SECTION EC
ENGINE CONTROL SYSTEM

CONTENTS

VQ35HR

VK45DE

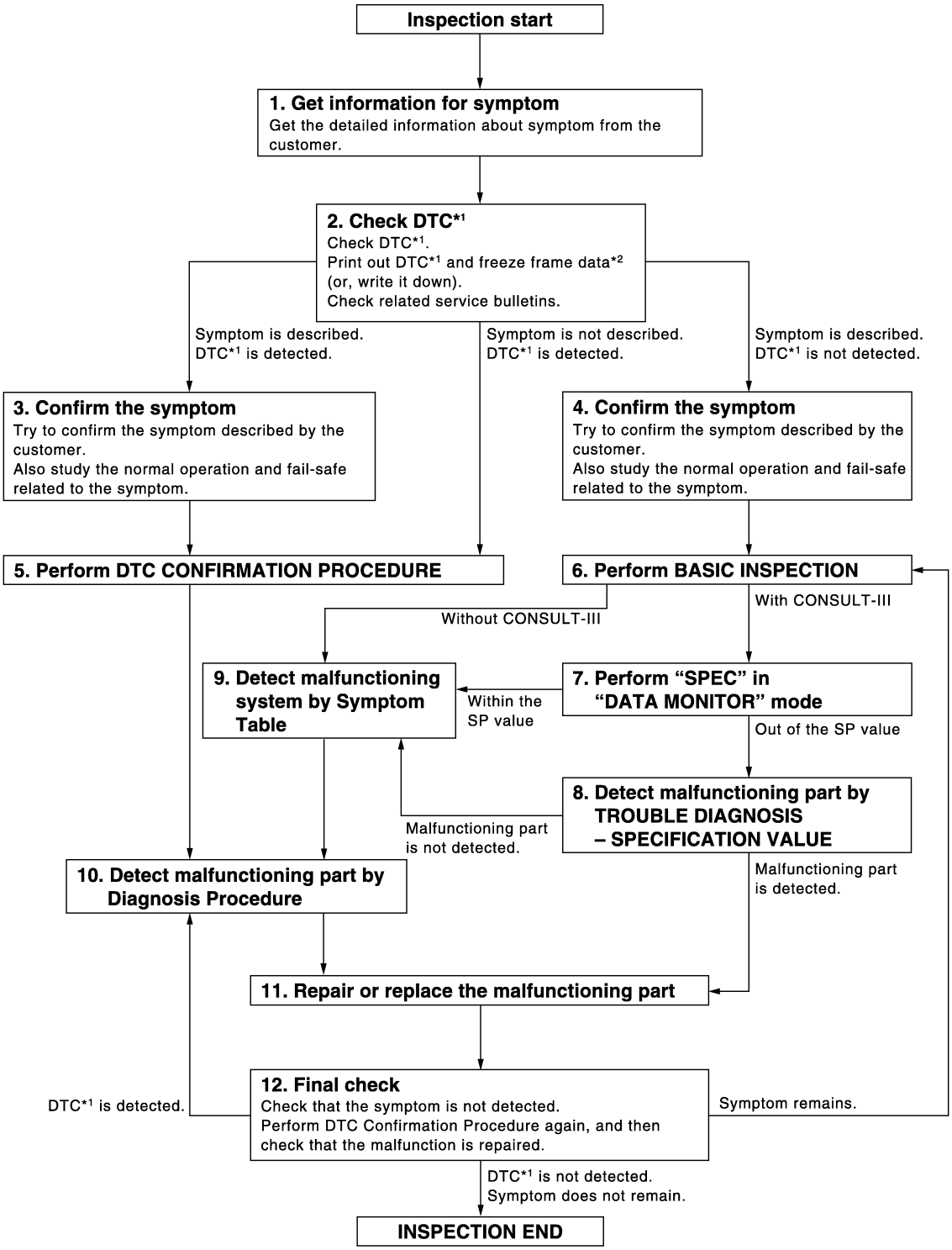
BASIC INSPECTION

DIAGNOSIS AND REPAIR WORK FLOW

Work Flow

INFOID:0000000005353316

OVERALL SEQUENCE



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

JMBIA1416GB

DETAILED FLOW

1.GET INFORMATION FOR SYMPTOM

Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the “Diagnostic Work Sheet”. (Refer to EC-21, "Diagnostic Work Sheet".)

>> GO TO 2.

2.CHECK DTC

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

- Record DTC and freeze frame data. (Print them out with CONSULT-III or GST.)
- Erase DTC. (Refer to EC-121, "Diagnosis Description".)
- Study the relationship between the cause detected by DTC and the symptom described by the customer. (Symptom Matrix Chart is useful. Refer to EC-680, "Symptom Table".)

3. Check related service bulletins for information.

Are any symptoms described and is 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-684, "Description" and EC-663, "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-684, "Description" and EC-663, "Fail-safe".
Diagnosis Work Sheet is useful to verify the incident.
Verify relation between the symptom and the condition when the symptom is detected.

>> GO TO 6.

5.PERFORM DTC CONFIRMATION PROCEDURE

Perform DTC CONFIRMATION PROCEDURE for the displayed DTC, and then check that DTC is detected again.
If two or more DTCs are detected, refer to EC-665, "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 EC-154, "Description".

6.PERFORM BASIC INSPECTION

Perform EC-22, "BASIC INSPECTION : Special Repair Requirement".

Will CONSULT-III be used?

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

7. PERFORM SPEC IN DATA MONITOR MODE

With CONSULT-III

Check 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-III “SPEC” in “DATA MONITOR” mode. Refer to EC-146, "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-147, "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-680, "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-26, "How to Perform Efficient Diagnosis for an Electrical Incident".

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-III. Refer to EC-645, "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-121, "Diagnosis Description".

>> GO TO 12.

12. FINAL CHECK

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

Is DTC detected and does symptom remain?

YES-1 >> DTC is detected: GO TO 10.
YES-2 >> Symptom remains: GO TO 6.
NO >> Before returning the vehicle to the customer, always erase unnecessary DTC in ECM and TCM (Transmission Control Module). (Refer to EC-121, "Diagnosis Description".) If the completion of SRT is needed, drive vehicle under the specific driving pattern. Refer to EC-671, "How to Set SRT Code".

Diagnostic Work Sheet

INFOID:0000000005353317

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 come on 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

SEF907L

WORKSHEET SAMPLE

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

MTBL0017

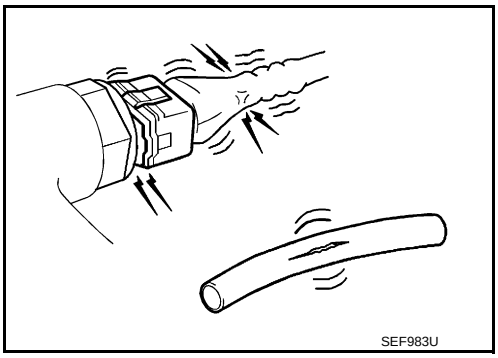
INSPECTION AND ADJUSTMENT
BASIC INSPECTION

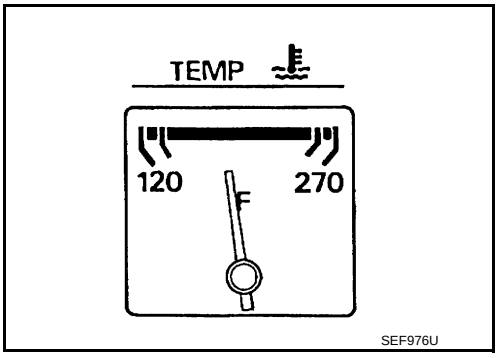
BASIC INSPECTION : Special Repair Requirement

INFOID:0000000005353318

1.INSPECTION START

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


SEF983U

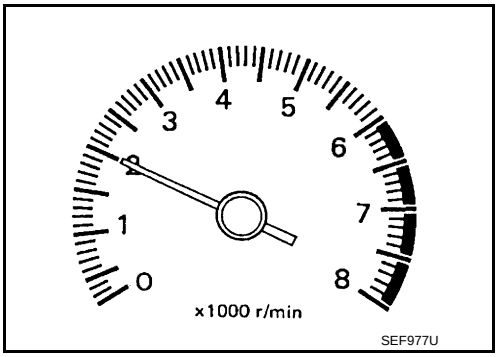


SEF976U

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

Are any DTCs detected?

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



SEF977U

2.REPAIR OR REPLACE

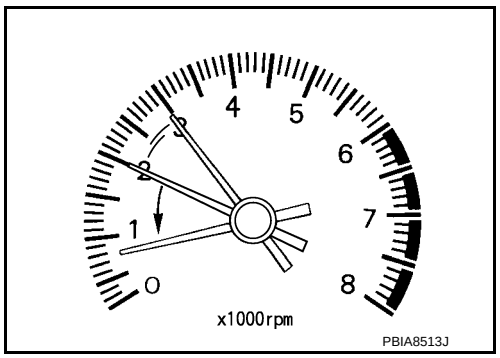
Repair or replace components as necessary according to corresponding Diagnosis Procedure.

>> GO TO 3

3.CHECK IDLE SPEED

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

2. Rev engine (2,000 to 3,000 rpm) 2 or 3 times under no load, then run engine at idle speed for approximately 1 minute.
3. Check idle speed.
   For procedure, refer to EC-26, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to EC-697, "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-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

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

7. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-26, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to EC-697, "Idle Speed".

Is the inspection result normal?

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

8. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor and circuit. Refer to EC-352, "Component Inspection".
- Check crankshaft position sensor and circuit. Refer to EC-345, "Component Inspection".

Is the inspection result normal?

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

9. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".

>> GO TO 4.

10. CHECK IGNITION TIMING

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

For procedure, refer to EC-26, "IGNITION TIMING : Special Repair Requirement".
For specification, refer to EC-697, "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-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Perform EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

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

14. CHECK IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   For procedure, refer to EC-26, "IDLE SPEED : Special Repair Requirement".
   For specification, refer to EC-697, "Idle Speed".

Is the inspection result normal?

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

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
   For procedure, refer to EC-26, "IGNITION TIMING : Special Repair Requirement".
   For specification, refer to EC-697, "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-60, "Removal and Installation".

Is the inspection result normal?

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

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor and circuit. Refer to EC-352, "Component Inspection".
- Check crankshaft position sensor and circuit. Refer to EC-345, "Component Inspection".

Is the inspection result normal?

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

18. CHECK ECM FUNCTION

1. Substitute with a non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this BASIC INSPECTION procedure, go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Description

INFOID:0000000005353319

When replacing ECM, the following procedure must be performed.

ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement

INFOID:0000000005353320

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

Refer to BL-224, "ECM Re-Communicating Function".

>> GO TO 2.

2. PERFORM VIN REGISTRATION

Refer to EC-26, "VIN REGISTRATION : Special Repair Requirement".

>> GO TO 3.

3. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 4.

4. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 5.

5. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> GO TO 6.

6. PERFORM EXHAUST VALVE TIMING CONTROL LEARNING

Refer to EC-29, "EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement".

>> END

IDLE SPEED

IDLE SPEED : Description

INFOID:0000000005353321

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

IDLE SPEED : Special Repair Requirement

INFOID:0000000005353322

1.CHECK IDLE SPEED

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

>> INSPECTION END

IGNITION TIMING

IGNITION TIMING : Description

INFOID:0000000005353323

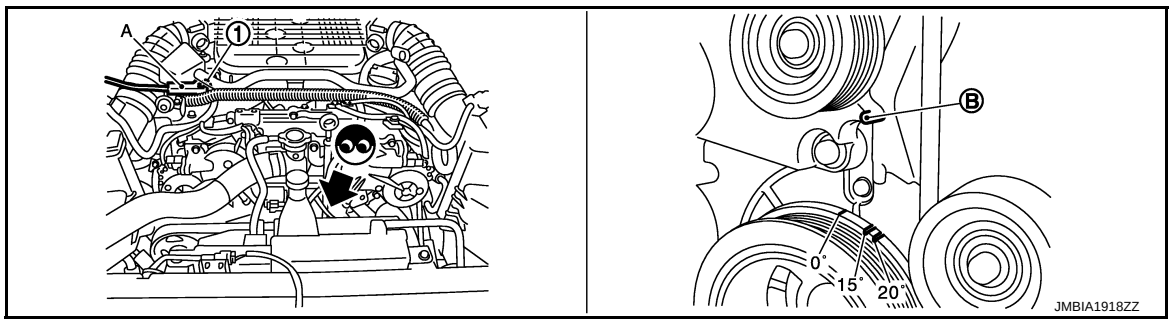
This describes how to check the ignition timing. For the actual procedure, follow the instructions in “BASIC INSPECTION”.

IGNITION TIMING : Special Repair Requirement

INFOID:0000000005353324

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:0000000005353325

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

VIN REGISTRATION : Special Repair Requirement

INFOID:0000000005353326

1.CHECK VIN

Check the VIN of the vehicle and note it. Refer to GI-47, "Model Variation".

>> GO TO 2.

2.PERFORM VIN REGISTRATION

With CONSULT-III
1. Turn ignition switch ON with engine stopped.
2. Select “VIN REGISTRATION” in “WORK SUPPORT” mode.
3. Follow the instructions on the CONSULT-III display.

>> END

ACCELERATOR PEDAL RELEASED POSITION LEARNING

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Description

INFOID:0000000005353327

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

ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement

INFOID:0000000005353328

1.START

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

>> END

THROTTLE VALVE CLOSED POSITION LEARNING

THROTTLE VALVE CLOSED POSITION LEARNING : Description

INFOID:0000000005353329

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

THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement

INFOID:0000000005353330

1.START

1. Check that accelerator pedal is fully released.
2. Turn ignition switch ON.
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:0000000005353331

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

IDLE AIR VOLUME LEARNING : Special Repair Requirement

INFOID:0000000005353332

1.PRECONDITIONING

Check that all of the following conditions are satisfied.

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

Will CONSULT-III be used?

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

2. PERFORM IDLE AIR VOLUME LEARNING

With CONSULT-III

1. Perform Accelerator Pedal Released Position Learning. Refer to EC-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
3. Start engine and warm it up to normal operating temperature.
4. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
5. Touch “START” and wait 20 seconds.

Is “CMPLT” displayed on CONSULT-III screen?

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

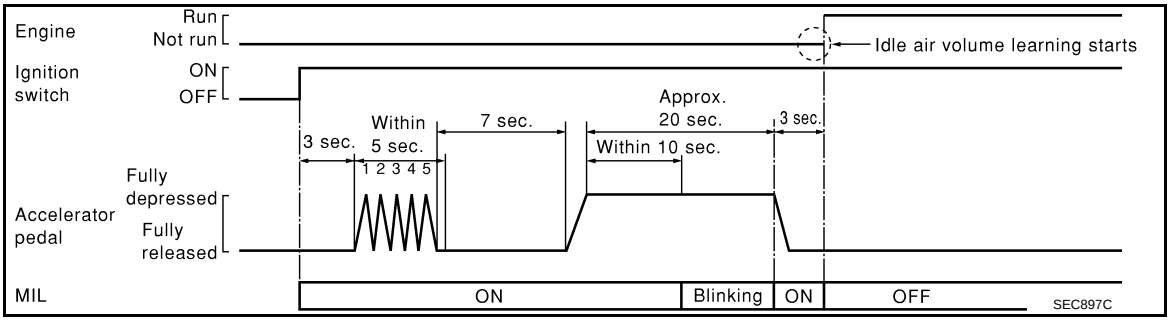
3. PERFORM IDLE AIR VOLUME LEARNING

Without CONSULT-III

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

1. Perform Accelerator Pedal Released Position Learning. Refer to EC-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".
2. Perform Throttle Valve Closed Position Learning. EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
3. Start engine and warm it up to normal operating temperature.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
6. Repeat the following procedure quickly 5 times within 5 seconds.
- Fully depress the accelerator pedal.
- Fully release the accelerator pedal.
7. Wait 7 seconds, fully depress the accelerator pedal for approx. 20 seconds until the MIL stops blinking and turns ON.
8. Fully release the accelerator pedal within 3 seconds after the MIL turns ON.
9. Start engine and let it idle.

10. Wait 20 seconds.



>> GO TO 4.

4. CHECK IDLE SPEED AND IGNITION TIMING

Rev up the engine 2 or 3 times and check that idle speed and ignition timing are within the specifications. Refer to EC-697, "Idle Speed" and EC-697, "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-146, "Description".
If any of the following conditions occur after the engine has started, eliminate the cause of the incident and perform Idle Air Volume Learning again:
- Engine stalls.
- Incorrect idle.

>> INSPECTION END

EXHAUST VALVE TIMING CONTROL LEARNING

EXHAUST VALVE TIMING CONTROL LEARNING : Description

INFOID:0000000005353333

Exhaust Valve Timing Control Learning is a function of ECM to learn the characteristic of exhaust valve timing control magnet retarder by comparing the target angle of exhaust camshaft with the actual retarded angle of exhaust camshaft. It must be performed each time exhaust valve timing control magnet retarder is disconnected or replaced, or ECM is replaced.

EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement

INFOID:0000000005353334

1. START

With CONSULT-III
1. Start engine and warm it up to normal operating temperature.
2. Set selector lever position to N and confirm that the following 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.

3. Keep the engine speed between 2,200 and 4,000 rpm.
4. Select “EXH V/T CONTROL LEARN” in “WORK SUPPORT” mode with CONSULT-III.
5. Touch “START” and wait 20 seconds.
6. Check that “CMPLT” is displayed on CONSULT-III screen.

Learning completed : CMPLT
Learning not yet : YET

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Set selector lever position to N and confirm that the following 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.

3. Keep the engine speed between 2,200 and 4,000 rpm at 20 seconds.

>> END

MIXTURE RATIO SELF-LEARNING VALUE CLEAR

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Description

INFOID:0000000005353335

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

MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement

INFOID:0000000005353336

1.START

With CONSULT-III

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

With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (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. Check DTC P0102 is detected.
7. Select Service $04 with GST to erase the DTC P0102.

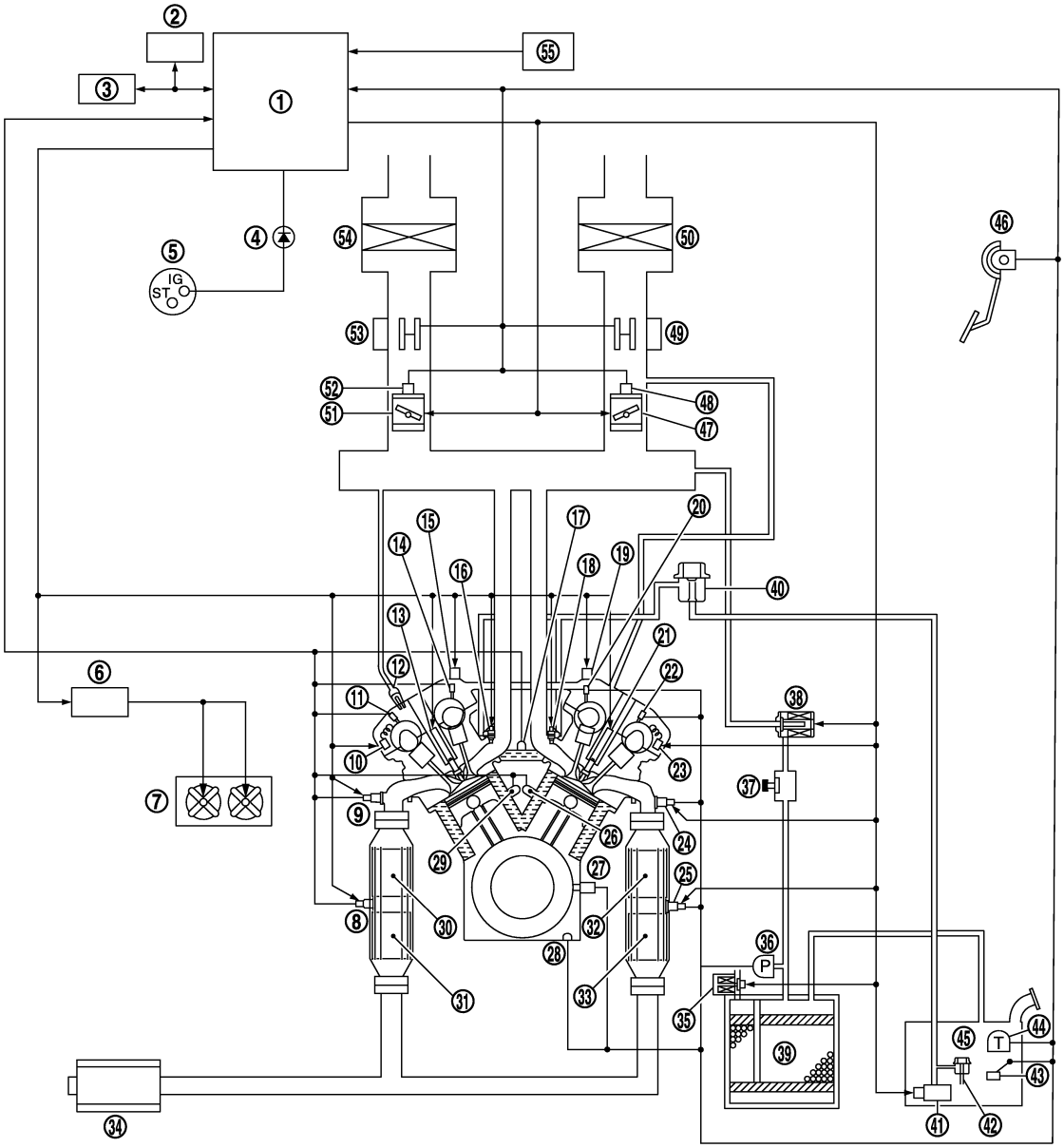
>> END

FUNCTION DIAGNOSIS

ENGINE CONTROL SYSTEM

System Diagram

INFOID:0000000005353337



1. ECM	2. Data link connector	3. CAN communication
4. MIL	5. Ignition switch	6. Cooling fan control module
7. Cooling fan	8. Heated oxygen sensor 2 (bank 1)	9. A/F sensor 1 (bank 1)
10. Exhaust valve timing control magnet retarder (bank 1)	11. Exhaust valve timing control position sensor (bank 1)	12. PCV valve
13. Spark plug	14. Camshaft position sensor (bank 1)	15. Intake valve timing control solenoid valve (bank 1)
16. Fuel injector	17. Engine coolant temperature sensor	18. Fuel injector
19. Intake valve timing control solenoid valve (bank 2)	20. Camshaft position sensor (bank 2)	21. Spark plug

22. Exhaust valve timing control position sensor (bank 2)
23. Exhaust valve timing control magnet retarder (bank 2)
24. A/F sensor 1 (bank 2)
25. Heated oxygen sensor 2 (bank 2)
26. Knock sensor (bank 2)
27. Crankshaft position sensor
28. Engine oil temperature sensor
29. Knock sensor (bank 1)
30. Three way catalyst 1
31. Three way catalyst 2
32. Three way catalyst 1
33. Three way catalyst 2
34. Muffler
35. EVAP canister vent control valve
36. EVAP control system pressure sensor
37. EVAP service port
38. EVAP canister purge volume control solenoid valve
39. EVAP canister
40. Fuel damper
41. Fuel pump
42. Fuel pressure regulator
43. Fuel level sensor
44. Fuel tank temperature sensor
45. Fuel tank
46. Accelerator pedal position sensor
47. Electric throttle control actuator (bank 2)
48. Throttle position sensor (bank 2)
49. Mass air flow sensor (with intake air temperature sensor)
50. Air cleaner (bank 2)
51. Electric throttle control actuator (bank 1)
52. Throttle position sensor (bank 1)
53. Mass air flow sensor (with intake air temperature sensor)
54. Air cleaner (bank 1)
55. PNP signal

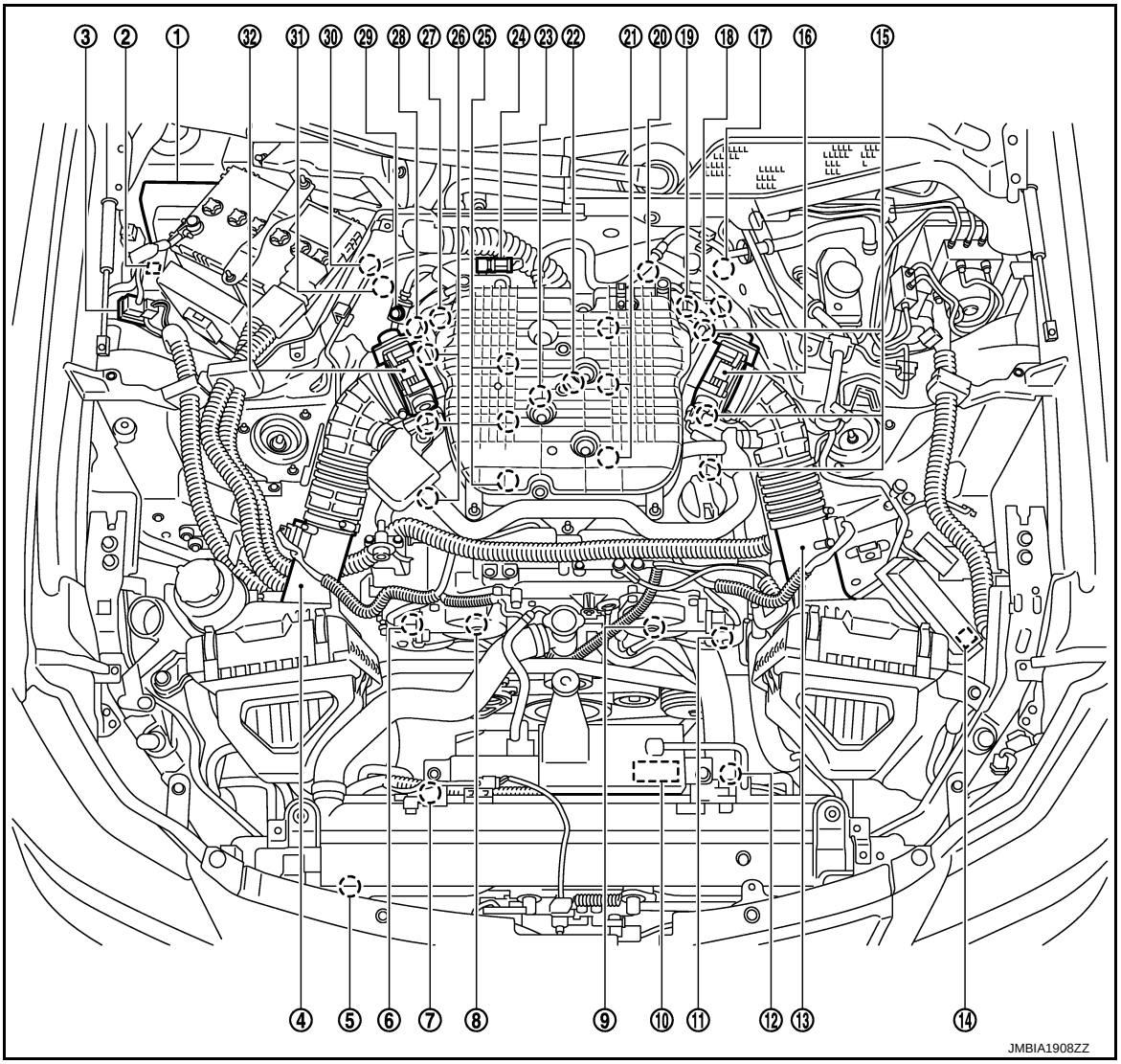
System Description

INFOID:0000000005353338

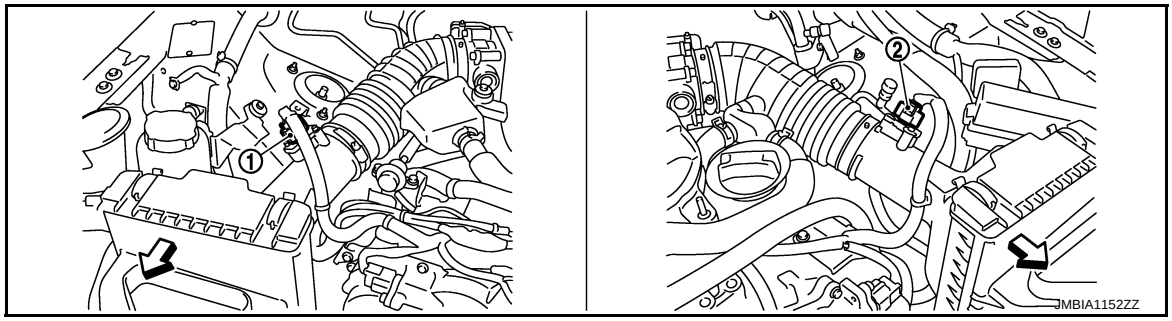
ECM performs various controls such as fuel injection control and ignition timing control.

Component Parts Location

INFOID:0000000005353339

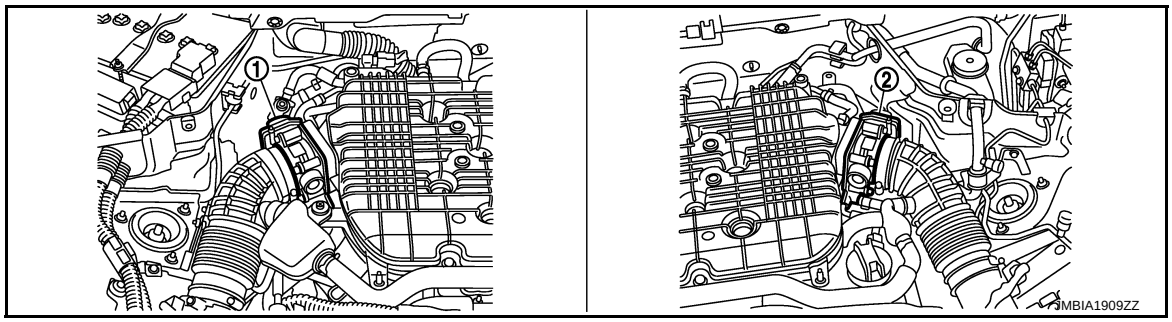


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

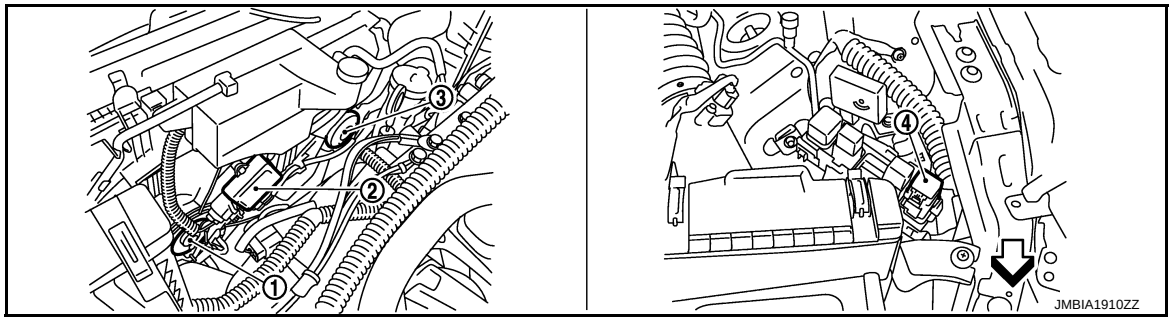


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

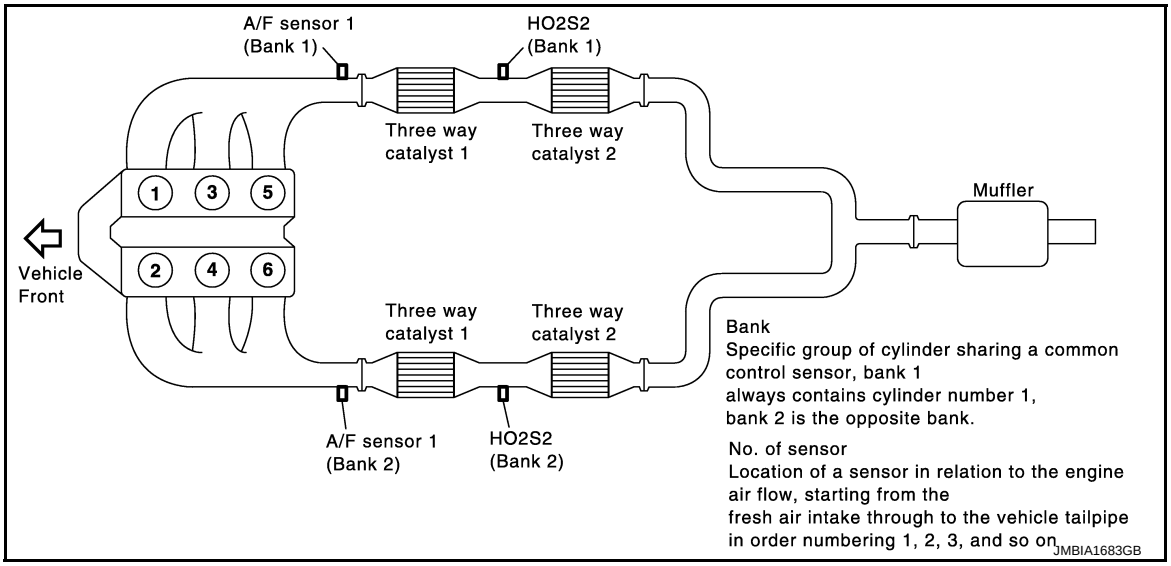


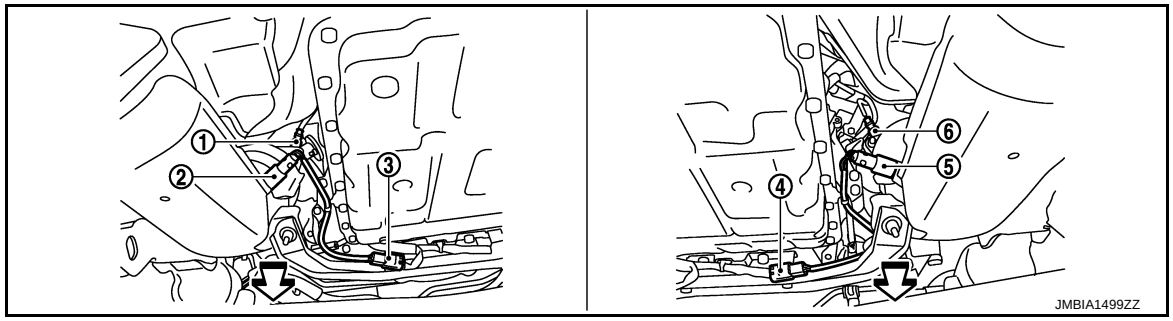
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

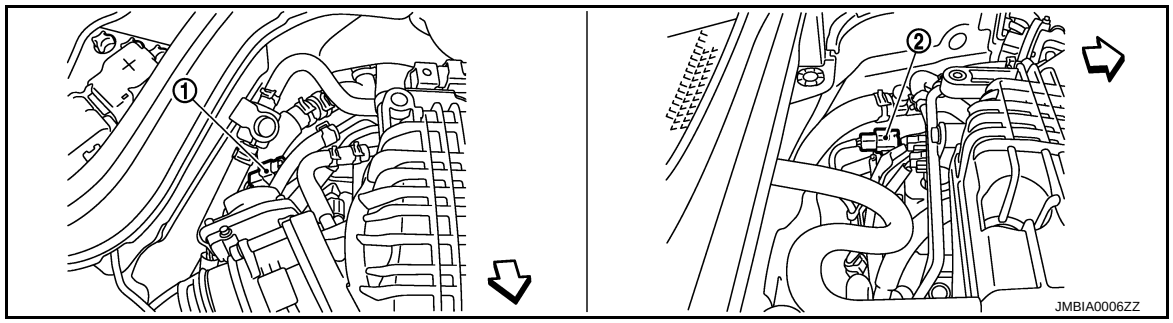
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

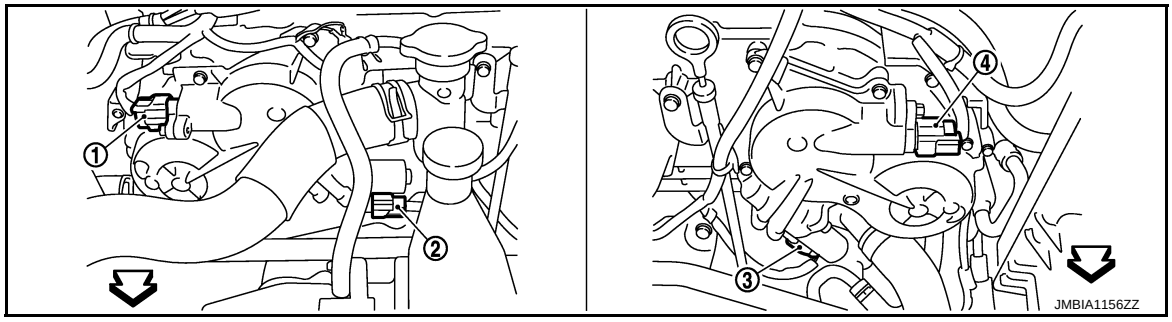
⇦ : Vehicle front



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

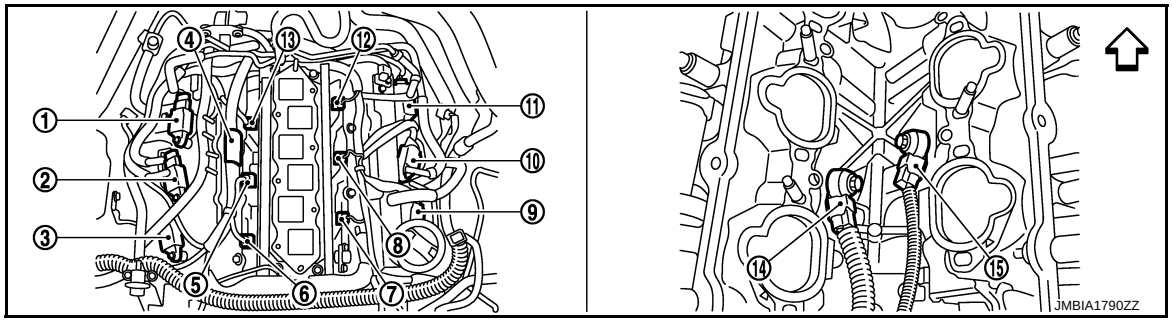
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



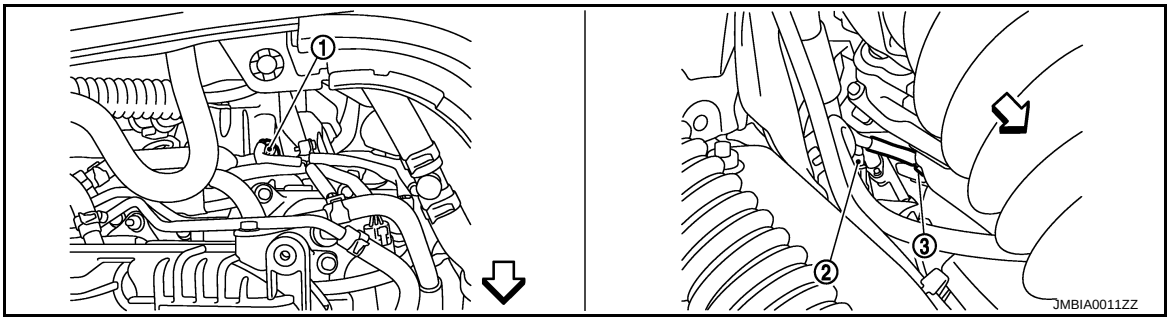
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



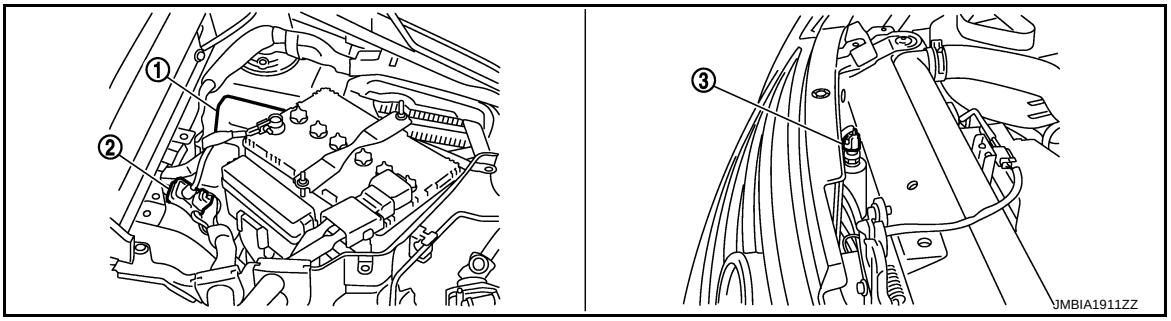
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

