEL LEVL SEN/CIRC	—	2	×	B	EC-356
P0500	0500	VEH SPEED SEN/CIRC*6	—	2	×	B	EC-358
P0506	0506	ISC SYSTEM	—	2	×	B	EC-360
P0507	0507	ISC SYSTEM	—	2	×	B	EC-362
P050A	050A	COLD START CONTROL	—	2	×	A	EC-364
P050B	050B	COLD START CONTROL	—	2	×	A	EC-364
P050E	050E	COLD START CONTROL	—	2	×	A	EC-364
P0524	0524	ENGINE OIL PRESSURE	—	2	×	B	EC-367
P0550	0550	PW ST P SEN/CIRC	—	2	—	—	EC-370
P0603	0603	ECM BACK UP/CIRCUIT	—	2	×	B	EC-373
P0605	0605	ECM	—	1 or 2	× or —	B	EC-375
P0607	P0607	ECM	—	1	×	B	EC-377
P0643	0643	SENSOR POWER/CIRC	—	1	×	B	EC-378
P0705	0705	T/M RANGE SWITCH A	—	1	×	B	TM-74
P0710	0710	FLUID TEMP SENSOR A*9	—	2	×	B	TM-76
P0717	0717	INPUT SPEED SENSOR A	—	2	×	B	TM-79
P0720	0720	OUTPUT SPEED SENSOR*6	—	2	×	B	TM-81
P0729	0729	6GR INCORRECT RATIO*9	—	2	×	B	TM-85
P0730	0730	INCORRECT GR RATIO	—	2	×	B	TM-87
P0731	0731	1GR INCORRECT RATIO*9	—	2	×	B	TM-89
P0732	0732	2GR INCORRECT RATIO*9	—	2	×	B	TM-91
P0733	0733	3GR INCORRECT RATIO*9	—	2	×	B	TM-93
P0734	0734	4GR INCORRECT RATIO*9	—	2	×	B	TM-95
P0735	0735	5GR INCORRECT RATIO*9	—	2	×	B	TM-97
P0740	0740	TORQUE CONVERTER	—	2	×	B	TM-99
P0744	0744	TORQUE CONVERTER	—	2	×	B	TM-101
P0745	0745	PC SOLENOID A	—	2	×	B	TM-103
P0750	0750	SHIFT SOLENOID A	—	2	×	B	TM-104
P0775	0775	PC SOLENOID B	—	2	×	B	TM-105
P0780	0780	SHIFT	—	1	×	B	TM-106
P0795	0795	PC SOLENOID C	—	2	×	B	TM-108
P0850	0850	P-N POS SW/CIRCUIT	—	2	×	B	EC-381
P100A	100A	VVEL SYSTEM-B1	—	2	×	B	EC-384
P100B	100B	VVEL SYSTEM-B2	—	2	×	B	EC-384
P1087	1087	VVEL SYSTEM-B1	—	1	×	B	EC-388

DTC[*1]		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*4]	Reference page
CONSULT GST[*2]	ECM[*3]						
P1088	1088	VVEL SYSTEM-B2	—	1	×	B	EC-388
P1089	1089	VVEL POS SEN/CIRC-B1	—	1	×	B	EC-389
P1090	1090	VVEL ACTR MOT-B1	—	1	×	B	EC-393
P1091	1091	VVEL ACTR MOT PWR	—	1 or 2	×	B	EC-397
P1092	1092	VVEL POS SEN/CIRC-B2	—	1	×	B	EC-389
P1093	1093	VVEL ACTR MOT-B2	—	1	×	B	EC-393
P1148	1148	CLOSED LOOP-B1	—	1	×	A	EC-400
P1168	1168	CLOSED LOOP-B2	—	1	×	A	EC-400
P1211	1211	TCS C/U FUNCTN	—	2	—	—	EC-401
P1212	1212	TCS/CIRC	—	2	—	—	EC-402
P1217	1217	ENG OVER TEMP	—	1	×	B	EC-403
P1225	1225	CTP LEARNING-B1	—	2	—	—	EC-407
P1226	1226	CTP LEARNING-B1	—	2	—	—	EC-409
P1233	1233	ETC FNCTN/CIRC-B2	—	1	×	B	EC-411
P1234	1234	CTP LEARNING-B2	—	2	—	—	EC-407
P1235	1235	CTP LEARNING-B2	—	2	—	—	EC-409
P1236	1236	ETC MOT-B2	—	1	×	B	EC-415
P1238	1238	ETC ACTR-B2	—	1	×	B	EC-418
P1239	1239	TP SENSOR-B2	—	1	×	B	EC-420
P1290	1290	ETC MOT PWR-B2	—	1	×	B	EC-423
P1550	1550	BAT CURRENT SENSOR	—	2	—	—	EC-425
P1551	1551	BAT CURRENT SENSOR	—	2	—	—	EC-428
P1552	1552	BAT CURRENT SENSOR	—	2	—	—	EC-428
P1553	1553	BAT CURRENT SENSOR	—	2	—	—	EC-431
P1554	1554	BAT CURRENT SENSOR	—	2	—	—	EC-434
P1564	1564	ASCD SW	—	1	—	—	EC-438 (with ASCD) EC-441 (with ICC)
P1568	1568	ICC COMMAND VALUE	—	1	—	—	EC-444
P1572	1572	ASCD BRAKE SW	—	1	—	—	EC-445 (with ASCD) EC-450 (with ICC)
P1574	1574	ASCD VHL SPD SEN	—	1	—	—	EC-457 (with ASCD) EC-459 (with ICC)
P1606	1606	VVEL CONTROL MODULE	—	1 or 2	× or —	B	EC-461
P1607	1607	VVEL CONTROL MODULE	—	1	×	B	EC-463
P1608	1608	VVEL SENSOR POWER/CIRC	—	1	×	B	EC-465
P1610	1610	LOCK MODE	—	2	—	—	SEC-33
P1611	1611	ID DISCARD, IMM-ECM	—	2	—	—	SEC-34
P1612	1612	CHAIN OF ECM-IMMU	—	2	—	—	SEC-35
P1614	1614	CHAIN OF IMMU-KEY	—	2	—	—	SEC-36

DTC[*1]		Items (CONSULT screen terms)	SRT code	Trip	MIL	Permanent DTC group[*4]	Reference page
CONSULT GST[*2]	ECM[*3]						
P1615	1615	DIFFERENCE OF KEY	—	2	—	—	SEC-39
P1730	1730	INTERLOCK	—	2	×	B	TM-113
P1734	1734	7GR INCORRECT RATIO[*9]	—	2	×	B	TM-115
P1805	1805	BRAKE SW/CIRCUIT	—	2	—	—	EC-468
P1806	1806	BRAKE BSTR PRES SEN/CIRC	—	2	×	B	BRC-103
P2096	2096	POST CAT FUEL TRIM SYS B1	—	2	×	A	EC-471
P2097	2097	POST CAT FUEL TRIM SYS B1	—	2	×	A	EC-471
P2098	2098	POST CAT FUEL TRIM SYS B2	—	2	×	A	EC-471
P2099	2099	POST CAT FUEL TRIM SYS B2	—	2	×	A	EC-471
P2100	2100	ETC MOT PWR-B1	—	1	×	B	EC-423
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	B	EC-411
P2103	2103	ETC MOT PWR	—	1	×	B	EC-423
P2118	2118	ETC MOT-B1	—	1	×	B	EC-415
P2119	2119	ETC ACTR-B1	—	1	×	B	EC-418
P2122	2122	APP SEN 1/CIRC	—	1	×	B	EC-476
P2123	2123	APP SEN 1/CIRC	—	1	×	B	EC-476
P2127	2127	APP SEN 2/CIRC	—	1	×	B	EC-480
P2128	2128	APP SEN 2/CIRC	—	1	×	B	EC-480
P2132	2132	TP SEN 1/CIRC-B2	—	1	×	B	EC-284
P2133	2133	TP SEN 1/CIRC-B2	—	1	×	B	EC-284
P2135	2135	TP SENSOR-B1	—	1	×	B	EC-420
P2138	2138	APP SENSOR	—	1	×	B	EC-485
P219A	219A	AIR FUEL RATIO B1	—	2	×	A	EC-490
P219B	219B	AIR FUEL RATIO B2	—	2	×	A	EC-490
P2713	2713	PC SOLENOID D	—	2	×	B	TM-120
P2722	2722	PC SOLENOID E	—	2	×	B	TM-121
P2731	2731	PC SOLENOID F	—	2	×	B	TM-122
P2807	2807	PC SOLENOID G	—	2	×	B	TM-123

*1: 1st trip DTC No. is the same as DTC No.
*2: This number is prescribed by SAE J2012/ISO 15031-6.
*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.
*4: Refer to EC-32, "Description", “PERMANENT DIAGNOSTIC TROUBLE CODE (PERMANENT DTC)”.
*5: The troubleshooting for this DTC needs CONSULT.
*6: When the fail-safe operations for both self-diagnoses occur, the MIL illuminates.
*7: SRT code will not be set if the self-diagnostic result is NG.
*8: When the ECM is in the mode that displays SRT status, MIL may blink. For the details, refer to “How to Display SRT Status”.
*9: When erasing this DTC, always use CONSULT or GST.

Test Value and Test Limit

INFOID:0000000012088260

The following is the information specified in Service $06 of SAE J1979/ISO 15031-5.
The test value is a parameter used to determine whether a system/circuit diagnostic test is OK or NG while being monitored by the ECM during self-diagnosis. The test limit is a reference value which is specified as the maximum or minimum value and is compared with the test value being monitored.
These data (test value and test limit) are specified by On Board Monitor ID (OBDMID), Test ID (TID), Unit and Scaling ID and can be displayed on the GST screen.

The items of the test value and test limit will be displayed with GST screen which items are provided by the ECM. (e.g., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	01H	Air fuel ratio (A/F) sensor 1 (Bank 1)	P0131	83H	0BH	Minimum sensor output voltage for test cycle
			P0131	84H	0BH	Maximum sensor output voltage for test cycle
			P0130	85H	0BH	Minimum sensor output voltage for test cycle
			P0130	86H	0BH	Maximum sensor output voltage for test cycle
			P0133	87H	04H	Response rate: Response ratio (lean to rich)
			P0133	88H	04H	Response rate: Response ratio (rich to lean)
			P2A00 or P2096	89H	84H	The amount of shift in air fuel ratio (too lean)
			P2A00 or P2097	8AH	84H	The amount of shift in air fuel ratio (too rich)
			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited frequency
			P014C	8DH	04H	O2 sensor slow response - Rich to lean bank 1 sensor 1
			P014C	8EH	04H	O2 sensor slow response - Rich to lean bank 1 sensor 1
			P014D	8FH	84H	O2 sensor slow response - Lean to rich bank 1 sensor 1
			P014D	90H	84H	O2 sensor slow response - Lean to rich bank 1 sensor 1
			P015A	91H	01H	O2 sensor delayed response - Rich to lean bank 1 sensor 1
			P015A	92H	01H	O2 sensor delayed response - Rich to lean bank 1 sensor 1
			P015B	93H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1
			P015B	94H	01H	O2 sensor delayed response - Lean to rich bank 1 sensor 1
			P0133	95H	04H	Response rate: Response ratio (lean to rich)
			P0133	96H	84H	Response rate: Response ratio (rich to lean)

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	02H	Heated oxygen sensor 2 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle
			P0137	08H	0CH	Maximum sensor output voltage for test cycle
			P0138	80H	0CH	Sensor output voltage
			P0139	81H	0CH	Difference in sensor output voltage
			P0139	82H	11H	Rear O2 sensor delay response diagnosis
	03H	Heated oxygen sensor 3 (Bank 1)	P0143	07H	0CH	Minimum sensor output voltage for test cycle
			P0144	08H	0CH	Maximum sensor output voltage for test cycle
			P0146	80H	0CH	Sensor output voltage
			P0145	81H	0CH	Difference in sensor output voltage
	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	P0151	83H	0BH	Minimum sensor output voltage for test cycle
			P0151	84H	0BH	Maximum sensor output voltage for test cycle
			P0150	85H	0BH	Minimum sensor output voltage for test cycle
			P0150	86H	0BH	Maximum sensor output voltage for test cycle
			P0153	87H	04H	Response rate: Response ratio (lean to rich)
			P0153	88H	04H	Response rate: Response ratio (rich to lean)
			P2A03 or P2098	89H	84H	The amount of shift in air fuel ratio (too lean)
			P2A03 or P2099	8AH	84H	The amount of shift in air fuel ratio (too rich)
			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
			P014E	8DH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014E	8EH	04H	O2 sensor slow response - Rich to lean bank 2 sensor 1
			P014F	8FH	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1
			P014F	90H	84H	O2 sensor slow response - Lean to rich bank 2 sensor 1
			P015C	91H	01H	O2 sensor delayed response - Rich to lean bank 2 sensor 1
			P015C	92H	01H	O2 sensor delayed response - Rich to lean bank 2 sensor 1
			P015D	93H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	P015D	94H	01H	O2 sensor delayed response - Lean to rich bank 2 sensor 1
			P0153	95H	04H	Response rate: Response ratio (lean to rich)
			P0153	96H	84H	Response rate: Response ratio (rich to lean)
	06H	Heated oxygen sensor 2 (Bank 2)	P0158	07H	0CH	Minimum sensor output voltage for test cycle
			P0157	08H	0CH	Maximum sensor output voltage for test cycle
			P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
			P0159	82H	11H	Rear O2 sensor delay response diagnosis
	07H	Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
			P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
CATALYST	21H	Three way catalyst function (Bank1)	P0420	80H	01H	O2 storage index
			P0420	82H	01H	Switching time lag engine exhaust index value
			P2423	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2423	84H	84H	O2 storage index in HC trap catalyst
	22H	Three way catalyst function (Bank2)	P0430	80H	01H	O2 storage index
			P0430	82H	01H	Switching time lag engine exhaust index value
			P2424	83H	0CH	Difference in 3rd O2 sensor output voltage
			P2424	84H	84H	O2 storage index in HC trap catalyst
EGR SYSTEM	31H	EGR function	P0400	80H	96H	Low flow faults: EGR temp change rate (short term)
			P0400	81H	96H	Low flow faults: EGR temp change rate (long term)
			P0400	82H	96H	Low flow faults: Difference between max EGR temp and EGR temp under idling condition
			P0400	83H	96H	Low flow faults: Max EGR temp
			P1402	84H	96H	High Flow Faults: EGR temp increase rate
			P0402	85H	FCH	EGR differential pressure high flow
			P0401	86H	37H	EGR differential pressure low flow
			P2457	87H	96H	EGR temperature

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
VVT SYSTEM	35H	VVT Monitor (Bank1)	P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
			P100A	84H	10H	VEL slow response diagnosis
			P1090	85H	10H	VEL servo system diagnosis
			P0011	86H	9DH	VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis)
			Advanced: P052A Retarded: P052B	87H	9DH	VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis)
	36H	VVT Monitor (Bank2)	P0021	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0024	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0024	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
			P100B	84H	10H	VEL slow response diagnosis
			P1093	85H	10H	VEL servo system diagnosis
			P0021	86H	9DH	VTC intake intermediate lock function diagnosis (VTC intermediate position alignment check diagnosis)
			Advanced: P052C Retarded: P052D	87H	9DH	VTC intake intermediate lock system diagnosis (VTC intermediate lock position check diagnosis)
EVAP SYSTEM	39H	EVAP control system leak (Cap Off)	P0455	80H	0CH	Difference in pressure sensor output voltage before and after pull down
	3BH	EVAP control system leak (Small leak)	P0442	80H	05H	Leak area index (for more than 0.04 inch)
	3CH	EVAP control system leak (Very small leak)	P0456	80H	05H	Leak area index (for more than 0.02 inch)
			P0456	81H	FDH	Maximum internal pressure of EVAP system during monitoring
			P0456	82H	FDH	Internal pressure of EVAP system at the end of monitoring
	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control valve close