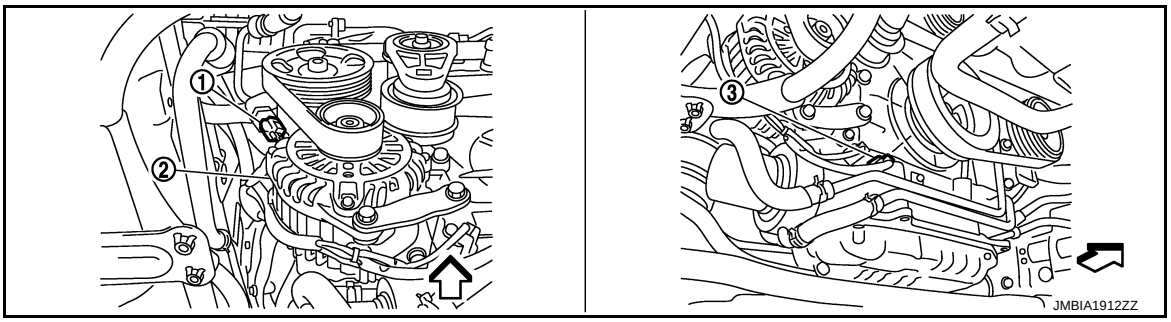


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

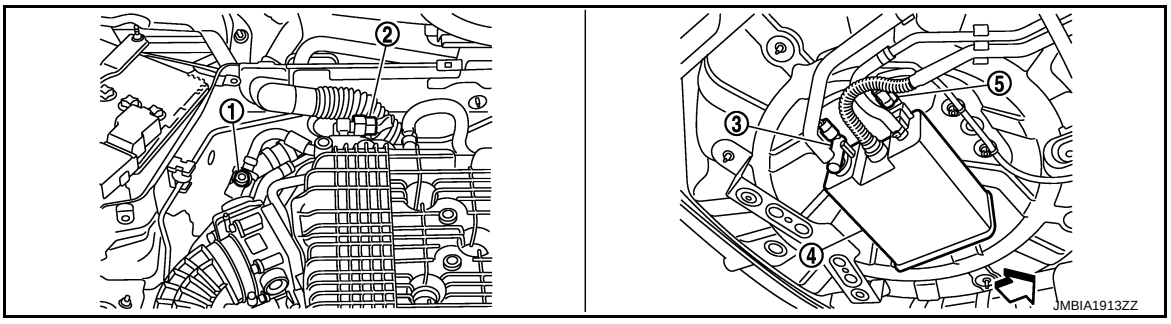


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

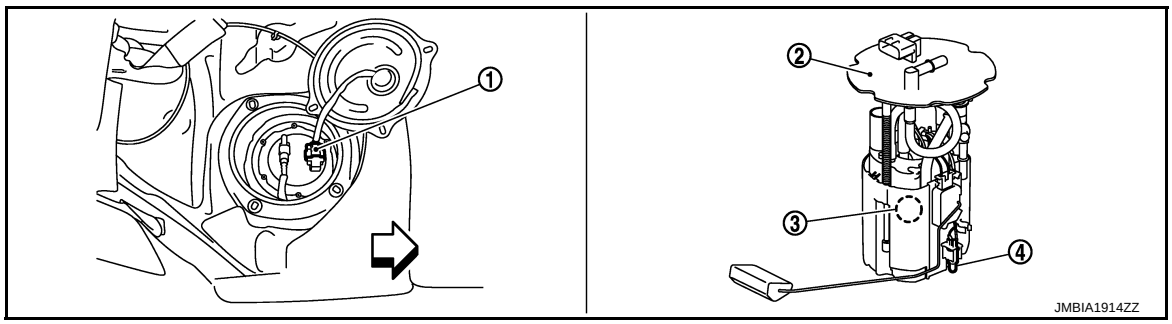
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

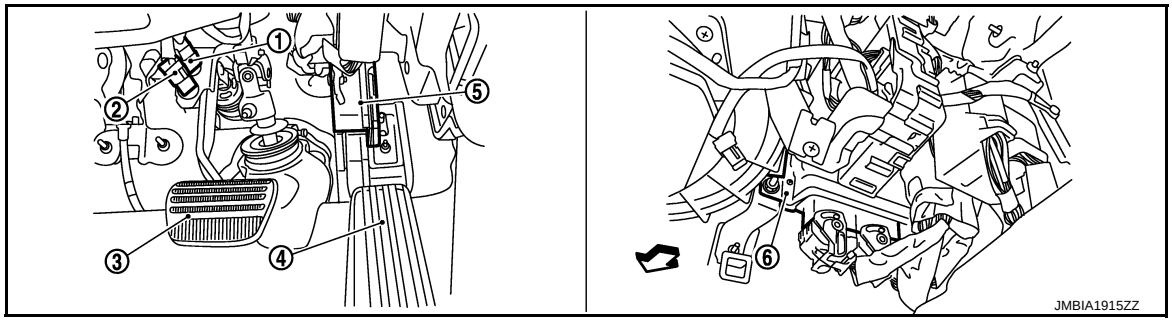
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



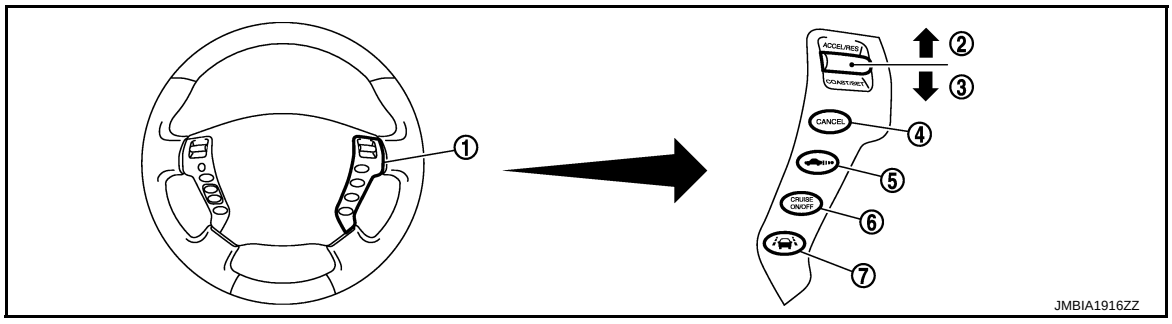
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

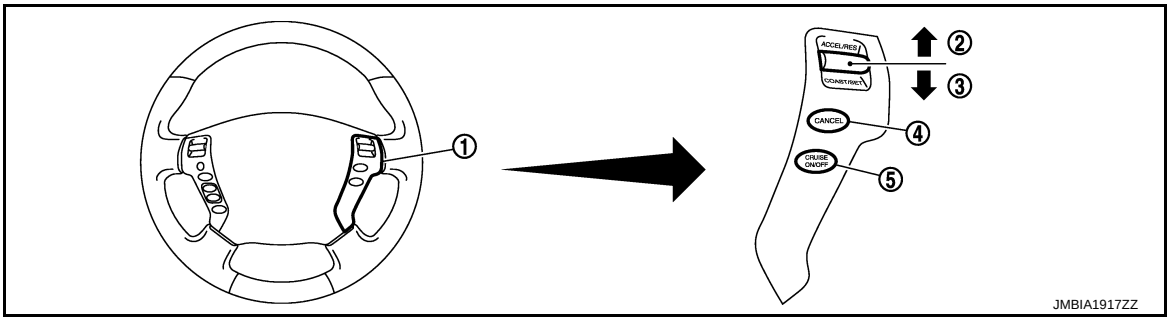


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

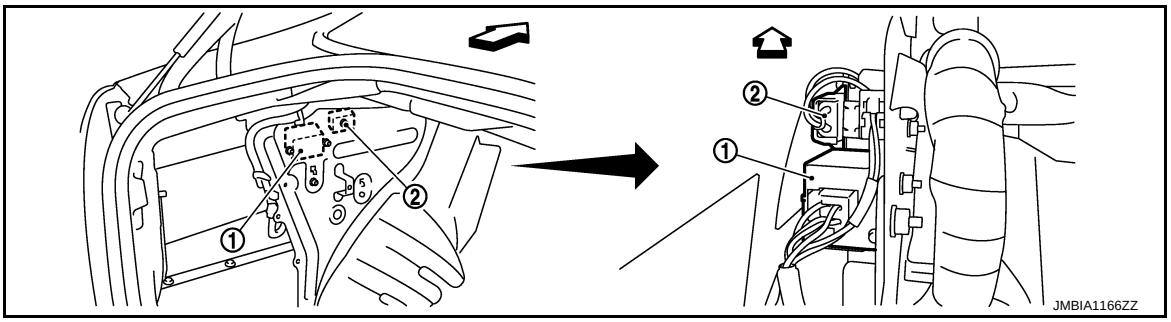
⇦ : Vehicle front



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

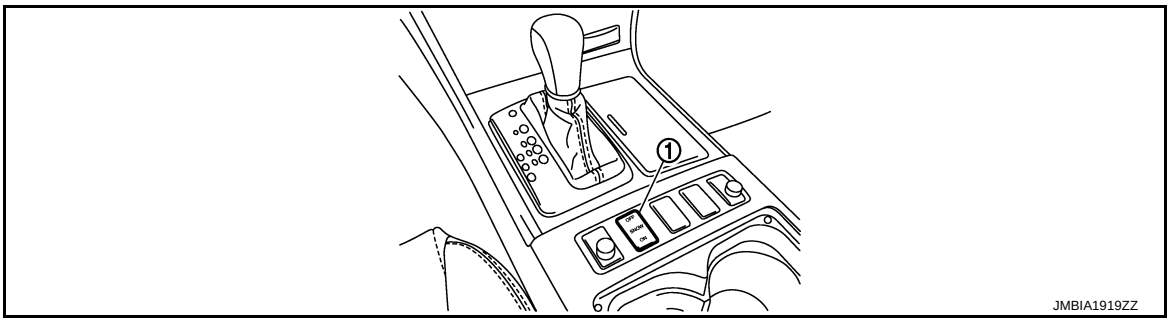


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

INFOID:0000000005353340

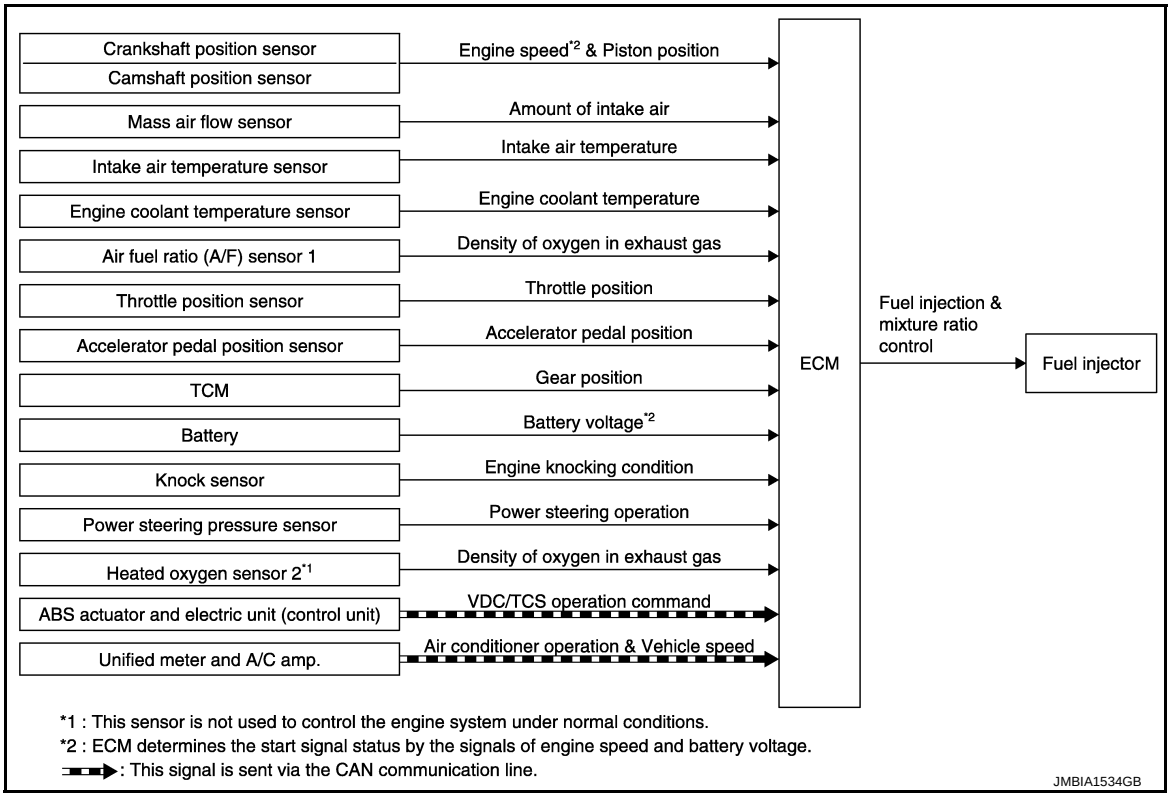
Component	Reference
A/F sensor 1	EC-237, "Description"
A/F sensor 1 heater	EC-174, "Description"
Accelerator pedal position sensor	EC-558, "Description"
ASCD brake switch	EC-533, "Description"
ASCD steering switch	EC-522, "Description"
Battery current sensor	EC-498, "Description"
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Cooling fan control module	EC-589, "Description"

Component	Reference
Cooling fan motor	EC-589, "Description"
Electric throttle control actuator	EC-484, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Engine oil temperature sensor	EC-316, "Description"
EVAP canister purge volume control solenoid valve	EC-369, "Description"
EVAP canister vent control valve	EC-379, "Description"
EVAP control system pressure sensor	EC-391, "Description"
Exhaust valve timing control magnet retarder	EC-190, "Description"
Exhaust valve timing control position sensor	EC-453, "Description"
Fuel injector	EC-598, "Description"
Fuel level sensor	EC-423, "Description"
Fuel pump	EC-602, "Description"
Fuel tank temperature sensor	EC-307, "Description"
Heated oxygen sensor 2	EC-264, "Description"
Heated oxygen sensor 2 heater	EC-179, "Description"
ICC brake switch	EC-541, "Description"
ICC steering switch	EC-527, "Description"
Ignition coil with power transistor	EC-617, "Description"
Intake air temperature sensor	EC-214, "Description"
Intake valve timing control solenoid valve	EC-185, "Description"
Knock sensor	EC-335, "Description"
Mass air flow sensor	EC-195, "Description"
PCV valve	EC-635, "Description"
Power steering pressure sensor	EC-435, "Description"
Refrigerant pressure sensor	EC-637, "Description"
Snow mode switch	EC-641, "Description"
Stop lamp switch	EC-554, "Description"
Throttle control motor	EC-479, "Description"
Throttle control motor relay	EC-492, "Description"
Throttle position sensor	EC-224, "Description"

MULTIPORT FUEL INJECTION SYSTEM

System Diagram

INFOID:0000000005353341



System Description

INFOID:0000000005353342

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*3 & Piston position	Fuel injection & mixture ratio control	Fuel injector
Camshaft position sensor			
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)	VDC/TCS operation command*2		
Unifed meter and A/C amp.	Vehicle speed & Air conditioner operation*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, camshaft position sensor and the mass air flow sensor.

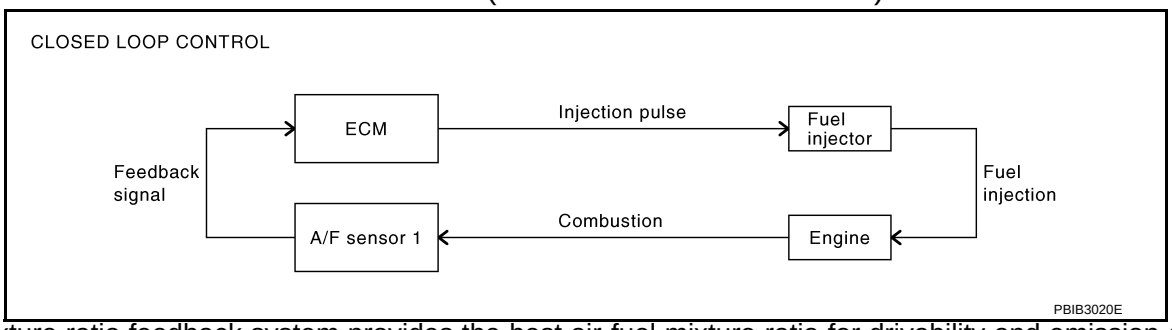
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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

<Fuel increase>
- During warm-up
- When starting the engine
- During acceleration
- Hot-engine operation
- When selector lever 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 drivability 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-237, "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.

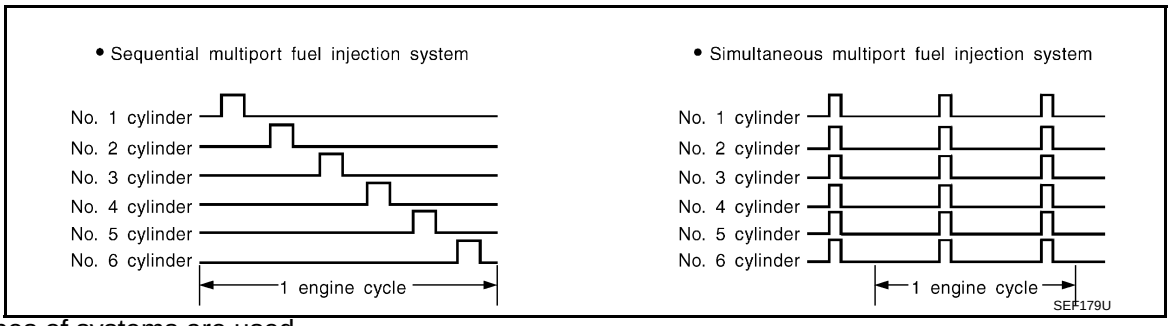
Accordingly, the difference between the basic and theoretical mixture ratios is monitored in this system. This is then computed in terms of “injection pulse duration” to automatically compensate for the difference between the two ratios.

“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.

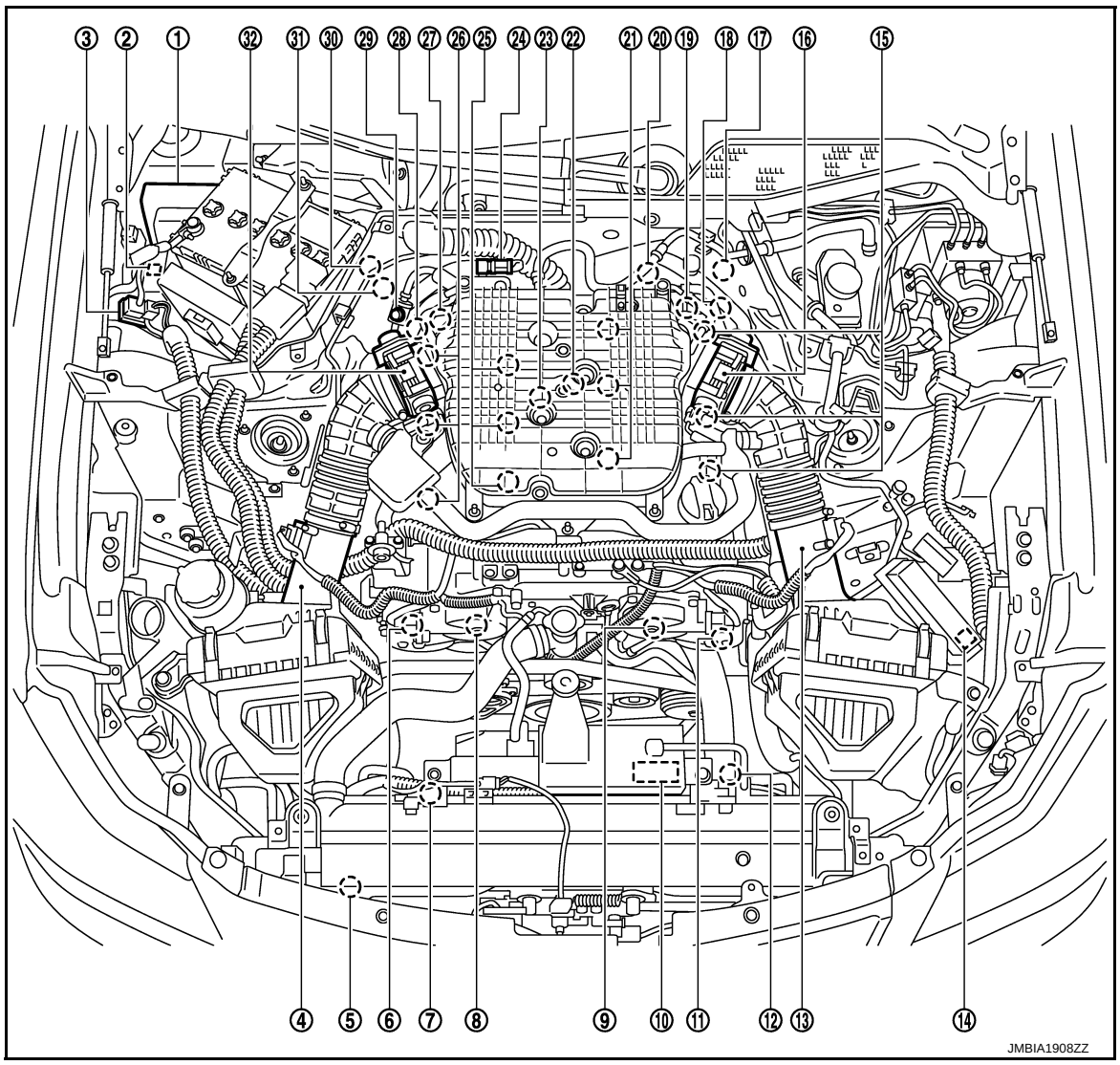
- Sequential Multiport Fuel Injection System
  Fuel is injected into each cylinder during each engine cycle according to the firing order. This system is used when the engine is running.
- Simultaneous Multiport Fuel Injection System
  Fuel is injected simultaneously into all six cylinders twice each 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 2 times for each engine cycle.
  This system is used when the engine is being started and/or if the fail-safe system (CPU) is operating.

FUEL SHUT-OFF

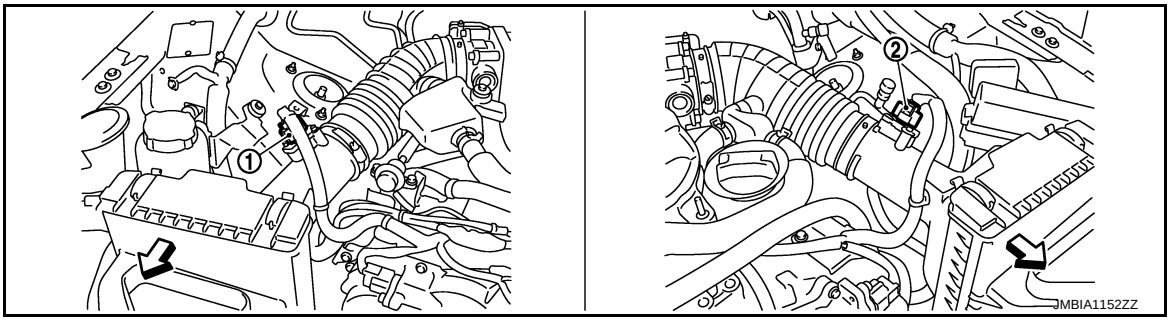
Fuel to each cylinder is cut off during deceleration, operation of the engine at excessively high speeds or operation of the vehicle at excessively high speeds.

Component Parts Location

INFOID:0000000005353343

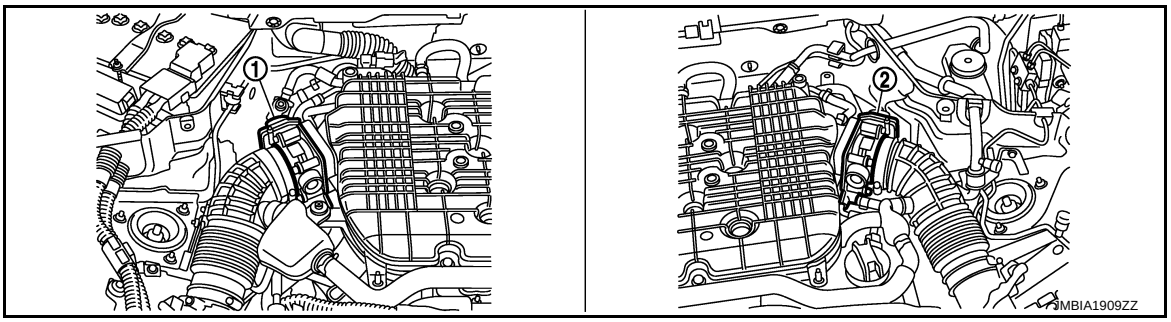


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

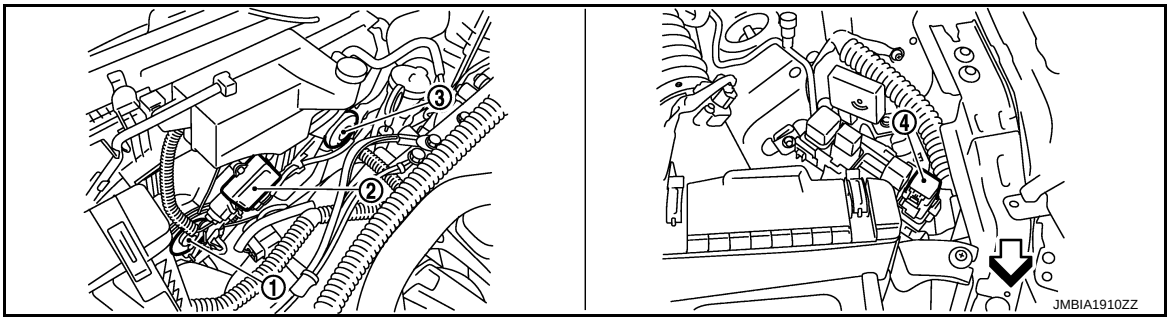


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

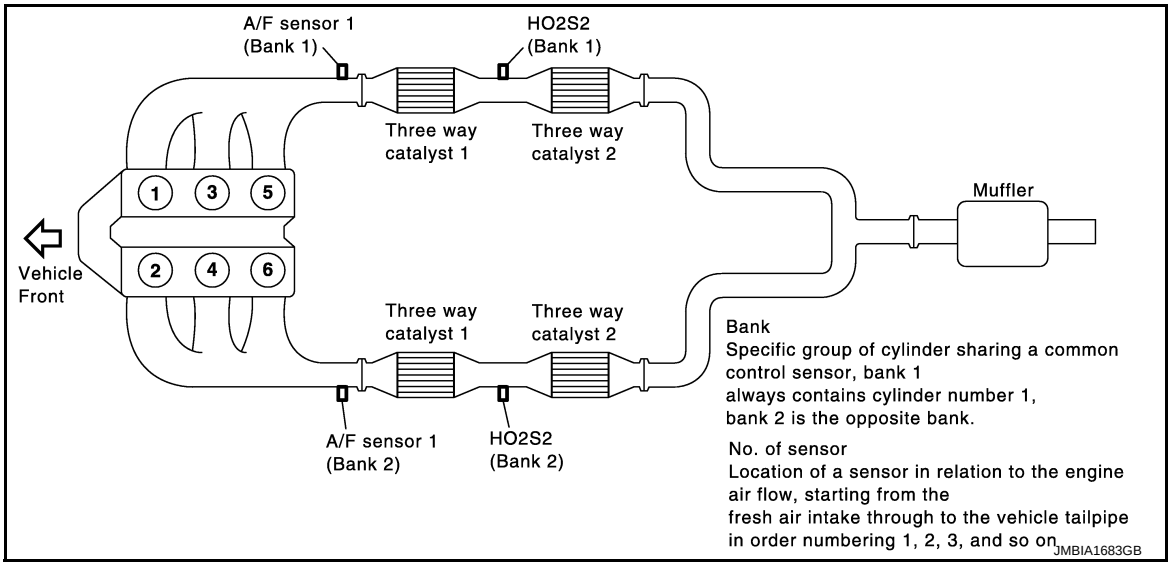


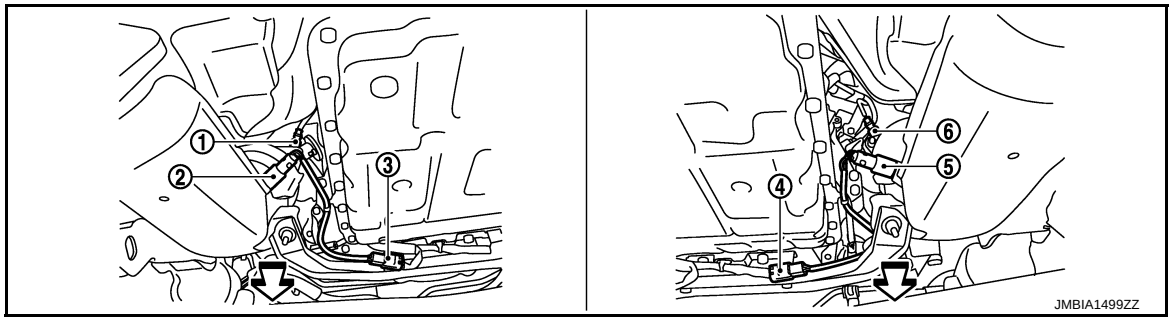
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

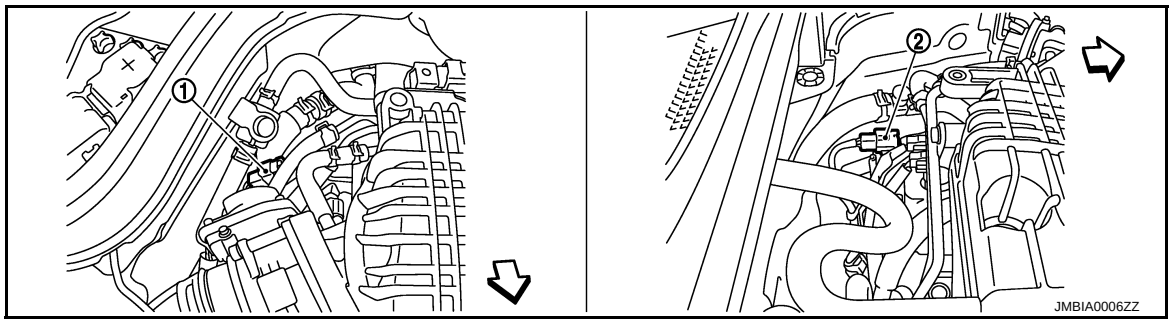
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

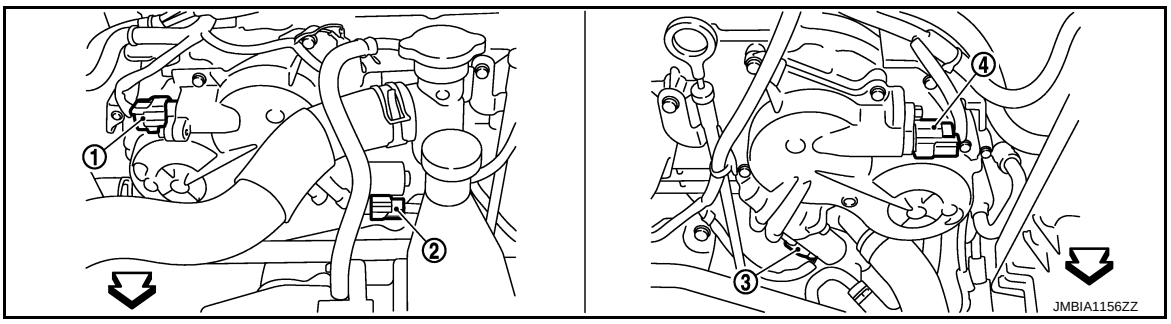
⇦ : Vehicle front



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

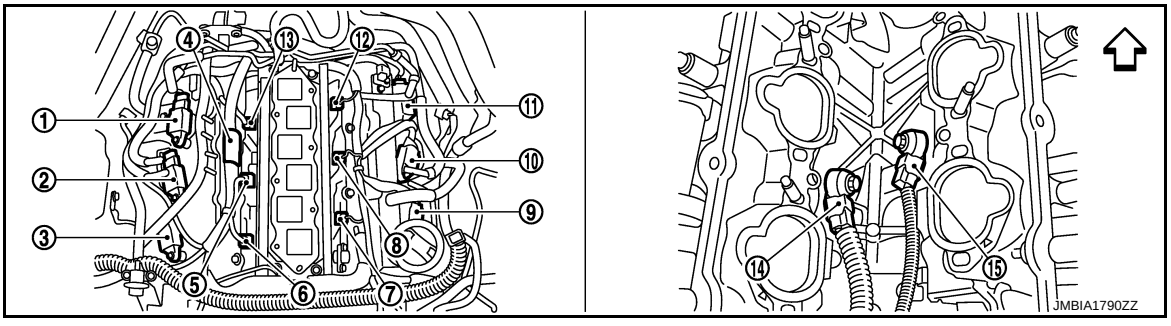
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



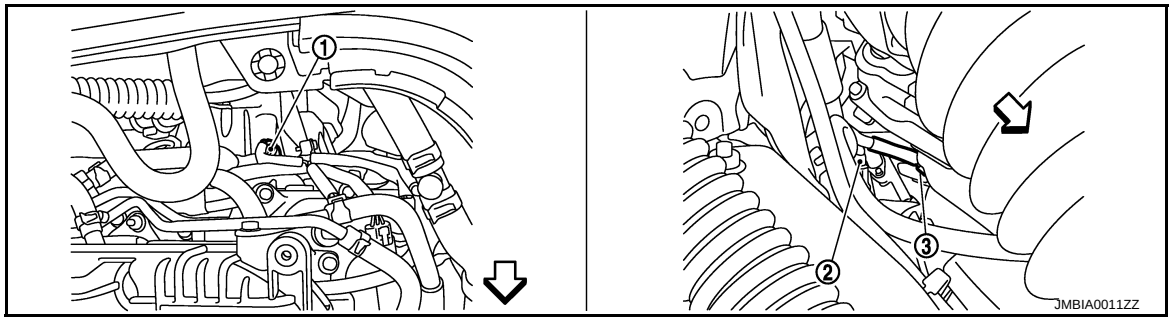
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



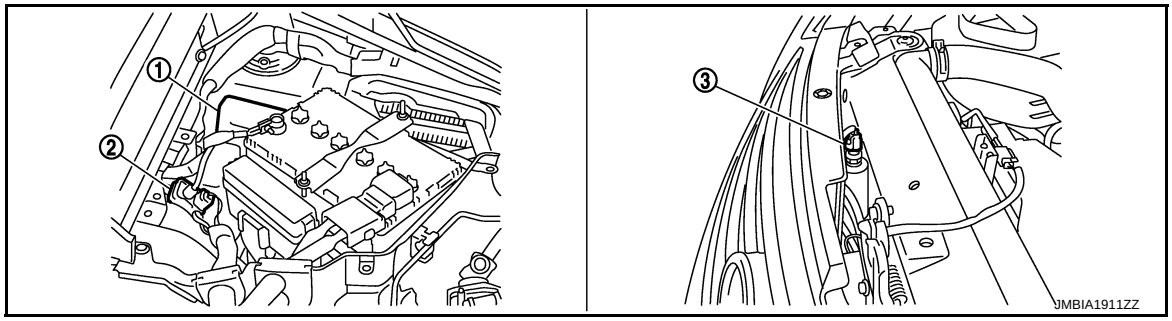
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

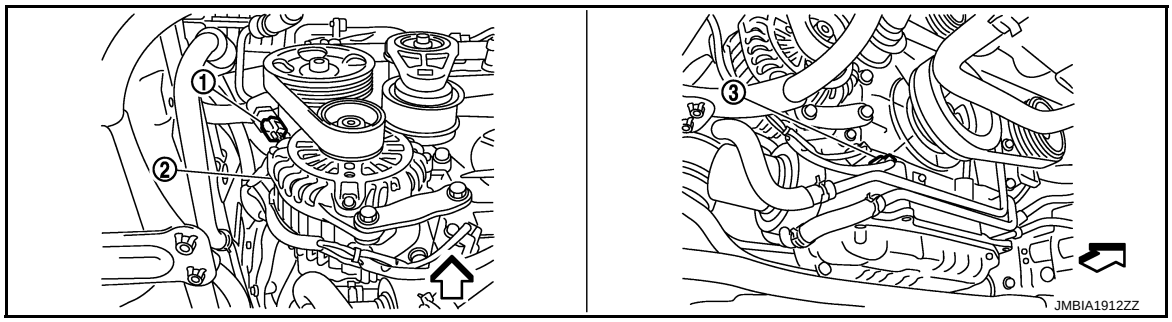


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

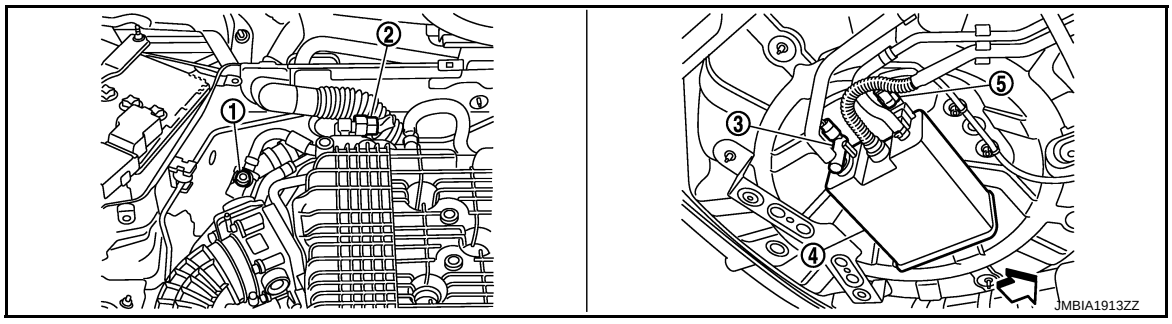


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

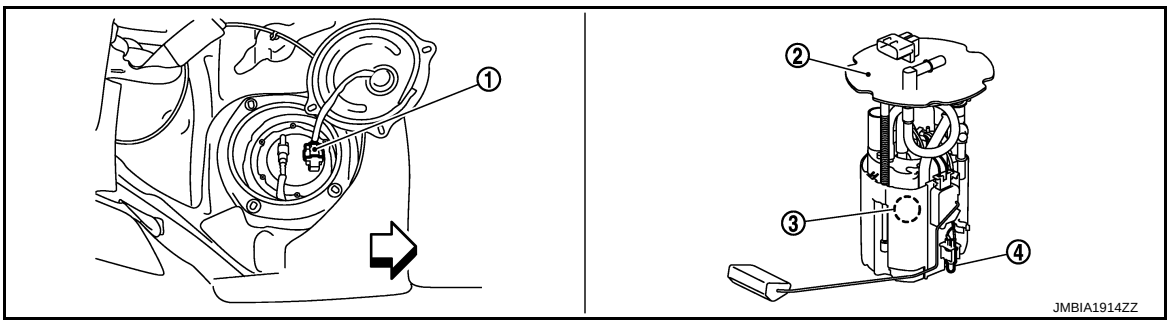
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

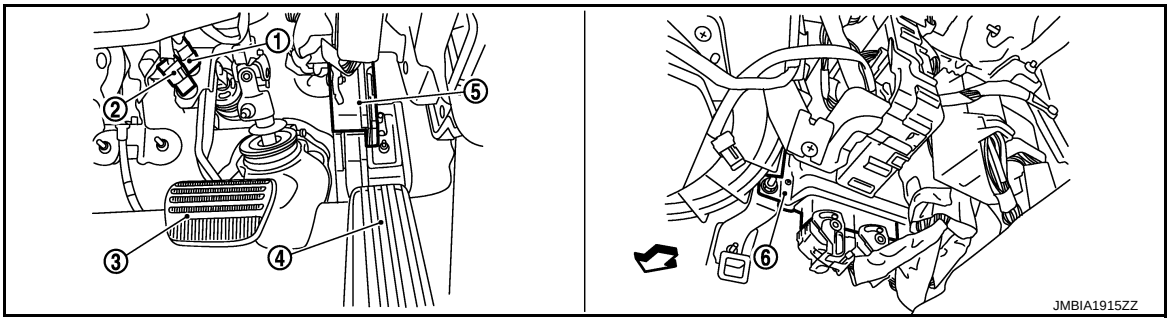
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



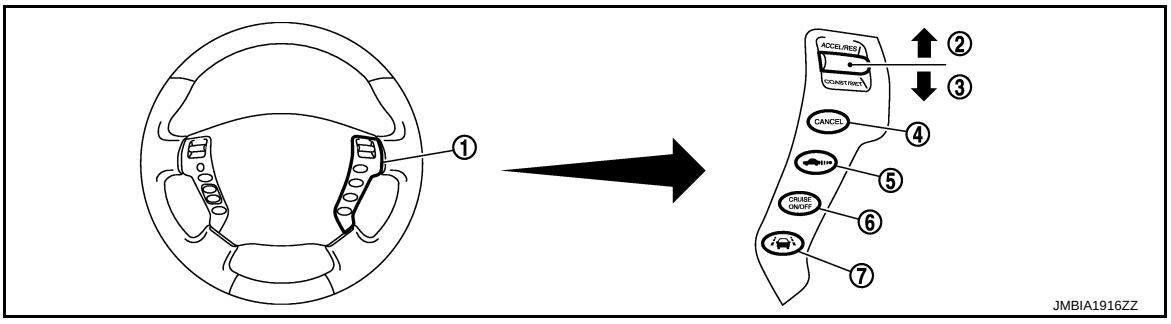
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

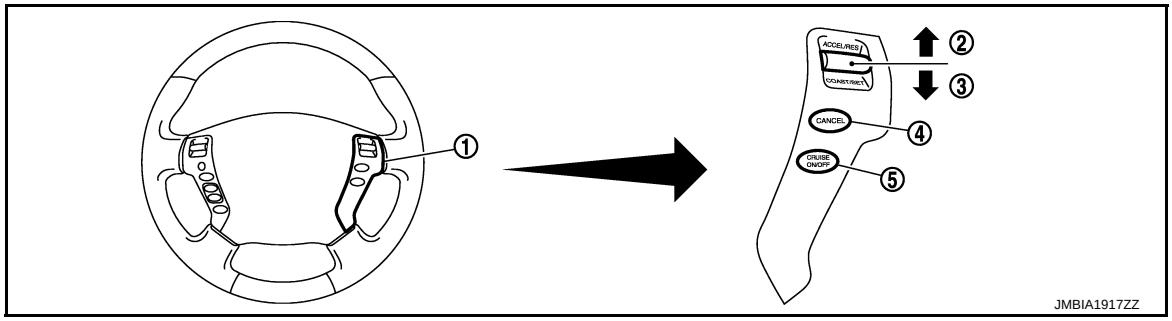


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

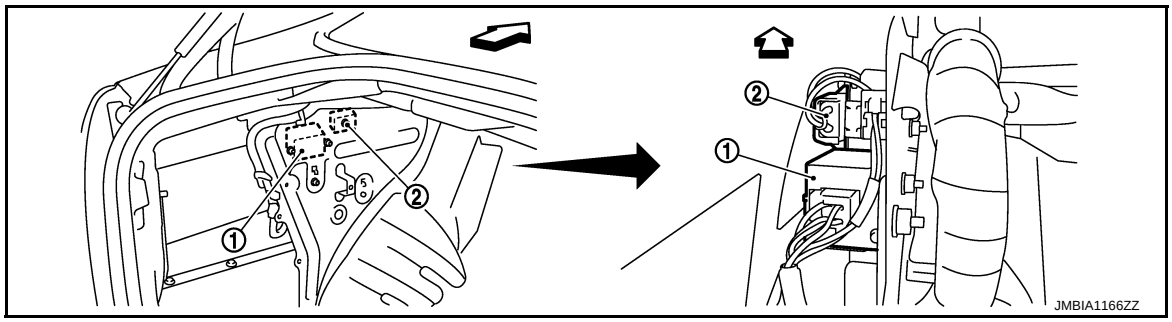
⇦ : Vehicle front



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

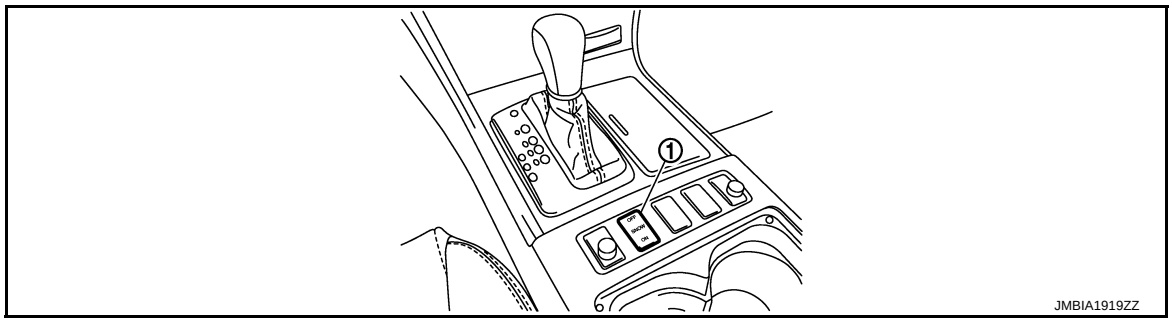


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

INFOID:0000000005353344

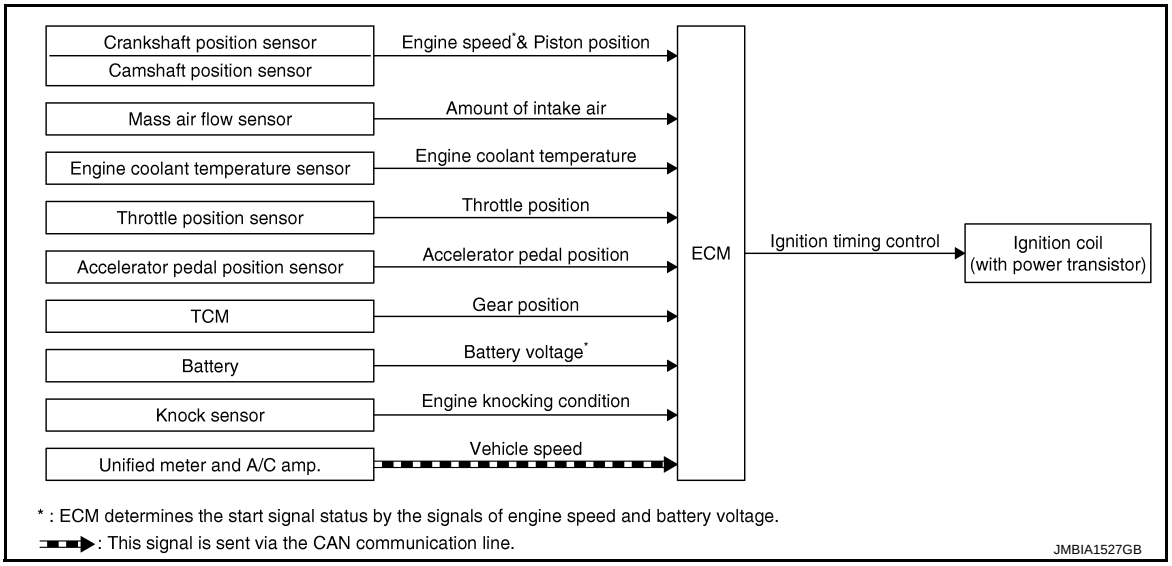
Component	Reference
A/F sensor 1	EC-237, "Description"
Accelerator pedal position sensor	EC-558, "Description"
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Fuel injector	EC-598, "Description"
Heated oxygen sensor 2	EC-264, "Description"
Intake air temperature sensor	EC-214, "Description"
Knock sensor	EC-335, "Description"

Component	Reference
Mass air flow sensor	EC-195, "Description"
Power steering pressure sensor	EC-435, "Description"
Throttle position sensor	EC-224, "Description"

ELECTRIC IGNITION SYSTEM

System Diagram

INFOID:0000000005353345



System Description

INFOID:0000000005353346

INPUT/OUTPUT SIGNAL CHART

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

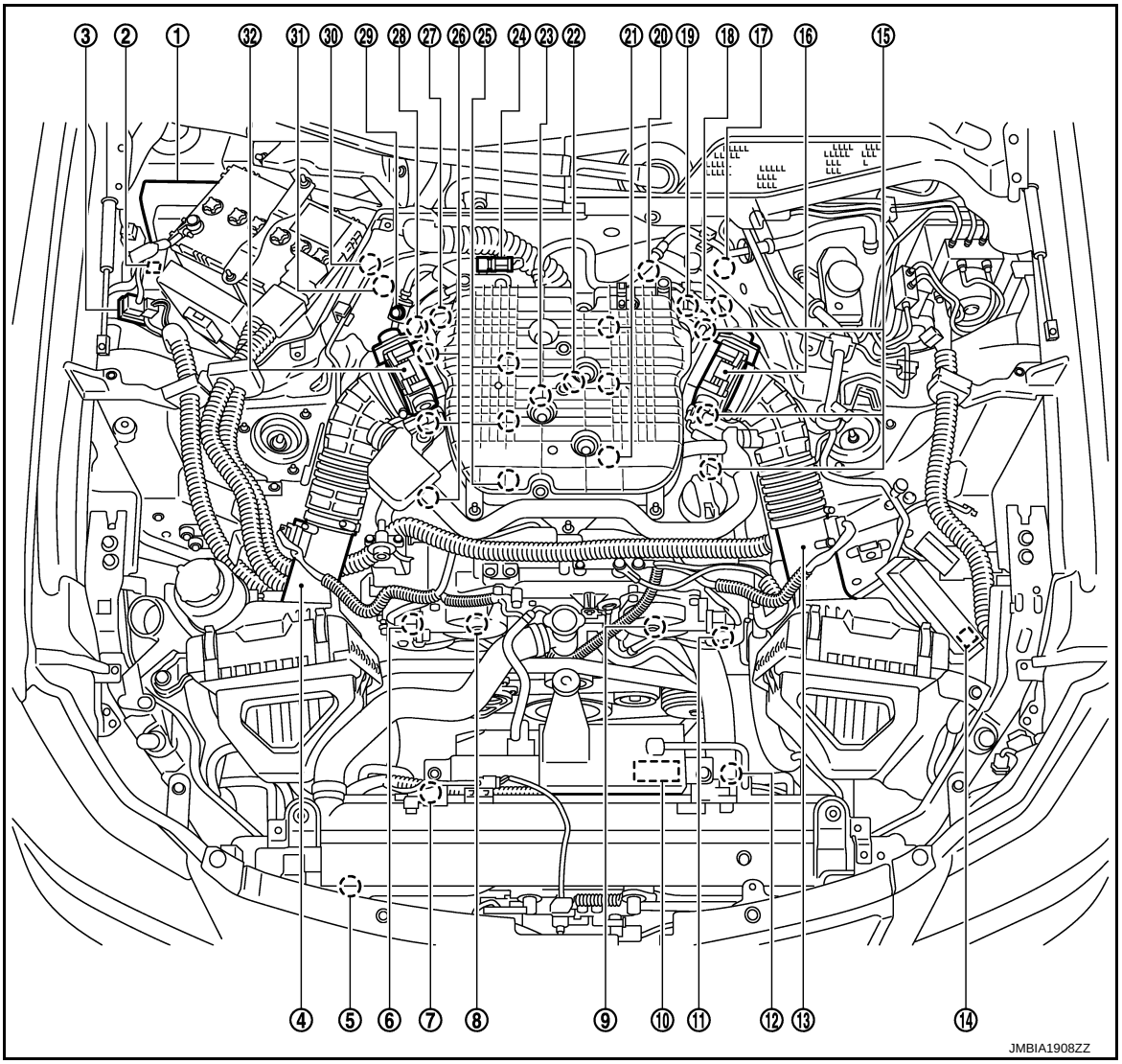
- At starting
- During warm-up
- At idle
- At low battery voltage
- During acceleration

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.

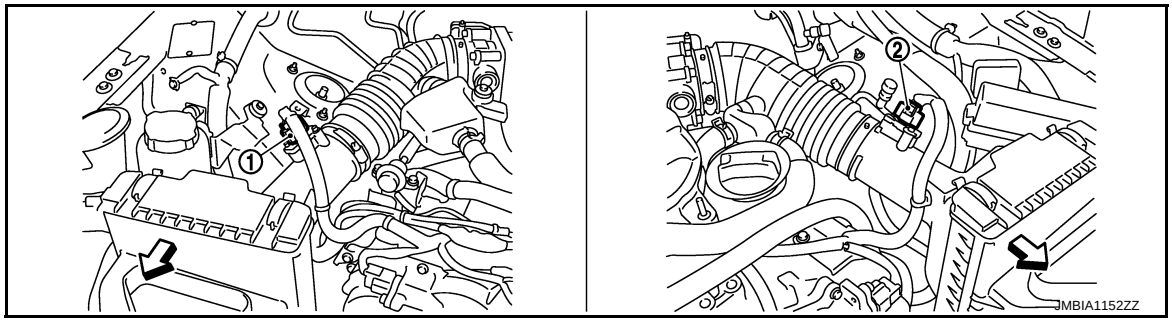
Component Parts Location

INFOID:0000000005353347



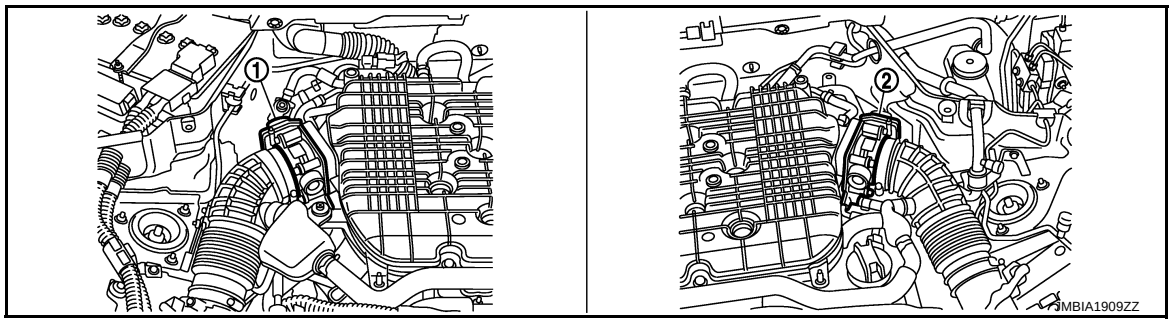
1. IPDM E/R	2. ICC brake hold relay (ICC models)	3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)	5. Refrigerant pressure sensor	6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2	8. Intake valve timing control solenoid valve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

28. Exhaust valve timing control position sensor (bank 1)
29. EVAP service port
30. A/F sensor 1 (bank 1)
31. Crankshaft position sensor
32. Electric throttle control actuator (bank 1)

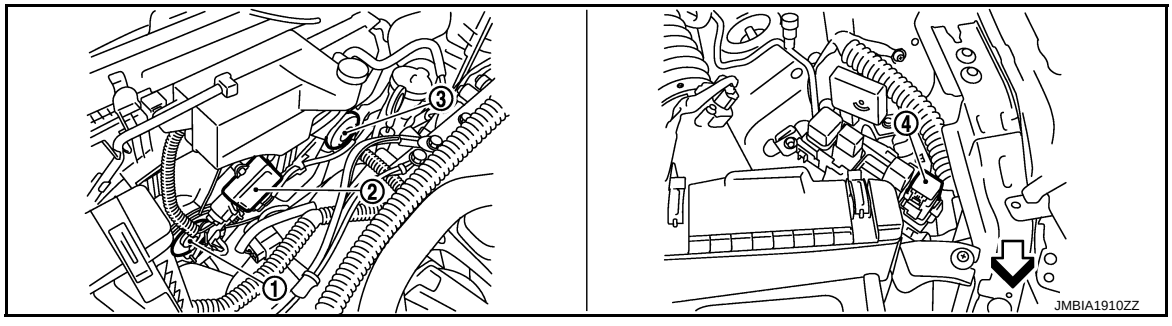


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

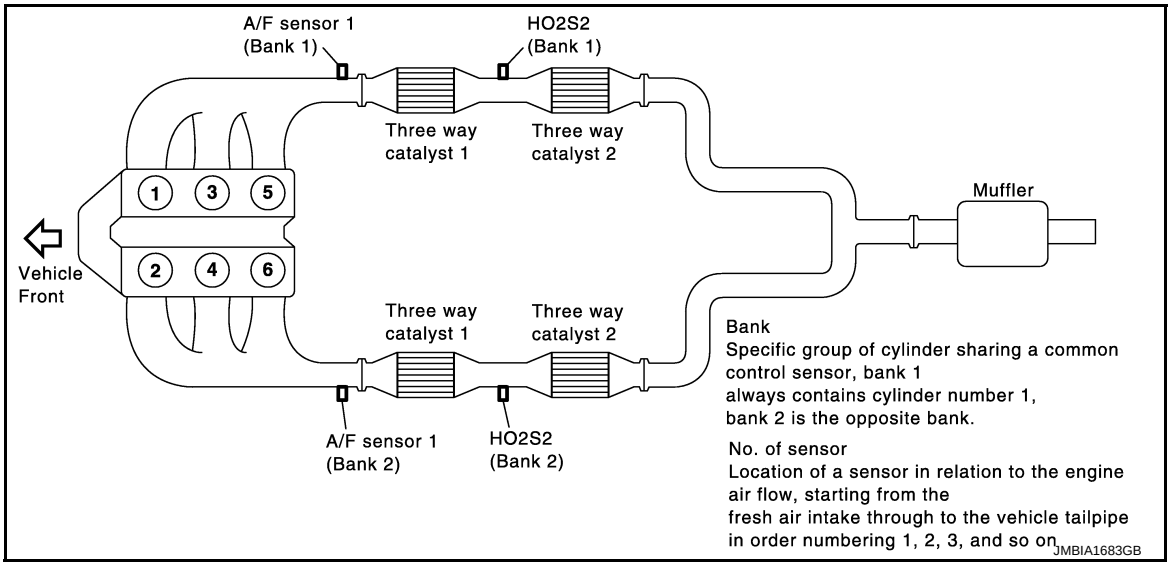


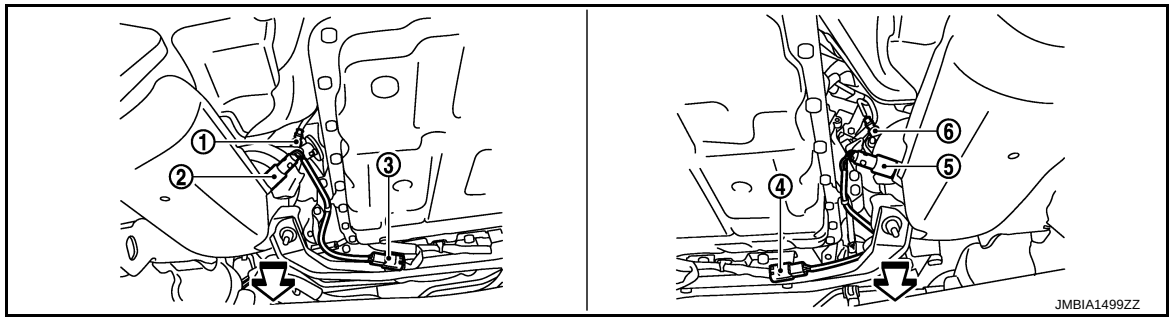
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

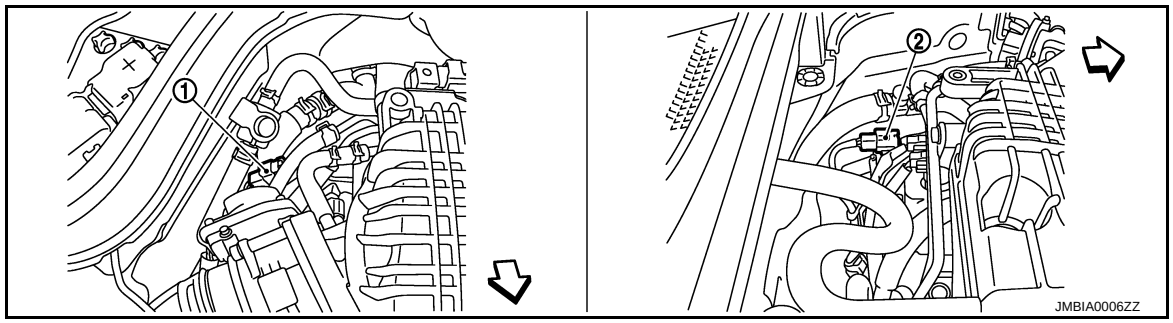
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

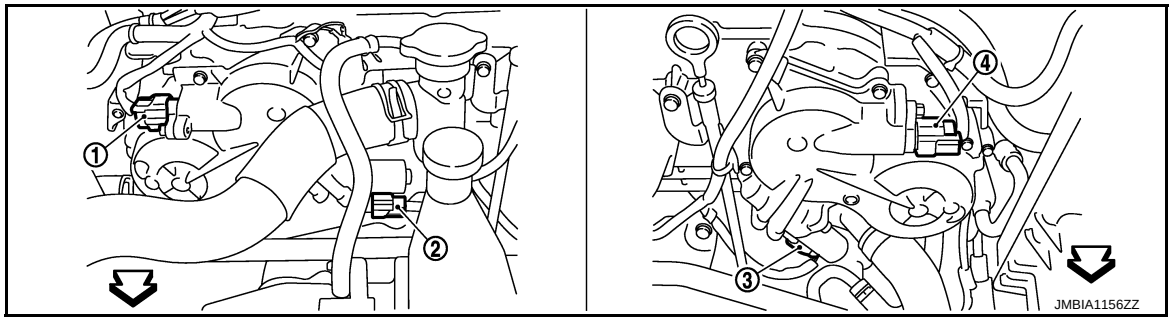
⇦ : Vehicle front



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

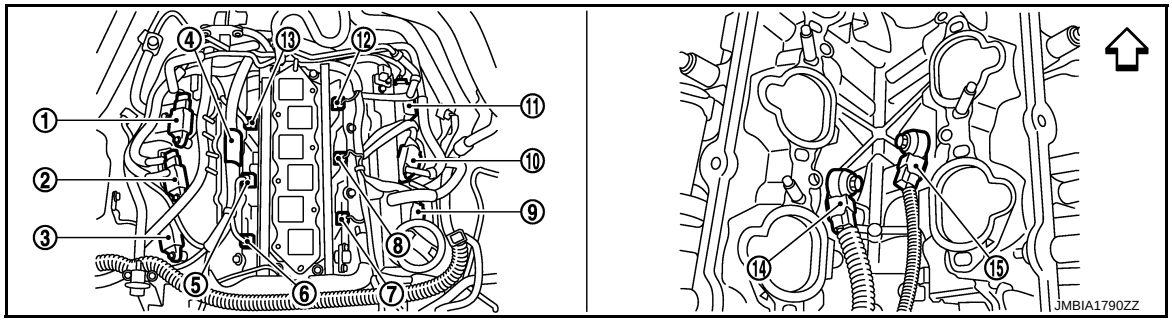
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



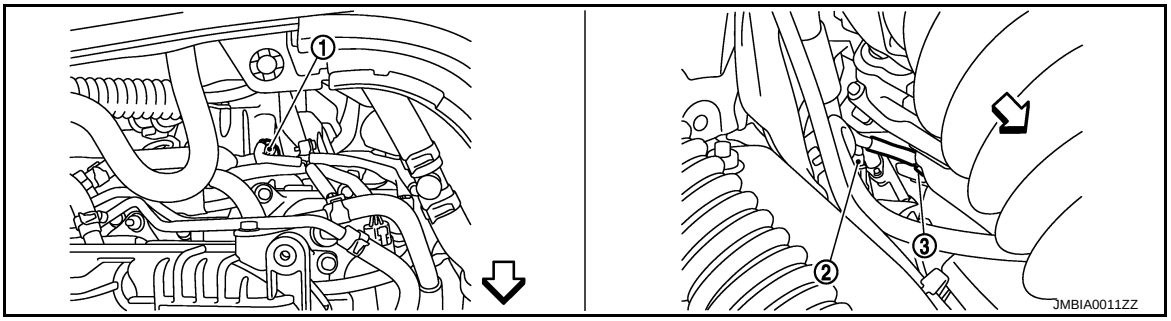
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



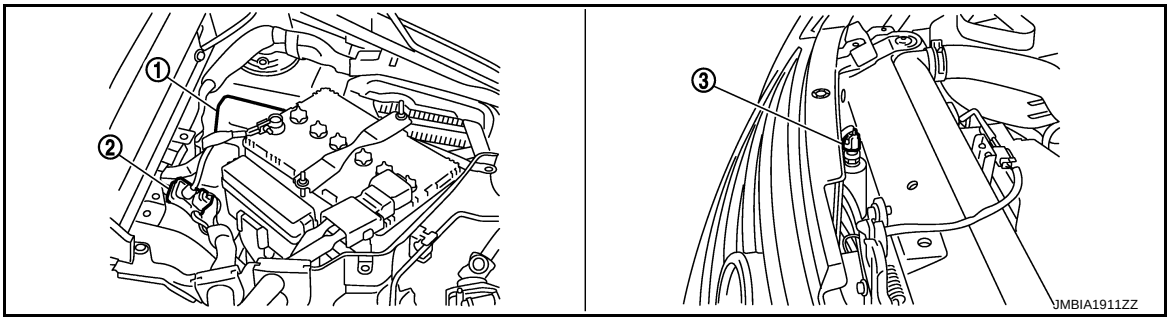
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

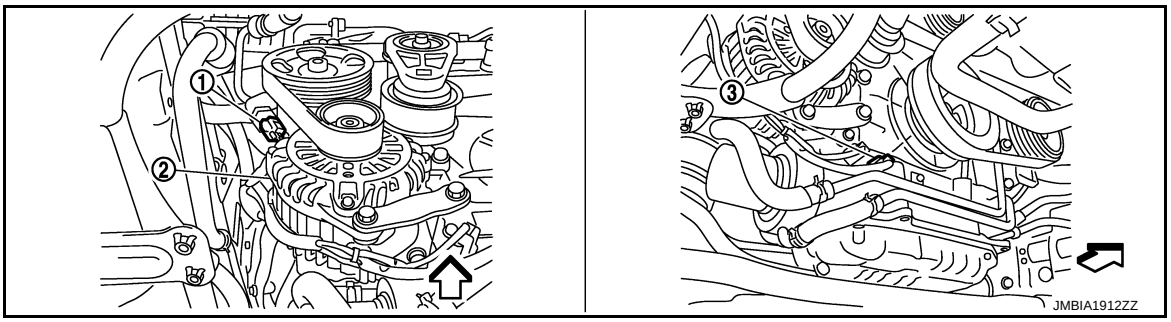


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

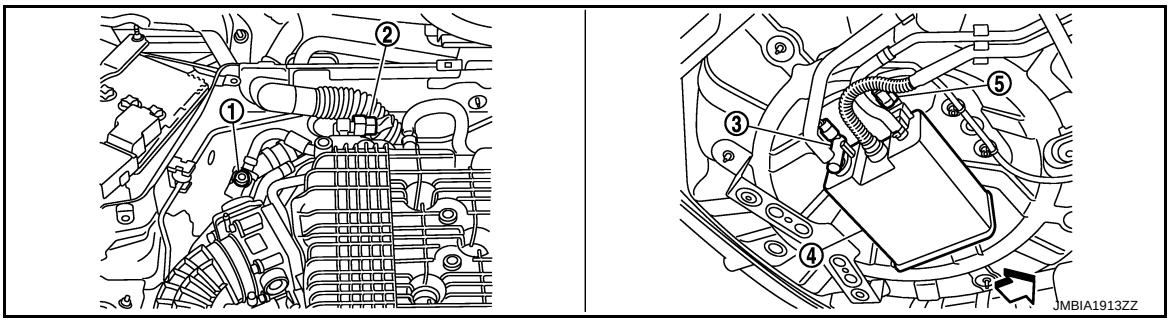


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

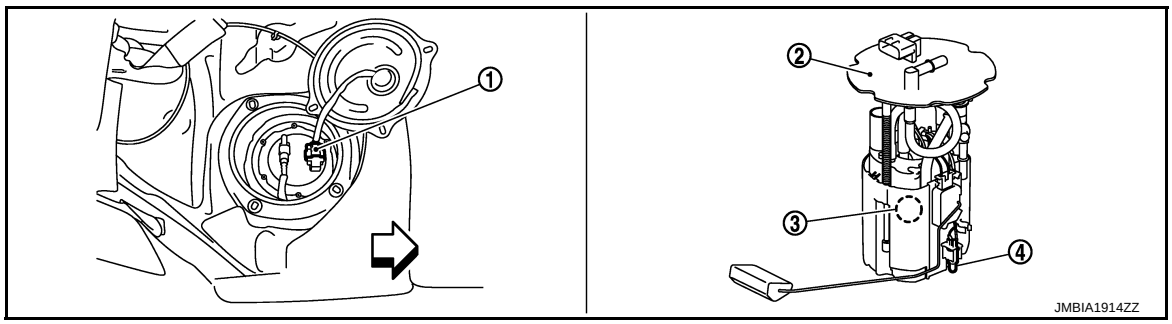
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

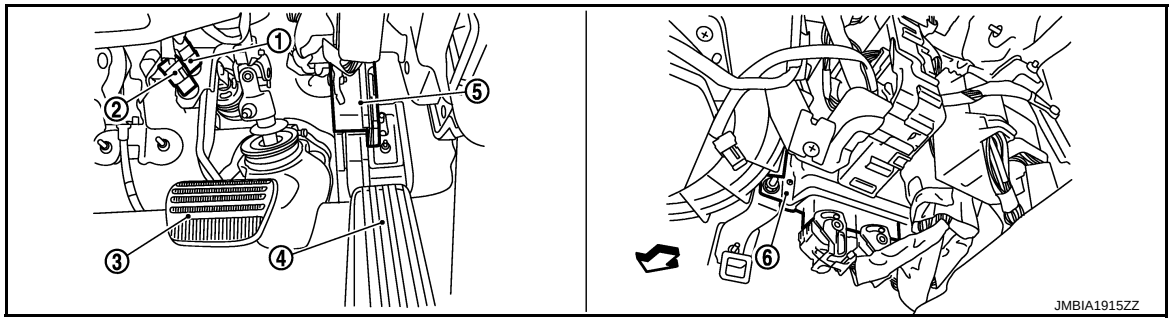
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



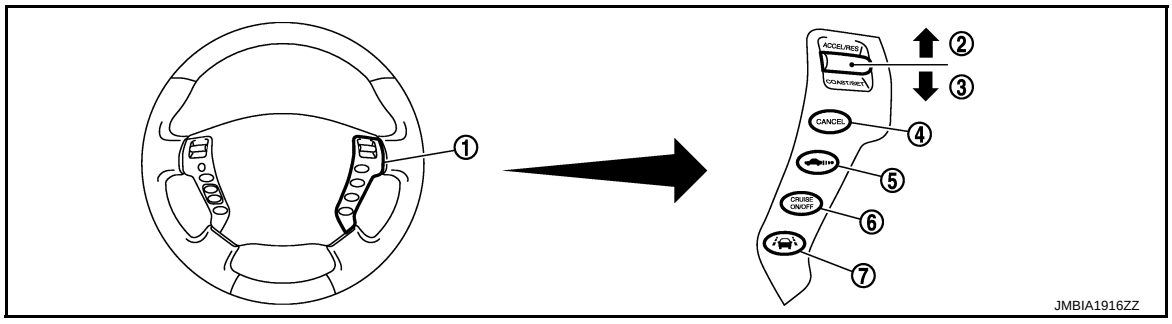
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

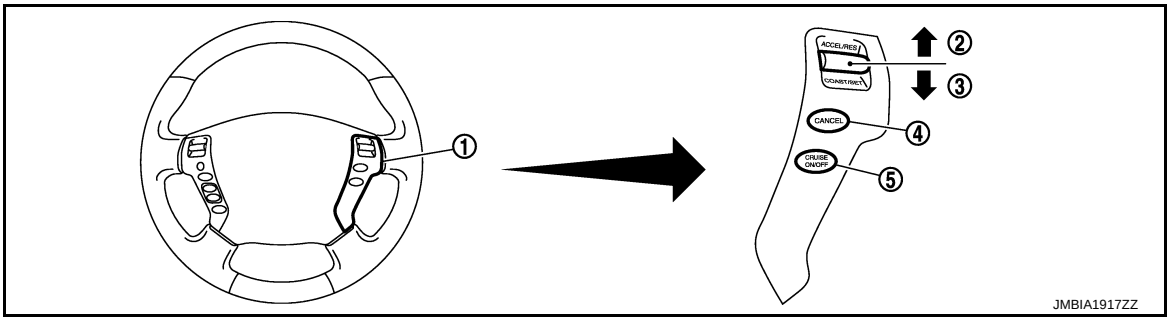


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

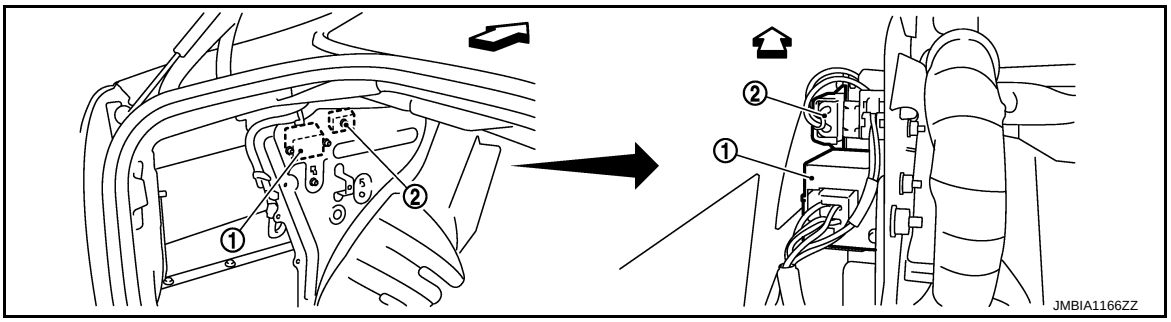
⇦ : Vehicle front



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

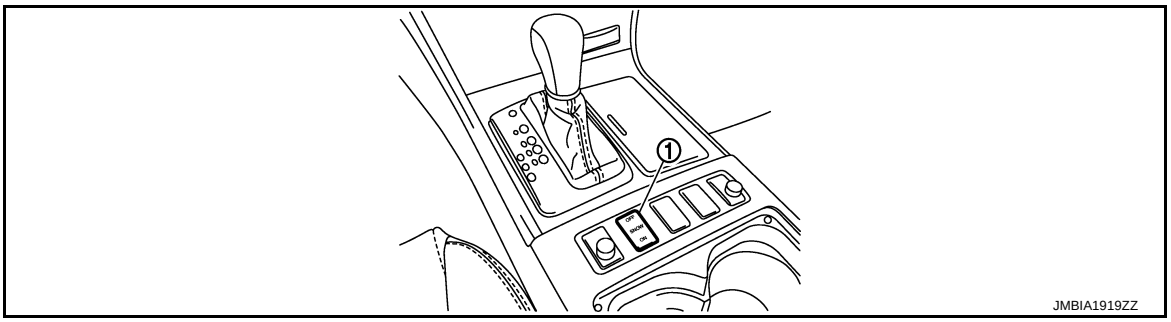


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

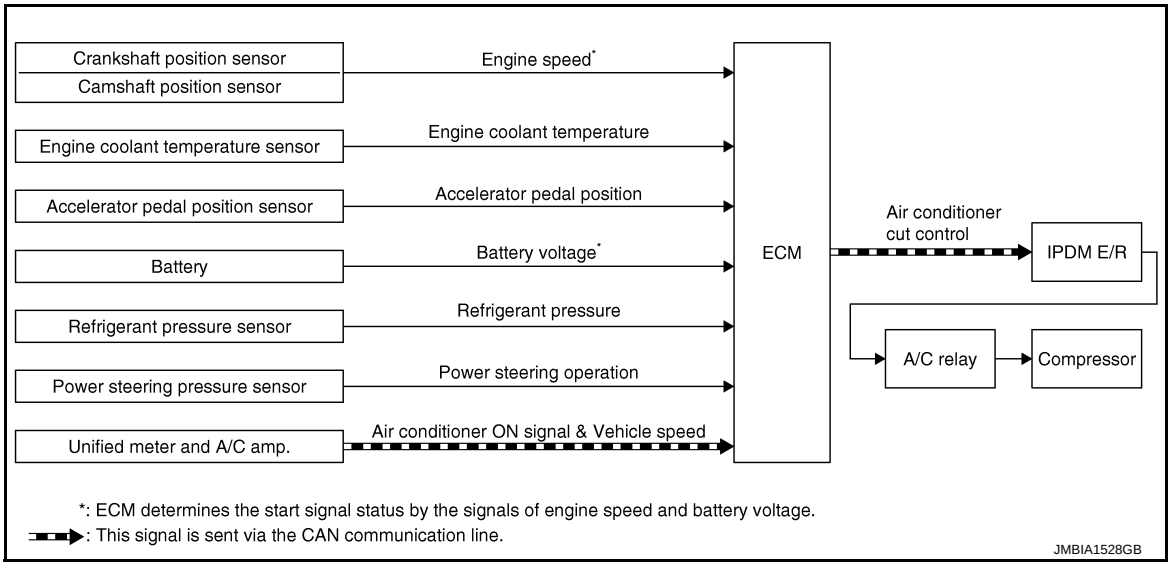
INFOID:0000000005353348

Component	Reference
Accelerator pedal position sensor	EC-558, "Description"
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Knock sensor	EC-335, "Description"
Mass air flow sensor	EC-195, "Description"
Throttle position sensor	EC-224, "Description"

AIR CONDITIONING CUT CONTROL

System Diagram

INFOID:0000000005353349



System Description

INFOID:0000000005353350

INPUT/OUTPUT SIGNAL CHART

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*2	Air conditioner cut control	IPDM E/R ↓ A/C relay ↓ Compressor
Camshaft position sensor			
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.	Vehicle speed & Air conditioner ON signal*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.