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
O2 SENSOR HEATER	41H	A/F sensor 1 heater (Bank 1)	Low Input: P0031 High Input: P0032	81H	0BH	Converted value of heater electric current to voltage
			P0030	83H	0BH	A/F sensor heater circuit malfunction
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input: P0037 High Input: P0038	80H	0CH	Converted value of heater electric current to voltage
			P0141	81H	14H	Rear O2 sensor internal impedance
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input: P0051 High Input: P0052	81H	0BH	Converted value of heater electric current to voltage
			P0036	83H	0BH	A/F sensor heater circuit malfunction
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input: P0057 High Input: P0058	80H	0CH	Converted value of heater electric current to voltage
			P0161	81H	14CH	Rear O2 sensor internal impedance
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of heater electric current to voltage
SECONDARY AIR	71H	Secondary air system	P0411	80H	01H	Secondary air injection system incorrect flow detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary air injection system insufficient flow
			P2445	82H	01H	Secondary air injection system pump stuck off
			P2448	83H	01H	Secondary air injection system high airflow
			Bank1: P2440 Bank2: P2442	84H	01H	Secondary air injection system switching valve stuck open
			P2440	85H	01H	Secondary air injection system switching valve stuck open
			P2444	86H	01H	Secondary air injection system pump stuck on

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
FUEL SYSTEM	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
			P0171 or P0172	81H	24H	The number of lambda control clamped
			P117A / P219A	82H	03H	Cylinder A/F imbalance monitoring
			P219C	83H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #1 cylinder parameter
			P219D	84H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #2 cylinder parameter
			P219E	85H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #3 cylinder parameter
			P219F	86H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #4 cylinder parameter
			P21A0	87H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #5 cylinder parameter
			P21A2	89H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #7 cylinder parameter
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	80H	2FH	Long term fuel trim
			P0174 or P0175	81H	24H	The number of lambda control clamped
			P117B / P219B	82H	03H	Cylinder A/F imbalance monitoring
			P219D	84H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #2 cylinder parameter
			P219F	86H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #4 cylinder parameter
			P21A1	88H	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #6 cylinder parameter
			P21A3	8AH	83H	Air-fuel ratio cylinder imbalance diagnosis CPS (Crankshaft Position Sensor) method #8 cylinder parameter

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A1H	Multiple cylinder misfires	P0301	80H	24H	Misfiring counter at 1000 revolution of the first cylinder
			P0302	81H	24H	Misfiring counter at 1000 revolution of the second cylinder
			P0303	82H	24H	Misfiring counter at 1000 revolution of the third cylinder
			P0304	83H	24H	Misfiring counter at 1000 revolution of the fourth cylinder
			P0305	84H	24H	Misfiring counter at 1000 revolution of the fifth cylinder
			P0306	85H	24H	Misfiring counter at 1000 revolution of the sixth cylinder
			P0307	86H	24H	Misfiring counter at 1000 revolution of the seventh cylinder
			P0308	87H	24H	Misfiring counter at 1000 revolution of the eighth cylinder
			P0300	88H	24H	Misfiring counter at 1000 revolution of the multiple cylinders
			P0301	89H	24H	Misfiring counter at 200 revolution of the first cylinder
			P0302	8AH	24H	Misfiring counter at 200 revolution of the second cylinder
			P0303	8BH	24H	Misfiring counter at 200 revolution of the third cylinder
			P0304	8CH	24H	Misfiring counter at 200 revolution of the fourth cylinder
			P0305	8DH	24H	Misfiring counter at 200 revolution of the fifth cylinder
			P0306	8EH	24H	Misfiring counter at 200 revolution of the sixth cylinder
			P0307	8FH	24H	Misfiring counter at 200 revolution of the seventh cylinder
			P0308	90H	24H	Misfiring counter at 200 revolution of the eighth cylinder
			P0300	91H	24H	Misfiring counter at 1000 revolution of the single cylinder
			P0300	92H	24H	Misfiring counter at 200 revolution of the single cylinder
			P0300	93H	24H	Misfiring counter at 200 revolution of the multiple cylinders

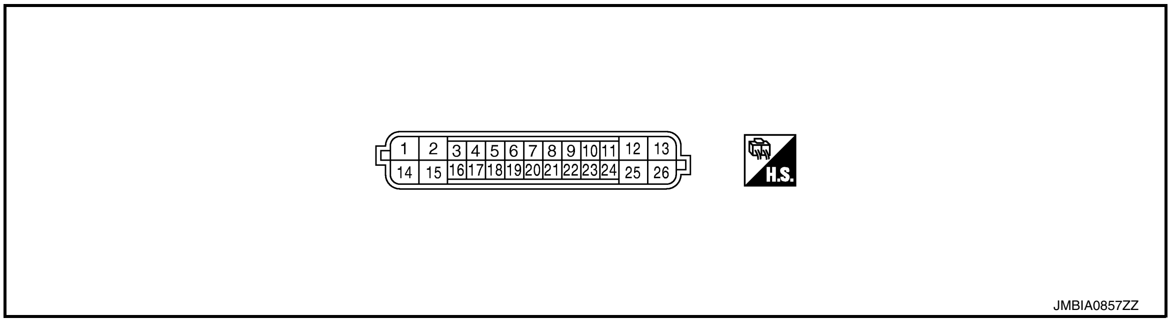
Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
MISFIRE	A2H	No. 1 cylinder misfire	P0301	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0301	0CH	24H	Misfire counts for last/current driving cycles
	A3H	No. 2 cylinder misfire	P0302	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0302	0CH	24H	Misfire counts for last/current driving cycles
	A4H	No. 3 cylinder misfire	P0303	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0303	0CH	24H	Misfire counts for last/current driving cycles
	A5H	No. 4 cylinder misfire	P0304	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0304	0CH	24H	Misfire counts for last/current driving cycles
	A6H	No. 5 cylinder misfire	P0305	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0305	0CH	24H	Misfire counts for last/current driving cycles
	A7H	No. 6 cylinder misfire	P0306	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0306	0CH	24H	Misfire counts for last/current driving cycles
	A8H	No. 7 cylinder misfire	P0307	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0307	0CH	24H	Misfire counts for last/current driving cycles
	A9H	No. 8 cylinder misfire	P0308	0BH	24H	EWMA (Exponential Weighted Moving Average) misfire counts for last 10 driving cycles
			P0308	0CH	24H	Misfire counts for last/current driving cycles

VVEL CONTROL MODULE

Reference Value

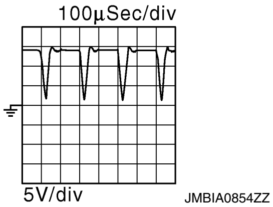
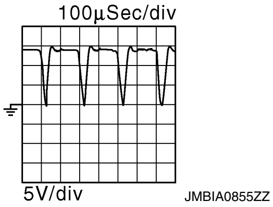
INFOID:0000000010597152

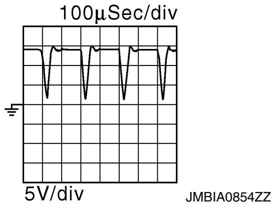
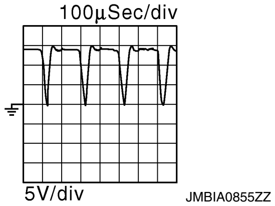
TERMINAL LAYOUT

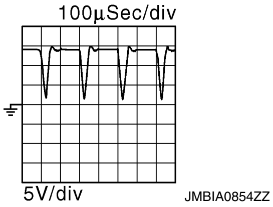
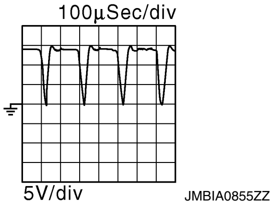


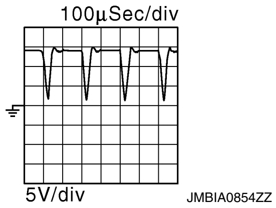
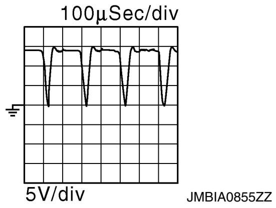
PHYSICAL VALUES

NOTE:
- VVEL control module is located behind the IPDM E/R. For this inspection, remove hoodledge cover (RH).
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT.

Terminal No.		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
1 (V)	14 (B/W)	VVEL actuator motor power supply (bank 2)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
2 (L/B)	14 (B/W)	VVEL actuator motor (High lift) (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0 - 14 V★ 
3 (G)	4 (W)	VVEL control shaft position sensor 1 (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	Approx.0.25 - 1.40 V
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	Approx.0.25 - 4.75 V
4 (W)	—	Sensor ground [VVEL control shaft position sensor 1 (bank 1)]	—	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
5 (R)	6 (B)	VVEL control shaft position sensor 1 (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	Approx.0.25 - 1.40 V
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	Approx.0.25 - 4.75 V
6 (B)	—	Sensor ground [VVEL control shaft position sensor 1 (bank 2)]	—	—	—
7 (SB)	6 (B)	Sensor power supply [VVEL control shaft position sensor 1 (bank 2)]	—	[Ignition switch: ON]	5 V
8 (BG)	14 (B/W)	Power supply for VVEL control module	—	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
9 (LG)	4 (W)	Sensor power supply [VVEL control shaft position sensor 1 (bank 1)]	—	[Ignition switch: ON]	5 V
11 (G)	—	Engine communication line	Input/ Output	—	—
12 (G)	14 (B/W)	VVEL actuator motor (High lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0 - 14 V★ 
13 (W)	14 (B/W)	VVEL actuator motor power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
14 (B/W)	—	VVEL control module ground	—	—	—

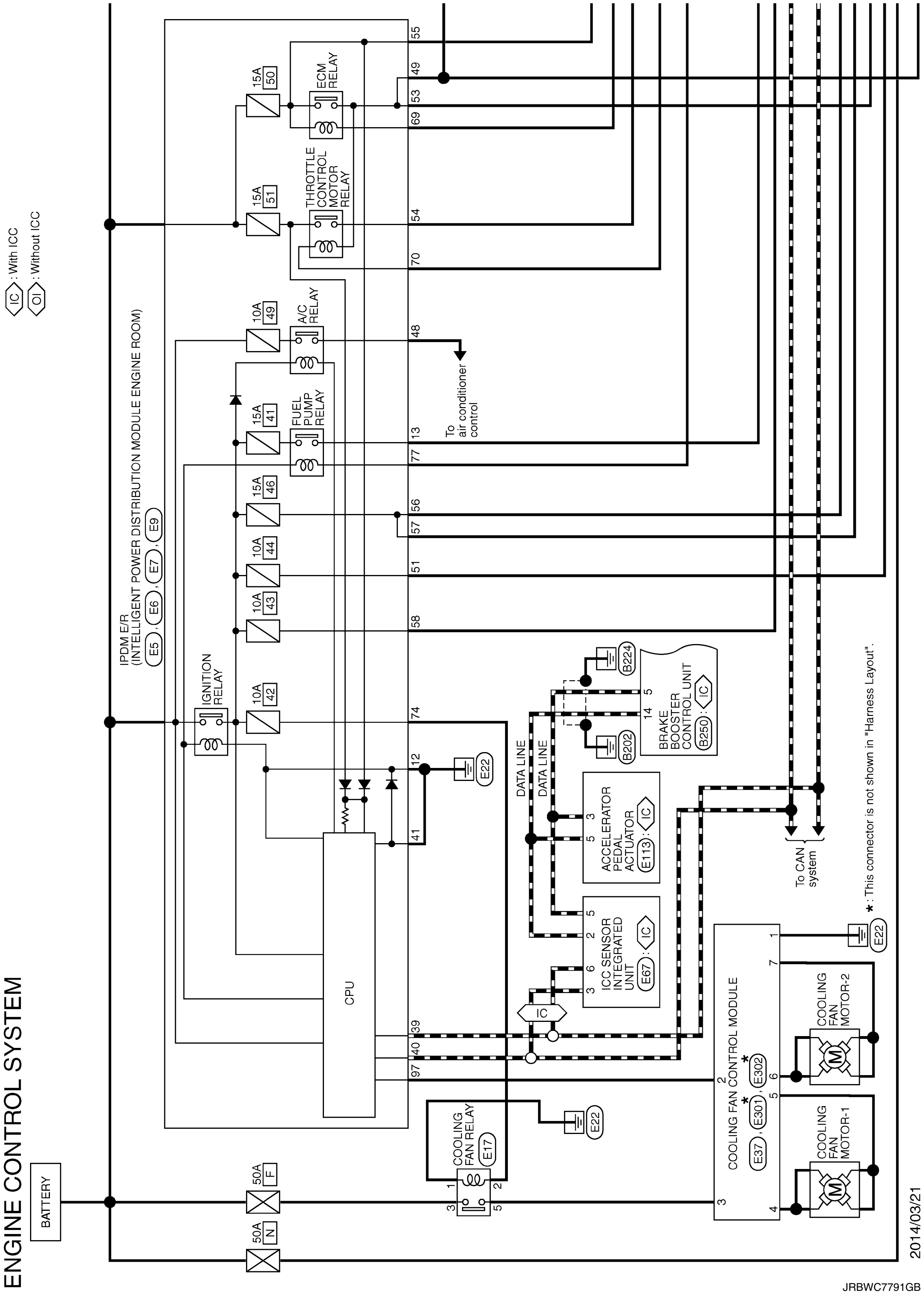
Terminal No.		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
15 (L/Y)	14 (B/W)	VVEL actuator motor (Low lift) (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0 - 14 V★ 
16 (R)	17 (L)	VVEL control shaft position sensor 2 (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed	3.50 - 4.75 V
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0.25 - 4.75 V
17 (L)	—	Sensor ground [VVEL control shaft position sensor 2 (bank 1)]	—	—	—
18 (G)	19 (W)	VVEL control shaft position sensor 2 (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed	3.50 - 4.75 V
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0.25 - 4.75 V
19 (W)	—	Sensor ground [VVEL control shaft position sensor 2 (bank 2)]	—	—	—
20 (BR)	19 (W)	Sensor power supply [VVEL control shaft position sensor 2 (bank 2)]	—	[Ignition switch: ON]	5 V
21 (V)	14 (B/W)	VVEL actuator motor relay abort signal	Input	[Engine is running] • Warm-up condition • Idle speed	0 V
22 (P)	17 (L)	Sensor power supply [VVEL position sensor 2 (bank 1)]	—	[Ignition switch: ON]	5 V
23 (GR)	14 (B/W)	VVEL control motor relay	Output	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
				[Ignition switch: ON]	0 - 1.0 V
24 (L)	—	Engine communication line	Input/ Output	—	—

Terminal No.		Description		Condition	Value (Approx.)
+	—	Signal name	Input/ Output		
25 (BR)	14 (B/W)	VVEL control motor (Low lift) (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	0 - 14 V★ 
				[Engine is running] • Warm-up condition • When revving engine up to 2,000 rpm quickly	0 - 14 V★ 

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Wiring Diagram - ENGINE CONTROL SYSTEM -