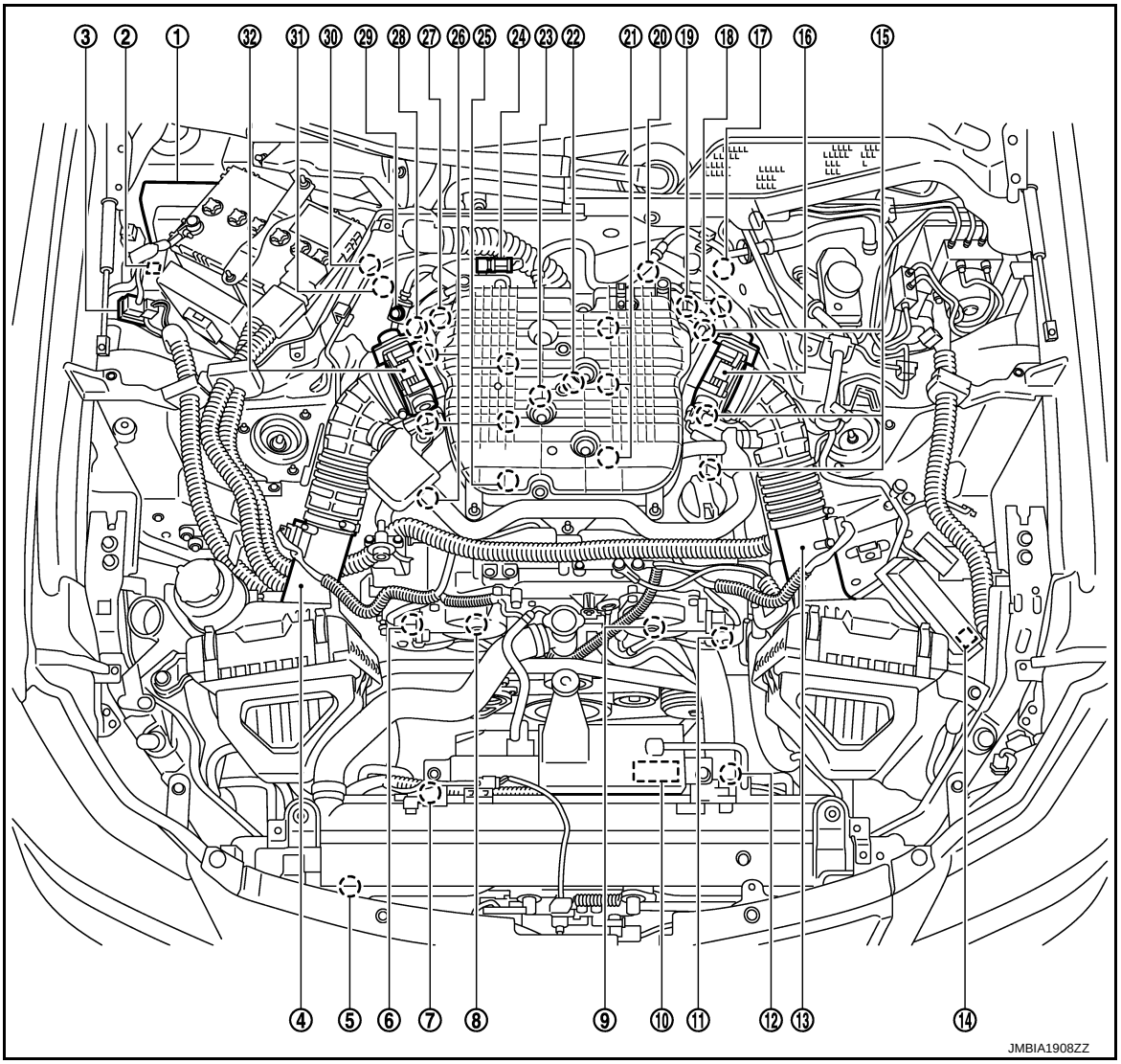
SYSTEM DESCRIPTION

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

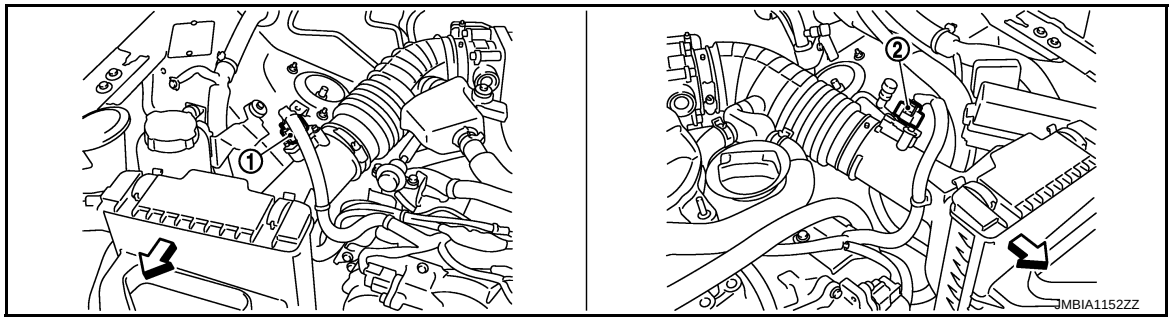
- When the accelerator pedal is fully depressed.
- When cranking the engine.
- At high engine speeds.
- When the engine coolant temperature becomes excessively high.
- When operating power steering during low engine speed or low vehicle speed.
- When engine speed is excessively low.
- When refrigerant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

Component Parts Location

INFOID:0000000005353351

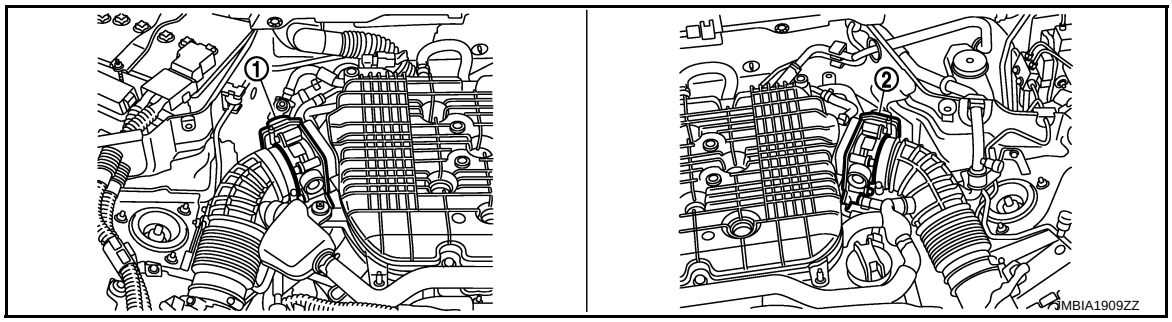


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

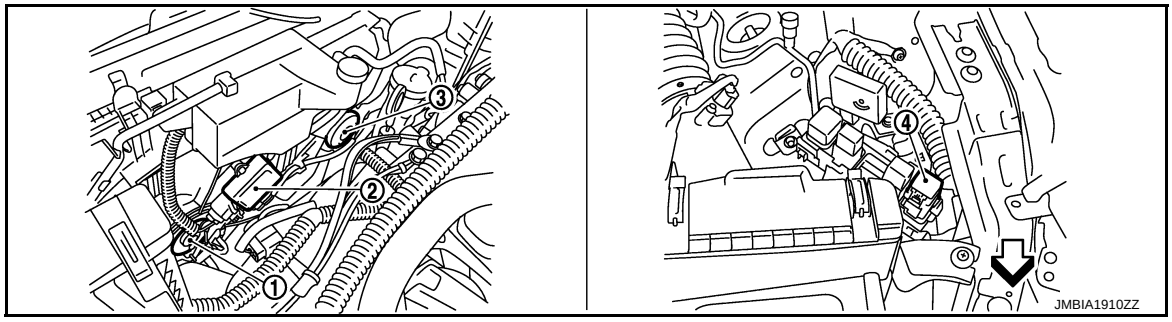


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

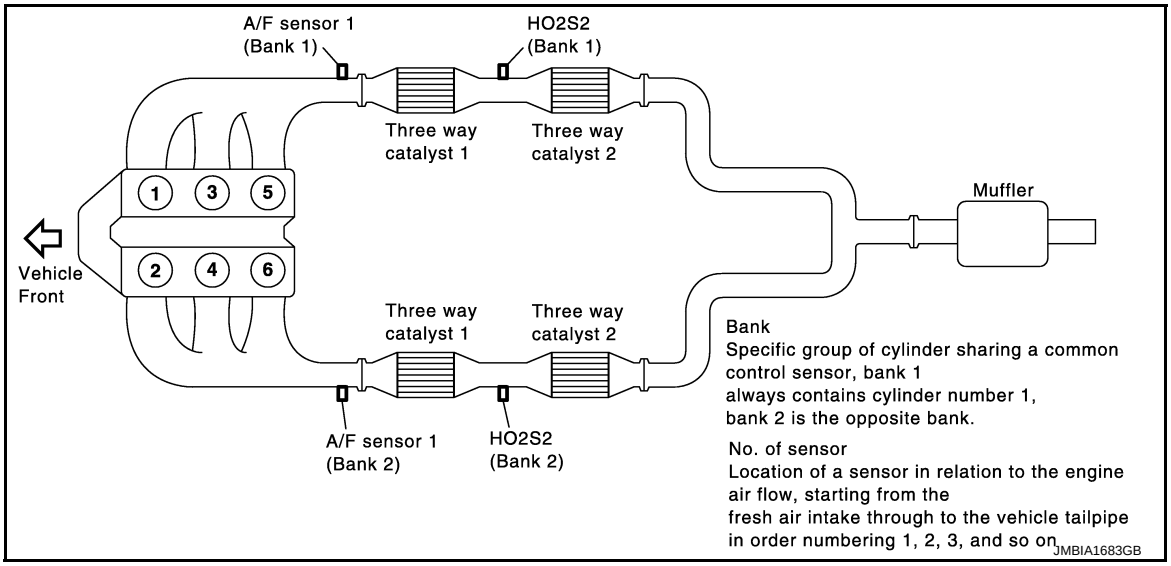


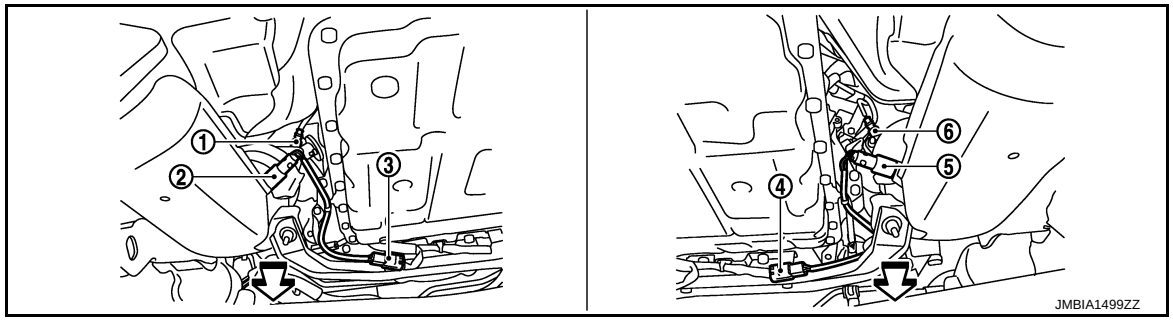
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

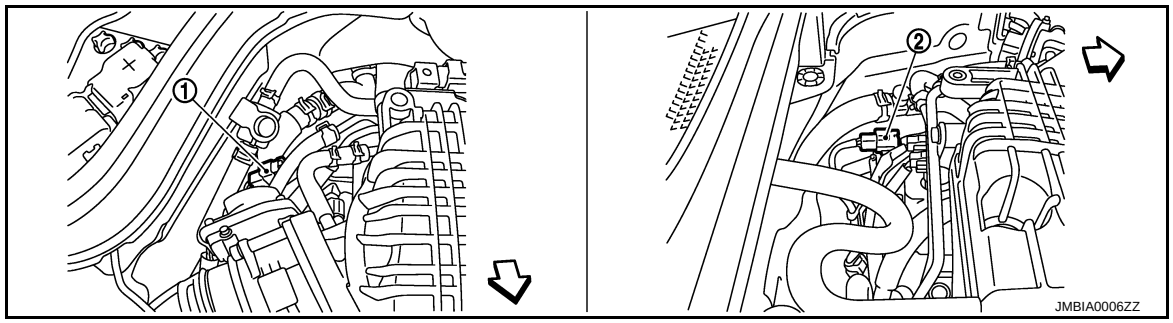
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

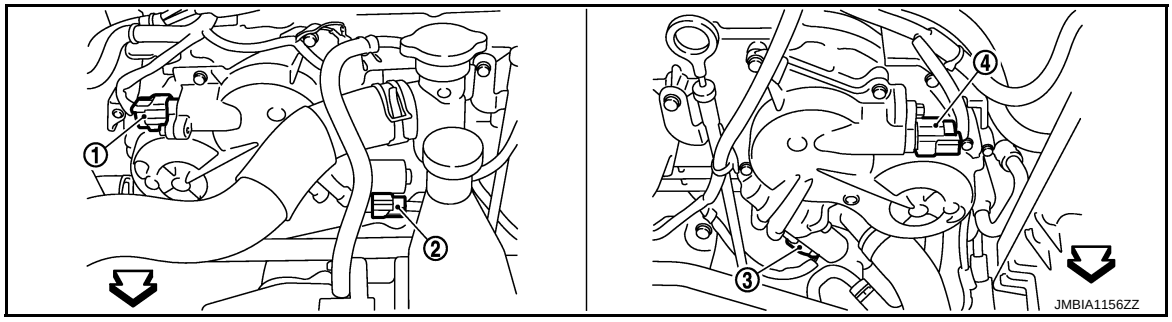
⇦ : Vehicle front



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

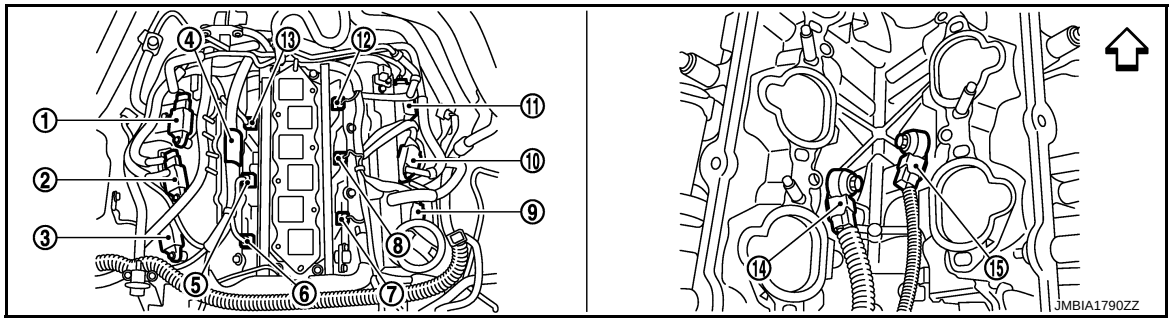
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



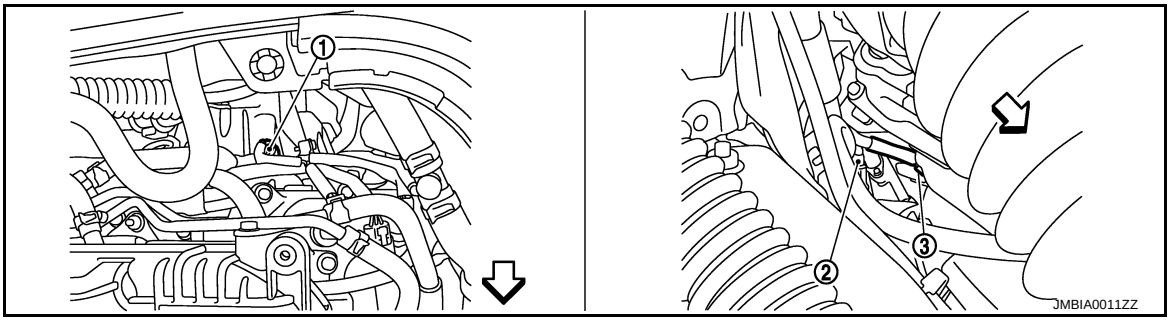
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



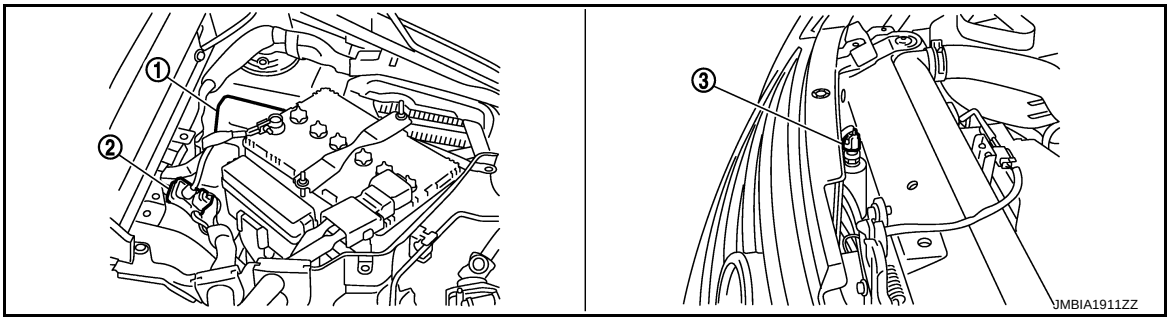
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

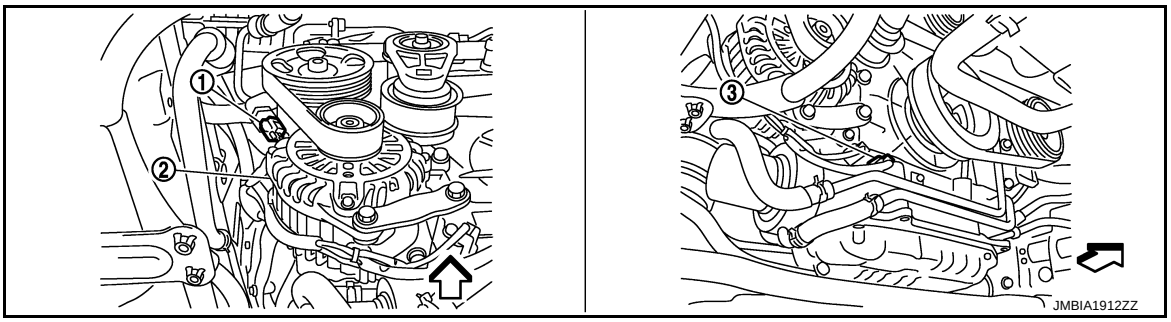


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

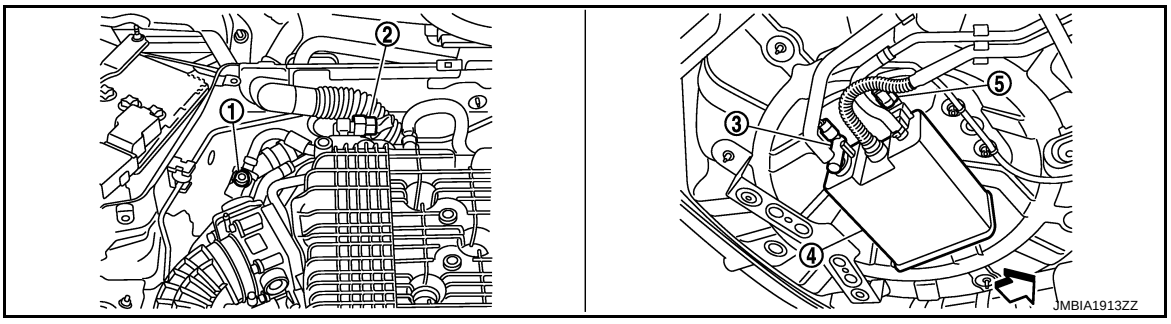


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

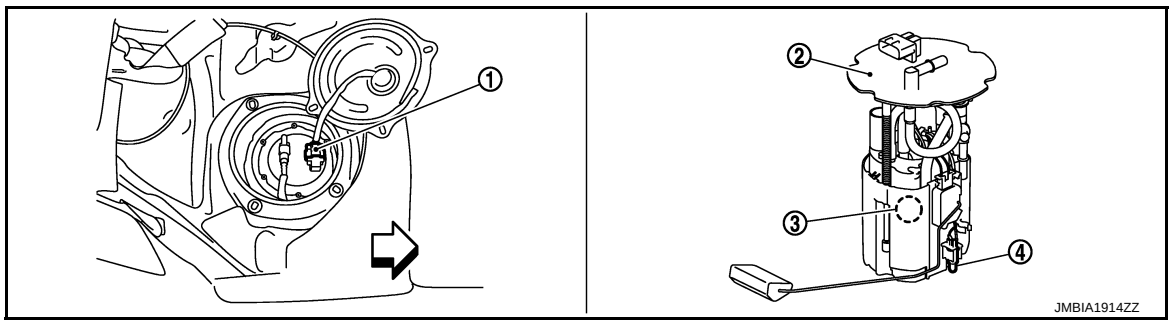
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

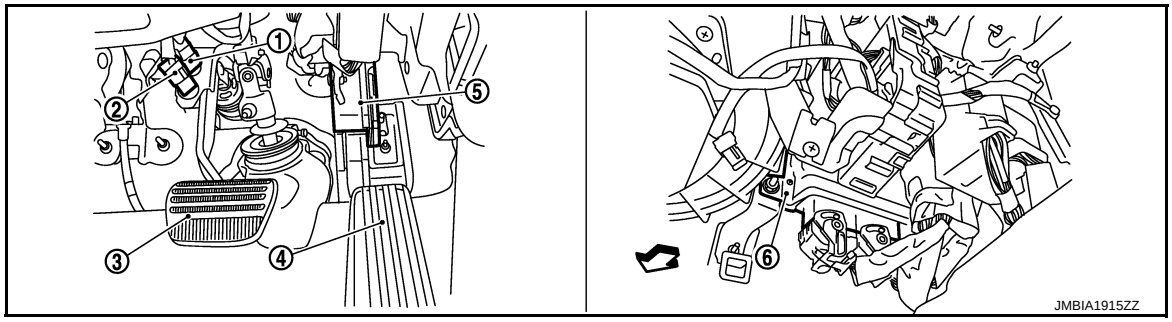
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



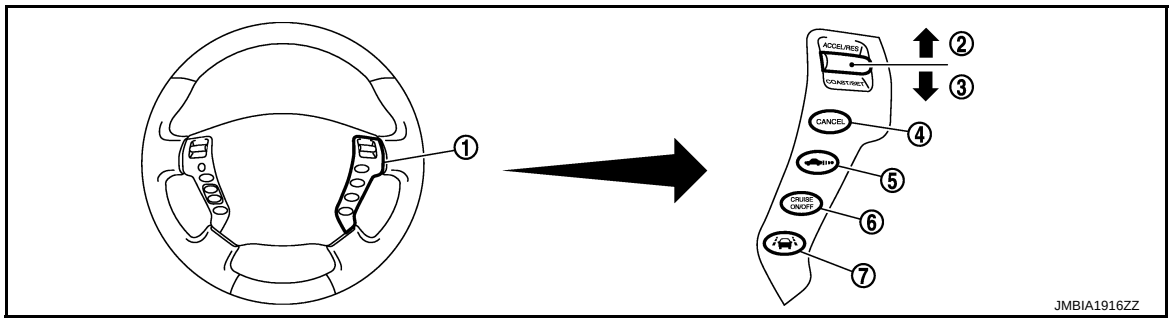
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

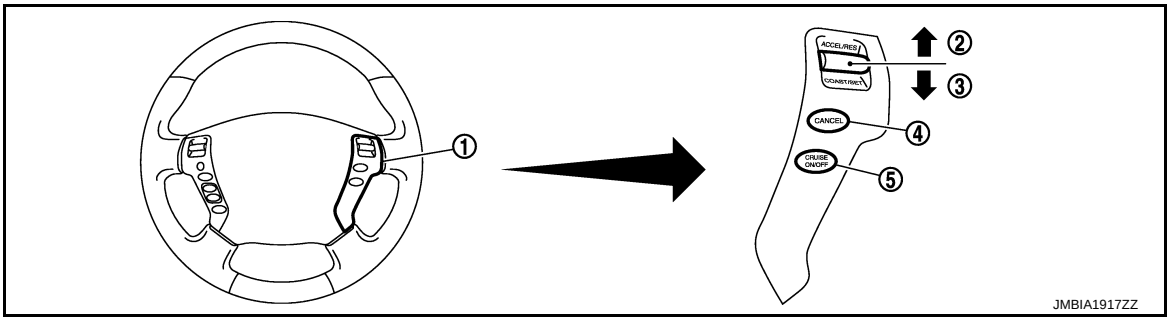


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

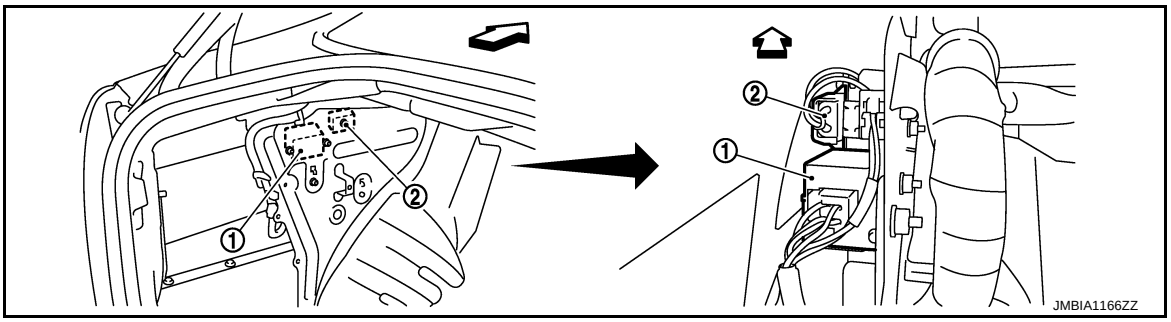
⇦ : Vehicle front



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

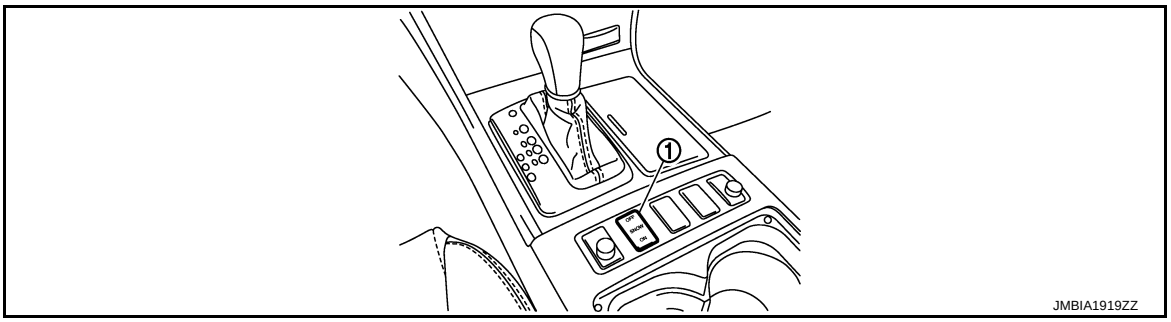


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

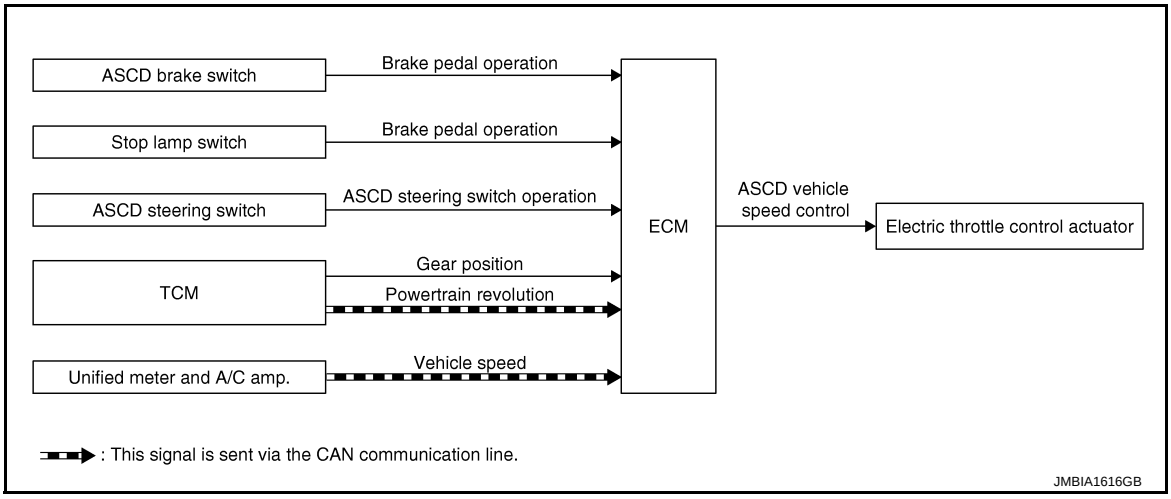
INFOID:0000000005353352

Component	Reference
Accelerator pedal position sensor	EC-558, "Description"
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Power steering pressure sensor	EC-435, "Description"
Refrigerant pressure sensor	EC-637, "Description"

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Diagram

INFOID:0000000005353353



System Description

INFOID:0000000005353354

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		
TCM	Gear position		
	Powertrain revolution*		
Unified meter and A/C amp.	Vehicle speed*		

*: 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 indicated and SET indicator in combination meter. If any malfunction occurs in the ASCD system, CRUISE lamp blinks and ASCD control is deactivated.
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 is displayed.)
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 indicator in combination meter is displayed.)

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 on ASCD steering switch are pressed at the same time (Set speed will be cleared)
- Brake pedal is depressed

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

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

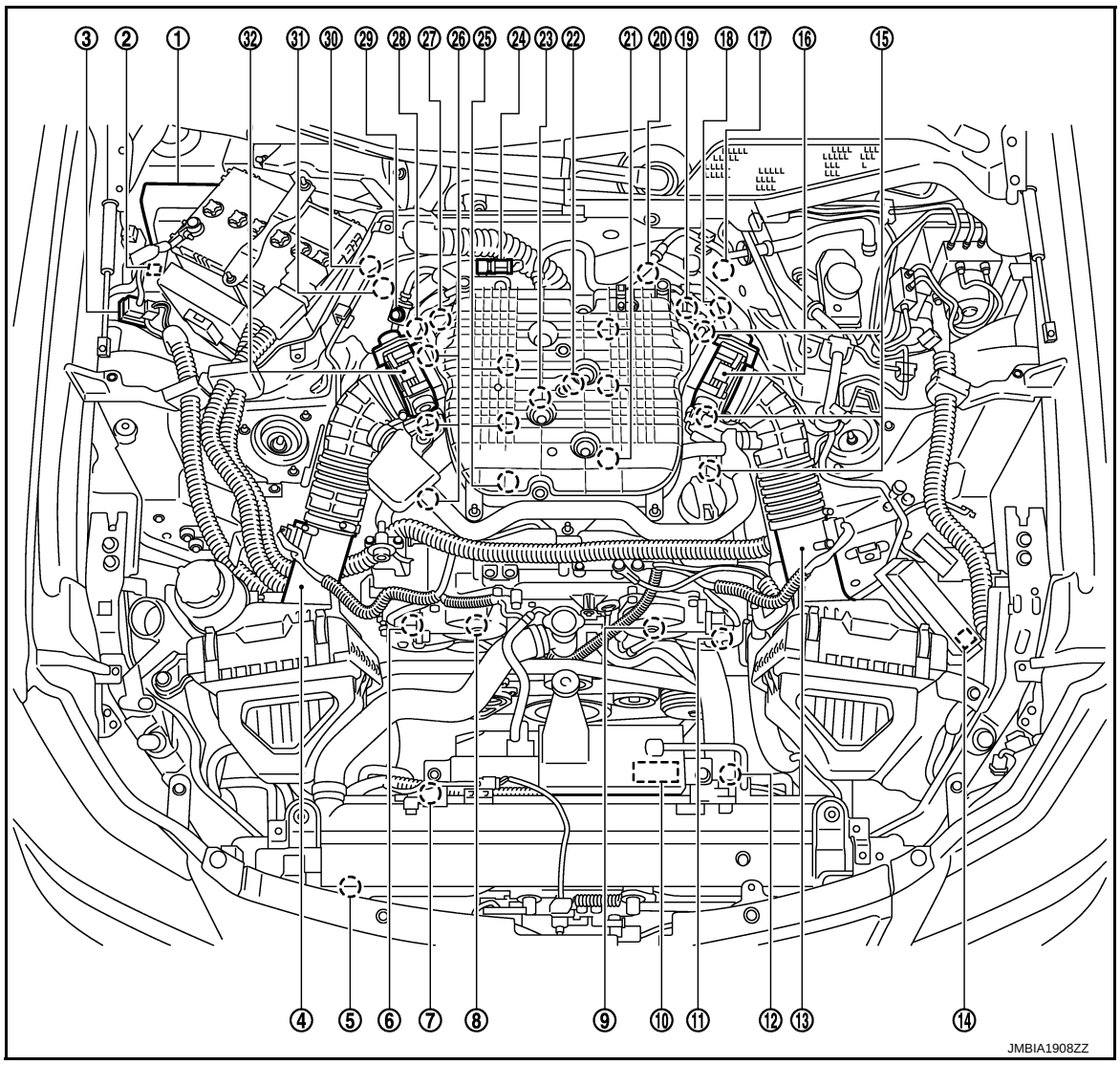
RESUME OPERATION

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

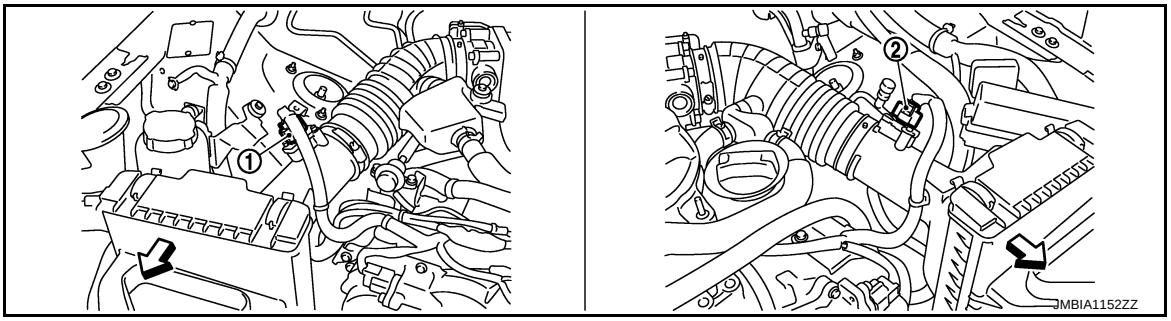
- Brake pedal is released
- A/T selector lever is in a position other than P and N
- Vehicle speed is greater than 40 km/h (25 MPH) and less than 144 km/h (89 MPH)

Component Parts Location

INFOID:0000000005353355

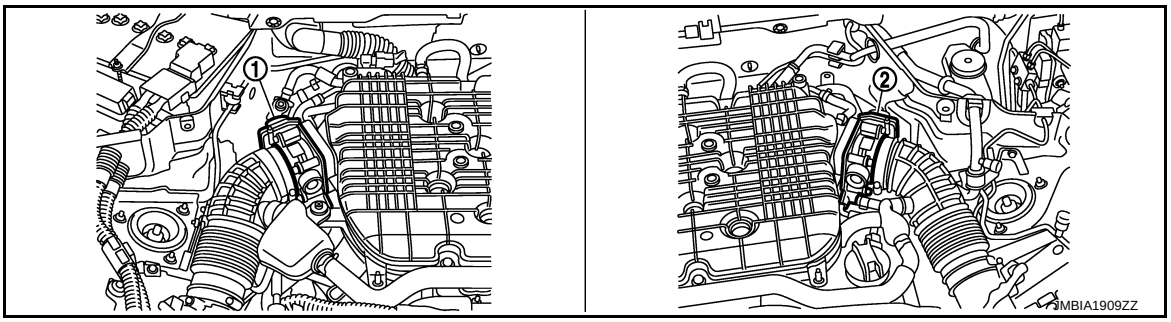


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

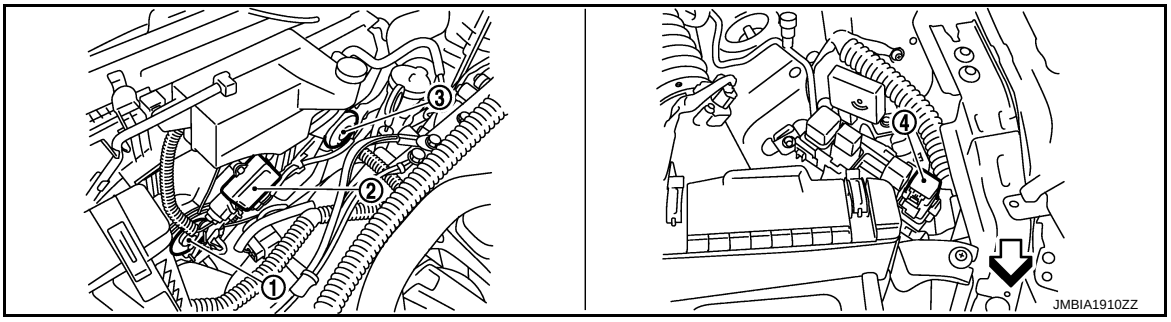


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

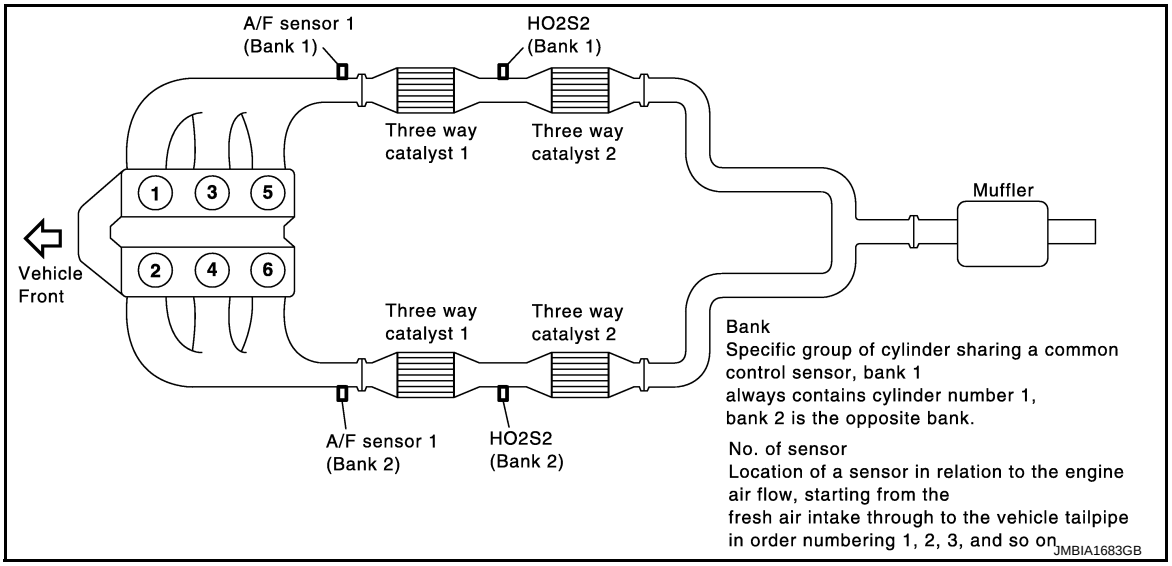


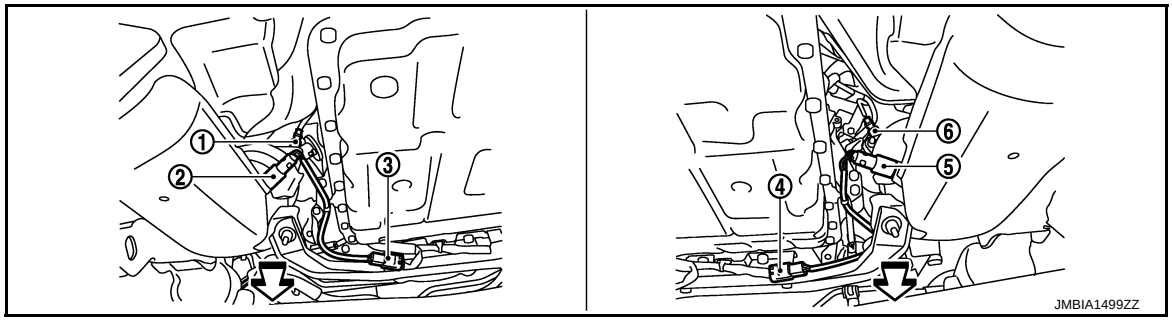
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

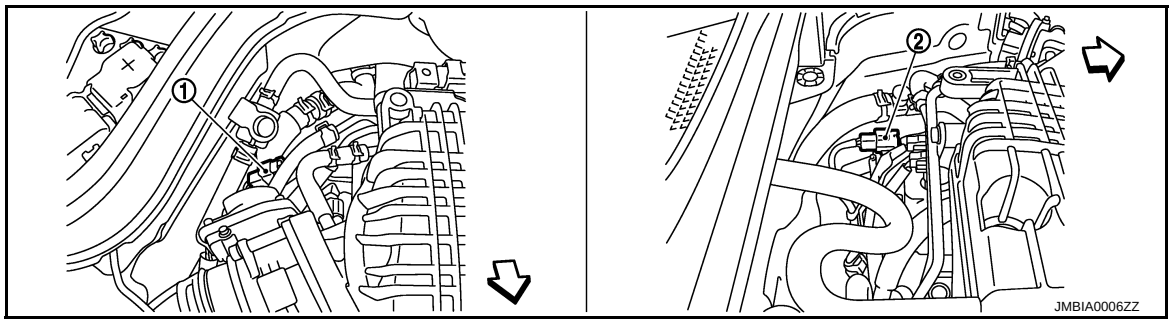
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

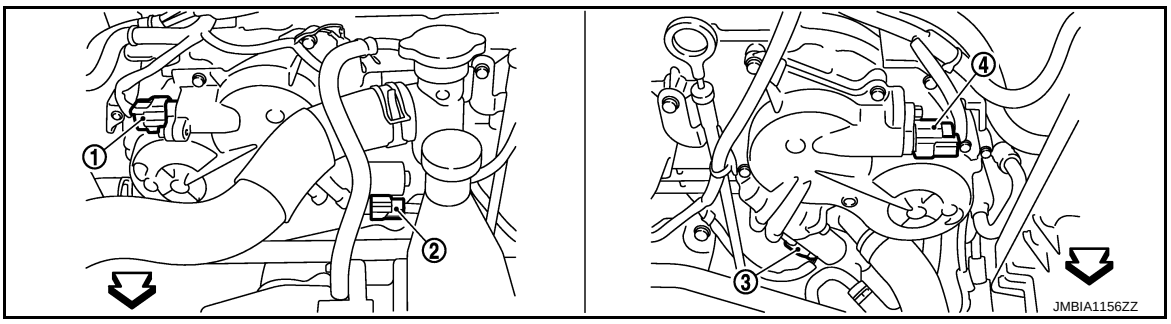
⇦ : Vehicle front



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

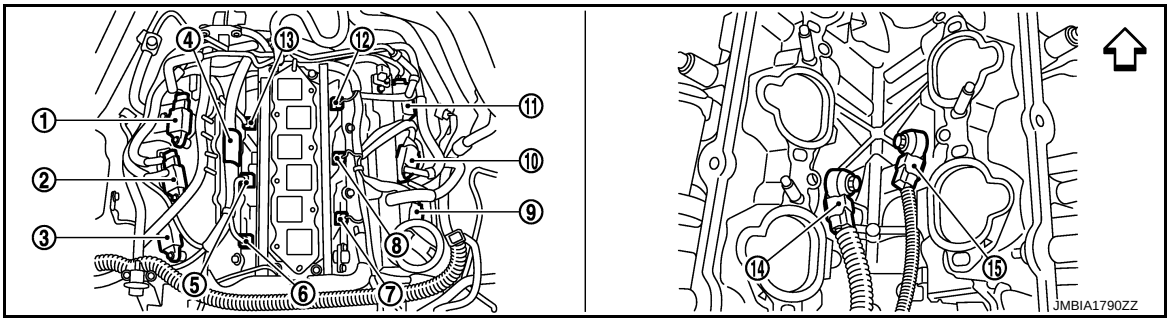
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



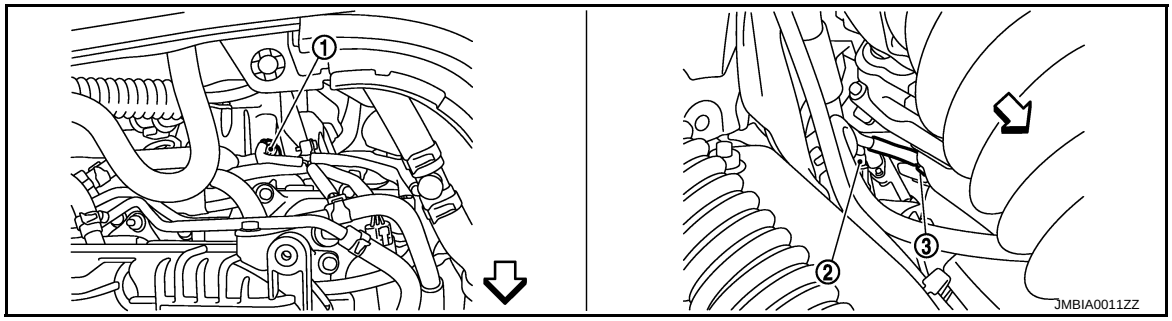
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



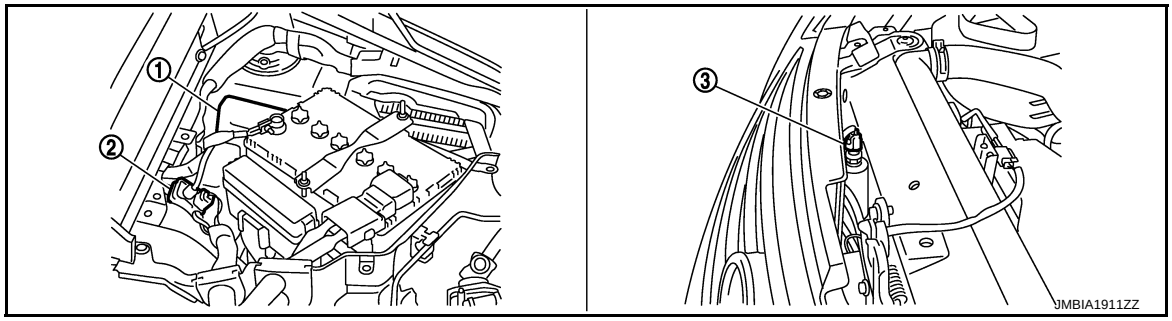
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

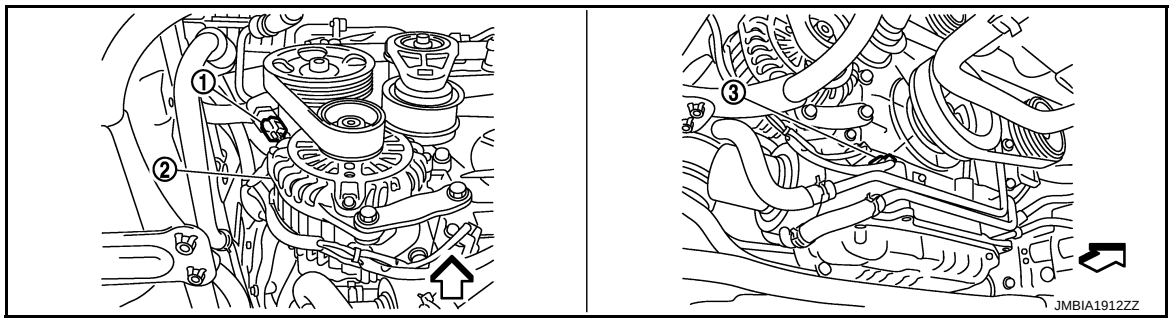


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

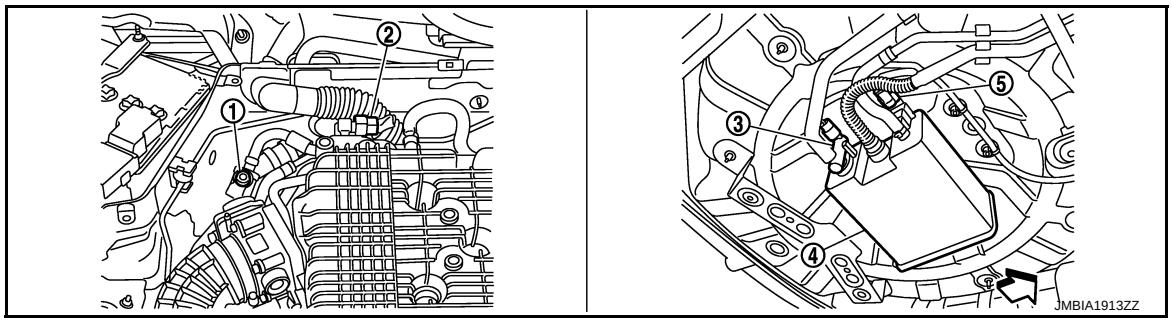


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

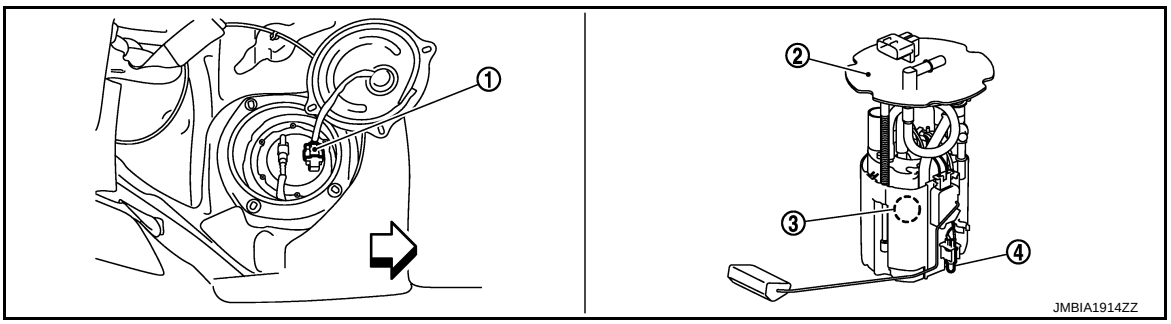
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

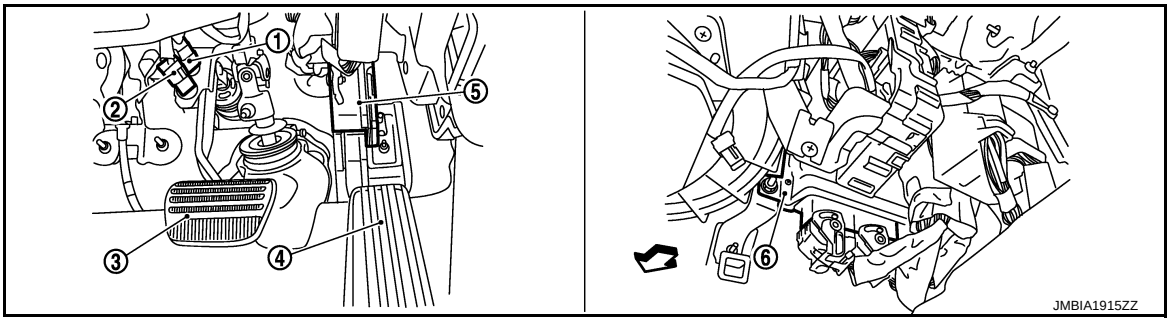
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



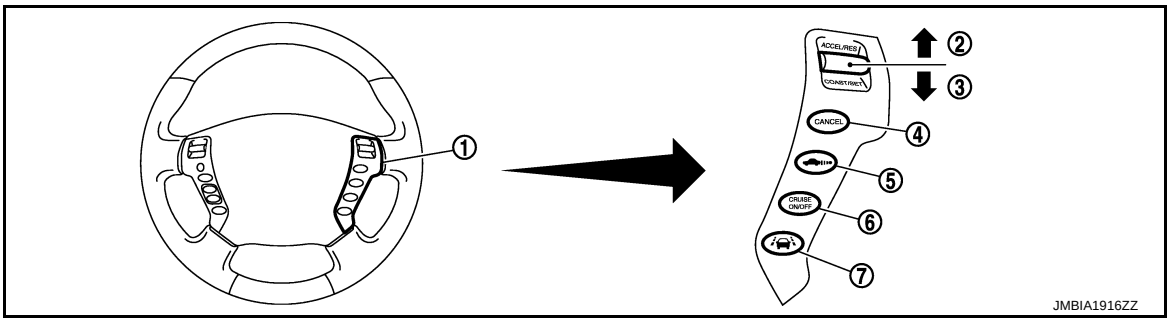
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

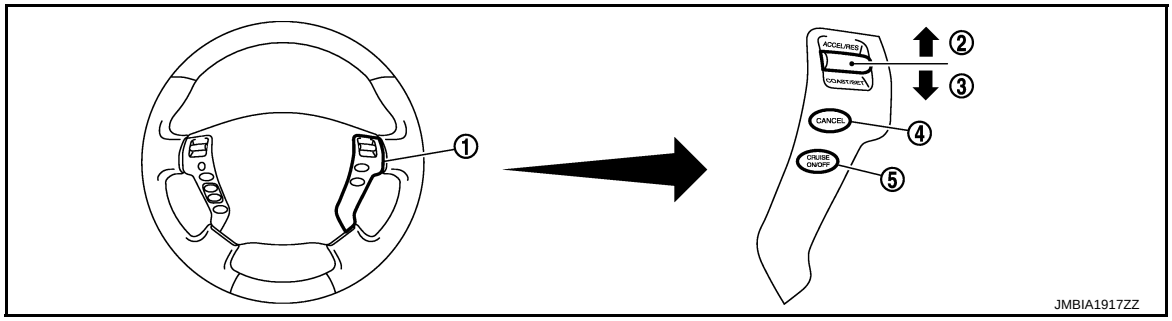


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

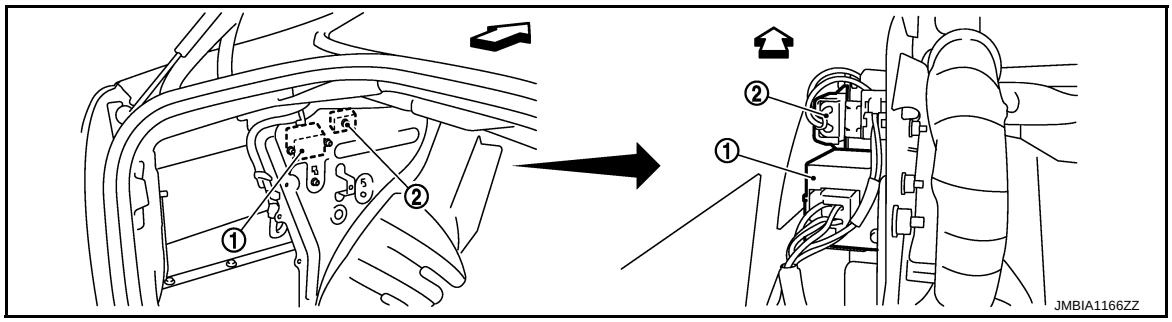
⇦ : Vehicle front



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

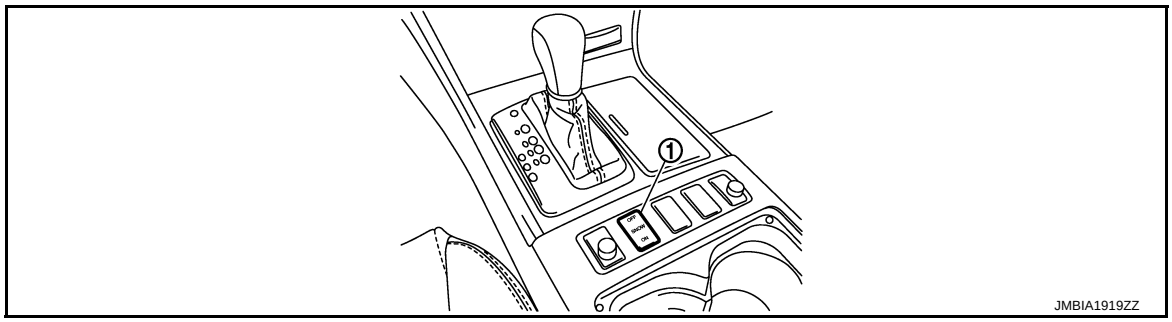


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

INFOID:0000000005353356

Component	Reference
ASCD brake switch	EC-533, "Description"
ASCD indicator	EC-586, "Description"
ASCD steering switch	EC-522, "Description"
Electric throttle control actuator	EC-492, "Description"
Stop lamp switch	EC-533, "Description"

CAN COMMUNICATION

System Description

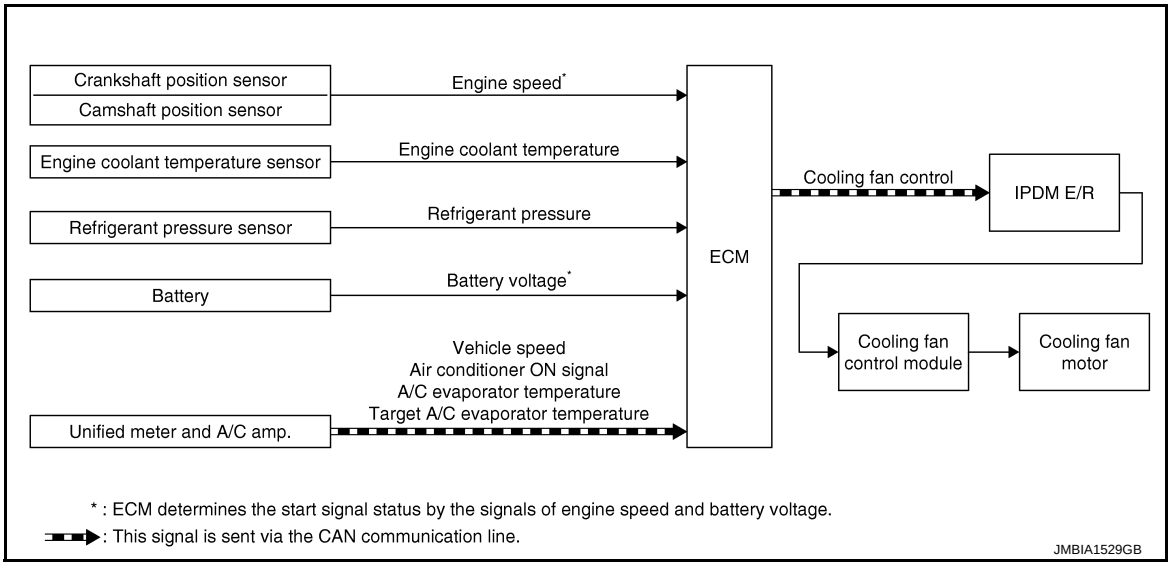
INFOID:0000000005353357

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-29, "CAN Communication Signal Chart", about CAN communication for detail.

COOLING FAN CONTROL

System Diagram

INFOID:0000000005353358



System Description

INFOID:0000000005353359

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*1	Cooling fan control	IPDM E/R ↓ Cooling fan control module ↓ Cooling fan motor
Camshaft position sensor			
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.

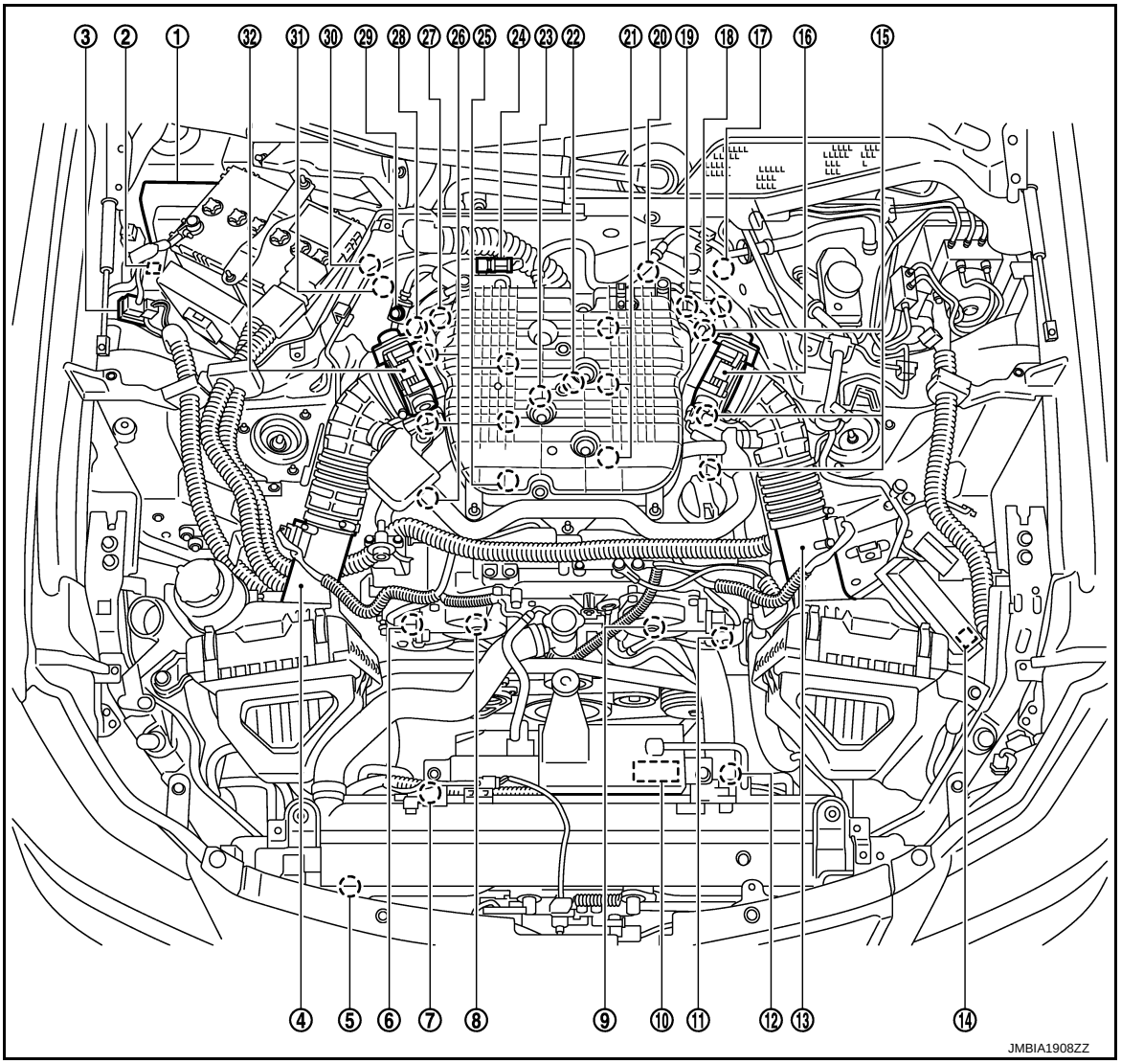
*2: This signal is sent to ECM via the CAN communication line.

SYSTEM DESCRIPTION

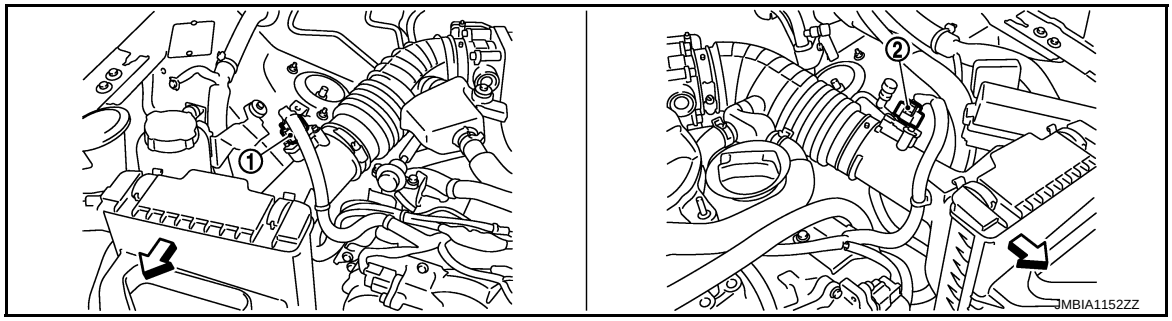
ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, air conditioner ON signal, refrigerant pressure, target A/C evaporator temperature and A/C evaporator temperature.
Cooling fan control signal is sent to IPDM E/R from ECM by CAN communication line. Then, IPDM E/R 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

INFOID:0000000005353360

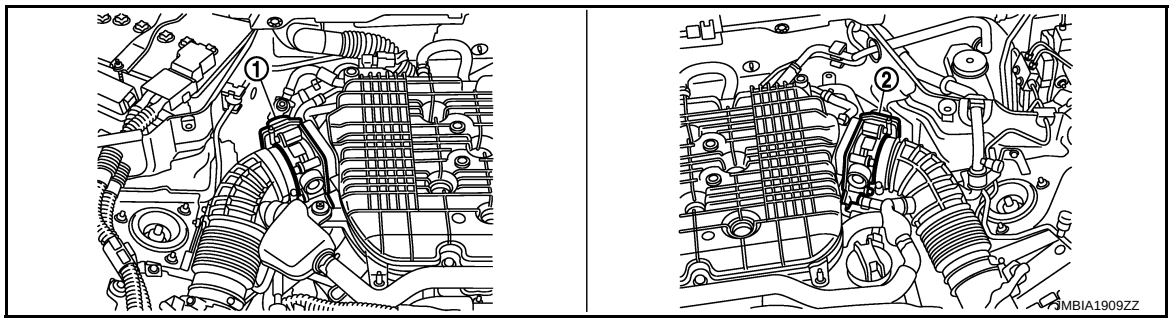


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

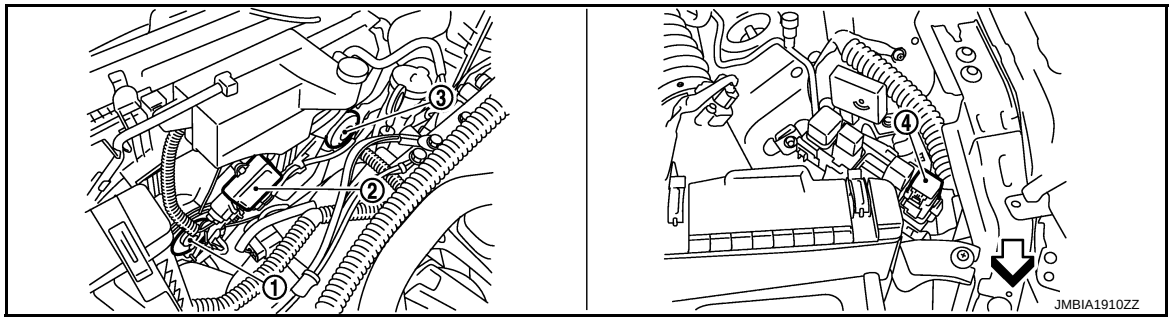


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

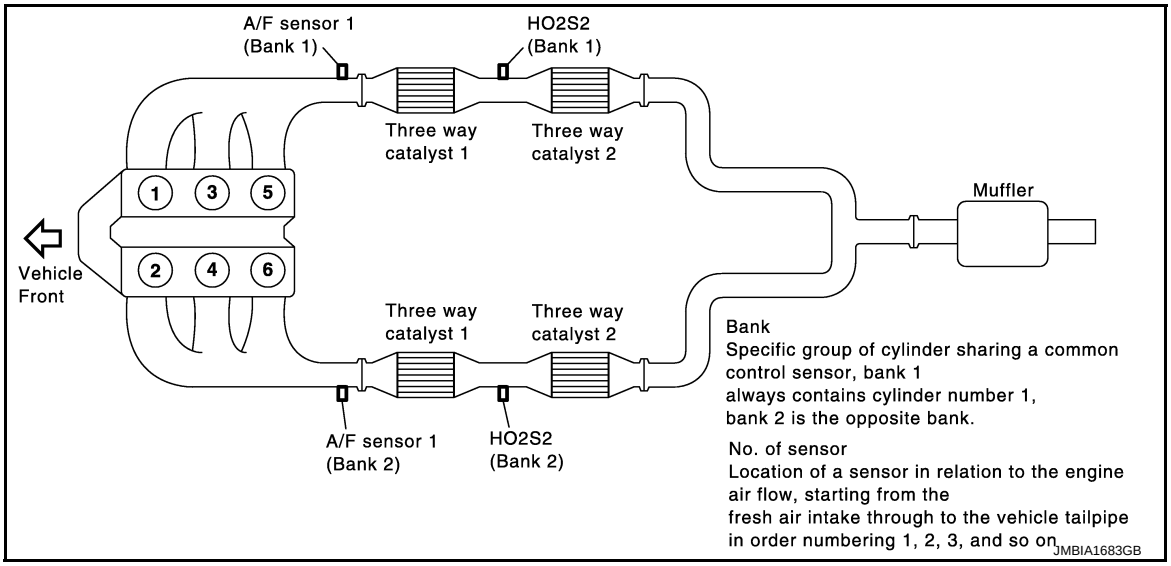


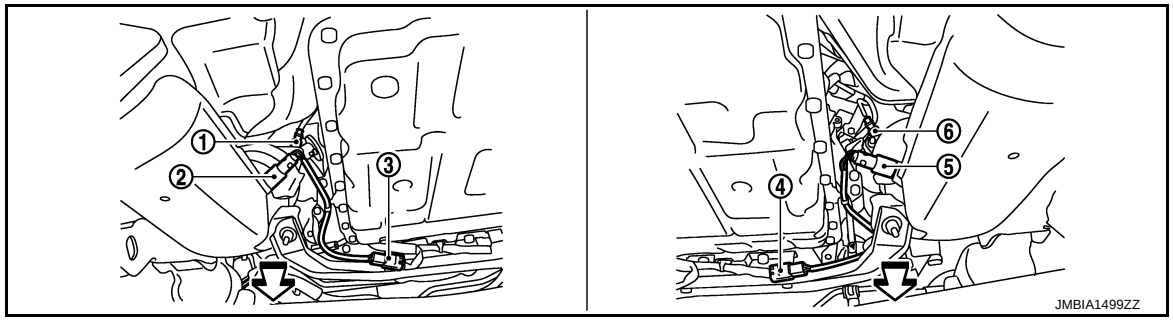
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

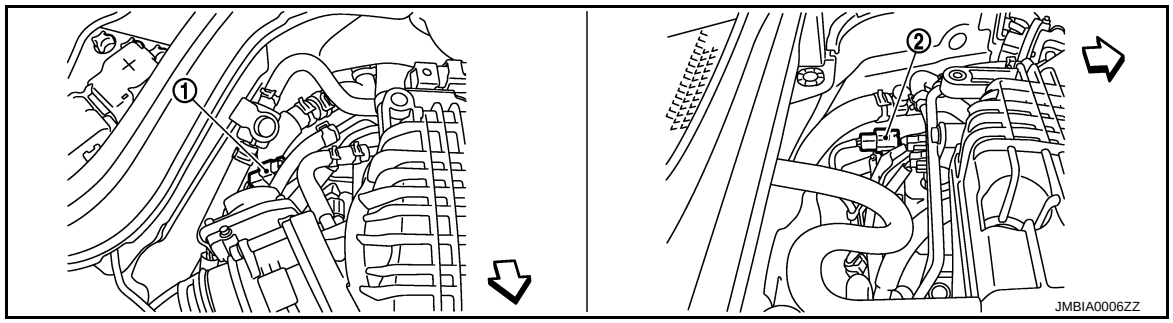
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

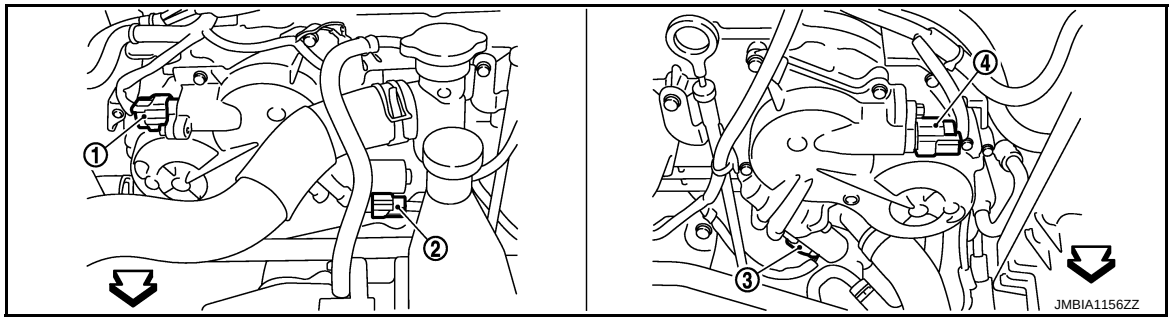
⇦ : Vehicle front



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

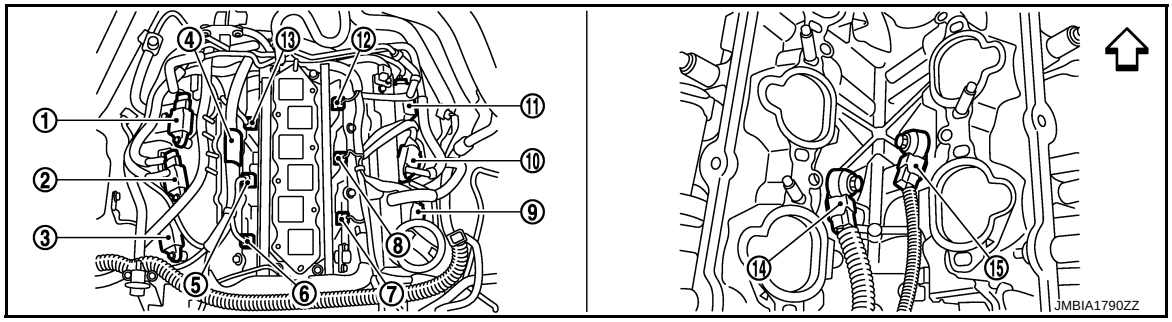
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



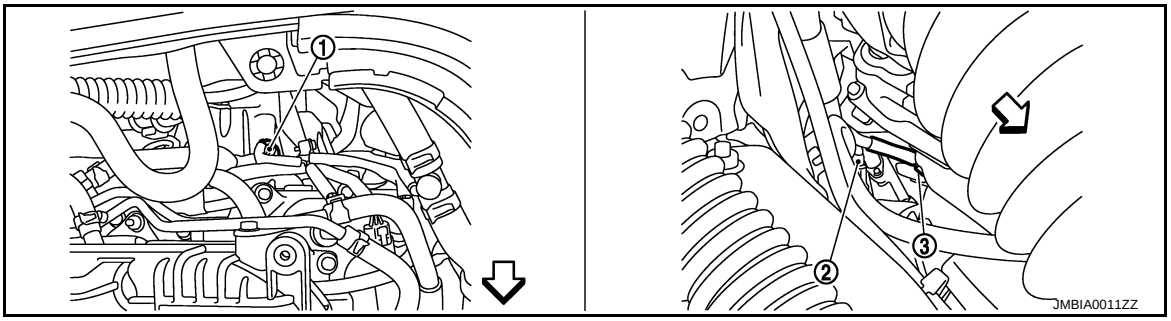
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



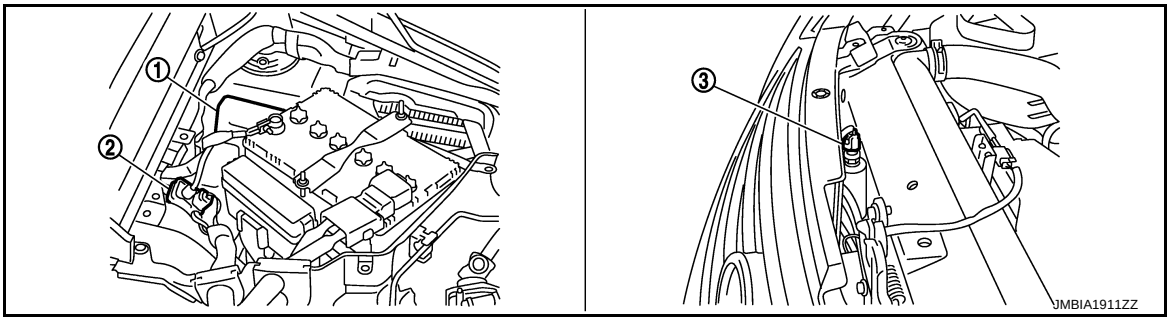
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

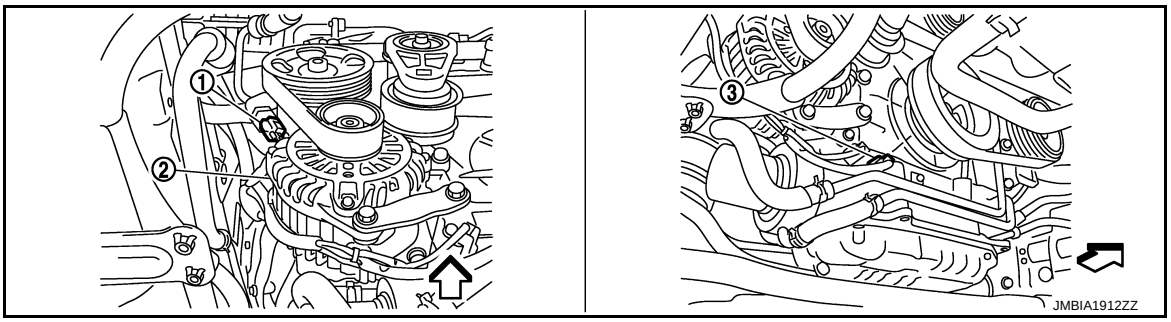


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

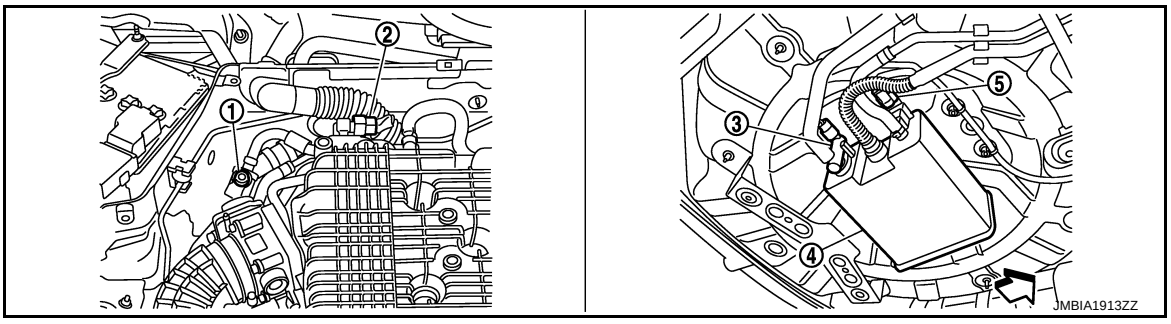


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

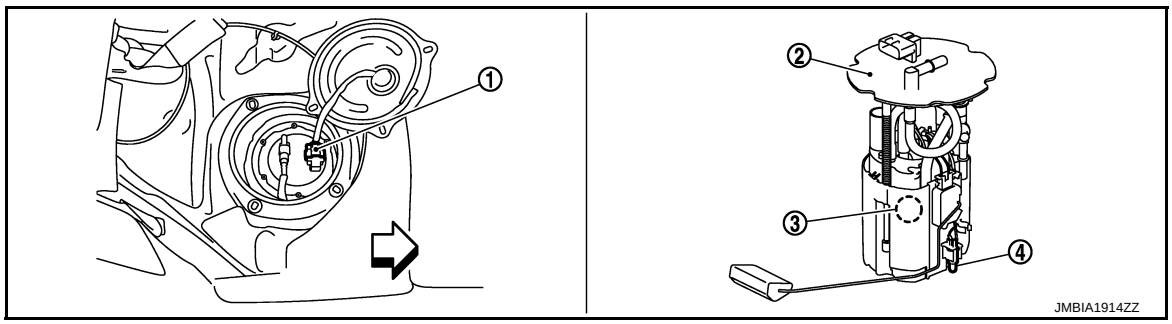
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

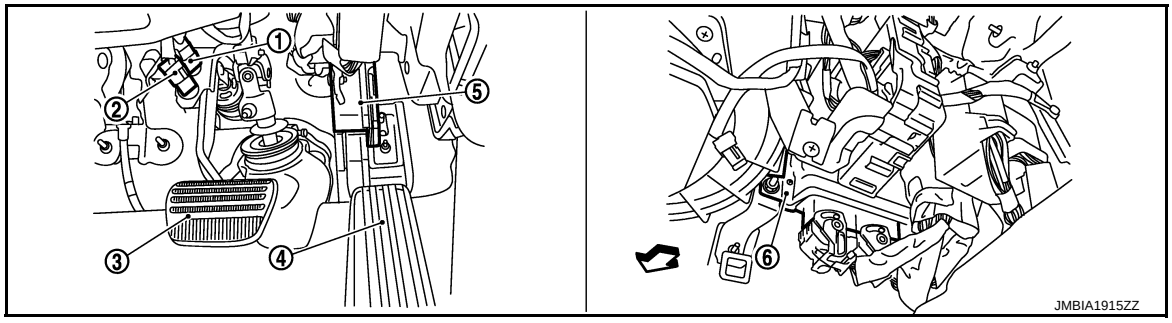
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



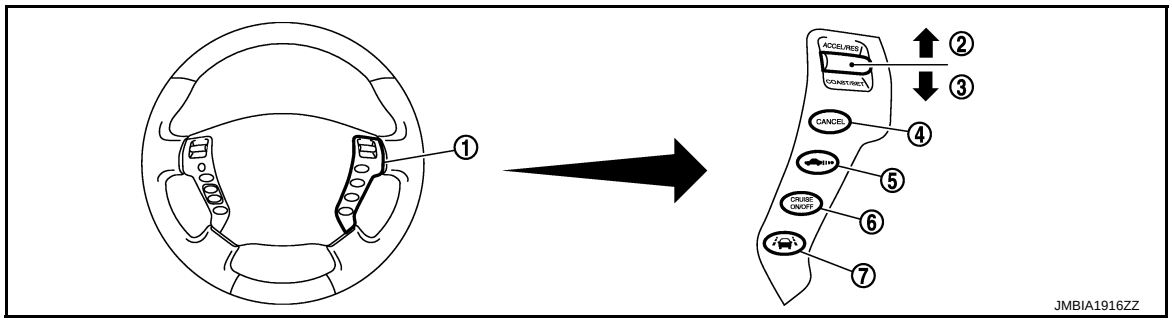
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