INFOID:0000000010597153



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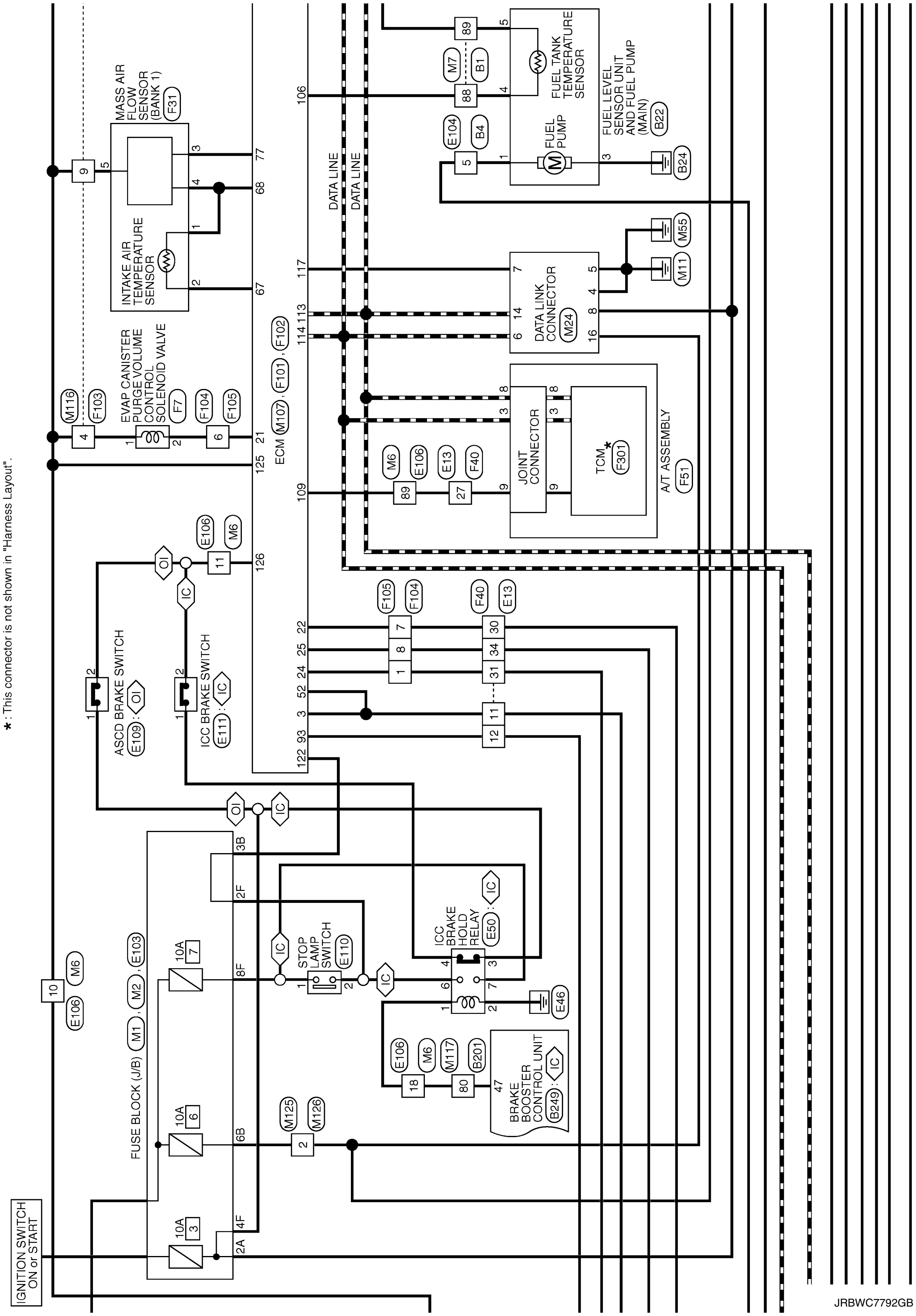
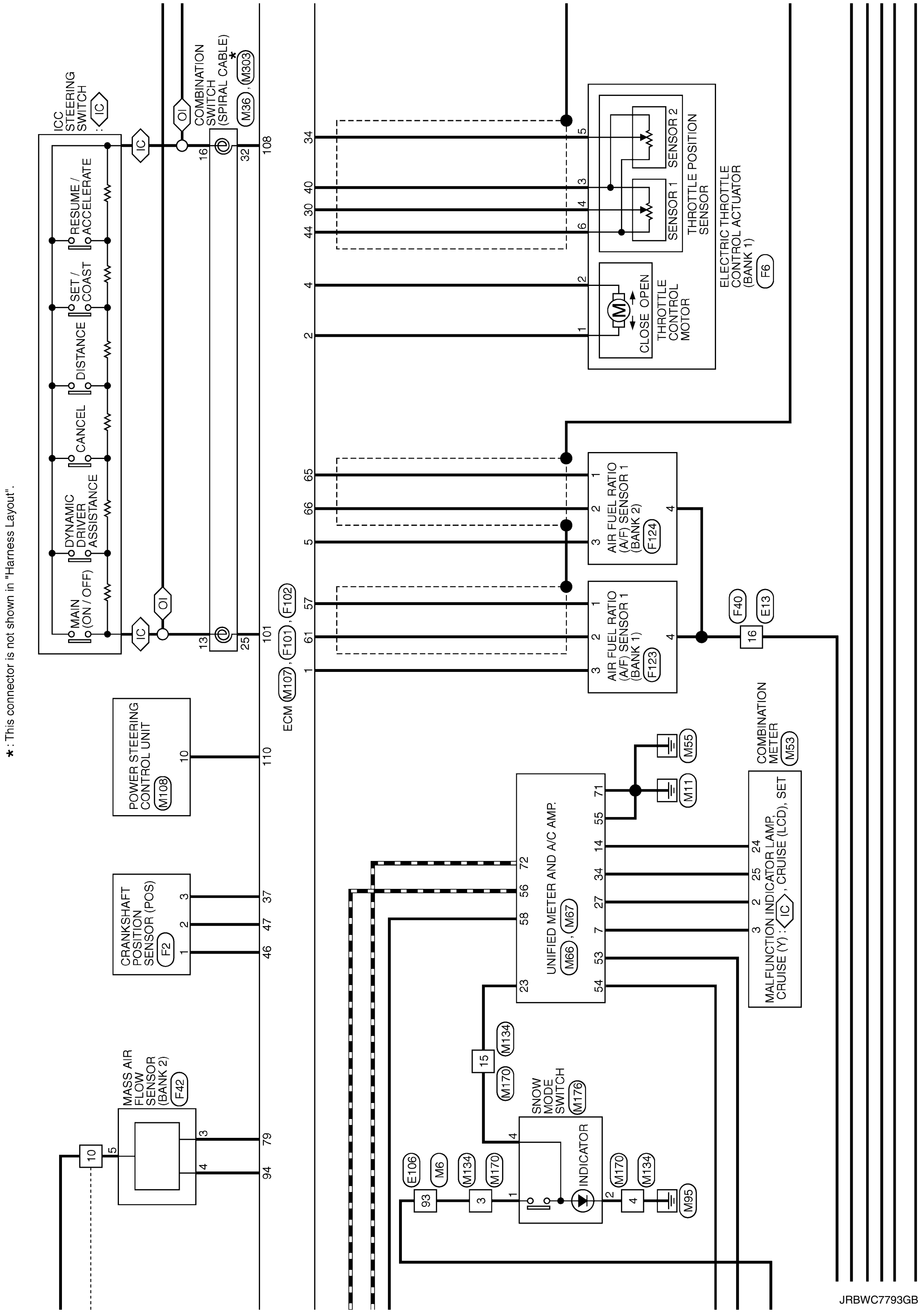
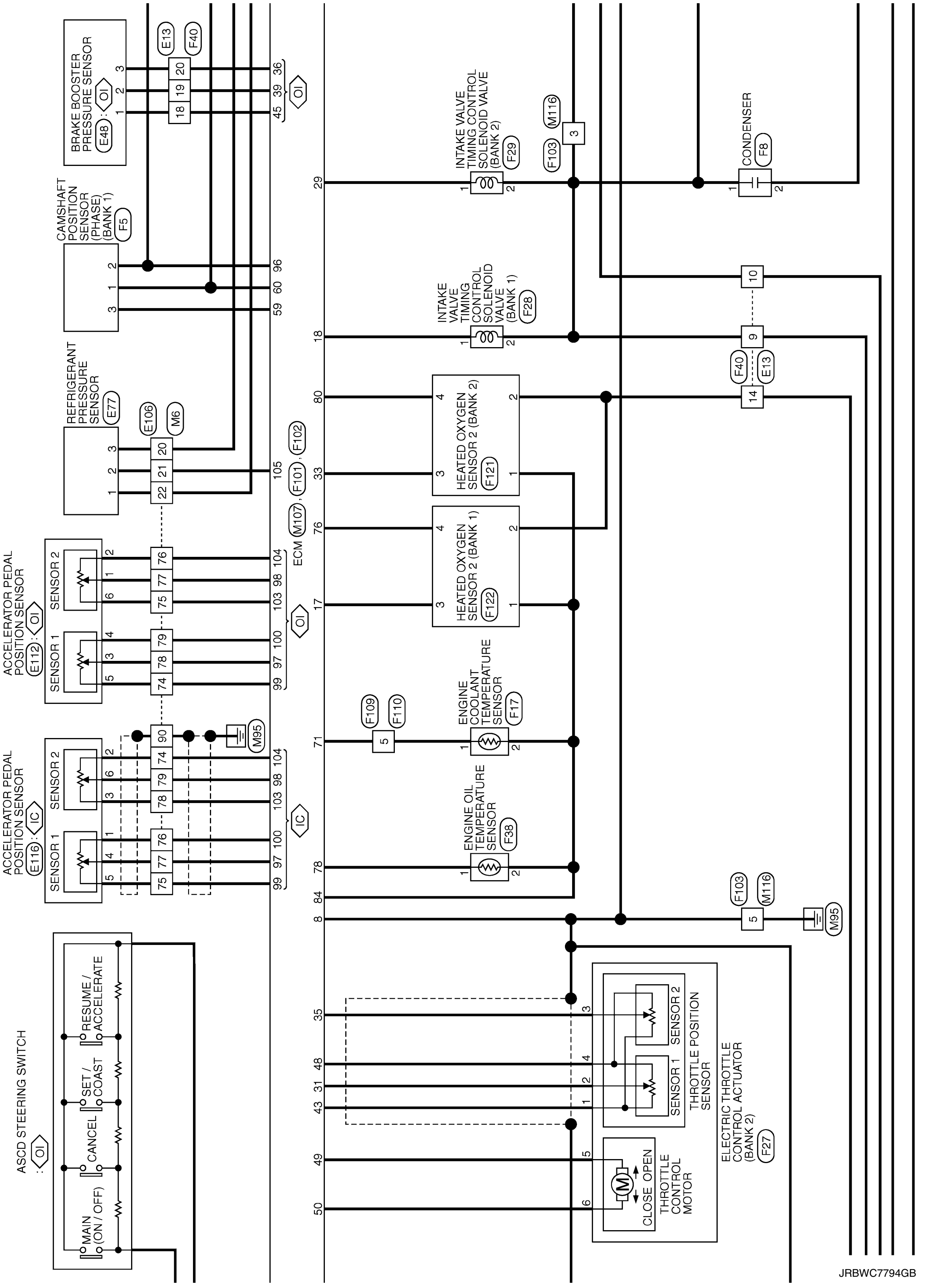
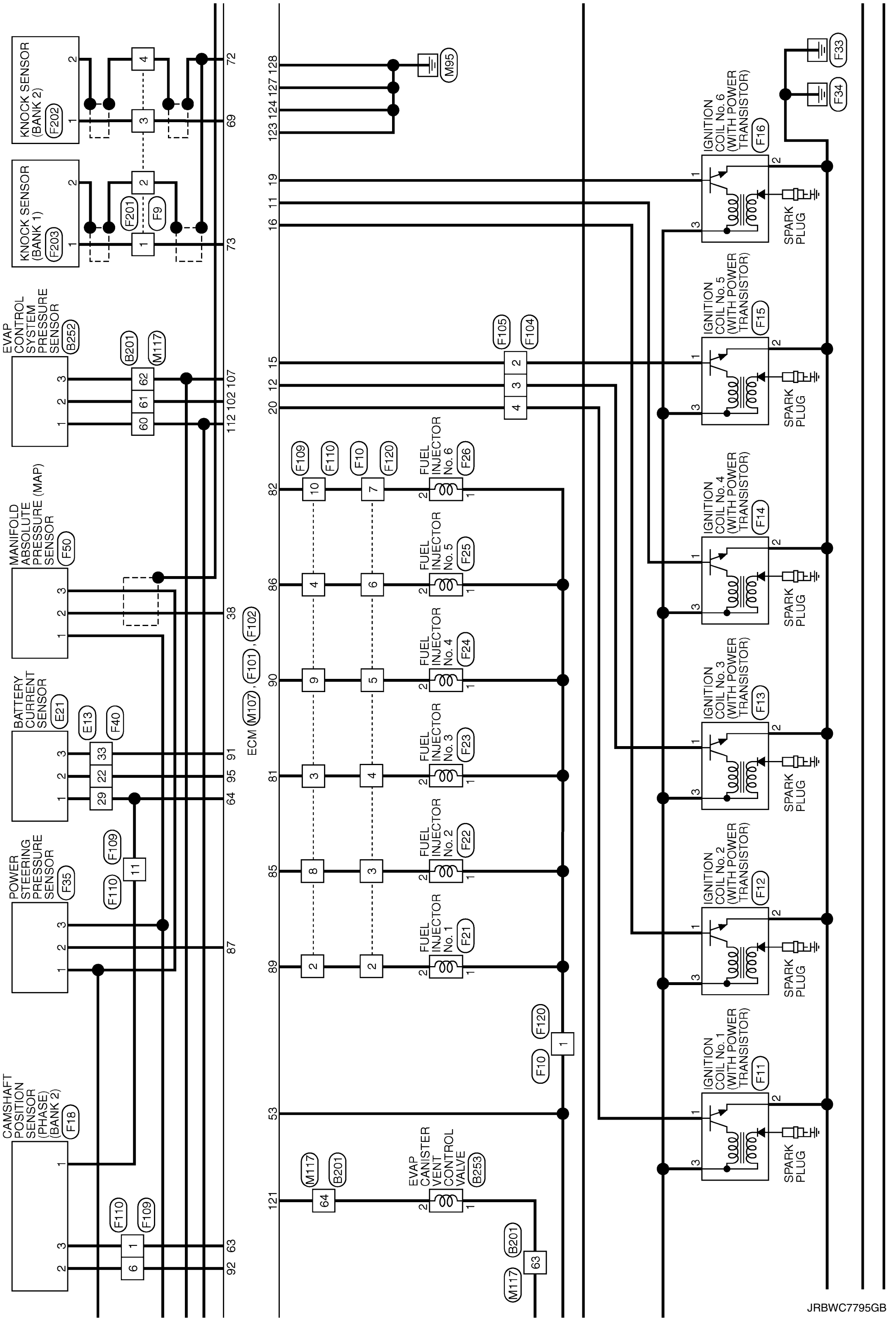
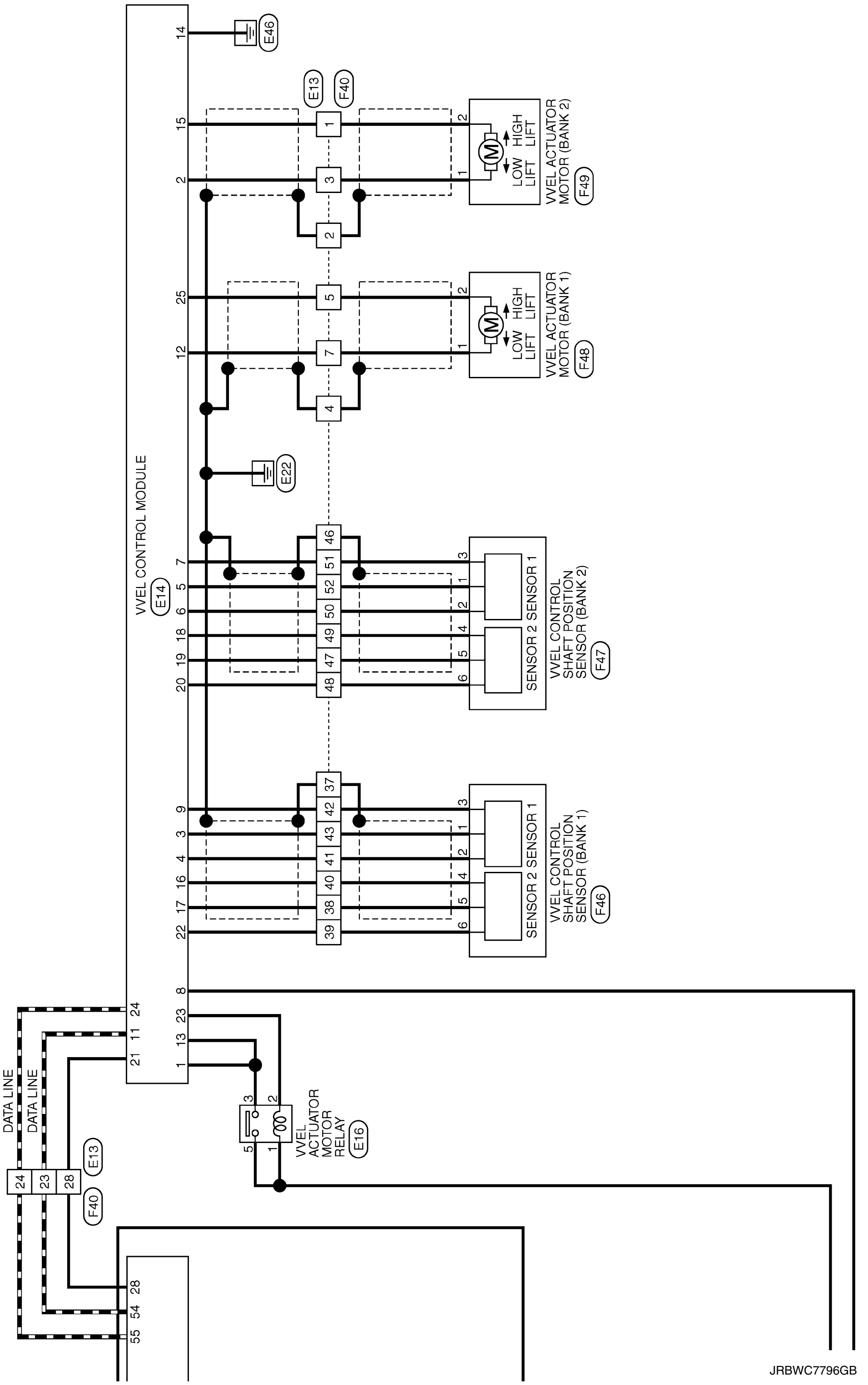