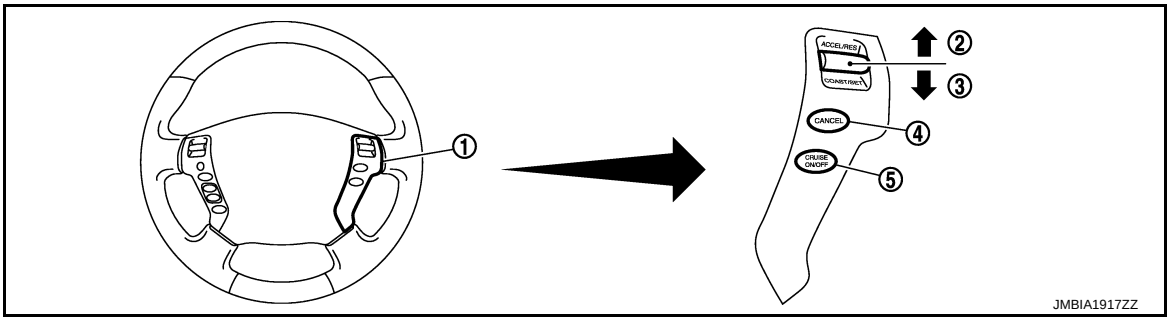


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

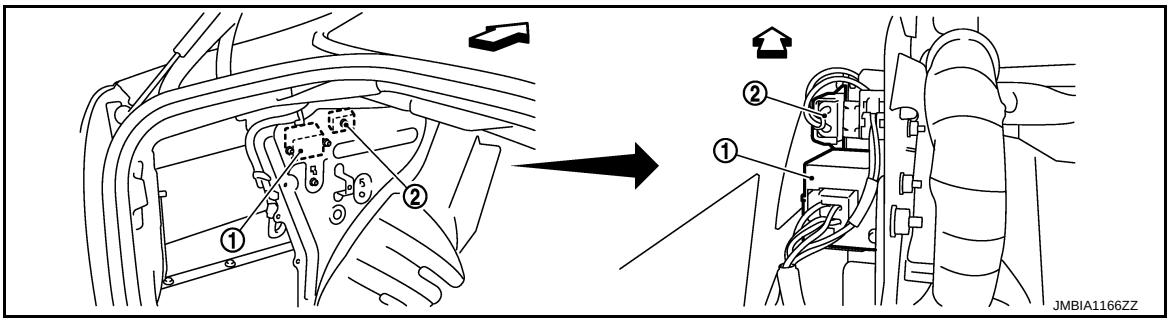
⇦ : Vehicle front



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

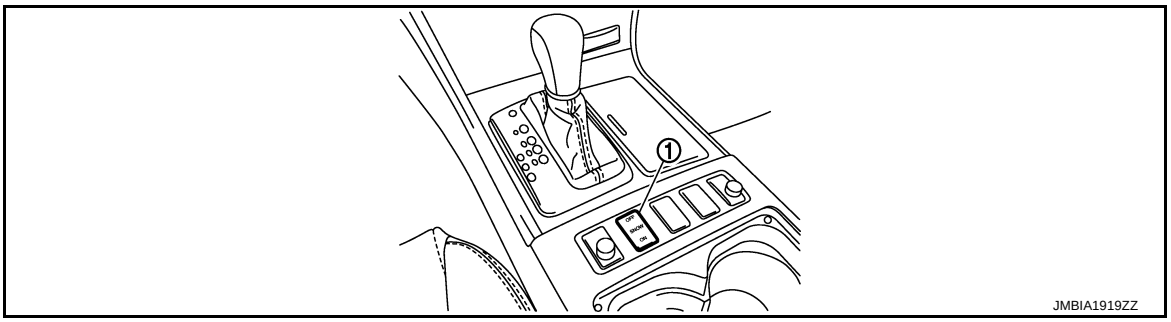


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

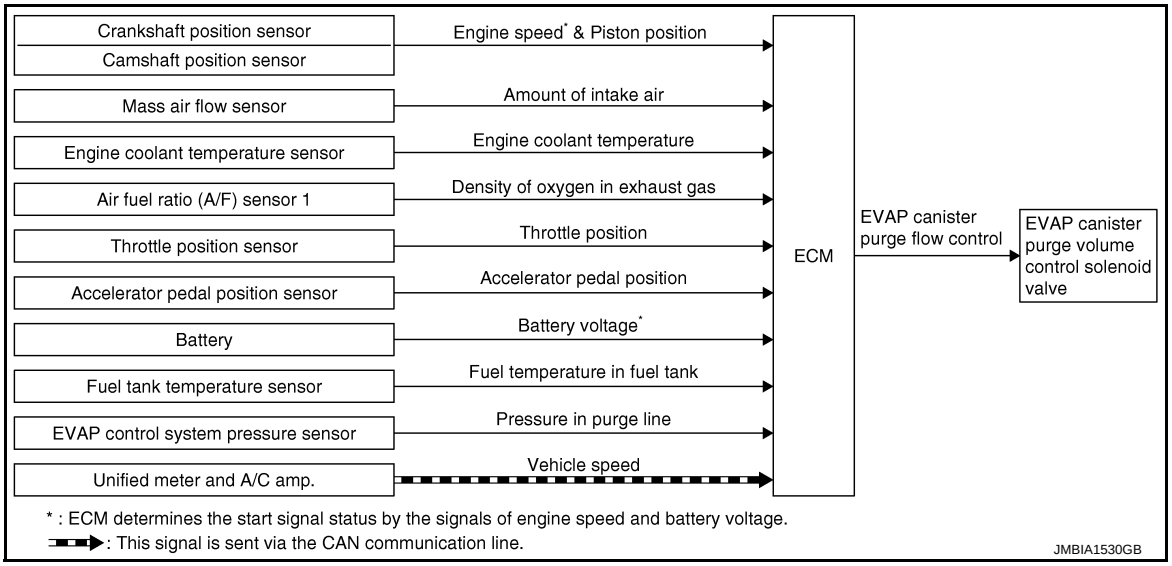
INFOID:0000000005353361

Component	Reference
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Cooling fan control module	EC-589, "Description"
Cooling fan motor	EC-589, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Refrigerant pressure sensor	EC-637, "Description"

EVAPORATIVE EMISSION SYSTEM

System Diagram

INFOID:0000000005353362



System Description

INFOID:0000000005353363

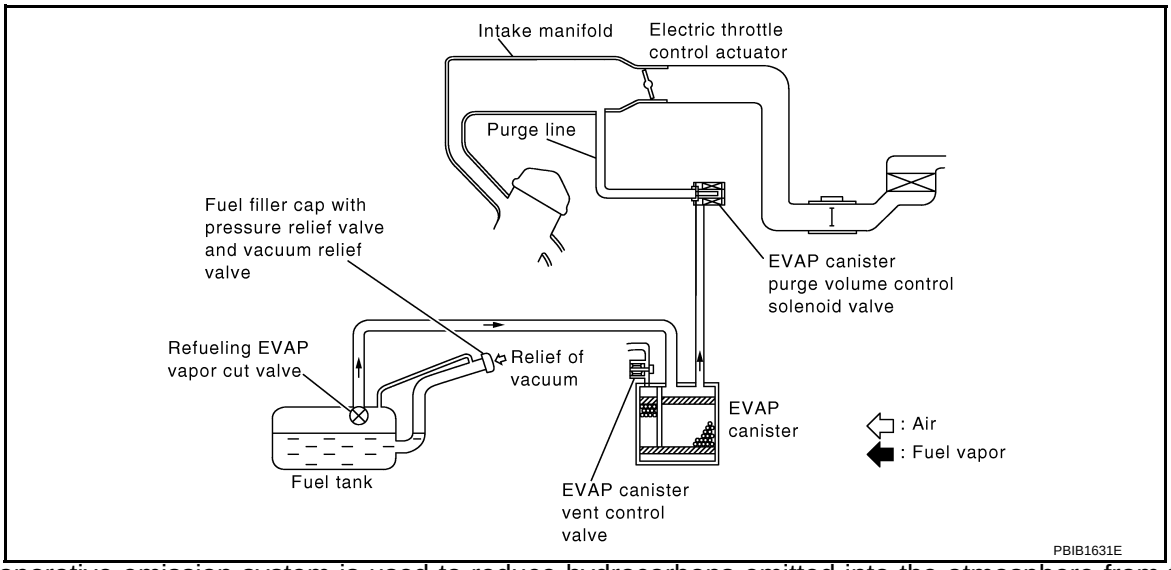
INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed*1 & Piston position	EVAP canister purge flow control	EVAP canister purge volume control solenoid valve
Camshaft position sensor			
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.

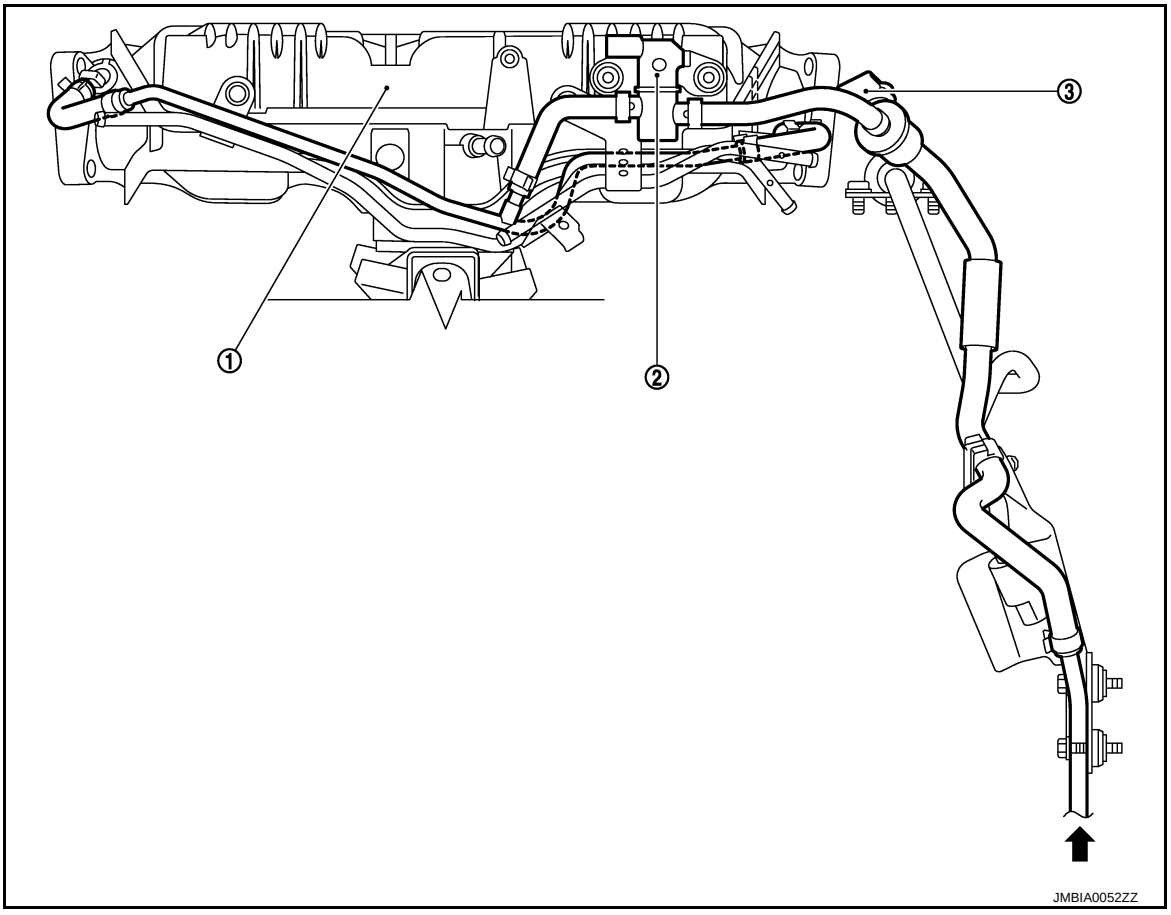
*2: This signal is sent to the ECM via the CAN communication line.

SYSTEM DESCRIPTION



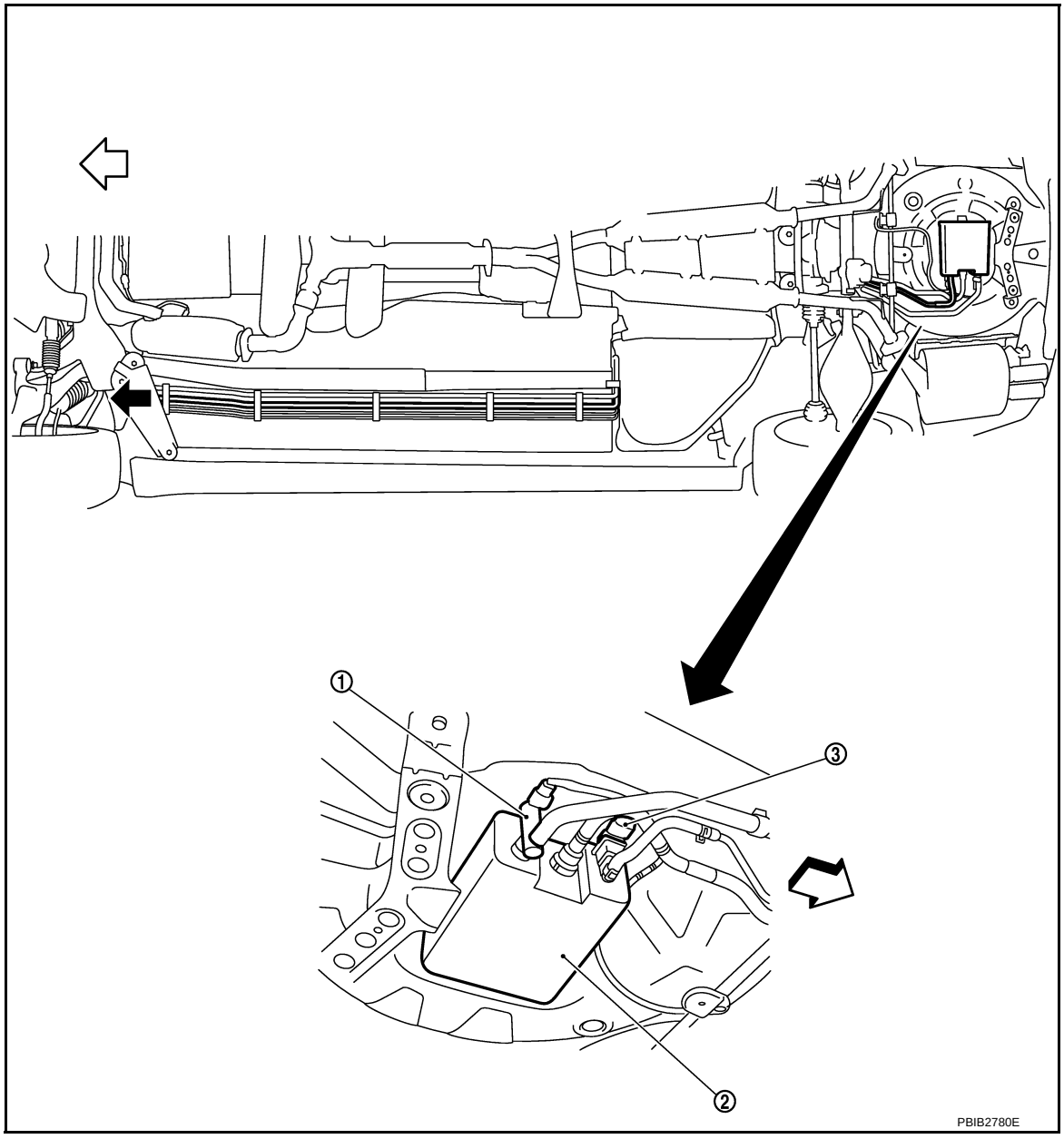
The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating.

EVAPORATIVE EMISSION LINE DRAWING



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

⬅: From next figure



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

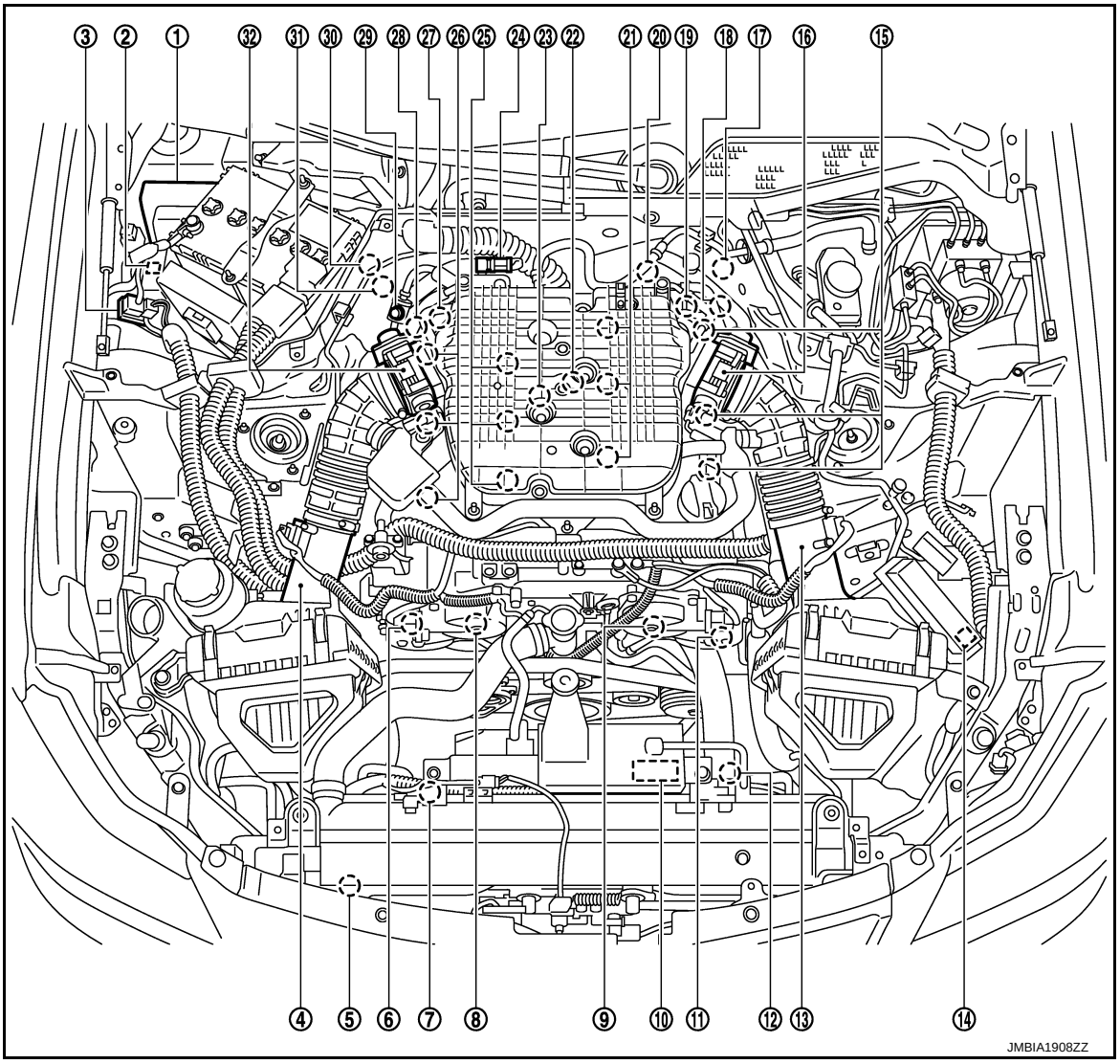
⇦: Vehicle front

⬅: To previous figure

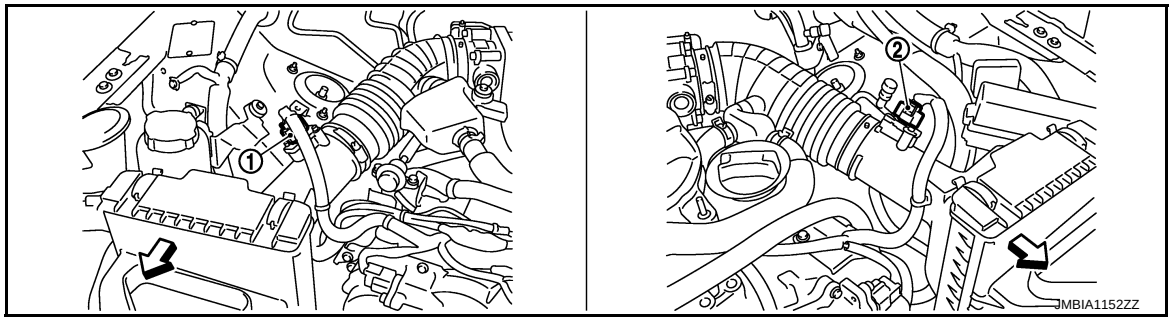
NOTE:
Do not use soapy water or any type of solvent while installing vacuum hose or purge hoses.

Component Parts Location

INFOID:0000000005353364

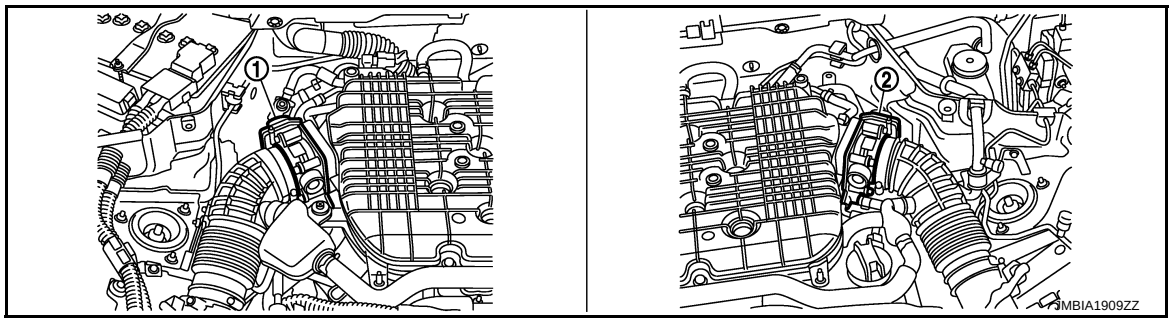


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

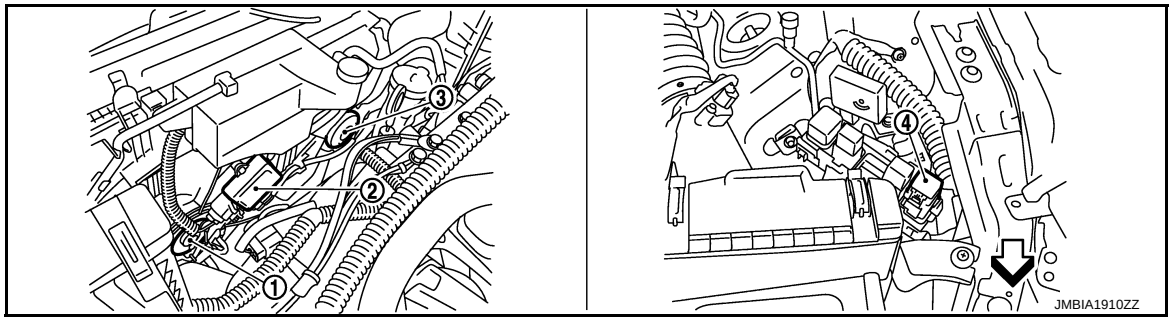


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

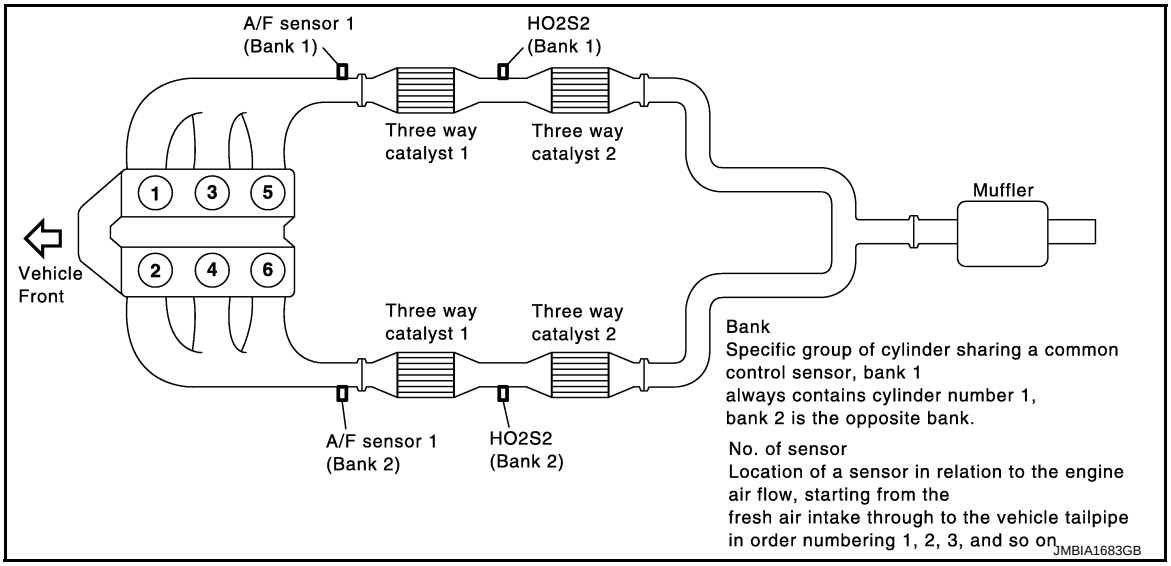


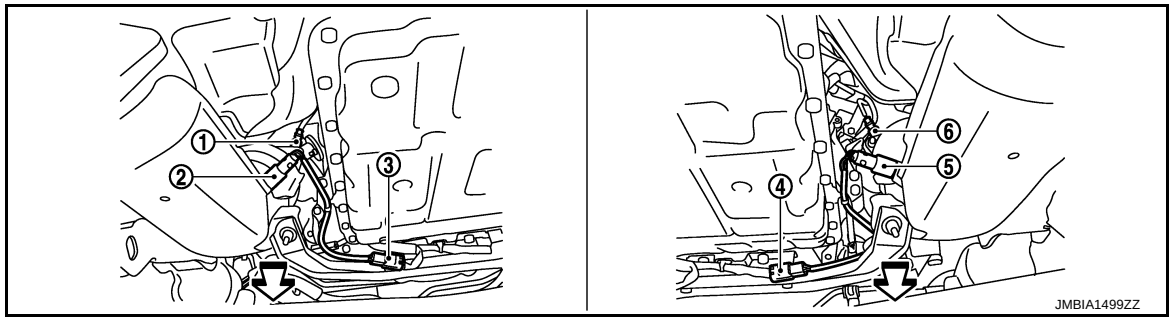
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

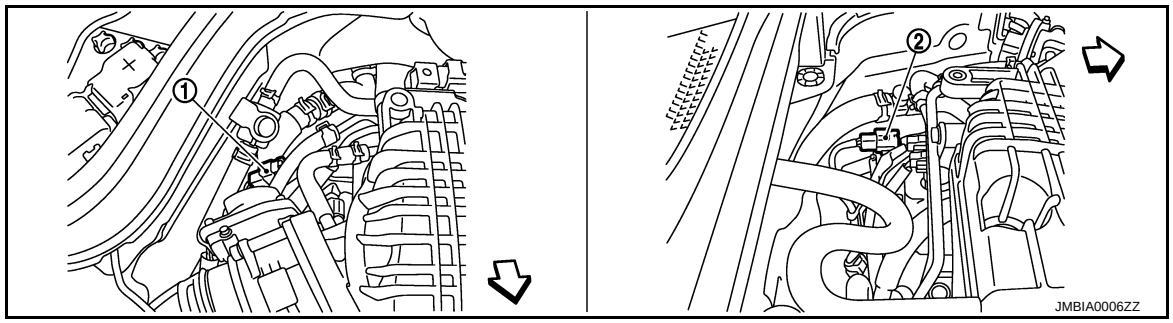
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

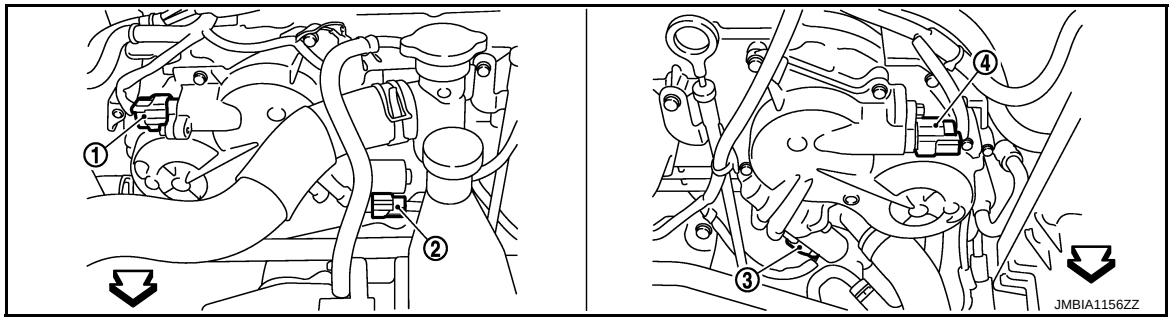
⇦ : Vehicle front



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

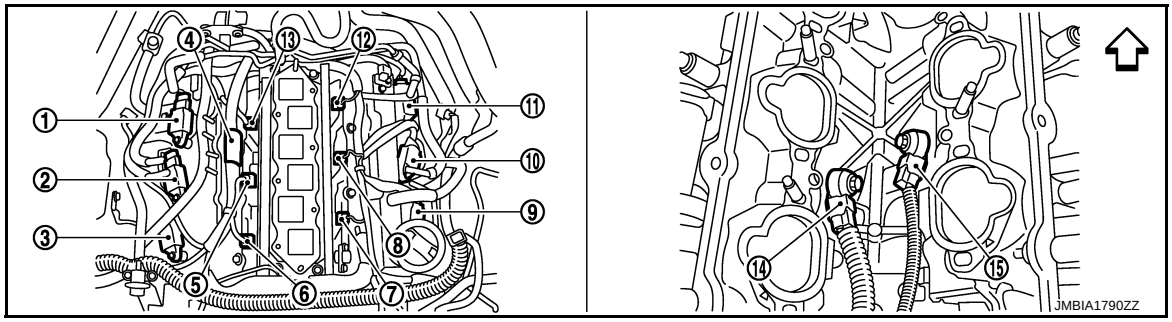
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



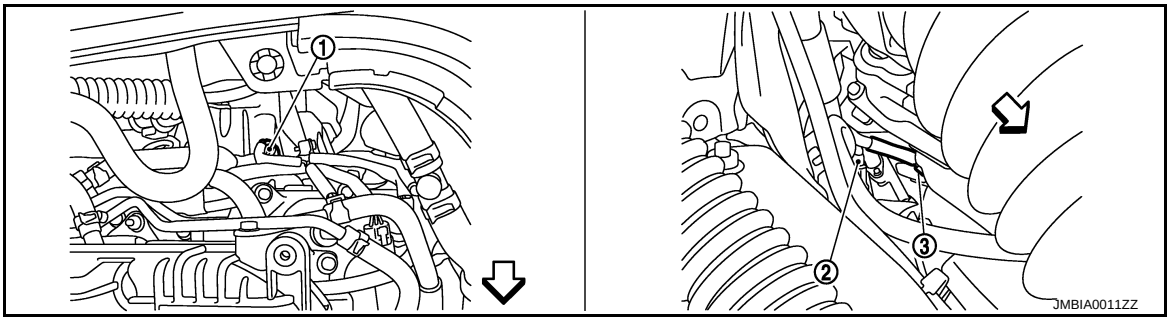
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



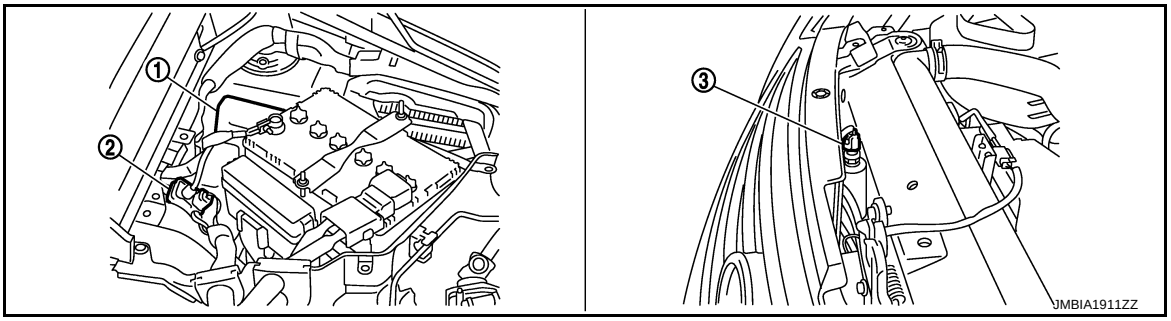
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

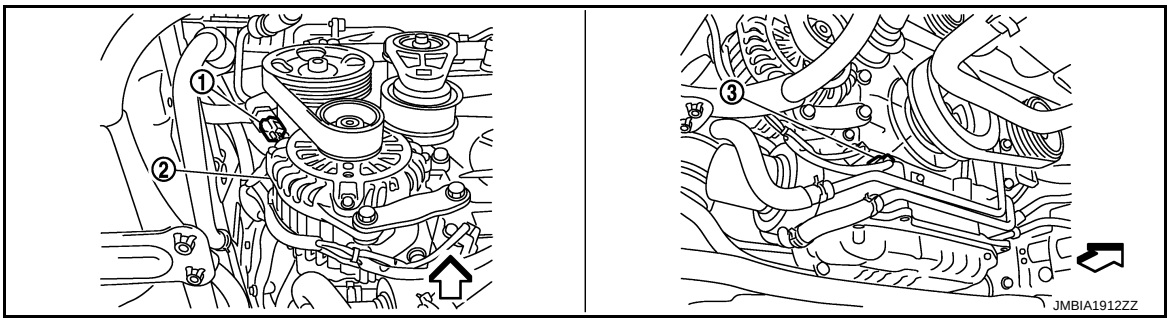


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

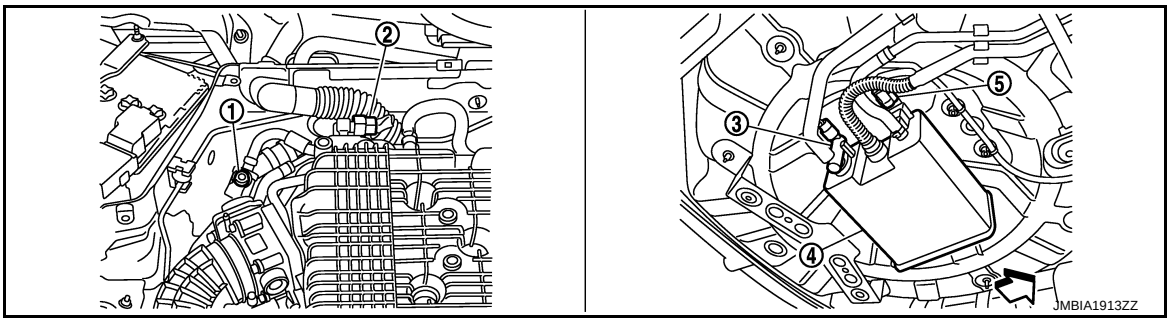


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

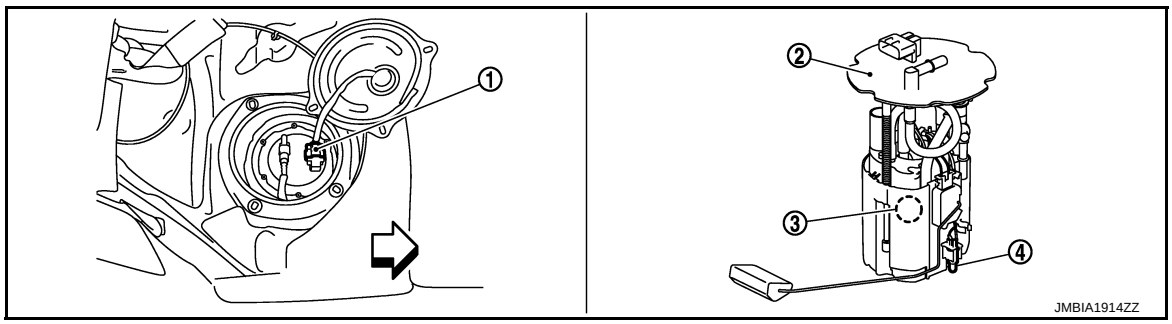
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

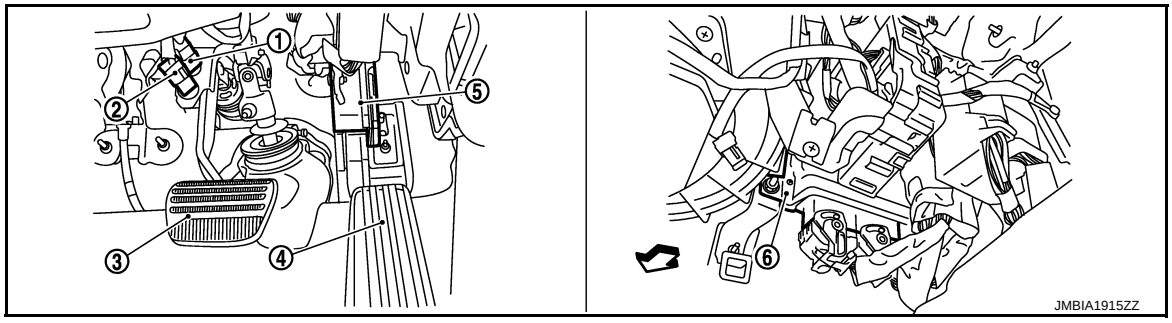
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



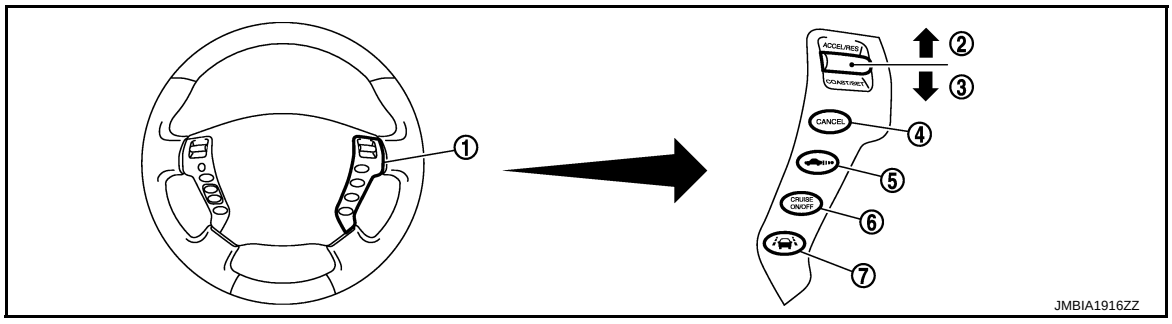
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