IGNITION SWITCH ON or START
FUSE BLOCK (J/B) M1, M2, E103
10A 3
10A 6
10A 7
2A
4F
6B
8F
2F
3B
10 E106 M6
2 M125 M126
STOP LAMP SWITCH E110
ICC BRAKE HOLD RELAY E50 : IC
E46
18 E106 M6
80 M117 B201
47
BRAKE BOOSTER CONTROL UNIT B249 : IC
ASCD BRAKE SWITCH E109 : OI
ICC BRAKE SWITCH E111 : IC
OI
IC
11 E106 M6
126
EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE F7
4 M116 F103
6 F104 F105
21
125
INTAKE AIR TEMPERATURE SENSOR
MASS AIR FLOW SENSOR (BANK 1) F31
9
77
68
67
ECM M107, F101, F102
117
114
113
106
109
122
93
3
52
24
25
22
DATA LINE
DATA LINE
7 8 1 F105 F104
30 34 31 11 12 F40 E13
89 27 M6 E106 E13 F40
JOINT CONNECTOR
TCM * F301
A/T ASSEMBLY F51
DATA LINK CONNECTOR M24
M11
M55
FUEL PUMP
FUEL TANK TEMPERATURE SENSOR
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN) B22
89 88 M7 B1
5 E104 B4
B24
* : This connector is not shown in "Harness Layout".
JRBWC7792GB



*: This connector is not shown in "Harness Layout".


BRAKE BOOSTER PRESSURE SENSOR
E48 : OI
CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
F5
REFRIGERANT PRESSURE SENSOR
E77
E106
M6
E13
F40
ACCELERATOR PEDAL POSITION SENSOR
E112 : OI
ACCELERATOR PEDAL POSITION SENSOR
E116 : IC
SENSOR 1
SENSOR 2
M95
ASCD STEERING SWITCH
: OI
RESUME / ACCELERATE
SET / COAST
CANCEL
MAIN (ON / OFF)
ECM
M107, F101, F102
OI
IC
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
F29
INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
F28
F103
M116
CONDENSER
F8
HEATED OXYGEN SENSOR 2 (BANK 2)
F121
HEATED OXYGEN SENSOR 2 (BANK 1)
F122
F109
F110
ENGINE COOLANT TEMPERATURE SENSOR
F17
ENGINE OIL TEMPERATURE SENSOR
F38
F103
M116
M95
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
THROTTLE CONTROL MOTOR
OPEN
CLOSE
ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 2)
F27
36 39 45
96 60 59
105
104 98 103 100 97 99
104 98 103 100 97 99
29 18 80 33 76 17 71 78 84 8 35 48 31 43 49 50
20 19 18
20 21 22
76 77 75 79 78 74
90 74 79 78 76 77 75
3 2 1
2 1 3
3 2 1
2 1 6 4 3 5
2 6 3 1 4 5
10 9 14 3 5 5
JRBWC7794GB

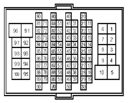

KNOCK SENSOR (BANK 2) F202
KNOCK SENSOR (BANK 1) F203
F201
F9
EVAP CONTROL SYSTEM PRESSURE SENSOR B252
B201
M117
MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR F50
BATTERY CURRENT SENSOR E21
E13
F40
POWER STEERING PRESSURE SENSOR F35
F109
F110
CAMSHAFT POSITION SENSOR (PHASE) (BANK 2) F18
ECM M107, F101, F102
M95
FUEL INJECTOR No. 6 F26
FUEL INJECTOR No. 5 F25
FUEL INJECTOR No. 4 F24
FUEL INJECTOR No. 3 F23
FUEL INJECTOR No. 2 F22
FUEL INJECTOR No. 1 F21
F10
F120
EVAP CANISTER VENT CONTROL VALVE B253
F105
F104
IGNITION COIL No.6 (WITH POWER TRANSISTOR) F16
IGNITION COIL No.5 (WITH POWER TRANSISTOR) F15
IGNITION COIL No.4 (WITH POWER TRANSISTOR) F14
IGNITION COIL No.3 (WITH POWER TRANSISTOR) F13
IGNITION COIL No.2 (WITH POWER TRANSISTOR) F12
IGNITION COIL No.1 (WITH POWER TRANSISTOR) F11
SPARK PLUG
F33
F34
72 69 73 107 102 112 38 91 95 64 87 63 92
128 127 124 123 19 11 16 15 12 20 82 86 90 81 85 89 53 121
JRBWC7795GB


VVEL CONTROL MODULE
E14
E46
E13
F40
E22
VVEL ACTUATOR MOTOR (BANK 2)
F49
VVEL ACTUATOR MOTOR (BANK 1)
F48
M
LOW LIFT
HIGH LIFT
VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
F47
VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
F46
SENSOR 1
SENSOR 2
DATA LINE
DATA LINE
VVEL ACTUATOR MOTOR RELAY
E16
JRBWC7796GB

ENGINE CONTROL SYSTEM

Connector No.	B1
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

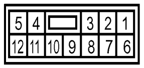
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3	R	–
5	G	–
6	SB	–
7	V	–
8	L	–
11	V	–
12	SB	–
13	LG	–
14	GR	–
15	LG	–
16	R	–
17	W	–
18	SB	–
19	LG	–
20	BR	–
21	SHIELD	–
22	Y	–
24	P	–
27	B	–
28	R	–
29	W	–
30	SHIELD	–
31	SHIELD	–
32	W	–
33	SB	–
34	L	–
35	P	–
36	L	–
37	P	–
38	P	–
39	Y	–
40	SB	–
44	Y	–
45	GR	–
46	LG	–
47	SB	–
48	BG	–
49	R	–
50	L	–
60	P	–
61	L	–
62	SHIELD	–
63	R	–
64	G	–
65	SHIELD	–
66	W	–
67	V	–
68	SB	–
69	SHIELD	–
70	W	–
73	SB	–
74	L	–
75	W	–
76	BR	–
77	R	–
78	P	–
79	GR	–
83	BG	–
85	V	–
86	LG	–
87	Y	–
88	R	–
89	B	–
90	BG	–
91	G	–
92	BR	–
93	G	–
94	SB	–
95	G	–
96	Y	–
98	W	–
99	GR	–

Connector No.	B4
Connector Name	WIRE TO WIRE
Connector Type	NS12FW-CS

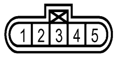
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	B	–
3	G	–
4	SHIELD	–
5	P	–
7	Y	–
8	R	–
9	BR	–
10	BG	–
11	LG	–
12	GR	–

Connector No.	B22
Connector Name	FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN)
Connector Type	E05FGY-RS

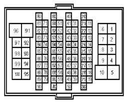
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	W	–
3	B	–
4	R	–
5	B	–

Connector No.	B201
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	R	–
3	GR	–
4	BG	–
7	LG	–
10	W	–
15	SB	–
16	V	–
17	BR	–
26	BR	–
27	L	–
28	Y	–
29	Y	–
30	GR	–
31	R	–
32	BR	–
33	G	–
51	R	–
55	G	–
56	R	–
57	W	–
58	B	–
59	SHIELD	–
60	LG	–
61	W	–
62	BR	–
63	P	–
64	L	–
65	G	–
66	P	–
67	L	–
68	SHIELD	–
69	V	–
70	Y	–
71	SB	–

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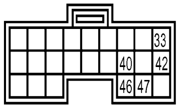
72	W	–
73	BR	–
75	Y	–
80	V	–
81	SB	–
82	LG	–
83	P	–
84	R	–
85	L	–
86	BG	–
87	L	–
88	P	–
91	V	–
92	R	–
94	R	–
95	SB	–
96	G	–
97	G	–
98	R	–
99	P	–
100	L	–

Connector No.	B249
Connector Name	BRAKE BOOSTER CONTROL UNIT
Connector Type	TK24FGY

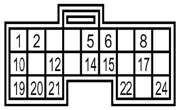
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
33	BR	IGNITION
40	SB	IBA OFF SW
42	G	IGNITION
46	B	GROUND
47	V	BRAKE HOLD RLY DRIVE SIGNAL

Connector No.	B250
Connector Name	BRAKE BOOSTER CONTROL UNIT
Connector Type	TK24FW

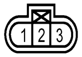
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	BATTERY
2	W	BATTERY
5	P	ITS COMM-L
6	SB	RELEASE SW PWR
8	R	BRAKE PRESSURE SEN PWR
10	G	BOOSTER SOL PWR
12	R	BOOSTER SOL GND
14	L	ITS COMM-H
15	LG	RELEASE SW (NC)
17	L	BRAKE PRESSURE SEN SIGNAL
19	B	GROUND
20	B	GROUND
21	Y	CHIME SIGNAL
22	P	RELEASE SW (NO)
24	BG	BRAKE PRESSURE SEN GND

Connector No.	B252
Connector Name	EVAP CONTROL SYSTEM PRESSURE SENSOR
Connector Type	E03FGY-RS

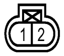
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	–
2	W	–
3	BR	–

Connector No.	B253
Connector Name	EVAP CANISTER VENT CONTROL VALVE
Connector Type	E02FB-RS

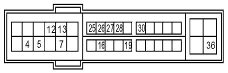
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	L	–

Connector No.	E5
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4-1V

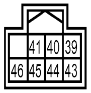
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
4	V	–
5	L	–
7	R	–
12	B/W	–
13	Y	–
16	LG	–
19	W	–
25	G	–
26	R	–
27	BG	–
28	L	–
30	GR	–
36	G	–

Connector No.	E6
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH08FW-NH

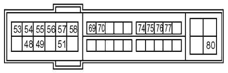
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
39	P	–
40	L	–
41	B/W	–
43	SB	–
44	BR	–
45	G	–
46	R	–

Connector No.	E7
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH20FW-CS12-M4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
48	L	–
49	BG	–
51	Y	–
53	W	–
54	P	–
55	SB	–
56	LG	–
57	G	–
58	V	–
69	BR	–
70	BG	–
74	P	–
75	SB	–

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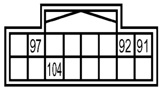
76	Y	–
77	R	–
80	W	–

Connector No.	E9
Connector Name	IPDM E/R (INTELLIGENT POWER DISTRIBUTION MODULE ENGINE ROOM)
Connector Type	TH16FW-NH

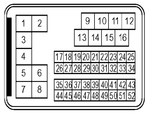
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
91	P	–
92	BG	–
97	V	–
104	LG	–

Connector No.	E13
Connector Name	WIRE TO WIRE
Connector Type	SAA36MB-RS8-SHZ8

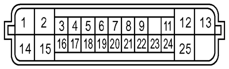
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/Y	–
2	SHIELD	–
3	L/B	–
4	SHIELD	–
5	BR	–
7	G	–
8	W	–
9	W	–
10	Y	–
11	P	–
12	SB	–
13	L	–
14	G	–
15	R	–
16	LG	–
18	Y	–
19	BG	–
20	B	–
21	SB	–
22	W	–
23	L	–
24	G	–
25	LG	–
27	GR	–
28	V	–
29	P	–
30	R	–
31	BR	–
32	Y	–
33	G	–
34	BG	–
37	SHIELD	–
38	L	–
39	P	–
40	R	–
41	W	–
42	LG	–
43	G	–
45	BG	–
46	SHIELD	–
47	W	–
48	BR	–
49	G	–
50	B	–
51	SB	–
52	R	–

Connector No.	E14
Connector Name	VVEL CONTROL MODULE
Connector Type	RH18FB-AJZ8-RH

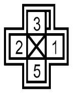
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	VVEL ACTUATOR MOTOR POWER SUPPLY (BANK 2)
2	L/B	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 2)
3	G	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)
4	W	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)]
5	R	VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)
6	B	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)]
7	SB	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 2)]
8	BG	POWER SUPPLY FOR VVEL CONTROL MODULE
9	LG	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 1 (BANK 1)]
11	G	ENGINE COMMUNICATION LINE
12	G	VVEL ACTUATOR MOTOR (HIGH LIFT) (BANK 1)
13	W	VVEL ACTUATOR MOTOR RELAY POWER SUPPLY (BANK 1)
14	B/W	VVEL CONTROL MODULE GROUND
15	L/Y	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 2)
16	R	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)
17	L	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)]
18	G	VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)
19	W	SENSOR GROUND [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)]
20	BR	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 2)]
21	V	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL
22	P	SENSOR POWER SUPPLY [VVEL CONTROL SHAFT POSITION SENSOR 2 (BANK 1)]
23	GR	VVEL ACTUATOR MOTOR RELAY
24	L	ENGINE COMMUNICATION LINE
25	BR	VVEL ACTUATOR MOTOR (LOW LIFT) (BANK 1)

Connector No.	E16
Connector Name	VVEL ACTUATOR MOTOR RELAY
Connector Type	24347 9F900

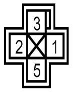
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	GR	–
3	V	–
5	R	–

Connector No.	E17
Connector Name	COOLING FAN RELAY
Connector Type	24347 9F900

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	–
2	P	–
3	W	–
5	R	–

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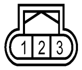
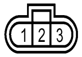
Connector No.	E21
Connector Name	BATTERY CURRENT SENSOR
Connector Type	RH03FB



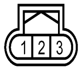
Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	W	–
3	G	–

Connector No.	E37
Connector Name	COOLING FAN CONTROL MODULE
Connector Type	SJZ01FGY-SNZ2



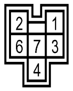
Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	–
2	V	–
3	R	–

Connector No.	E48
Connector Name	BRAKE BOOSTER PRESSURE SENSOR
Connector Type	RH03FB



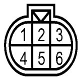
Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	AVCC2_MVPRES
2	BG	MVPRES
3	B	GNDA_MVPRES

Connector No.	E50
Connector Name	ICC BRAKE HOLD RELAY
Connector Type	M06FGY-R-US



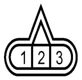
Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	–
2	B	–
3	P	–
4	SB	–
6	P	–
7	R	–

Connector No.	E67
Connector Name	ICC SENSOR INTEGRATED UNIT
Connector Type	RS06FB-PR



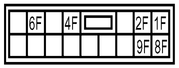
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	IGNITION
2	L	ITS COMM-H
3	L	CAN-H
4	B	GROUND
5	P	ITS COMM-L
6	P	CAN-L

Connector No.	E77
Connector Name	REFRIGERANT PRESSURE SENSOR
Connector Type	RK03FB



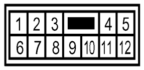
Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	–
2	L	–
3	BG	–

Connector No.	E103
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS16FW-CS



Terminal No.	Color Of Wire	Signal Name [Specification]
1F	SB	–
2F	W	–
4F	G	–
6F	BR	–
8F	L	–
9F	R	–

Connector No.	E104
Connector Name	WIRE TO WIRE
Connector Type	NS12MW-CS



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	BR	–
3	L	–
4	SHIELD	–
5	Y	–
7	Y	–
8	R	–
9	BR	–
10	BG	–
11	LG	–
12	GR	–

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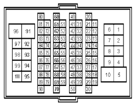
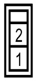
Connector No.	E106
Connector Name	WIRE TO WIRE
Connector Type	TH80FW-CS16-TM4



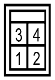
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	W	–
3	B	–
4	GR	–
5	GR	–
8	Y	–
9	BR	–
10	BG	–
11	SB	–
12	BG	–
13	L	–
14	R	–
15	P	–
16	V	–
17	SB	–
18	V	–
20	BG	–
21	L	–
22	V	–
23	G	–
24	P	–
25	Y	–
26	V	–
27	W	–
28	G	–
31	BG	–
32	W	–
33	B	–
34	R	–
35	G	–
36	SHIELD	–
37	V	–
38	BR	–
39	BG	–
41	W	–
42	G	–
43	BR	–
45	W	–
49	L	–
50	P	–
51	L	–
54	BG	–
57	BR	–
59	W	–
60	LG	–
61	G	–
62	SB	–
63	W	–
64	B	–
65	G	–
66	R	–
67	SHIELD	–
68	Y	–
69	LG	–
70	W	–
71	R	–
72	Y	–
73	B	–
74	BR	– [With ICC]
74	L	– [Without ICC]
75	G	– [With ICC]
75	W	– [Without ICC]
76	W	– [With ICC]
76	Y	– [Without ICC]
77	P	– [Without ICC]
77	R	– [With ICC]
78	BR	– [Without ICC]
78	L	– [With ICC]
79	L	– [Without ICC]
79	Y	– [With ICC]
80	SB	–
81	R	–
82	SB	–
83	BG	–
84	G	–
85	L	–
86	P	–
87	V	–
89	GR	–
90	SHIELD	–
91	W	–
92	Y	–
93	V	–
94	LG	–
95	BG	–
96	P	–
97	R	–
98	SHIELD	–
99	L	–
100	P	–

Connector No.	E109
Connector Name	ASCD BRAKE SWITCH
Connector Type	M02FBR-LC



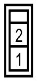
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	SB	–

Connector No.	E110
Connector Name	STOP LAMP SWITCH
Connector Type	M04FW-LC



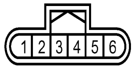
Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	W	–
3	Y	–
4	SB	–

Connector No.	E111
Connector Name	ICC BRAKE SWITCH
Connector Type	M02FBR-LC



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	–
2	SB	–

Connector No.	E112
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	RH06FB



Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	Y	–
3	BR	–
4	L	–
5	L	–
6	W	–

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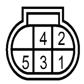
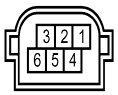
Connector No.	E113
Connector Name	ACCELERATOR PEDAL ACTUATOR
Connector Type	KDZ06FB



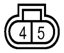
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	IGNITION
2	BG	BATTERY
3	P	ITS COMM-L
4	B/W	GROUND
5	L	ITS COMM-H

Connector No.	E116
Connector Name	ACCELERATOR PEDAL POSITION SENSOR
Connector Type	AAZ06FB1



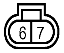
Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	BR	–
3	L	–
4	R	–
5	G	–
6	Y	–

Connector No.	E301
Connector Name	COOLING FAN CONTROL MODULE (COOLING FAN MOTOR-1)
Connector Type	6188-0259



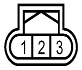
Terminal No.	Color Of Wire	Signal Name [Specification]
4	–	–
5	–	–

Connector No.	E302
Connector Name	COOLING FAN CONTROL MODULE (COOLING FAN MOTOR-2)
Connector Type	6188-0259



Terminal No.	Color Of Wire	Signal Name [Specification]
6	–	–
7	–	–

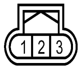
Connector No.	F2
Connector Name	CRANKSHAFT POSITION SENSOR (POS)
Connector Type	RH03FB



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–

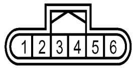
2	Y	–
3	W	–

Connector No.	F5
Connector Name	CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
Connector Type	RH03FB



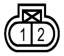
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	P	–
3	O	–

Connector No.	F6
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 1)
Connector Type	RH06FB



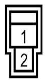
Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	MOTOR1-1
2	BR	MOTOR1-2
3	R	GND-A(TPS)
4	Y	TPS1-1
5	B	OUTPUT2(TPS)
6	L	INPUT(TPS)

Connector No.	F7
Connector Name	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Connector Type	E02FL-RS-LGY



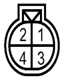
Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	GR	–

Connector No.	F8
Connector Name	CONDENSER
Connector Type	M02FW-LC



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	B	–

Connector No.	F9
Connector Name	WIRE TO WIRE
Connector Type	RS04FL-B



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–

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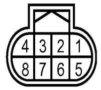
2	SHIELD	–
3	W	–
4	SHIELD	–

Connector No.	F10
Connector Name	WIRE TO WIRE
Connector Type	RH08FB

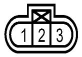
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	GR	–
3	BR	–
4	R	–
5	O	–
6	W	–
7	V	–

Connector No.	F11
Connector Name	IGNITION COIL No. 1 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

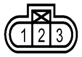
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	–
2	B	–
3	W	–

Connector No.	F12
Connector Name	IGNITION COIL No. 2 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

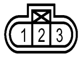
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	B	–
3	W	–

Connector No.	F13
Connector Name	IGNITION COIL No. 3 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

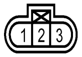
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	B	–
3	W	–

Connector No.	F14
Connector Name	IGNITION COIL No. 4 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

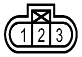
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	–
2	B	–
3	W	–

Connector No.	F15
Connector Name	IGNITION COIL No. 5 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

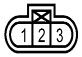
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	V	–
2	B	–
3	W	–

Connector No.	F16
Connector Name	IGNITION COIL No. 6 (WITH POWER TRANSISTOR)
Connector Type	E03FGY-RS

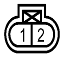
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	–
2	B	–
3	W	–

Connector No.	F17
Connector Name	ENGINE COOLANT TEMPERATURE SENSOR
Connector Type	E02FGY-RS

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	–
2	B	–

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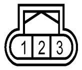
ENGINE CONTROL SYSTEM

Connector No.	F18
Connector Name	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)
Connector Type	RH03FB

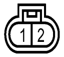
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	SB	–
2	G	–
3	L	–

Connector No.	F21
Connector Name	FUEL INJECTOR No. 1
Connector Type	HS02FGY

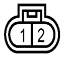
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	GR	–

Connector No.	F22
Connector Name	FUEL INJECTOR No. 2
Connector Type	HS02FGY

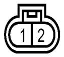
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	BR	–

Connector No.	F23
Connector Name	FUEL INJECTOR No. 3
Connector Type	HS02FGY

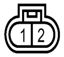
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	R	–

Connector No.	F24
Connector Name	FUEL INJECTOR No. 4
Connector Type	HS02FGY

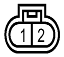
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	O	–

Connector No.	F25
Connector Name	FUEL INJECTOR No. 5
Connector Type	HS02FGY

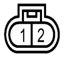
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	W	–

Connector No.	F26
Connector Name	FUEL INJECTOR No. 6
Connector Type	HS02FGY

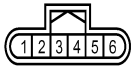
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	V	–

Connector No.	F27
Connector Name	ELECTRIC THROTTLE CONTROL ACTUATOR (BANK 2)
Connector Type	RH06FB

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	R	–
3	W	–
4	B	–
5	GR	–
6	V	–

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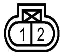
Connector No.	F28
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 1)
Connector Type	E02FG-RS-LGY

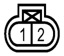
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	R	–

Connector No.	F29
Connector Name	INTAKE VALVE TIMING CONTROL SOLENOID VALVE (BANK 2)
Connector Type	E02FG-RS-LGY

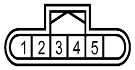
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	R	–

Connector No.	F31
Connector Name	MASS AIR FLOW SENSOR (BANK 1)
Connector Type	RH06FB

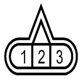
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	–
2	P	–
3	SB	–
4	LG	–
5	Y	–

Connector No.	F35
Connector Name	POWER STEERING PRESSURE SENSOR
Connector Type	RK03FB

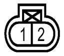
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	–
2	Y	–
3	R	–

Connector No.	F38
Connector Name	ENGINE OIL TEMPERATURE SENSOR
Connector Type	E02FGY-RS

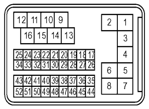
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	B	–

Connector No.	F40
Connector Name	WIRE TO WIRE
Connector Type	SAA36FB-RS8-SHZ8

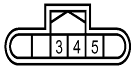
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/Y	–
2	SHIELD	–
3	L/B	–
4	SHIELD	–
5	BR	–
7	G	–
8	W	–
9	W	–
10	G	–
11	R	–
12	P	–
13	L	–
14	LG	–
15	BR	–
16	Y	–
18	LG	–
19	P	–
20	O	–
21	Y	–
22	G	–
23	Y	–
24	LG	–
25	V	–
27	GR	–
28	BR	–
29	L	–
30	R	–
31	P	–
32	W	–
33	SB	–
34	O	–
37	SHIELD	–
38	W	–
39	Y	–
40	G	–
41	B	–
42	GR	–
43	R	–
45	O	–
46	SHIELD	–
47	W/L	–
48	LG	–
49	O/L	–
50	L/Y	–
51	W	–
52	L/G	–

Connector No.	F42
Connector Name	MASS AIR FLOW SENSOR (BANK 2)
Connector Type	RH06FB

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3	BR	–
4	Y	–
5	GR	–

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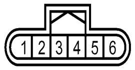
ENGINE CONTROL SYSTEM

Connector No.	F46
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 1)
Connector Type	RH06FB

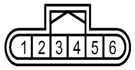
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	VEL/S-R1
2	B	AGND1
3	GR	AVCC1
4	G	VEL/S-R2
5	W	AGND2
6	Y	AVCC2

Connector No.	F47
Connector Name	VVEL CONTROL SHAFT POSITION SENSOR (BANK 2)
Connector Type	RH06FB

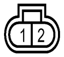
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/G	VEL/S-R1
2	L/Y	AGND3
3	W	AVCC3
4	O/L	VEL/S-L2
5	W/L	AGND4
6	LG	AVCC4

Connector No.	F48
Connector Name	VVEL ACTUATOR MOTOR (BANK 1)
Connector Type	X02FB

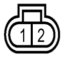
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	-
2	BR	-

Connector No.	F49
Connector Name	VVEL ACTUATOR MOTOR (BANK 2)
Connector Type	X02FB

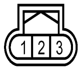
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L/B	-
2	L/Y	-

Connector No.	F50
Connector Name	MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
Connector Type	RH03FB

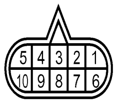
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	POWER
2	O	OUTPUT
3	W	GND

Connector No.	F51
Connector Name	A/T ASSEMBLY
Connector Type	RK10FG-DGY

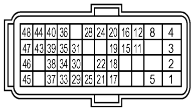
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	Y	IGNITION POWER SUPPLY
2	BR	BATTERY POWER SUPPLY
3	O	CAN-H
4	V	K-LINE
5	B	GROUND
6	Y	IGNITION POWER SUPPLY
7	R	BACK-UP LAMP RELAY
8	LG	CAN-L
9	GR	STARTER RELAY
10	B	GROUND

Connector No.	F101
Connector Name	ECM
Connector Type	RH40FB-RZ8-L-LH-Z

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	A/F SENSOR 1 HEATER (BANK 1)
2	G	THROTTLE CONTROL MOTOR (BANK 1) (OPEN)
3	R	THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (BANK 1)
4	BR	THROTTLE CONTROL MOTOR (BANK 1) (CLOSE)
5	W	A/F SENSOR 1 HEATER (BANK 2)
8	B	ECM GROUND
11	GR	IGNITION SIGNAL #4
12	L	IGNITION SIGNAL #3
15	V	IGNITION SIGNAL #5
16	G	IGNITION SIGNAL #2
17	P	HEATED OXYGEN SENSOR 2 HEATER (BANK 1)
18	W	IVT CONTROL SOLENOID VALVE (BANK 1)
19	SB	IGNITION SIGNAL #6
20	Y	IGNITION SIGNAL #1
21	GR	EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
22	R	FUEL PUMP RELAY
24	P	ECM RELAY (SELF SHUT-OFF)
25	O	THROTTLE CONTROL MOTOR RELAY
28	BR	VVEL ACTUATOR MOTOR RELAY ABORT SIGNAL (VVEL CONTROL MODULE)
29	G	IVT CONTROL SOLENOID VALVE (BANK 2)
30	Y	THROTTLE POSITION SENSOR 1 (BANK 1)
31	R	THROTTLE POSITION SENSOR 1 (BANK 2)
33	SB	HEATED OXYGEN SENSOR 2 HEATER (BANK 2)
34	B	THROTTLE POSITION SENSOR 2 (BANK 1)
35	W	THROTTLE POSITION SENSOR 2 (BANK 2)
36	O	SENSOR GROUND
37	W	CRANKSHAFT POSITION SENSOR (POS)
38	O	MANIFOLD ABSOLUTE PRESSURE (MAP) SENSOR
39	P	BRAKE BOOSTER PRESSURE SENSOR
40	R	SENSOR GROUND
43	G	SENSOR POWER SUPPLY
44	L	SENSOR POWER SUPPLY
45	LG	SENSOR POWER SUPPLY
46	R	SENSOR POWER SUPPLY
47	Y	SENSOR GROUND
48	B	SENSOR GROUND