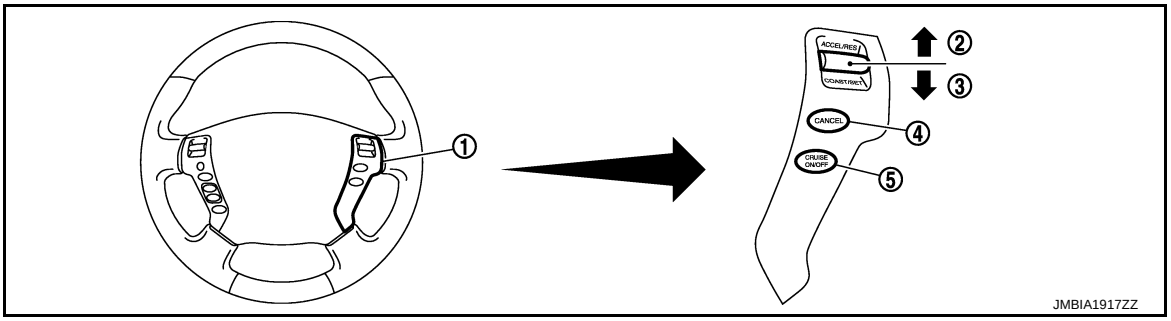


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

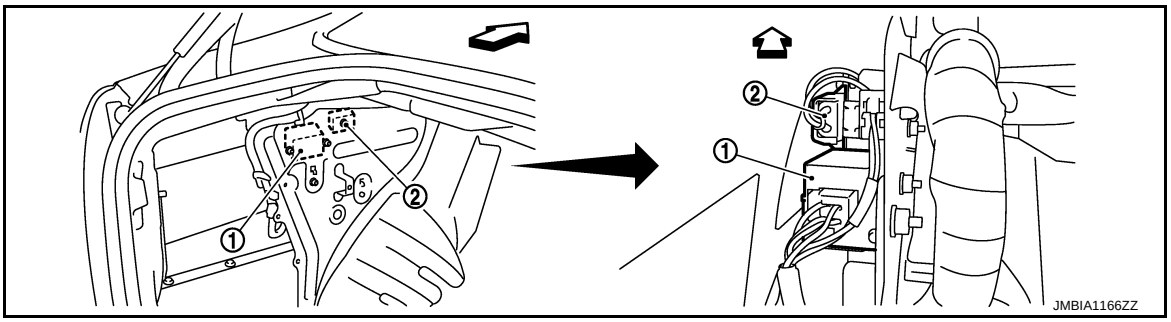
⇦ : Vehicle front



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

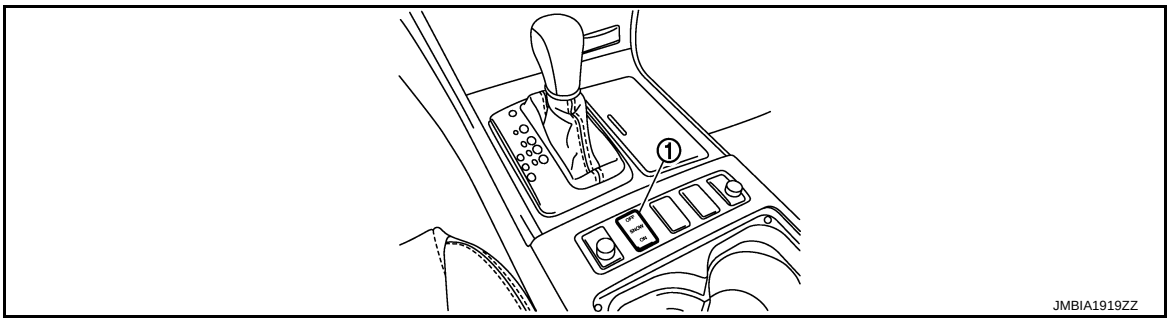


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

INFOID:0000000005353365

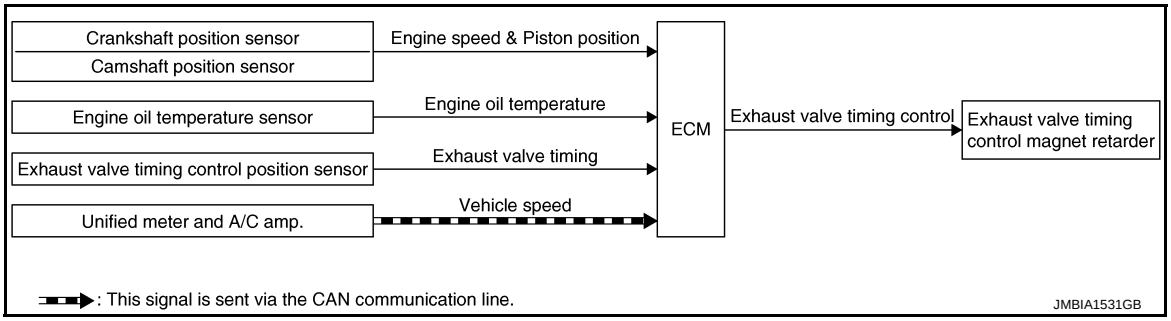
Component	Reference
A/F sensor 1	EC-237, "Description"
Accelerator pedal position sensor	EC-558, "Description"
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine coolant temperature sensor	EC-220, "Description"
EVAP canister purge volume control solenoid valve	EC-369, "Description"
EVAP control system pressure sensor	EC-391, "Description"
Fuel tank temperature sensor	EC-307, "Description"

Component	Reference
Mass air flow sensor	EC-195, "Description"
Throttle position sensor	EC-224, "Description"

EXHAUST VALVE TIMING CONTROL

System Diagram

INFOID:0000000005353366



System Description

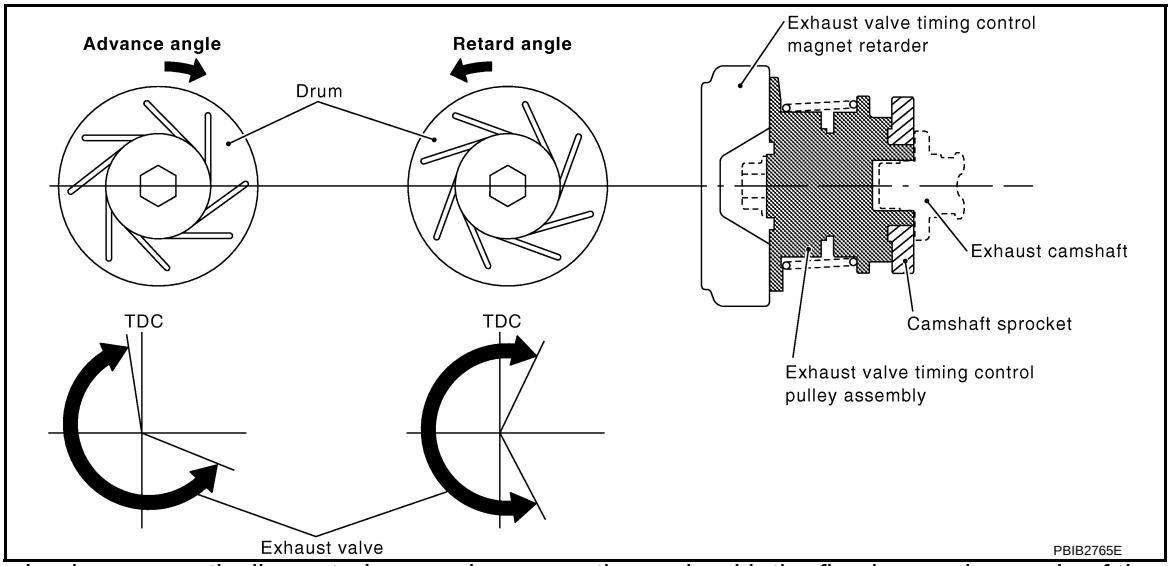
INFOID:0000000005353367

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed & piston position	Exhaust valve timing control	Exhaust valve timing control magnet retarder
Camshaft position sensor			
Engine oil temperature sensor	Engine oil temperature		
Exhaust valve timing control position sensor	Exhaust valve timing signal		
Unified meter and A/C amp.	Vehicle speed		

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

SYSTEM DESCRIPTION

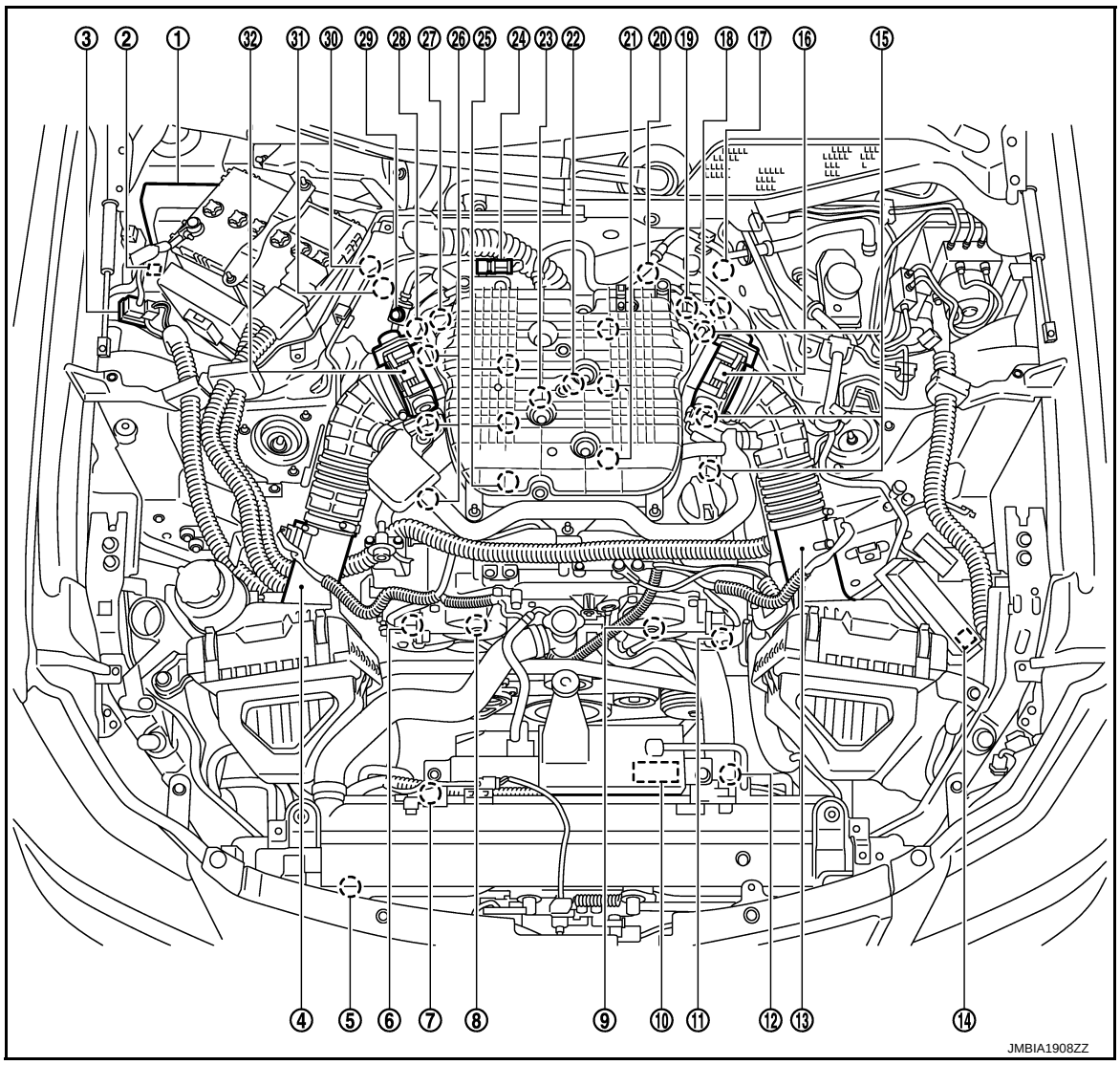


This mechanism magnetically controls cam phases continuously with the fixed operating angle of the exhaust valve.

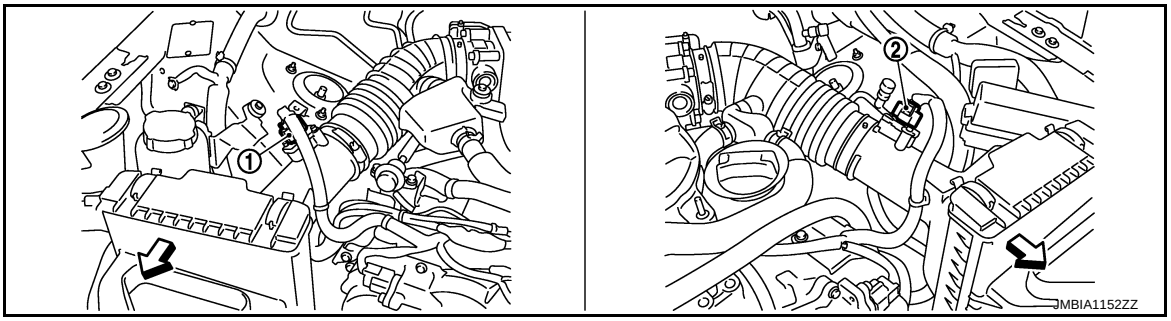
The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine oil temperature. Then, the ECM sends ON/OFF pulse duty signals to the exhaust valve timing control magnet retarder depending on driving status. This makes it possible to control the shut/open timing of the exhaust valve to increase engine torque and output in a range of high engine speed.

Component Parts Location

INFOID:0000000005353368

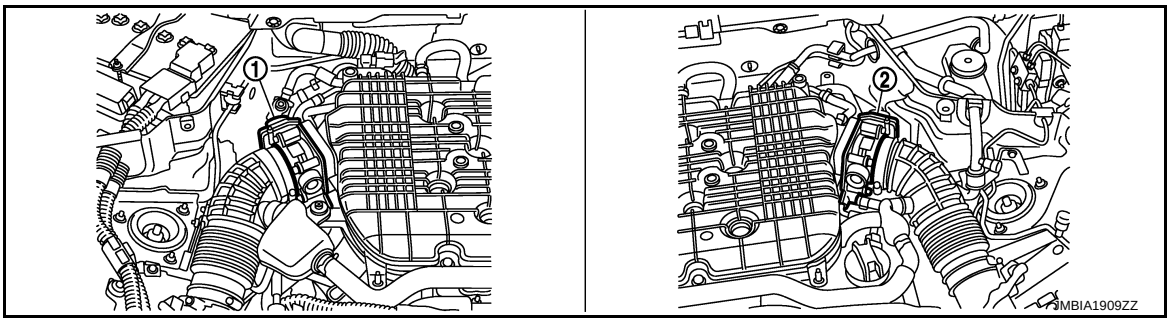


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

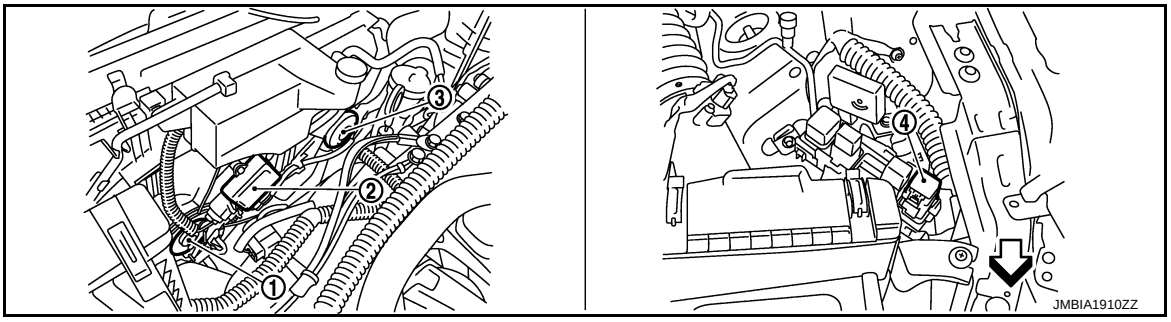


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

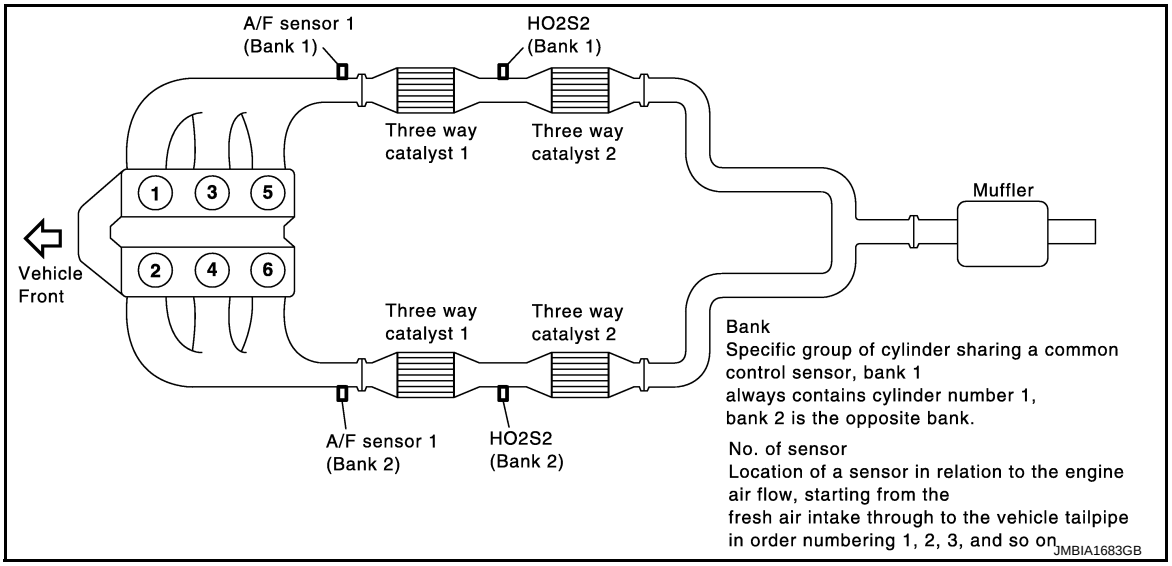


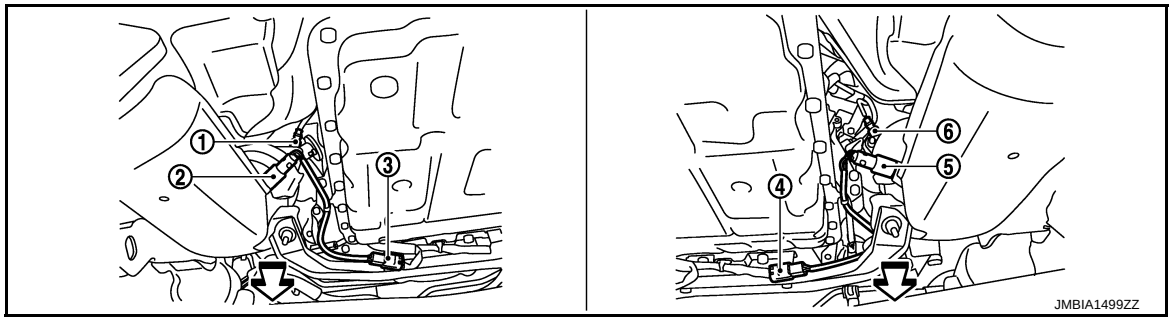
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

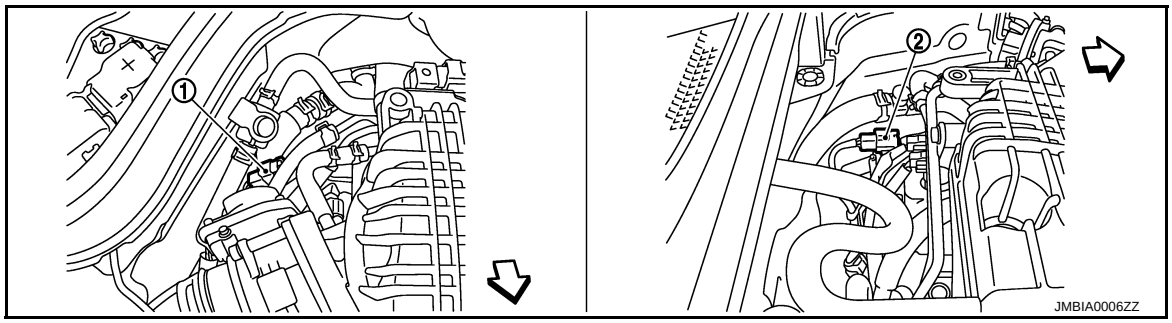
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

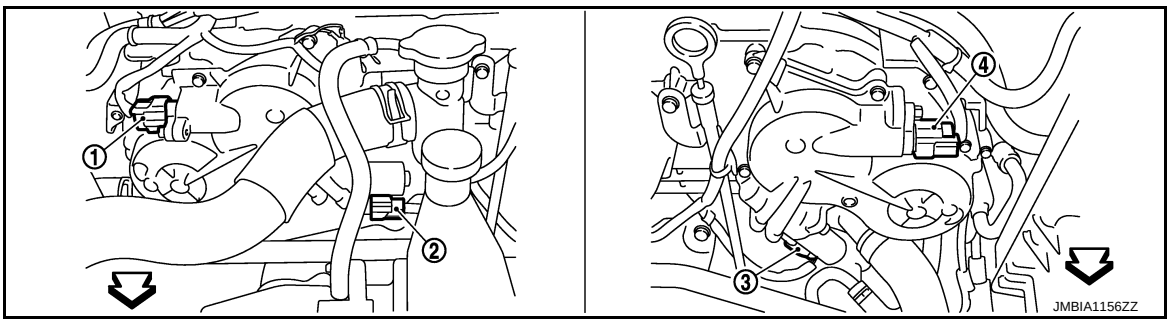
⇦ : Vehicle front



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

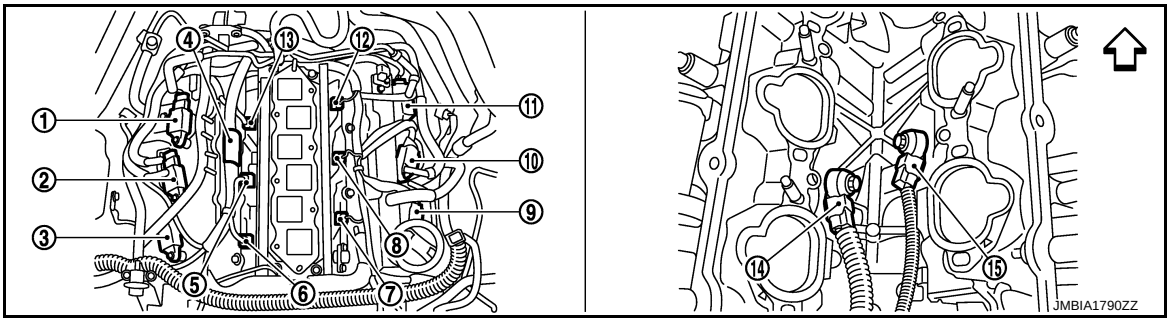
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



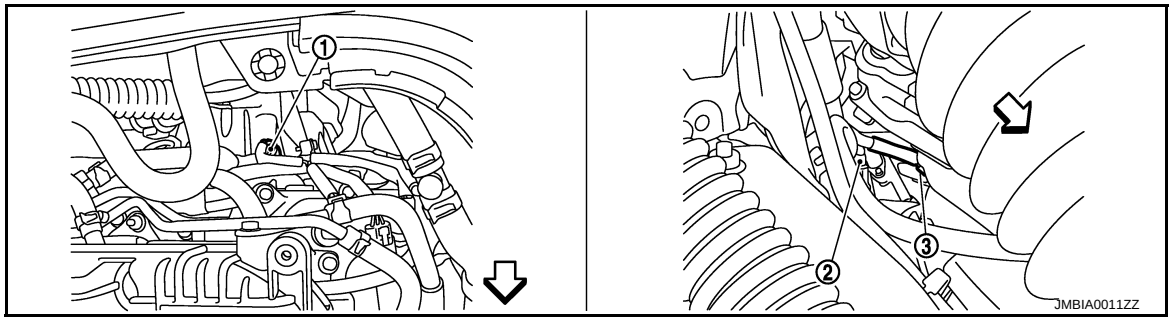
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



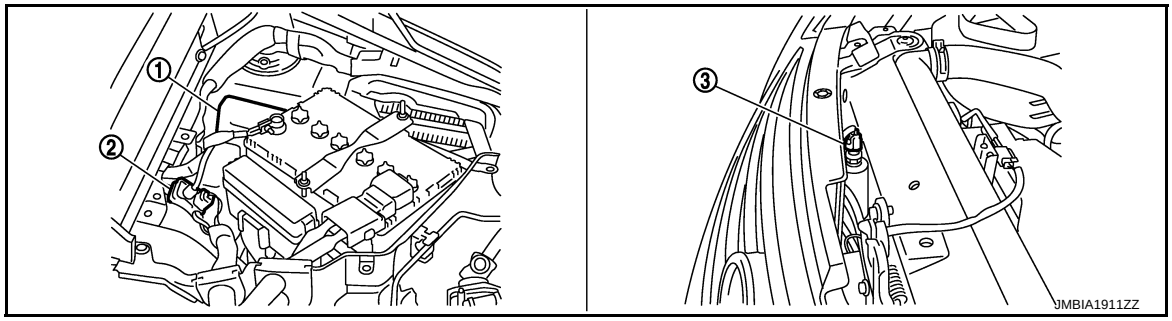
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

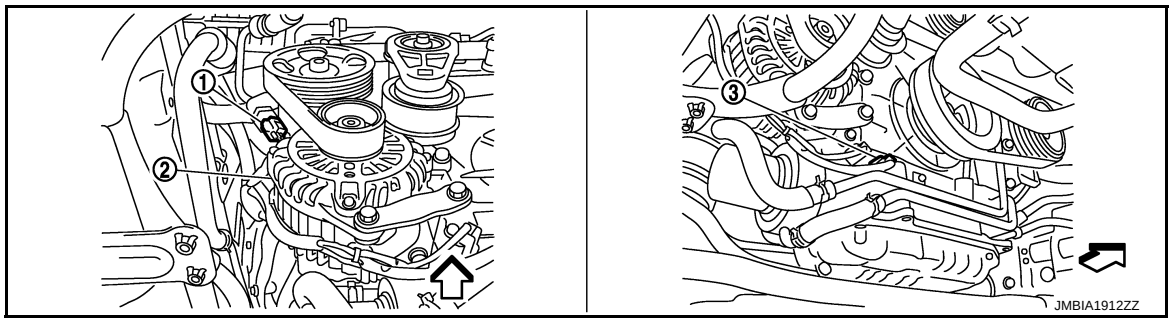


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

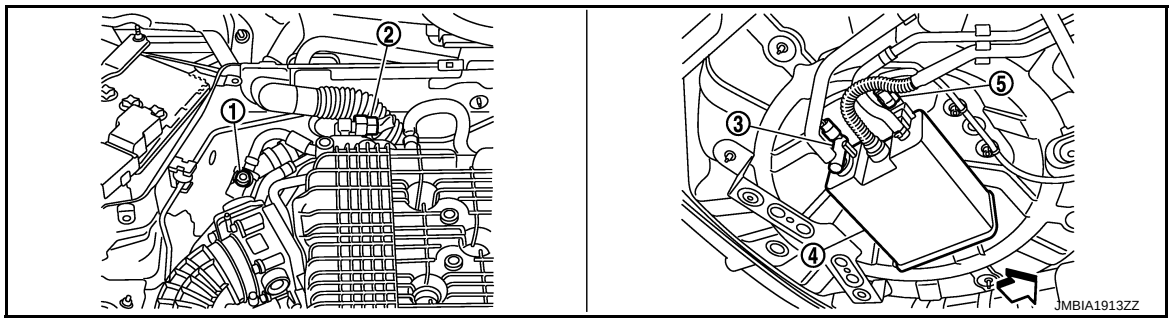


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

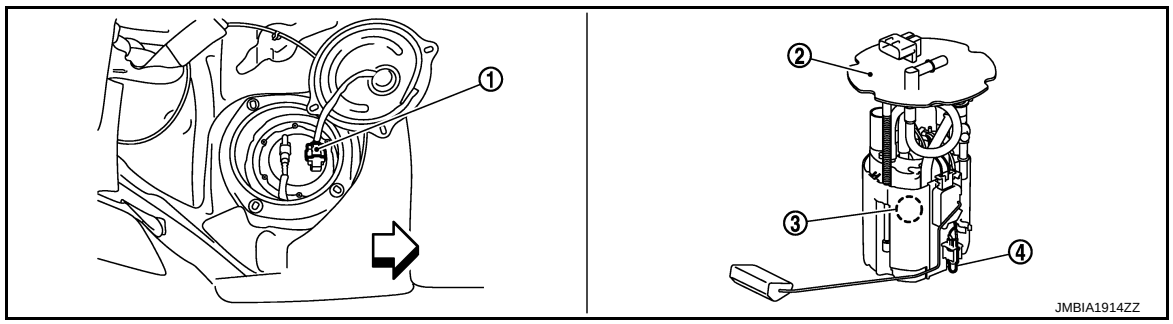
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

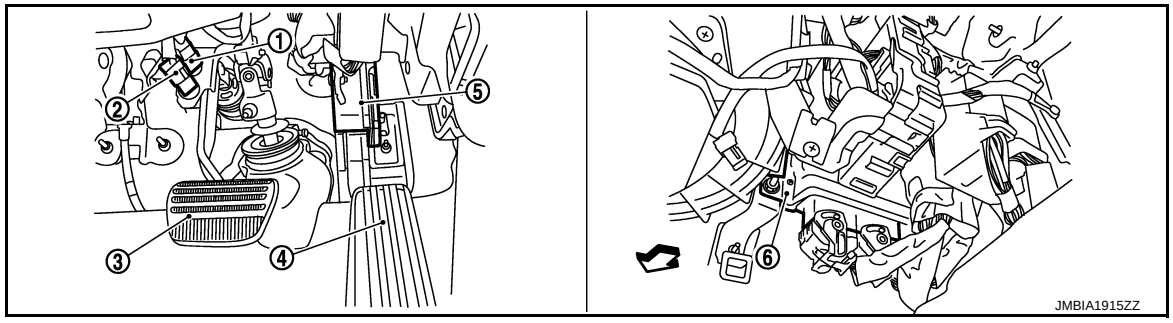
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



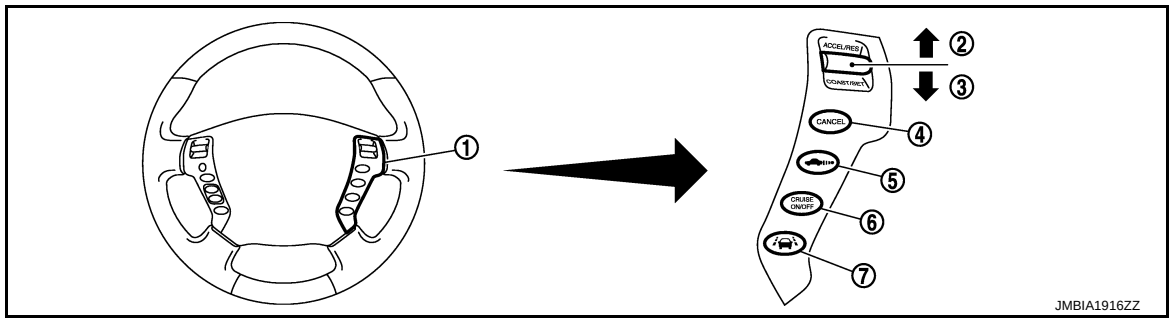
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

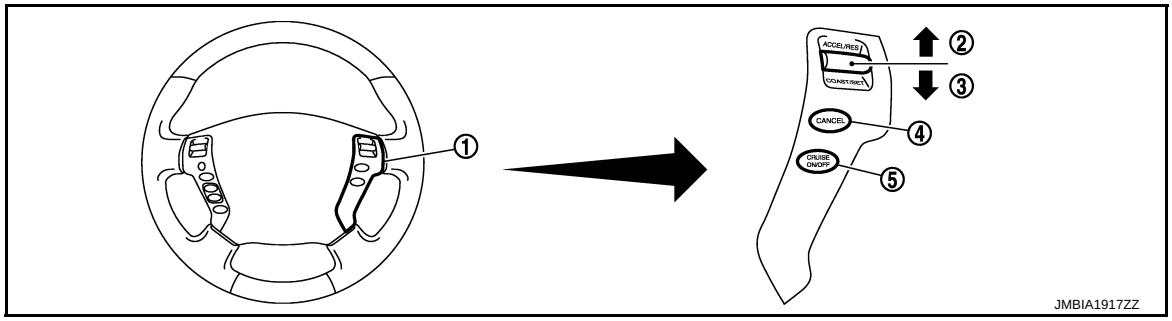


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

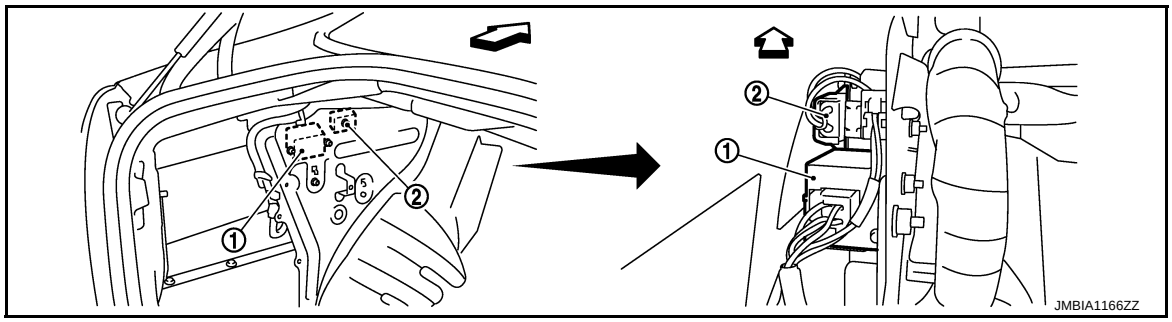
⇦ : Vehicle front



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

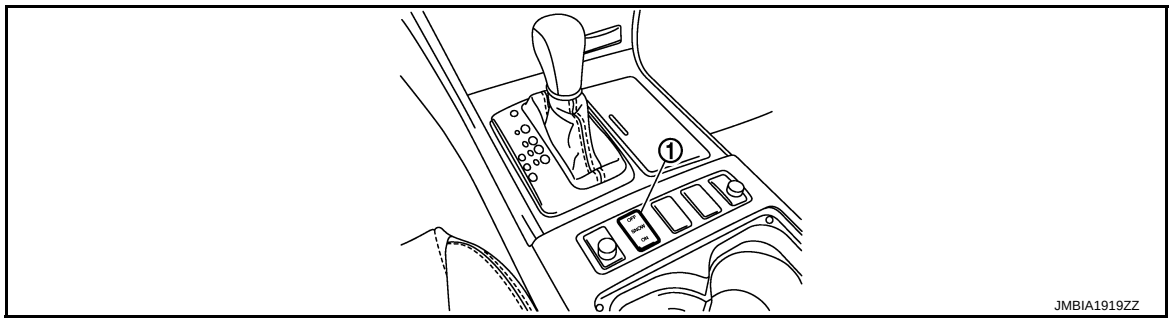


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

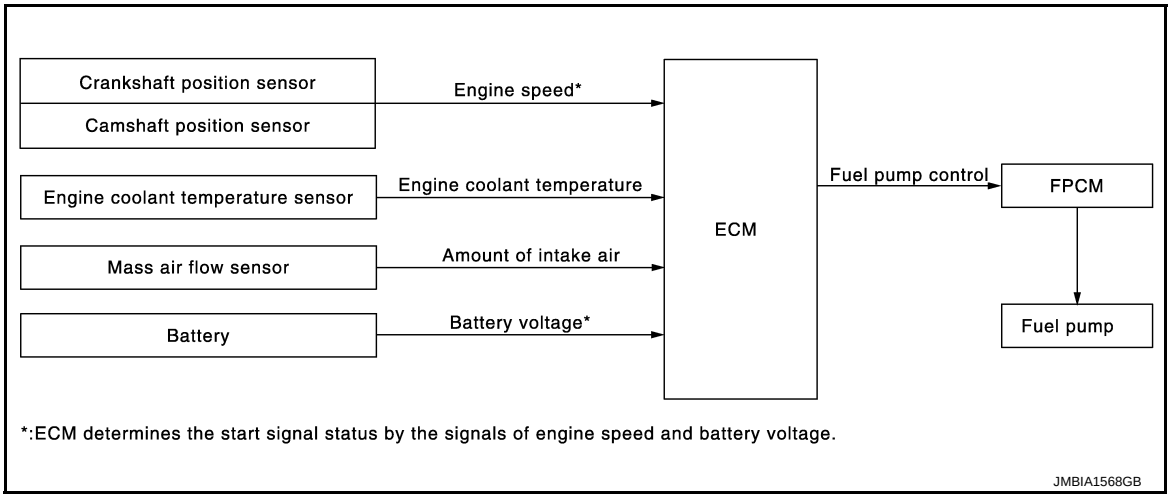
INFOID:0000000005353369

Component	Reference
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine oil temperature sensor	EC-316, "Description"
Exhaust valve timing control magnet retarder	EC-190, "Description"
Exhaust valve timing control position sensor	EC-453, "Description"

FUEL PUMP CONTROL MODULE

System Diagram

INFOID:0000000005353370



System Description

INFOID:0000000005353371

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor Camshaft position sensor	Engine speed*	Fuel pump control	FPCM ↓ Fuel pump
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		
Battery	Battery voltage*		

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

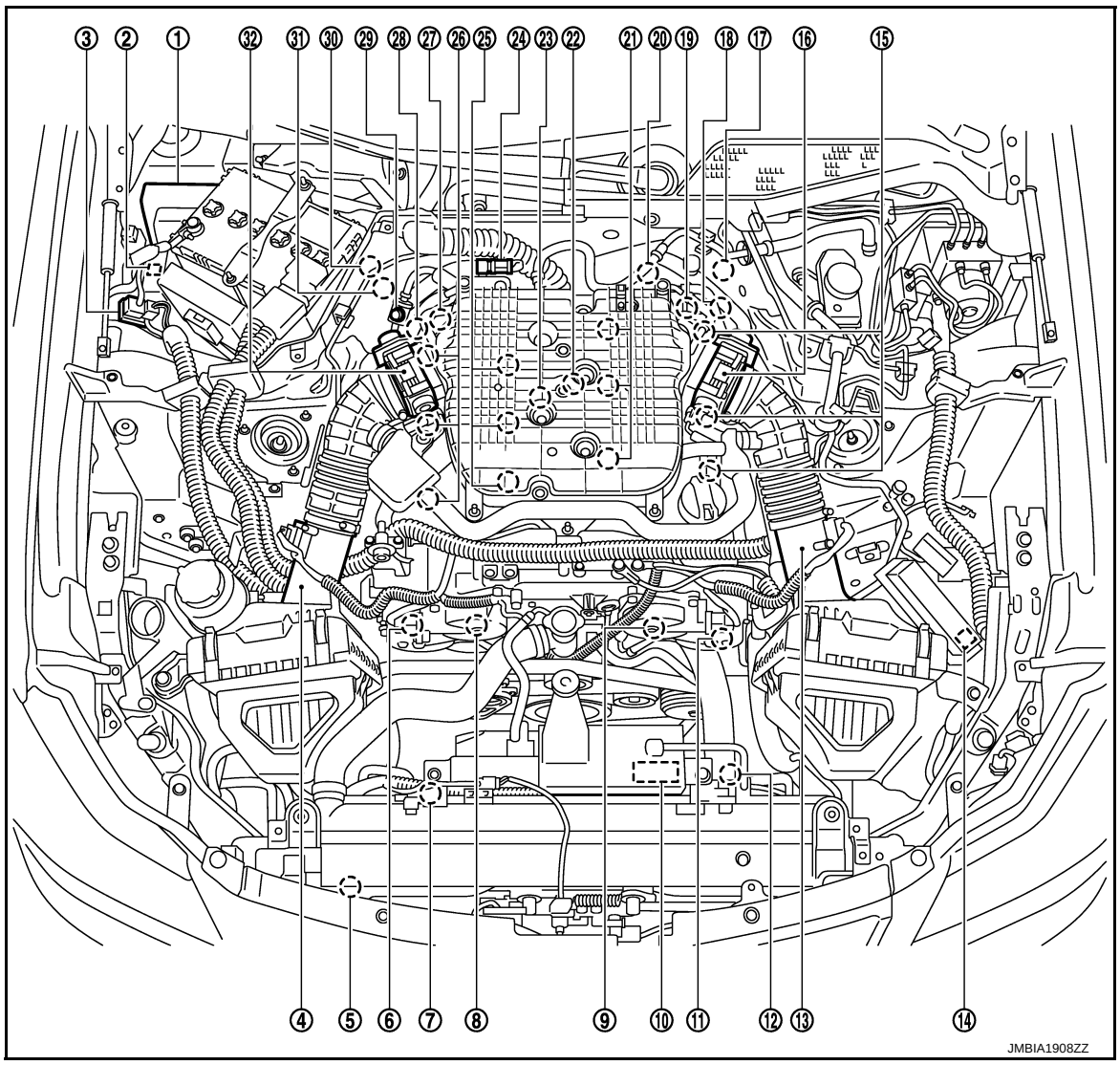
SYSTEM DESCRIPTION

This system controls the fuel pump operation. The amount of fuel flow delivered from the fuel pump is altered between two flow rates by the FPCM operation. The FPCM determines the voltage supplied to the fuel pump (and therefore fuel flow) according to the following conditions.