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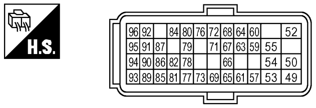
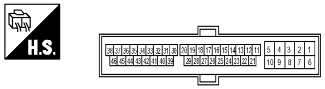
ENGINE CONTROL SYSTEM

Connector No.	F102
Connector Name	ECM
Connector Type	RH40FBR-RZ8-L-LH-Z



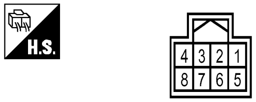
Terminal No.	Color Of Wire	Signal Name [Specification]
49	GR	THROTTLE CONTROL MOTOR (CLOSE) (BANK 2)
50	V	THROTTLE CONTROL MOTOR (OPEN) (BANK 2)
52	R	THROTTLE CONTROL MOTOR RELAY POWER SUPPLY (BANK 2)
53	W	IGNITION SWITCH
54	Y	CAN COMMUNICATION LINE (VVEL CONTROL MODULE)
55	LG	CAN COMMUNICATION LINE (VVEL CONTROL MODULE)
57	L	A/F SENSOR 1 (BANK 1)
59	O	CAMSHAFT POSITION SENSOR (PHASE) (BANK 1)
60	G	SENSOR POWER SUPPLY
61	R	A/F SENSOR 1 (BANK 1)
63	L	CAMSHAFT POSITION SENSOR (PHASE) (BANK 2)
64	SB	SENSOR POWER SUPPLY
65	LG	A/F SENSOR 1 (BANK 2)
66	V	A/F SENSOR 1 (BANK 2)
67	P	INTAKE AIR TEMPERATURE SENSOR
68	LG	SENSOR GROUND
69	W	KNOCK SENSOR (BANK 2)
71	Y	ENGINE COOLANT TEMPERATURE SENSOR
72	SHIELD	SENSOR GROUND
73	W	KNOCK SENSOR (BANK 1)
76	W	HEATED OXYGEN SENSOR 2 (BANK 1)
77	SB	MASS AIR FLOW SENSOR (BANK 1)
78	G	ENGINE OIL TEMPERATURE SENSOR
79	BR	MASS AIR FLOW SENSOR (BANK 2)
80	O	HEATED OXYGEN SENSOR 2 (BANK 2)
81	R	FUEL INJECTOR #3
82	V	FUEL INJECTOR #6
84	B	SENSOR GROUND
85	BR	FUEL INJECTOR #2
86	W	FUEL INJECTOR #5
87	Y	POWER STEERING PRESSURE SENSOR
89	GR	FUEL INJECTOR #1
90	O	FUEL INJECTOR #4
91	SB	BATTERY CURRENT SENSOR
92	G	SENSOR GROUND
93	P	POWER SUPPLY FOR ECM (BACK-UP)
94	Y	SENSOR GROUND
95	G	SENSOR GROUND
96	P	SENSOR GROUND

Connector No.	F103
Connector Name	WIRE TO WIRE
Connector Type	TK36FW-NS10



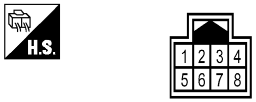
Terminal No.	Color Of Wire	Signal Name [Specification]
2	G	–
3	W	–
4	R	–
5	B	–
9	Y	–
10	GR	–
19	BG	– [Without ICC]
19	O	– [With ICC]
20	Y	–
28	B	–
29	LG	–
31	R	–
33	GR	–
34	B	–
35	L	–
36	P	–
37	Y	–
38	G	–
43	LG	–
44	O	–
45	Y	–
46	V	–

Connector No.	F104
Connector Name	WIRE TO WIRE
Connector Type	TH08FW-NH



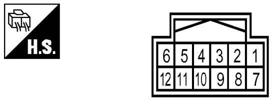
Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	V	–
3	L	–
4	Y	–
6	GR	–
7	R	–
8	O	–

Connector No.	F105
Connector Name	WIRE TO WIRE
Connector Type	TH08MW-NH



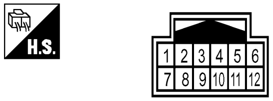
Terminal No.	Color Of Wire	Signal Name [Specification]
1	P	–
2	V	–
3	L	–
4	Y	–
6	GR	–
7	R	–
8	O	–

Connector No.	F109
Connector Name	WIRE TO WIRE
Connector Type	TH12FW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	GR	–
3	R	–
4	W	–
5	Y	–
6	G	–
8	BR	–
9	O	–
10	V	–
11	SB	–

Connector No.	F110
Connector Name	WIRE TO WIRE
Connector Type	TH12MW-NH



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	GR	–
3	R	–
4	W	–
5	Y	–
6	G	–
8	BR	–
9	O	–
10	V	–
11	SB	–

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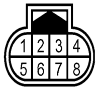
Connector No.	F120
Connector Name	WIRE TO WIRE
Connector Type	RH08MB

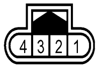
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	G	–
2	GR	–
3	BR	–
4	R	–
5	O	–
6	W	–
7	V	–

Connector No.	F121
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 2)
Connector Type	RH04MB

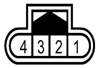
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	SENSOR(–)
2	LG	HEATER(+)
3	SB	HEATER(–)
4	O	SENSOR(+)

Connector No.	F122
Connector Name	HEATED OXYGEN SENSOR 2 (BANK 1)
Connector Type	RH04MB

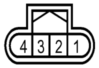
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	B	SENSOR(–)
2	R	HEATER(+)
3	P	HEATER(–)
4	W	SENSOR(+)

Connector No.	F123
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
Connector Type	RH04FDGY-P

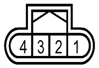
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	AF(+)
2	R	AF(–)
3	W	HEATER(–)
4	Y	HEATER(+)

Connector No.	F124
Connector Name	AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
Connector Type	RH04FDGY-P

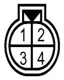
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	AF(+)
2	V	AF(–)
3	W	HEATER(–)
4	Y	HEATER(+)

Connector No.	F201
Connector Name	WIRE TO WIRE
Connector Type	RS04ML-B

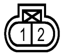
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	SHIELD	–
3	W	–
4	SHIELD	–

Connector No.	F202
Connector Name	KNOCK SENSOR (BANK 2)
Connector Type	E02FG-RS-LGY

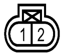
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	SHIELD	–

Connector No.	F203
Connector Name	KNOCK SENSOR (BANK 1)
Connector Type	E02FG-RS-LGY

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	SHIELD	–

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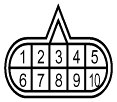
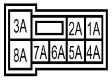
Connector No.	F301
Connector Name	TCM
Connector Type	SP10FG



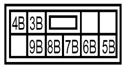
Terminal No.	Color Of Wire	Signal Name [Specification]
1	–	IGNITION POWER SUPPLY
2	–	BATTERY POWER SUPPLY
3	–	CAN-H
4	–	K-LINE
5	–	GROUND
6	–	IGNITION POWER SUPPLY
7	–	BACK-UP LAMP RELAY
8	–	CAN-L
9	–	STARTER RELAY
10	–	GROUND

Connector No.	M1
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS06FW-M2



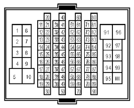
Terminal No.	Color Of Wire	Signal Name [Specification]
1A	Y	–
2A	G	–
3A	L	–
4A	R	–
5A	V	–
6A	Y	–
7A	R	–
8A	L	–

Connector No.	M2
Connector Name	FUSE BLOCK (J/B)
Connector Type	NS10FW-CS



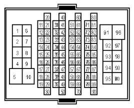
Terminal No.	Color Of Wire	Signal Name [Specification]
3B	P	–
4B	G	–
5B	BG	–
6B	Y	–
7B	P	–
8B	R	–
9B	SB	–

Connector No.	M6
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	R	–
3	B	–
4	SHIELD	–
5	G	–
8	Y	–
9	BR	–
10	R	–
11	BR	–
12	BG	–
13	L	–
14	R	–
15	P	–
16	V	–
17	SB	–
18	V	–
20	BG	–
21	L	–
22	W	–
23	P	–
24	BR	–
25	Y	–
26	V	–
27	G	–
28	G	–
31	L	–
32	G	–
33	B	–
34	W	–
35	R	–
36	SHIELD	–
37	V	–
38	BG	–
39	BR	–
41	W	–
42	BG	–
43	BG	–
45	W	–
49	L	–
50	P	–
51	BR	–
54	Y	–
57	G	–
59	W	–
60	L	–
61	G	–
62	SB	–
63	G	–
64	B	–
65	W	–
66	R	–
67	SHIELD	–
68	Y	–
69	GR	–
70	LG	–
71	LG	–
72	Y	–
73	SB	–
74	BR	– [With ICC]
74	L	– [Without ICC]
75	G	–
76	GR	– [Without ICC]
76	W	– [With ICC]
77	P	– [Without ICC]
77	R	– [With ICC]
78	L	– [With ICC]
78	R	– [Without ICC]
79	W	– [Without ICC]
79	Y	– [With ICC]
80	SB	–
81	SB	–
82	SB	–
83	V	–
84	G	–
85	L	–
86	P	–
87	W	–
89	GR	–
90	SHIELD	–
91	W	–
92	Y	–
93	BR	–
94	P	–
95	GR	–
96	W	–
97	L	–
98	SHIELD	–
99	V	–
100	SB	–

Connector No.	M7
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4



Terminal No.	Color Of Wire	Signal Name [Specification]
3	SB	– [With automatic drive positioner]
3	W	– [Without automatic drive positioner]
5	G	–
6	BG	–
7	W	–
8	B	–
11	V	–
12	SB	–

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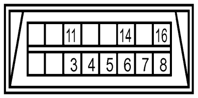
ENGINE CONTROL SYSTEM

13	LG	–
14	Y	–
15	G	–
16	R	–
17	W	–
18	SB	–
19	LG	–
20	BR	–
21	SHIELD	–
22	Y	–
24	V	–
27	B	–
28	W	–
29	R	–
30	SHIELD	–
31	L	–
32	P	–
33	SB	–
34	L	–
35	P	–
36	L	–
37	P	–
38	P	–
39	Y	–
40	SB	–
44	L	–
45	GR	–
46	LG	–
47	SB	–
48	BG	–
49	R	–
50	L	–
60	P	–
61	L	–
62	SHIELD	–
63	R	–
64	G	–
65	SHIELD	–
66	SB	–
67	V	–
68	LG	–
69	SHIELD	–
70	W	–
73	G	–
74	R	–
75	W	–
76	W	–
77	B	–
78	P	–
79	GR	–
83	BG	–
85	LG	–
86	R	–
87	Y	–
88	W	–
89	BR	–
90	BG	–
91	G	–
92	V	–
93	BR	–
94	V	–
95	G	–
96	Y	–
98	W	–
99	R	–

Connector No.	M24
Connector Name	DATA LINK CONNECTOR
Connector Type	BD16FW

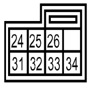
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
3	LG	–
4	B	–
5	B	–
6	L	–
7	V	–
8	G	–
11	SB	–
14	P	–
16	Y	–

Connector No.	M36
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY-1V

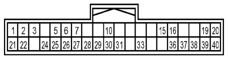
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
24	P	–
25	SB	–
26	B	–
31	L	–
32	Y	–
33	B	–
34	G	–

Connector No.	M53
Connector Name	COMBINATION METER
Connector Type	TH40FW-NH

H.S.

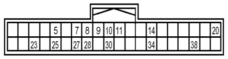


Terminal No.	Color Of Wire	Signal Name [Specification]
1	GR	BATTERY POWER SUPPLY
2	LG	COMMUNICATION SIGNAL (METER->AMP.)
3	GR	COMMUNICATION SIGNAL (AMP.->METER)
5	B	GROUND
6	P	ALTERNATOR SIGNAL
7	BR	AIR BAG SIGNAL
10	G	SECURITY SIGNAL
15	B	GROUND
16	B	METER CONTROL SWITCH GROUND
19	B	ILL GND
20	R	ILL
21	BG	IGNITION SIGNAL
22	B	GROUND

24	BR	COMMUNICATION SIGNAL (LCD->AMP.)
25	Y	COMMUNICATION SIGNAL (AMP.->LCD)
26	R	VEHICLE SPEED SIGNAL (8-PULSE)
27	V	PARKING BRAKE SWITCH SIGNAL
28	W	BRAKE FLUID LEVEL SWITCH SIGNAL
29	SB	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)
30	G	SEAT BELT BUCKLE SWITCH SIGNAL (PASSENGER SIDE)
31	L	WASHER LEVEL SWITCH SIGNAL
33	B	ILLUMINATION CONTROL SIGNAL
36	LG	SELECT SWITCH SIGNAL
37	SB	ENTER SWITCH SIGNAL
38	L	TRIP A/B RESET SWITCH SIGNAL
39	P	ILLUMINATION CONTROL SWITCH SIGNAL (-)
40	BG	ILLUMINATION CONTROL SWITCH SIGNAL (+)

Connector No.	M66
Connector Name	UNIFIED METER AND A/C AMP.
Connector Type	TH40FW-NH

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
5	L	MANUAL MODE SHIFT UP SIGNAL
7	GR	COMMUNICATION SIGNAL (AMP.->METER)
8	L	VEHICLE SPEED SIGNAL (2-PULSE)
9	SB	SEAT BELT BUCKLE SWITCH SIGNAL (DRIVER SIDE)
10	W	MANUAL MODE SIGNAL
11	G	NON-MANUAL MODE SIGNAL
14	BR	COMMUNICATION SIGNAL (LCD->AMP.)
20	L	ION ON/OFF SIGNAL
23	Y	AT SNOW SWITCH SIGNAL
25	V	MANUAL MODE SHIFT DOWN SIGNAL
27	LG	COMMUNICATION SIGNAL (METER->AMP.)
28	R	VEHICLE SPEED SIGNAL (8-PULSE)
30	V	PARKING BRAKE SWITCH SIGNAL
34	Y	COMMUNICATION SIGNAL (AMP.->LCD)
38	P	BLOWER MOTOR CONTROL SIGNAL

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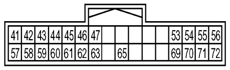
Connector No.	M67
Connector Name	UNIFIED METER AND A/C AMP.
Connector Type	TH32FW-NH

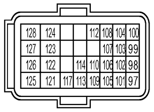
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
41	V	ACC POWER SUPPLY
42	Y	FUEL LEVEL SENSOR SIGNAL
43	R	INTAKE SENSOR SIGNAL
44	LG	IN-VEHICLE SENSOR SIGNAL
45	P	AMBIENT SENSOR SIGNAL
46	BG	SUNLOAD SENSOR SIGNAL
47	G	EXHAUST GAS / OUTSIDE ODOR DETECTING SENSOR SIGNAL
53	G	IGNITION POWER SUPPLY
54	Y	BATTERY POWER SUPPLY
55	B	GROUND
56	L	CAN-H
57	W	BRAKE FLUID LEVEL SWITCH SIGNAL
58	BR	FUEL LEVEL SENSOR GROUND
59	GR	INTAKE SENSOR GROUND
60	L	IN-VEHICLE SENSOR GROUND
61	BR	AMBIENT SENSOR GROUND
62	SB	SUNLOAD SENSOR GROUND
63	R	–
65	BG	ECV SIGNAL
69	L	A/C LAN SIGNAL
70	R	EACH DOOR MOTOR POWER SUPPLY
71	B	GROUND
72	P	CAN-L

Connector No.	M107
Connector Name	ECM
Connector Type	RH24FGY-RZ8-R-LH-Z

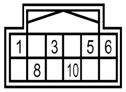
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
97	R	ACCELERATOR PEDAL POSITION SENSOR 1
98	P	ACCELERATOR PEDAL POSITION SENSOR 2 [Without ICC]
98	Y	ACCELERATOR PEDAL POSITION SENSOR 2 [With ICC]
99	G	SENSOR POWER SUPPLY [With ICC]
99	L	SENSOR POWER SUPPLY [Without ICC]
100	W	SENSOR GROUND
101	SB	ASCD/ICC STEERING SWITCH
102	LG	EVAP CONTROL SYSTEM PRESS SENSOR
103	G	SENSOR POWER SUPPLY [Without ICC]
103	L	SENSOR POWER SUPPLY [With ICC]
104	BR	SENSOR GROUND [With ICC]
104	GR	SENSOR GROUND [Without ICC]
105	L	REFRIGERANT PRESS SENSOR
106	W	FUEL TANK TEMPERATURE SENSOR
107	BG	SENSOR POWER SUPPLY
108	Y	SENSOR GROUND
109	G	PNP SIGNAL
110	R	ENGINE SPEED OUTPUT SIGNAL
112	V	SENSOR GROUND
113	P	CAN COMMUNICATION LINE
114	L	CAN COMMUNICATION LINE
117	V	DATA LINK CONNECTOR
121	LG	EVAP CANISTER VENT CONTROL VALVE
122	P	STOP LAMP SWITCH
123	B	ECM GROUND
124	B	ECM GROUND
125	R	POWER SUPPLY FOR ECM
126	BR	ASCD/ICC BRAKE SWITCH
127	B	ECM GROUND
128	B	ECM GROUND

Connector No.	M108
Connector Name	POWER STEERING CONTROL UNIT
Connector Type	TH12FW-NH

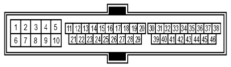
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	LG	EPS SOL+
3	G	IGN
5	B	EPS SOL-
6	B	GROUND
8	L	VEHICLE SPEED(2P)
10	R	ENG TACHO

Connector No.	M116
Connector Name	WIRE TO WIRE
Connector Type	TK36MW-NS10

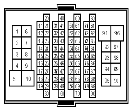
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
2	P	–
3	L	–
4	R	–
5	B	–
9	R	–
10	R	–
19	BG	–
20	Y	–
28	B	–
29	LG	–
31	W	–
33	B	–
34	B	–
35	L	–
36	P	–
37	Y	–
38	G	–
43	P	–
44	L	–
45	BR	–
46	BG	–

Connector No.	M117
Connector Name	WIRE TO WIRE
Connector Type	TH80MW-CS16-TM4

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	L	–
2	G	–
3	GR	–
4	SB	–
7	W	–
10	W	–
15	SB	–
16	V	–
17	BR	–
26	BR	–
27	LG	–
28	Y	–
29	Y	–
30	V	–
31	R	–
32	BR	–
33	G	–
51	R	–
55	W	–
56	B	–
57	R	–
58	G	–
59	SHIELD	–
60	V	–
61	LG	–
62	BR	–
63	L	–

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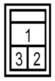
ENGINE CONTROL SYSTEM

64	LG	–
65	B	–
66	R	–
67	W	–
68	SHIELD	–
69	V	–
70	Y	–
71	SB	–
72	W	–
73	G	–
75	W	–
80	V	–
81	SB	–
82	V	–
83	P	–
84	R	–
85	L	–
86	BG	–
87	L	–
88	P	–
91	V	–
92	G	–
94	G	–
95	W	–
96	G	–
97	Y	–
98	BR	–
99	P	– [Without BOSE audio]
99	V	– [With BOSE audio]
100	L	– [Without BOSE audio]
100	SB	– [With BOSE audio]

Connector No.	M125
Connector Name	WIRE TO WIRE
Connector Type	M03FW-LC

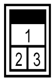
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	Y	–
3	R	–

Connector No.	M126
Connector Name	WIRE TO WIRE
Connector Type	M03MW-LC

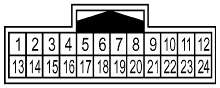
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	W	–
2	Y	–
3	R	–

Connector No.	M134
Connector Name	WIRE TO WIRE
Connector Type	TH24MW-NH

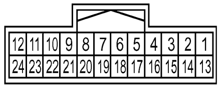
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	R	–
3	BR	–
4	B	–
5	R	–
6	V	–
7	B	–
8	B	–
9	B	–
13	W	–
14	W	–
15	Y	–
16	P	–
17	B	–
18	L	–
19	Y	–
20	L	–

Connector No.	M170
Connector Name	WIRE TO WIRE
Connector Type	TH24FW-NH

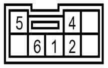
H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
1	R	–
2	R	–
3	BR	–
4	B	–
5	SB	–
6	GR	–
7	V	–
8	BR	–
9	B	–
13	W	–
14	W	–
15	Y	–
16	P	–
17	L	–
18	G	–
19	Y	–
20	R	–

Connector No.	M176
Connector Name	SNOW MODE SWITCH
Connector Type	TK08FW

H.S.

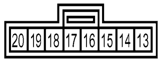


Terminal No.	Color Of Wire	Signal Name [Specification]
1	BR	–
2	B	–
4	Y	–

5	P	–
6	SB	–

Connector No.	M303
Connector Name	COMBINATION SWITCH (SPIRAL CABLE)
Connector Type	TK08FGY

H.S.



Terminal No.	Color Of Wire	Signal Name [Specification]
13	R	–
14	W	–
15	L	–
16	B	–
17	BR	–
18	Y	–
19	P	–
20	Y	–

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SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000010597154

SYSTEM — BASIC ENGINE CONTROL SYSTEM

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel pump circuit	1	1	2	3	2		2	2			3		2	EC-509
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-628
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-506
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-97
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-527
	Incorrect idle speed adjustment						1	1	1	1		1			EC-14
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-411, EC-418
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-14
	Ignition circuit	1	1	2	2	2		2	2			2			EC-516
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-164
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-188, EC-194
Engine coolant temperature sensor circuit					3		3			3					EC-209, EC-216
Air fuel ratio (A/F) sensor 1 circuit															EC-224, EC-228, EC-231, EC-471
Throttle position sensor circuit							2			2					EC-212, EC-284, EC-407, EC-409, EC-420
Accelerator pedal position sensor circuit				3	2	1									EC-476, EC-480, EC-485
Knock sensor circuit				2								3			EC-294

	SYMPTOM													Reference page
	HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code	AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Engine oil temperature sensor			4		1						3			EC-282, EC-281
Crankshaft position sensor (POS) circuit	2	2												EC-297
Camshaft position sensor (PHASE) circuit	3	2												EC-301
Vehicle speed signal circuit		2	3		3						3			EC-358
Power steering pressure sensor circuit		2					3	3						EC-370
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-373, EC-375
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-185
Manifold absolute pressure (MAP) sensor											3			-
Brake booster pressure sensor											3			-
VVEL control module	3		4	4	3									EC-461,EC-463
VVEL actuator motor	3		4	4	3									EC-393
VVEL actuator motor relay	3		4	4	3									EC-397
VVEL actuator shaft position sensor	3		4	4	3									EC-389
PNP signal circuit			3		3		3	3			3			EC-381
Refrigerant pressure sensor circuit		2				3			3		4			EC-529
Electrical load signal circuit							3							EC-504
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	HAC-4
ABS actuator and electric unit (control unit)			4											BRC-5

1 - 6: The numbers refer to the order of inspection.

(continued on next page)

SYSTEM — ENGINE MECHANICAL & OTHER

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-13
	Fuel piping			5	5	5		5	5			5			FL-4
	Vapor lock														—
	Valve deposit	5		5	5	5		5	5			5			—
	Poor fuel (Heavy weight gasoline, Low octane)														—
Air	Air duct		5	5		5		5	5			5			EM-28
	Air cleaner														EM-28
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)	5			5		5			5					EM-28
	Electric throttle control actuator														EM-29
	Air leakage from intake manifold/ Collector/Gasket														EM-33
Cranking	Battery	1	1	1		1		1	1			1		1	PG-114
	Generator circuit														CHG-27, CHG-28
	Starter circuit	3													STR-2 (With GR8-1200 NI), STR-5(Without GR8-1200 NI)
	Signal plate	6													EM-131
	PNP signal circuit	4													TM-74
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-118
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-131
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Valve mechanism	Timing chain	5	5	5	5	5		5	5			5			EM-66
	Camshaft														EM-105
	Intake valve timing control														EM-105
	Intake valve												3		EM-118
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EX-4, EX-6
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			LU-11, LU-13, LU-15
	Oil level (Low)/Filthy oil														LU-7
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-11, CO-11
	Thermostat									5					CO-23
	Water pump														CO-21
	Water gallery														CO-25
	Cooling fan									5					CO-18
	Coolant level (Low)/Contaminated coolant														CO-7
IVIS (INFINITI Vehicle Immobilizer System — NATS)		1	1												SEC-5

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

Description

INFOID:0000000010597155

FUEL CUT CONTROL (AT NO LOAD AND HIGH ENGINE SPEED)

If the engine speed is above 2,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 2,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed. However, if the engine speed is above 4,500 rpm, fuel will be cut off in a few seconds. Fuel cut will be operated until the engine speed reaches 1,500 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, EC-48, "System Description".

TORQUE CUT CONTROL (AT HIGH ENGINE OIL TEMPERATURE)

ECM receives engine oil temperature signal from engine oil temperature sensor.

To avoid VVEL performance, ECM performs the engine torque cut control at high engine oil temperature.

If engine oil temperature is too high, engine oil viscosity will change. As a result, engine oil pressure is decreased. This control is to control the VVEL operating angle by operating the VVEL actuator sub assembly. If this control is operated, engine performance will decrease, then maximum engine speed is reduced a little, for example.

NOTE:

If the engine oil temperature sensor is deteriorated, its characteristic will change.

In this case, the operating temperature for engine torque cut control might be decrease.

Perform Component Inspection of the engine oil temperature sensor to check for the deterioration.

Refer to EC-282, "Component Inspection".

PRECAUTION

PRECAUTIONS

Precaution for Supplemental Restraint System (SRS) "AIR BAG" and "SEAT BELT PRE-TENSIONER"

INFOID:0000000010597156

The Supplemental Restraint System such as “AIR BAG” and “SEAT BELT PRE-TENSIONER”, used along with a front seat belt, helps to reduce the risk or severity of injury to the driver and front passenger for certain types of collision. This system includes seat belt switch inputs and dual stage front air bag modules. The SRS system uses the seat belt switches to determine the front air bag deployment, and may only deploy one front air bag, depending on the severity of a collision and whether the front occupants are belted or unbelted.
Information necessary to service the system safely is included in the “SRS AIR BAG” and “SEAT BELT” of this Service Manual.

WARNING:

Always observe the following items for preventing accidental activation.

- **To avoid rendering the SRS inoperative, which could increase the risk of personal injury or death in the event of a collision that would result in air bag inflation, all maintenance must be performed by an authorized NISSAN/INFINITI dealer.**
- **Improper maintenance, including incorrect removal and installation of the SRS, can lead to personal injury caused by unintentional activation of the system. For removal of Spiral Cable and Air Bag Module, see “SRS AIR BAG”.**
- **Never use electrical test equipment on any circuit related to the SRS unless instructed to in this Service Manual. SRS wiring harnesses can be identified by yellow and/or orange harnesses or harness connectors.**

PRECAUTIONS WHEN USING POWER TOOLS (AIR OR ELECTRIC) AND HAMMERS

WARNING:

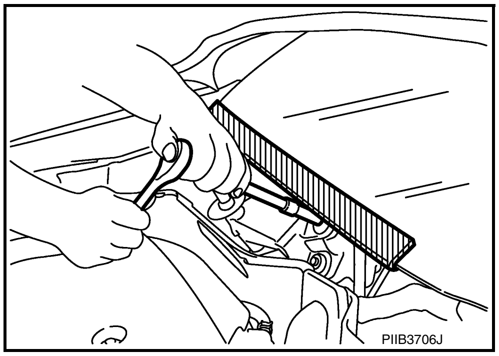
Always observe the following items for preventing accidental activation.

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, never use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Procedure without Cowl Top Cover

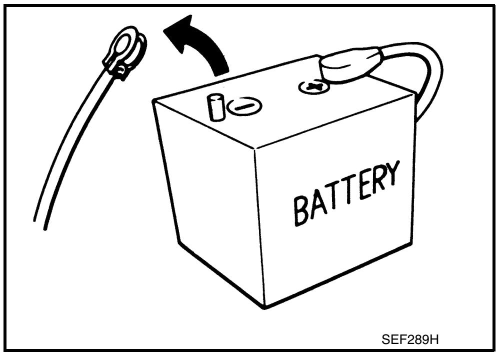
INFOID:0000000010597157

When performing the procedure after removing cowl top cover, cover the lower end of windshield with urethane, etc to prevent damage to windshield.



Precautions for Removing Battery Terminal

INFOID:0000000011035111



- When removing the 12V battery terminal, turn OFF the ignition switch and wait at least 30 seconds.
  NOTE:
  ECU may be active for several tens of seconds after the ignition switch is turned OFF. If the battery terminal is removed before ECU stops, then a DTC detection error or ECU data corruption may occur.
- For vehicles with the 2-batteries, be sure to connect the main battery and the sub battery before turning ON the ignition switch.
  NOTE:
  If the ignition switch is turned ON with any one of the terminals of main battery and sub battery disconnected, then DTC may be detected.
- After installing the 12V battery, always check "Self Diagnosis Result" of all ECUs and erase DTC.
  NOTE:
  The removal of 12V battery may cause a DTC detection error.

Precautions For Xenon Headlamp Service

INFOID:0000000010597158

WARNING:

Comply with the following warnings to prevent any serious accident.

- **Disconnect the battery cable (negative terminal) or the power supply fuse before installing, removing, or touching the xenon headlamp (bulb included). The xenon headlamp contains high-voltage generated parts.**
- **Never work with wet hands.**
- **Check the xenon headlamp ON-OFF status after assembling it to the vehicle. Never turn the xenon headlamp ON in other conditions. Connect the power supply to the vehicle-side connector. (Turning it ON outside the lamp case may cause fire or visual impairments.)**
- **Never touch the bulb glass immediately after turning it OFF. It is extremely hot.**

CAUTION:

Comply with the following cautions to prevent any error and malfunction.

- **Install the xenon bulb securely. (Insufficient bulb socket installation may melt the bulb, the connector, the housing, etc. by high-voltage leakage or corona discharge.)**
- **Never perform HID circuit inspection with a tester.**
- **Never touch the xenon bulb glass with hands. Never put oil and grease on it.**
- **Dispose of the used xenon bulb after packing it in thick vinyl without breaking it.**
- **Never wipe out dirt and contamination with organic solvent (thinner, gasoline, etc.).**

On Board Diagnostic (OBD) System of Engine and A/T

INFOID:0000000010597159

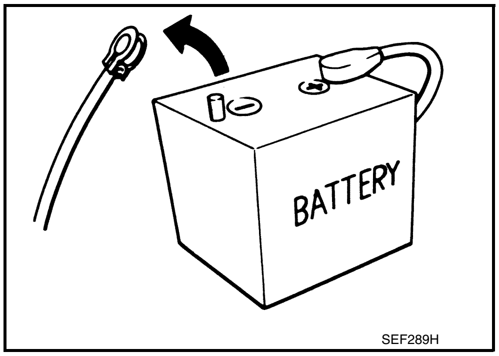
The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

CAUTION:

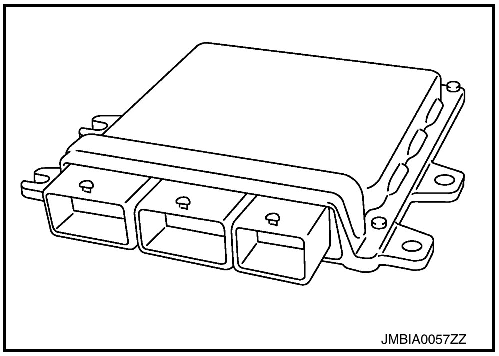
- **Always turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.**
- **Always connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Be sure the connector is free from water, grease, dirt, bent terminals, etc.)**
- **Certain systems and components, especially those related to OBD, may use a new style slide-locking type harness connector. For description and how to disconnect, refer to PG-103, "Description".**
- **Always route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.**
- **Always connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Always erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

General Precautions

INFOID:0000000010597160



- **Always use a 12 volt battery as power source.**
- **Never attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery voltage is applied to ECM even if ignition switch is turned OFF.**
- **Before removing parts, turn ignition switch OFF and then disconnect negative battery cable.**

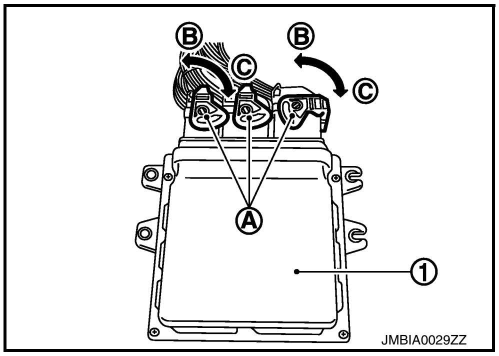


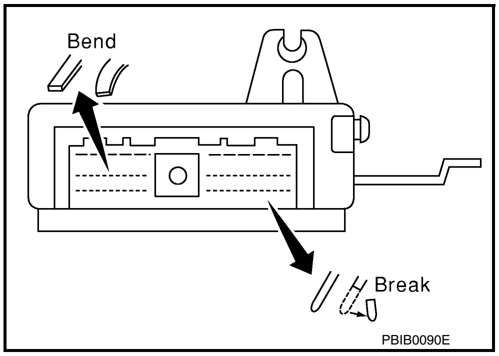
- **Never disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts because of a slight variation.
- **If the battery is disconnected, the following emission-related diagnostic information will be cleared within 24 hours.**

- **Diagnostic trouble codes**
- **1st trip diagnostic trouble codes**
- **Freeze frame data**
- **1st trip freeze frame data**
- **System readiness test (SRT) codes**
- **Test values**

- **When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.**

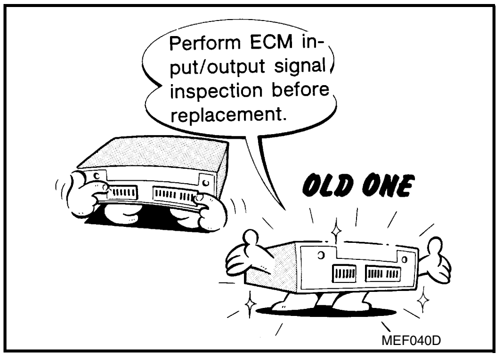
- 1 : ECM
- C : Loosen





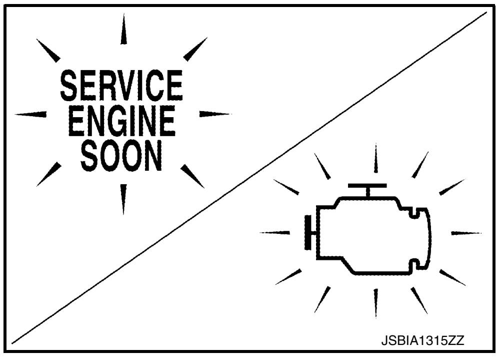
- **When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break).**
  Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**

- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and make sure ECM functions properly. Refer to EC-534, "Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Never clean mass air flow sensor with any type of detergent.**
- **Never disassemble electric throttle control actuator.**
- **Even a slight leak in the air intake system can cause serious incidents.**
- **Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**


Perform ECM input/output signal inspection before replacement.
OLD ONE

MEF040D

- **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.



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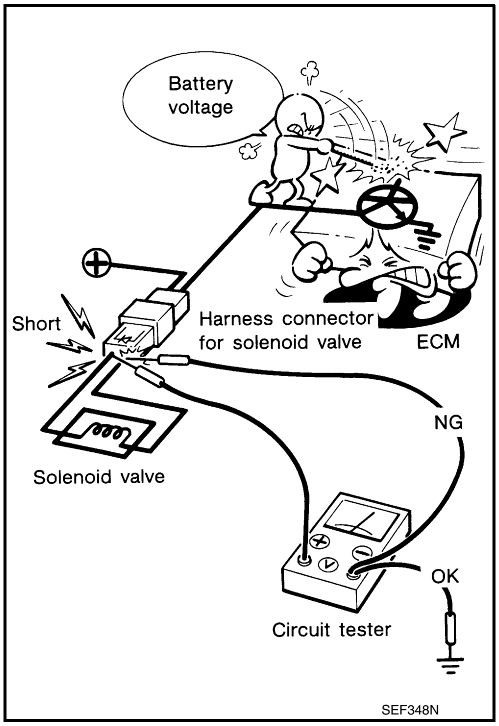
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.



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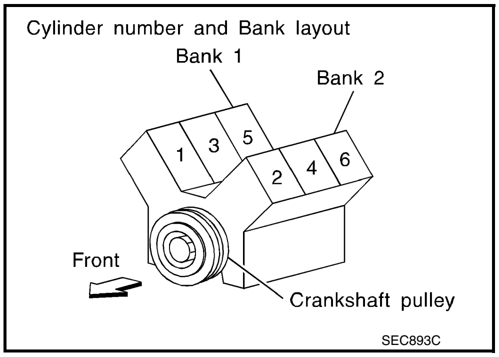
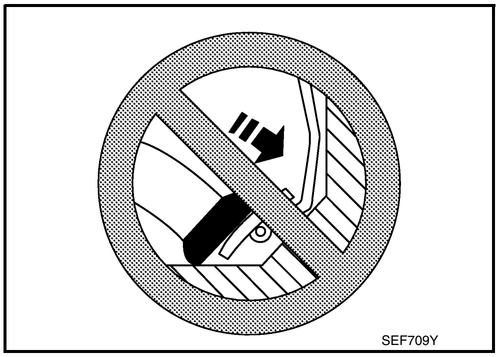
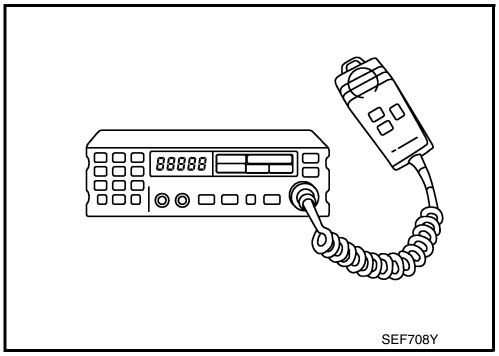
- **B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.**
- **Never operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



- **Never depress accelerator pedal when starting.**
- **Immediately after starting, never rev up engine unnecessarily.**
- **Never rev up engine just prior to shutdown.**



- **When installing C.B. ham radio or a mobile phone, be sure to observe the following as it may adversely affect electronic control systems depending on installation location.**
- **Keep the antenna as far as possible from the electronic control units.**
- **Keep the antenna feeder line more than 20 cm (8 in) away from the harness of electronic controls.**
  Never let them run parallel for a long distance.
- **Adjust the antenna and feeder line so that the standing-wave ratio can be kept smaller.**
- **Be sure to ground the radio to vehicle body.**

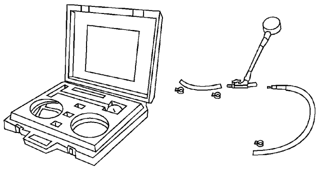


PREPARATION

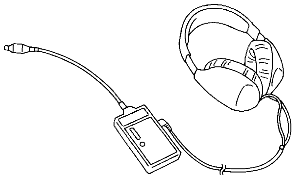
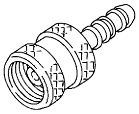
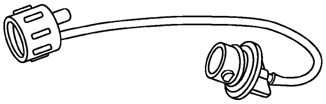
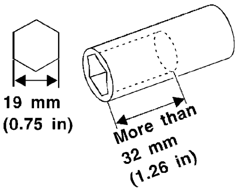
PREPARATION

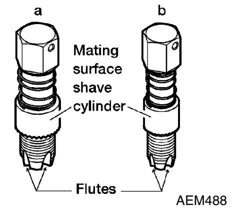
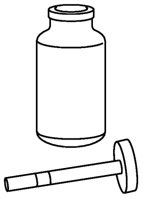
Special Service Tools

NOTE:
The actual shapes of TechMate tools may differ from those of special service tools illustrated here.

Tool number (TechMate No.) Tool name	Description
(J-44321) Fuel pressure gauge kit  LEC642	Checks fuel pressure

Commercial Service Tools

Tool name (TechMate No.)	Description
Leak detector i.e.: (J-41416)  S-NT703	Locates the EVAP leak
EVAP service port adapter i.e.: (J-41413-OBD)  S-NT704	Applies positive pressure through EVAP service port
Fuel filler cap adapter i.e.: (MLR-8382)  S-NT815	Checks fuel tank vacuum relief valve opening pressure
Socket wrench  S-NT705	Removes and installs engine coolant temperature sensor

Tool name (TechMate No.)		Description
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 AEM488	Reconditions the exhaust system threads before installing a new oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex^{TM} 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

PERIODIC MAINTENANCE

FUEL PRESSURE

Inspection

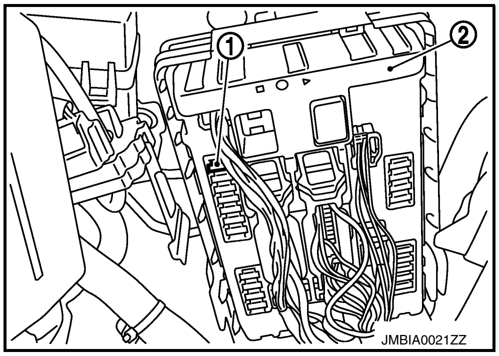
FUEL PRESSURE RELEASE

With CONSULT

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.

Without CONSULT

1. Remove fuel pump fuse (1) located in IPDM E/R (2).
2. Start engine.
3. After engine stalls, crank it two or three times to release all fuel pressure.
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.

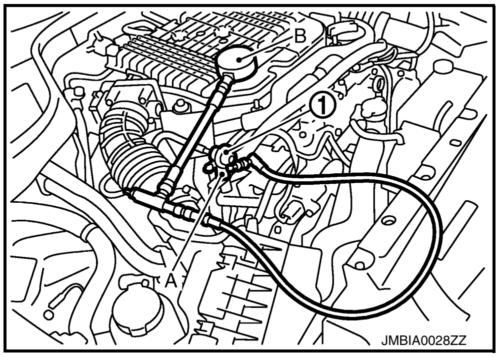
NOTE:

- **Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because this models do not have fuel return system.**
- **Use Fuel Pressure Gauge Kit (J-44321) to check fuel pressure.**

1. Release fuel pressure to zero.
2. Install the inline fuel quick disconnected fitting (A) between fuel damper (1) and injector tube.
3. Connect the fuel pressure test gauge (quick connector adapter hose) (B) to the inline fuel quick disconnected fitting.
4. Turn ignition switch ON and check for fuel leakage.
5. Start engine and check for fuel leakage.
6. Read the indication of fuel pressure gauge.

At idling : Approximately 350 kPa (3.57 kg/cm^2, 51 psi)

7. If result is unsatisfactory, check fuel hoses and fuel tubes for clogging.
If OK, Replace “fuel filter and fuel pump assembly”.
If NG, Repair or replace.



EVAP LEAK CHECK

Inspection

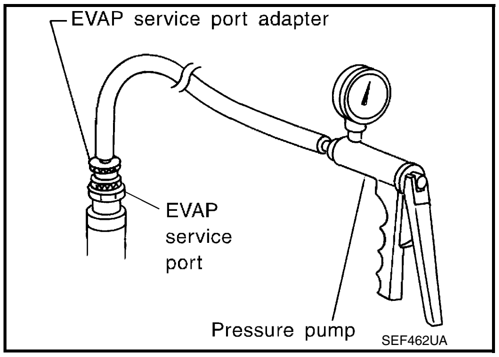
CAUTION:

- **Do not use compressed air or a high pressure pump.**
- **Do not exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

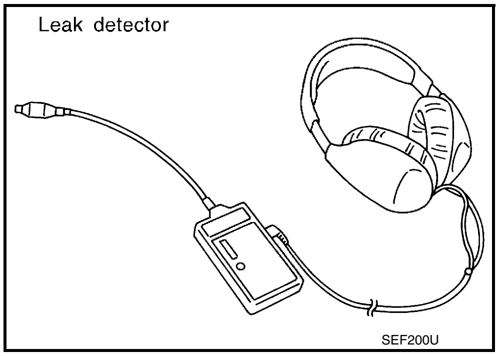
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter to the EVAP service port may cause a leak.

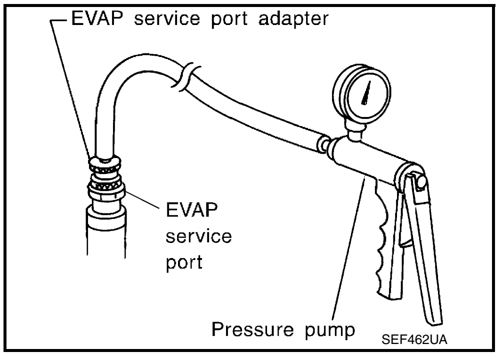
WITH CONSULT



1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
2. Turn ignition switch ON.
3. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT.
4. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter and hose with pressure pump.
7. Locate the leak using a leak detector. Refer to EC-97, "System Diagram".

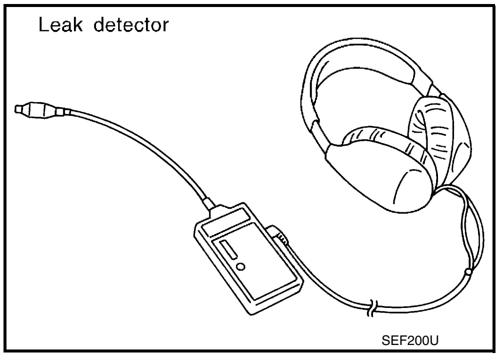


WITHOUT CONSULT



1. To locate the EVAP leak, install EVAP service port adapter and pressure pump to EVAP service port.
2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi).
4. Remove EVAP service port adapter and hose with pressure pump.

5. Locate the leak using a leak detector. Refer to EC-97, "System Diagram".



SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000010597165

Condition	Specification
No load* (in P or N position)	650 ± 50 rpm

*: Under the following conditions
- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Ignition Timing

INFOID:0000000010597166

Condition	Specification
No load* (in P or N position)	10 ± 5° BTDC

*: Under the following conditions
- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000010597167

Condition	Specification (Using CONSULT or GST)
At idle	5 – 35 %
At 2,500 rpm	5 – 35 %

Mass Air Flow Sensor

INFOID:0000000010597168

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.7 – 1.2 V*
Mass air flow (Using CONSULT or GST)	2.0 – 6.0 g/s at idle* 7.0 – 20.0 g/s at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.