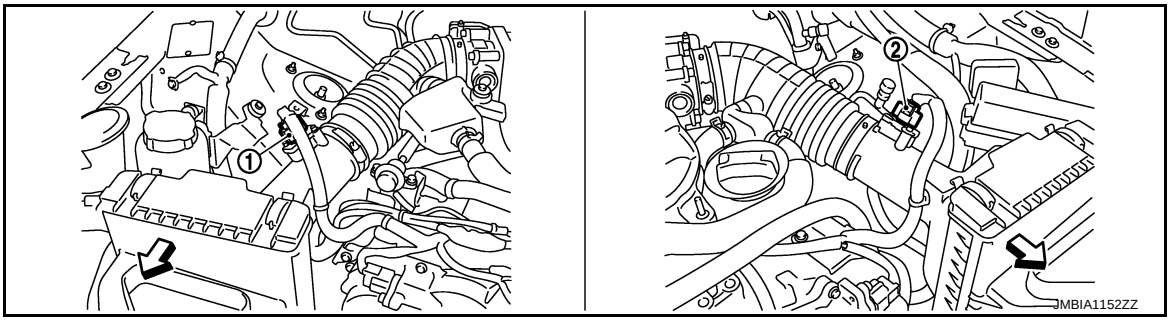
Conditions	Amount of fuel flow	Supplied voltage
• Engine cranking • Engine coolant temperature is below 10°C (50°F) • Engine is running under high load and high speed conditions	High	Battery voltage (11 - 14 V)
Except the above	Low	Approx. 8 V

Component Parts Location

INFOID:0000000005353372

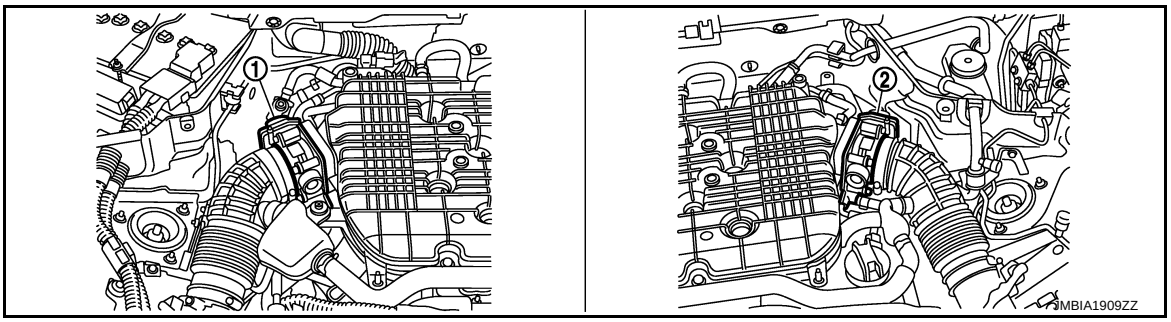


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

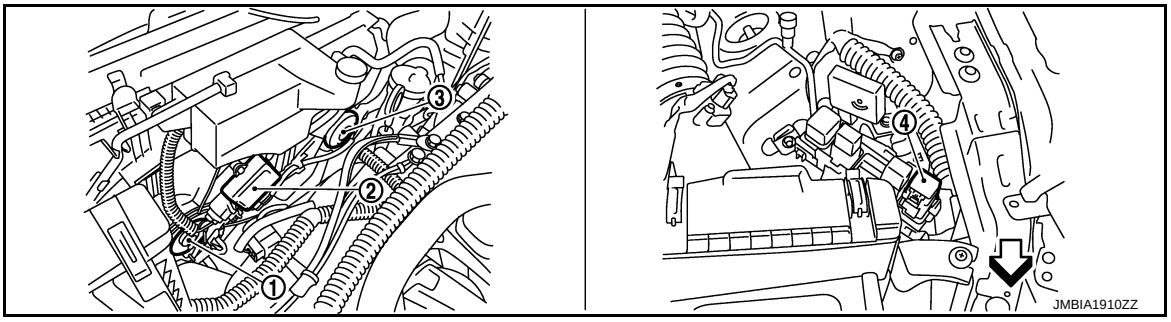


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

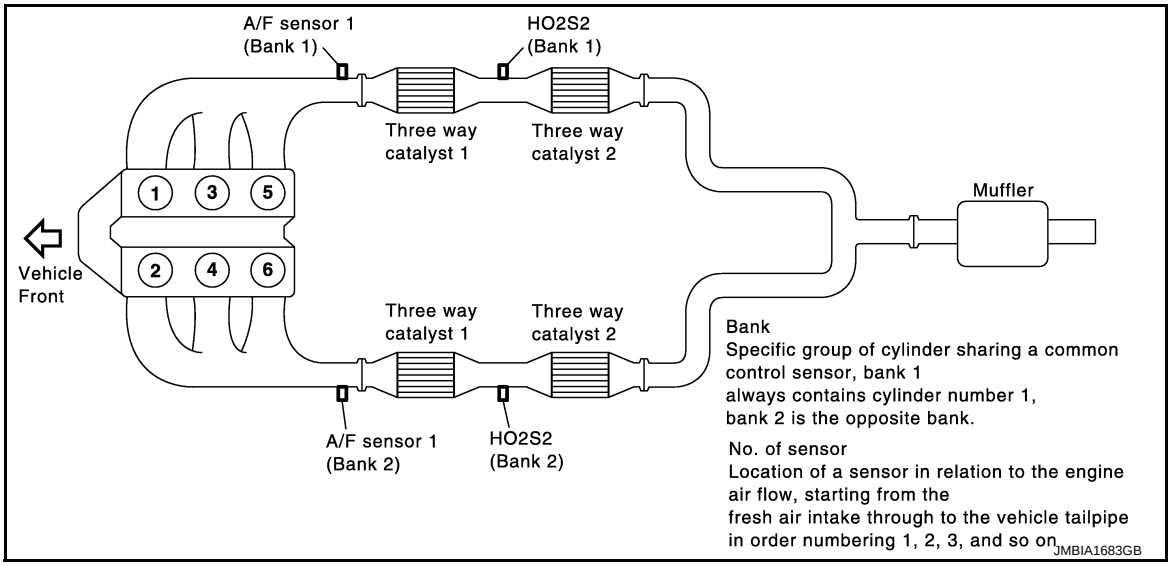


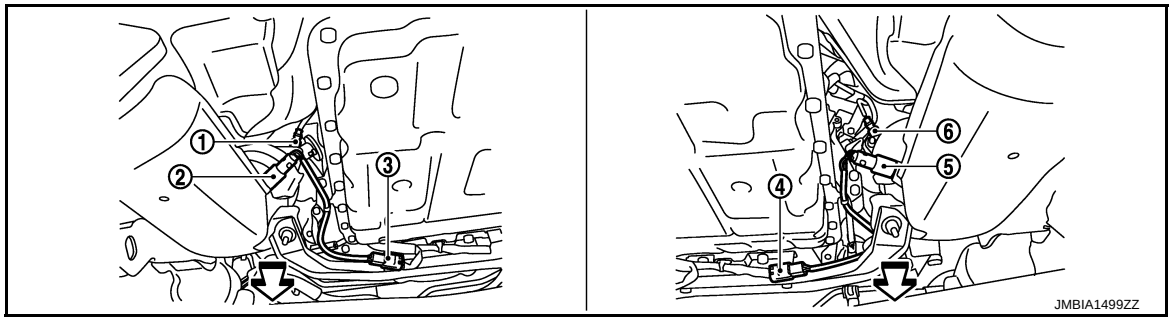
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

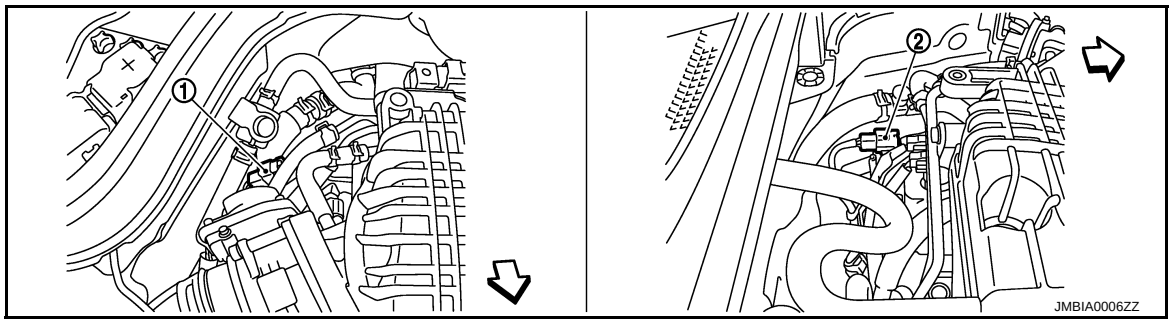
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

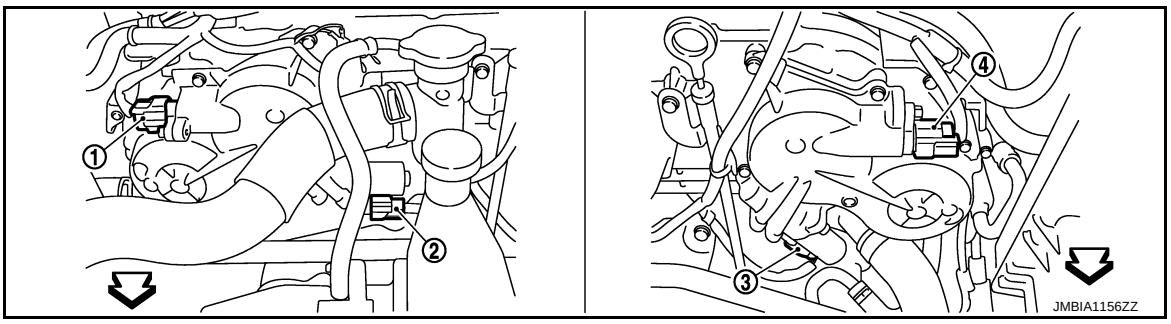
⇦ : Vehicle front



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

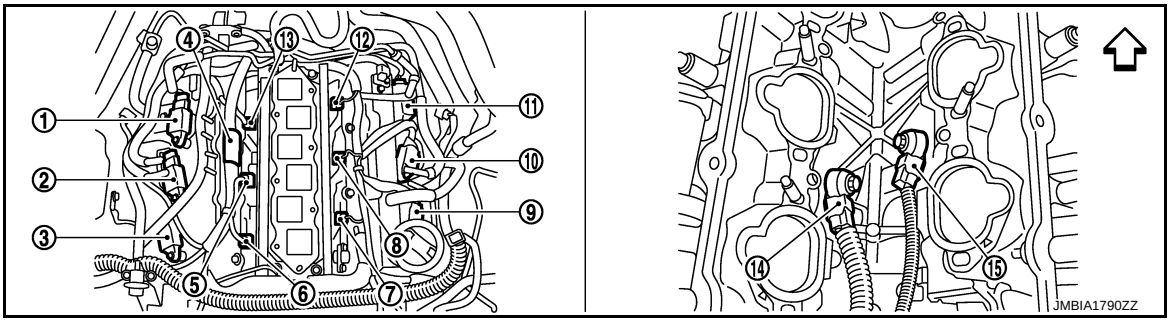
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



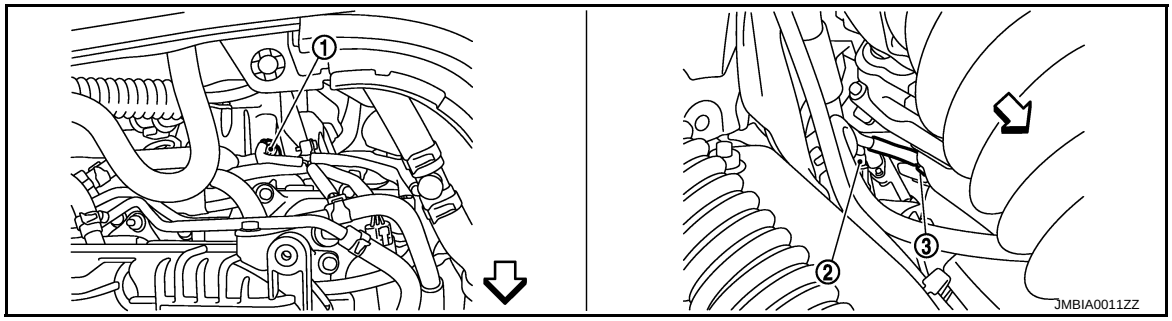
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



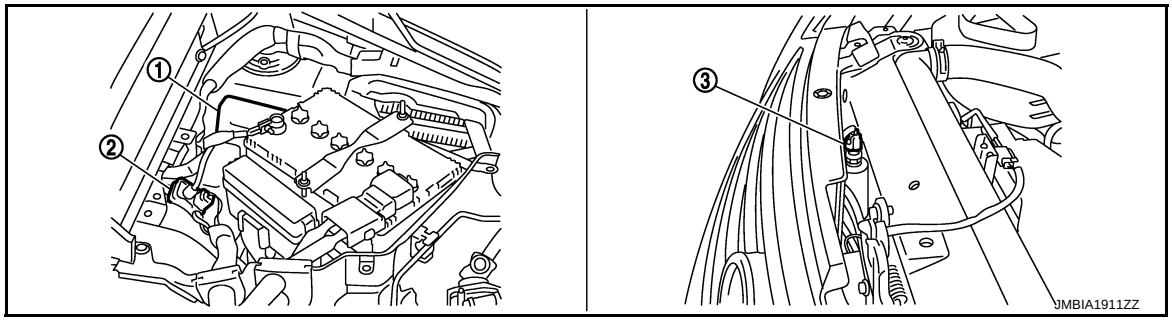
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

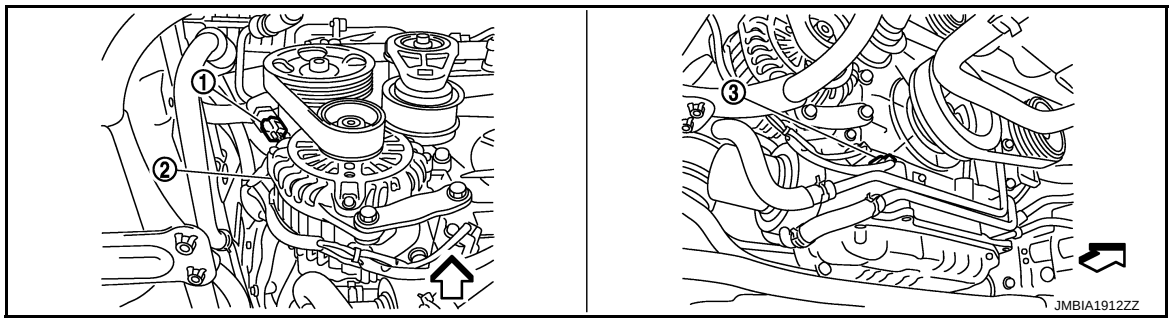


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

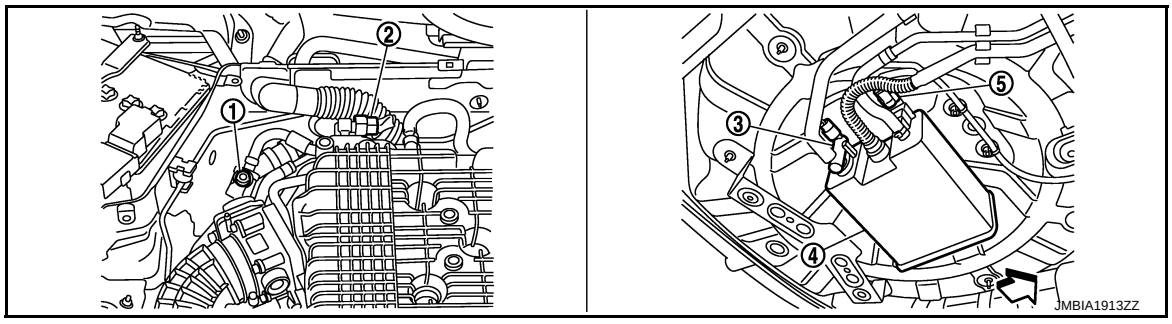


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

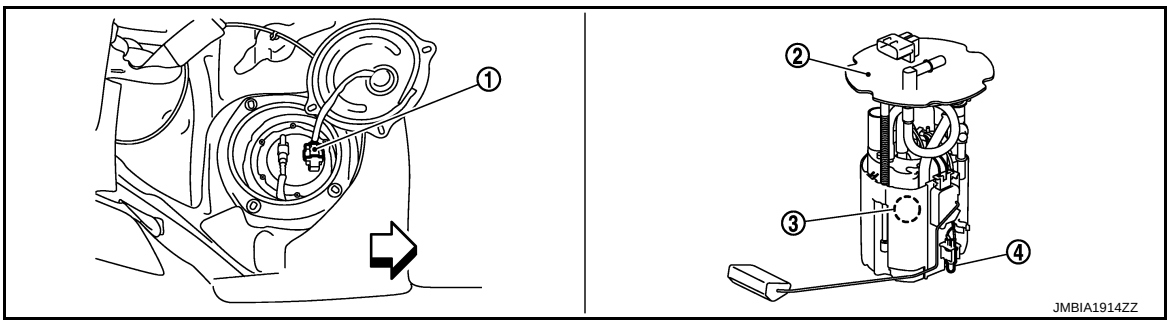
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

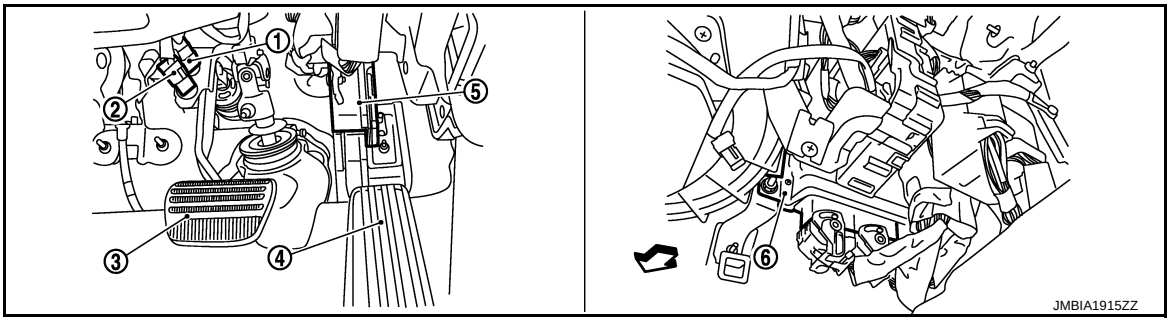
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



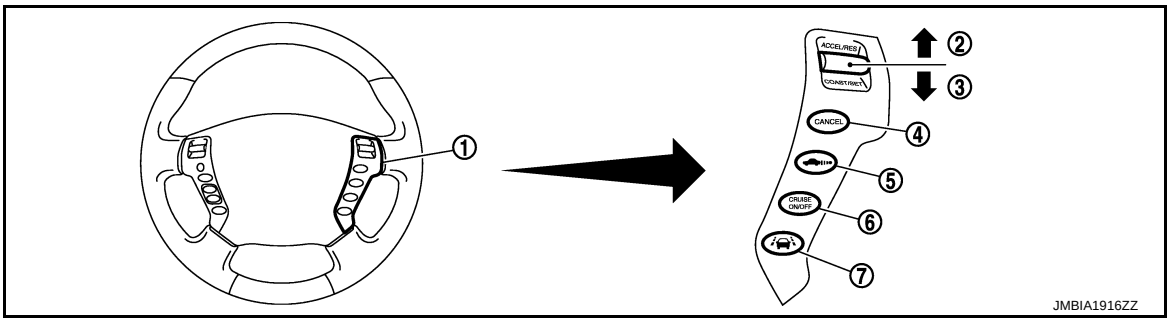
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

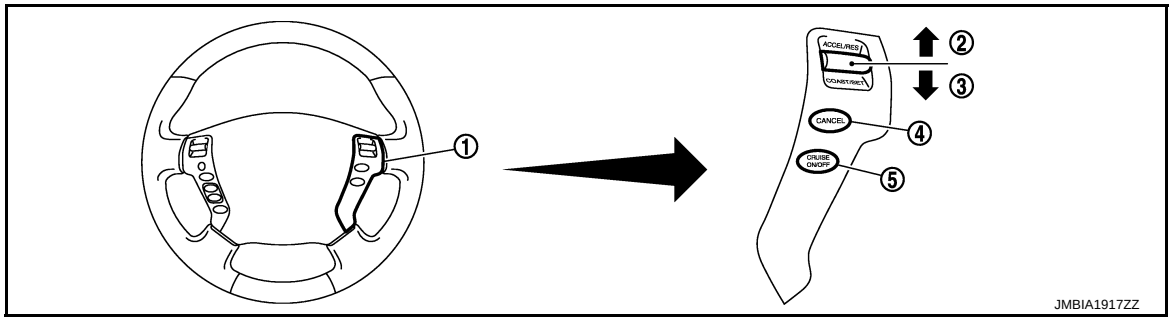


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

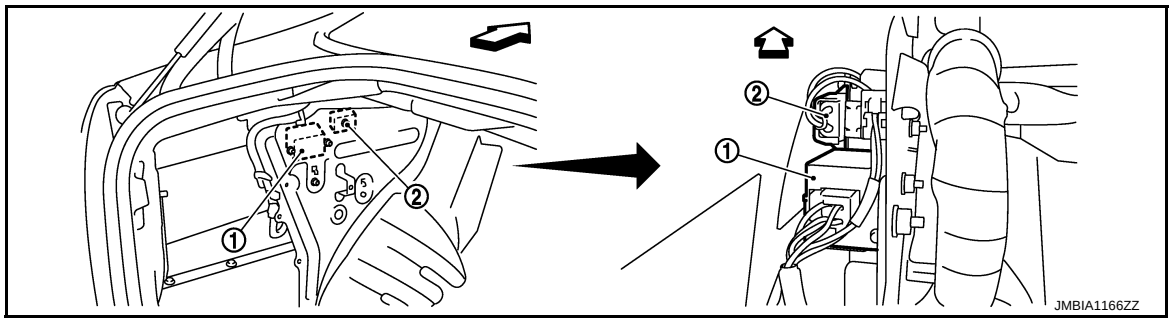
⇦ : Vehicle front



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

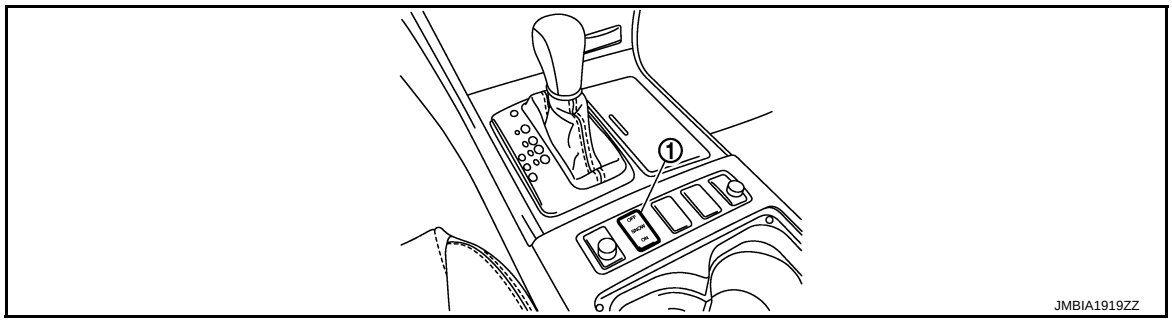


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

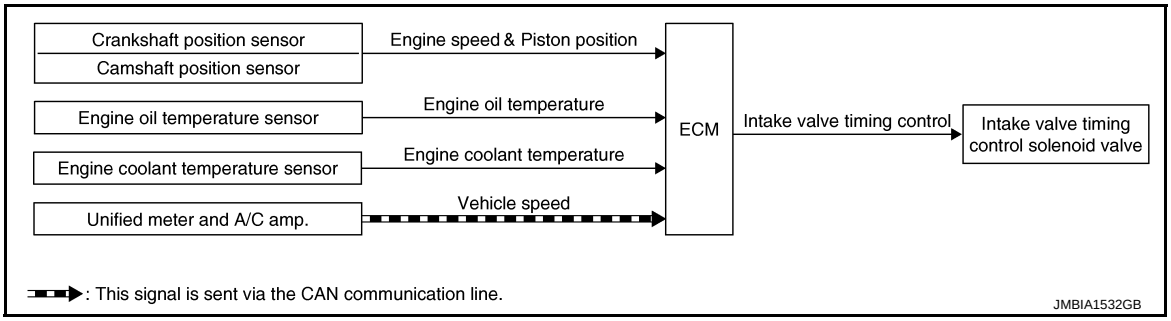
INFOID:0000000005353373

Component	Reference
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Fuel pump control module (FPCM)	EC-608, "Description"
Mass air flow sensor	EC-195, "Description"

INTAKE VALVE TIMING CONTROL

System Diagram

INFOID:0000000005353374



System Description

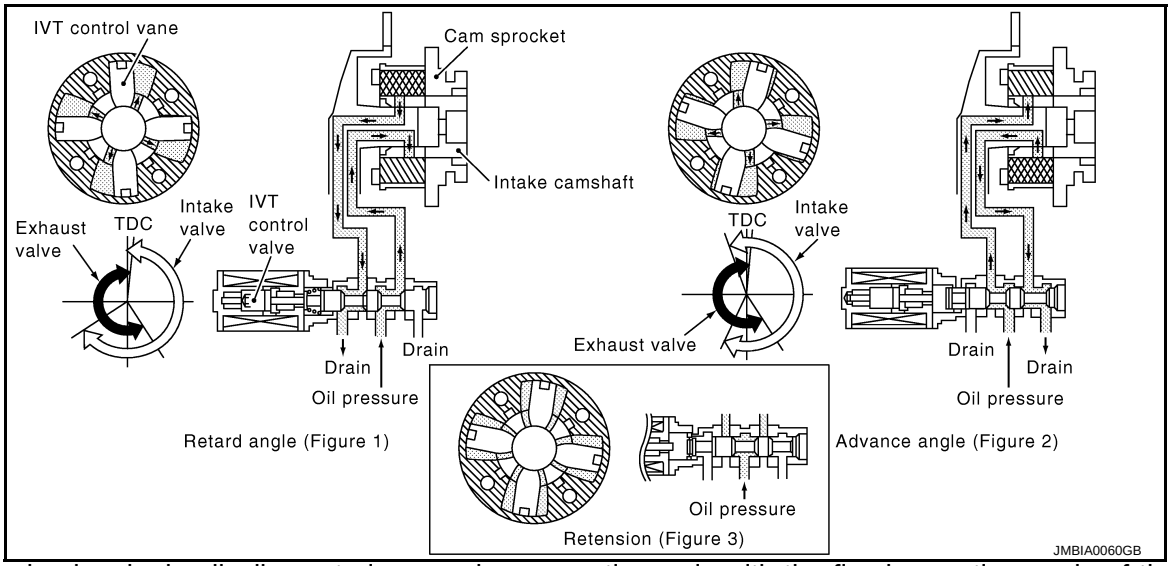
INFOID:0000000005353375

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor	Engine speed & piston position	Intake valve timing control	Intake valve timing control solenoid valve
Camshaft position sensor			
Engine oil temperature sensor	Engine oil temperature		
Engine coolant temperature sensor	Engine coolant temperature		
Unified meter and A/C amp.	Vehicle speed*		

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

SYSTEM DESCRIPTION

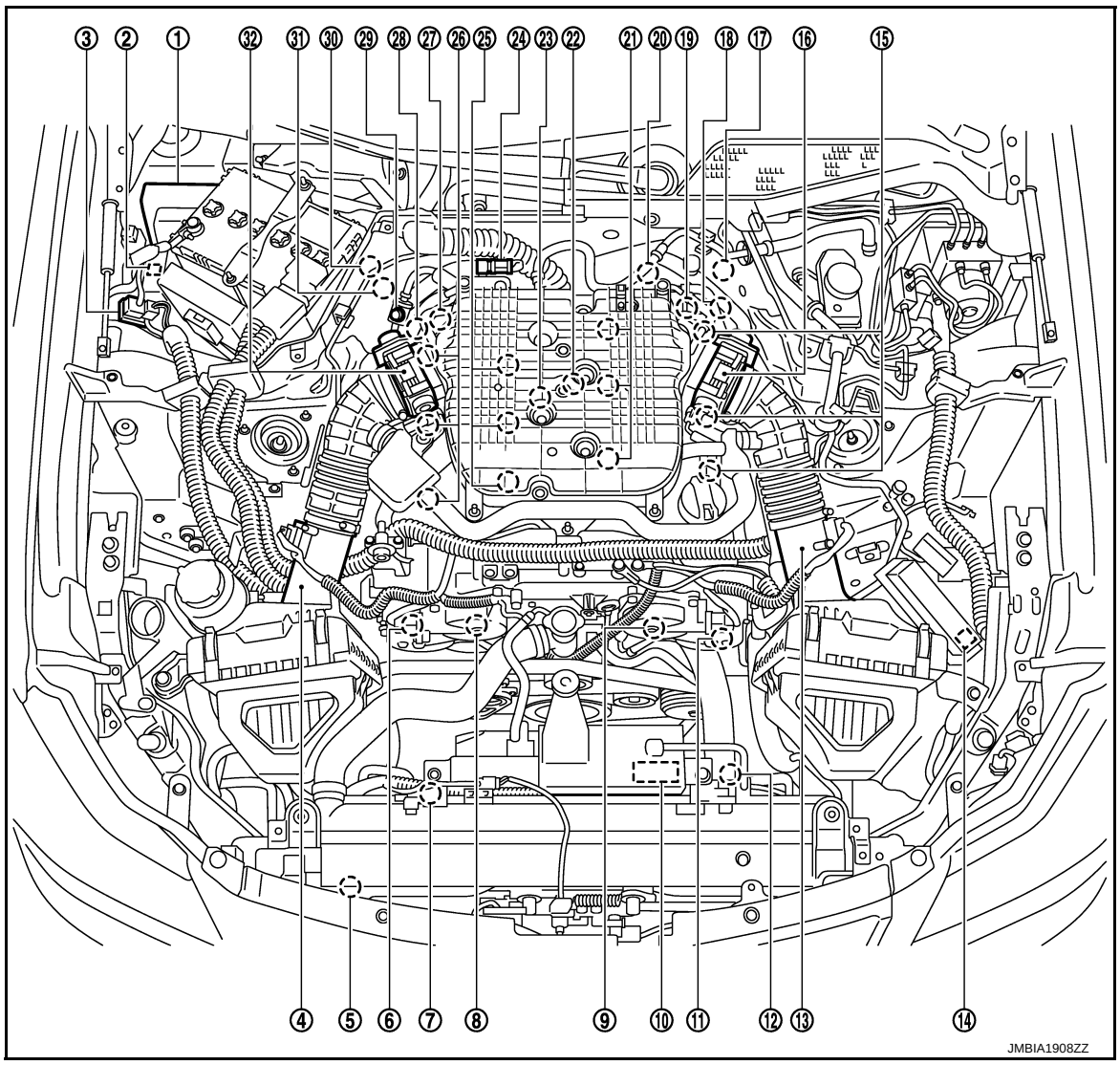


This mechanism hydraulically controls cam phases continuously with the fixed operating angle of the intake valve.

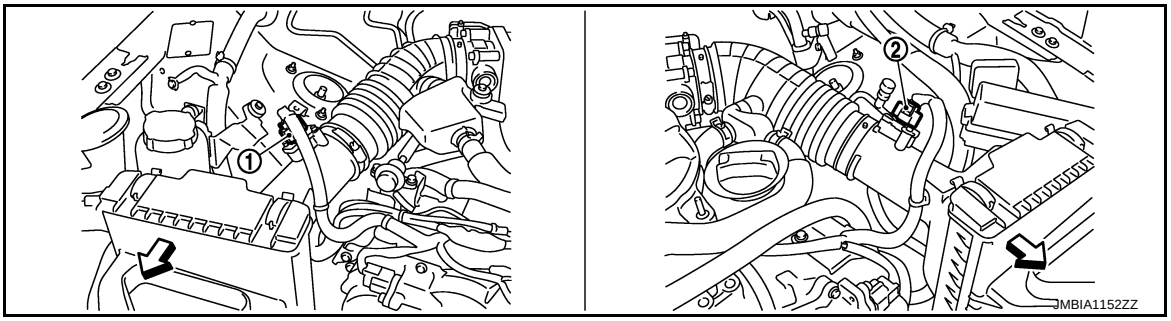
The ECM receives signals such as crankshaft position, camshaft position, engine speed, and engine coolant temperature. Then, the ECM sends ON/OFF pulse duty signals to the intake valve timing (IVT) control solenoid valve depending on driving status. This makes it possible to control the shut/open timing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

Component Parts Location

INFOID:0000000005353376

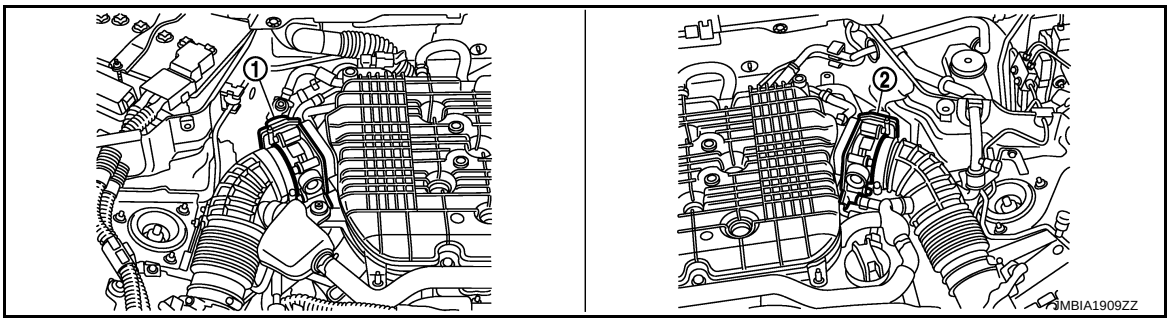


1. IPDM E/R
2. ICC brake hold relay (ICC models)
3. Battery current sensor
4. Mass air flow sensor (with intake air temperature sensor) (bank 1)
5. Refrigerant pressure sensor
6. Exhaust valve timing control magnet retarder (bank 1)
7. Cooling fan motor-2
8. Intake valve timing control solenoid valve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

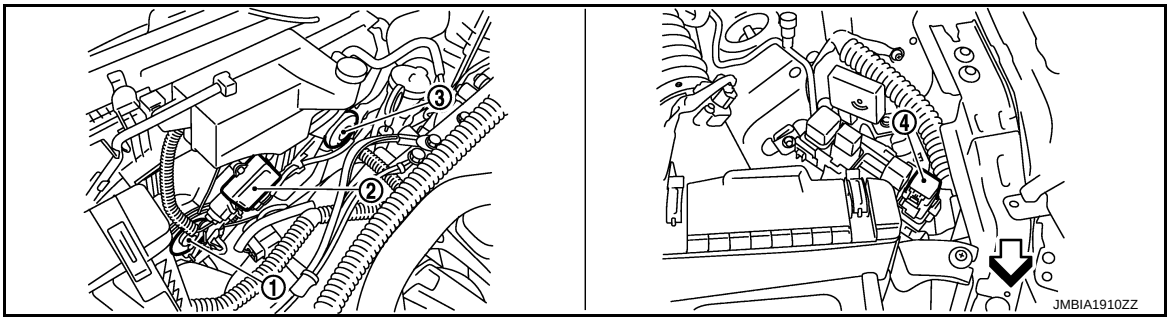


1. Mass air flow sensor (with intake air temperature sensor) (bank 1)
2. Mass air flow sensor (with intake air temperature sensor) (bank 2)

⇦ : Vehicle front

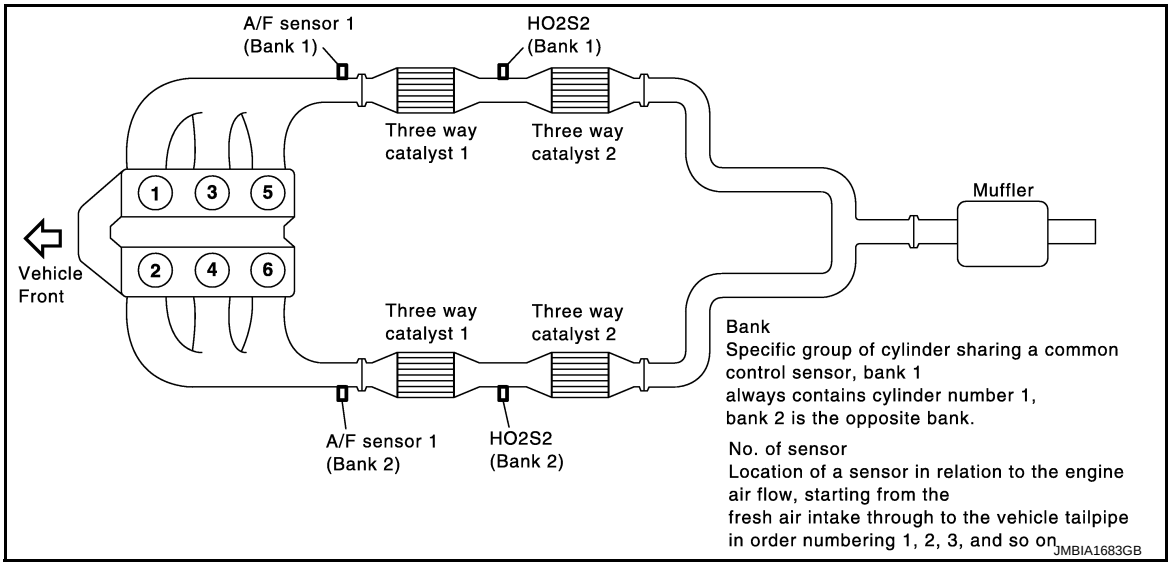


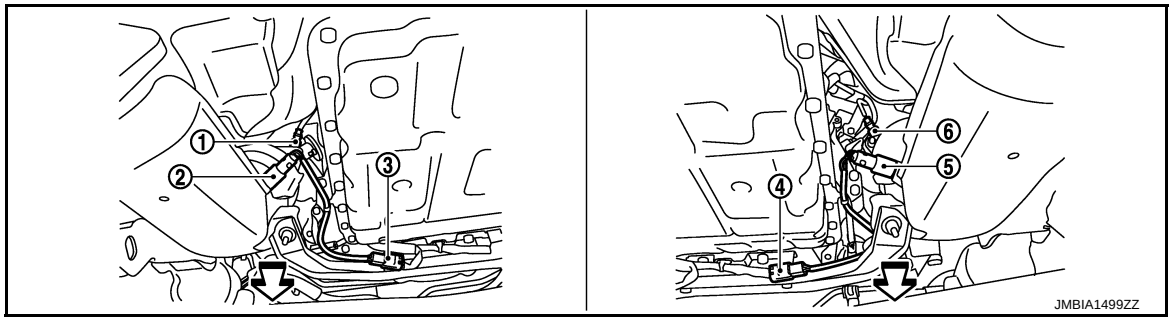
1. Electric throttle control actuator (bank 1)
2. Electric throttle control actuator (bank 2)



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

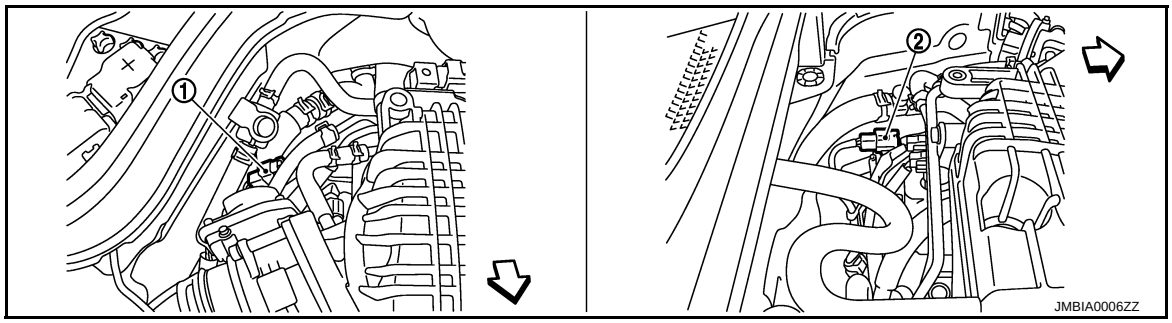
⇦ : Vehicle front





1. A/F sensor 1 (bank 2)
2. Heated oxygen sensor 2 (bank 2)
3. Heated oxygen sensor 2 (bank 2) harness connector
4. Heated oxygen sensor 2 (bank 1) harness connector
5. Heated oxygen sensor 2 (bank 1)
6. A/F sensor 1 (bank 1)

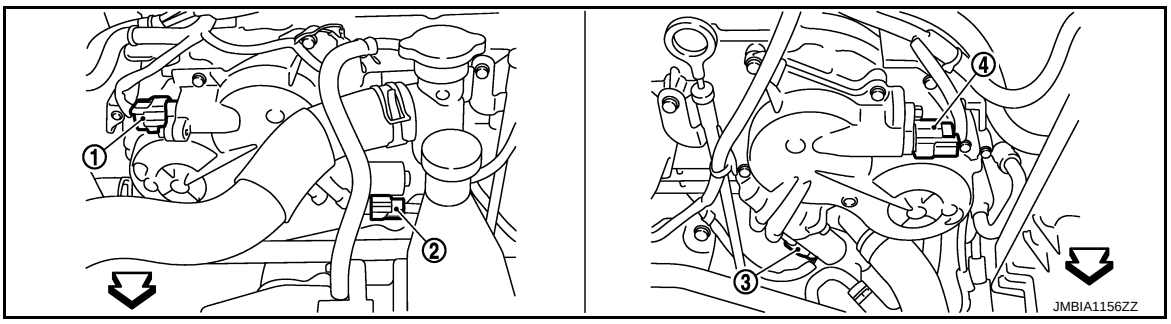
⇦ : Vehicle front



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

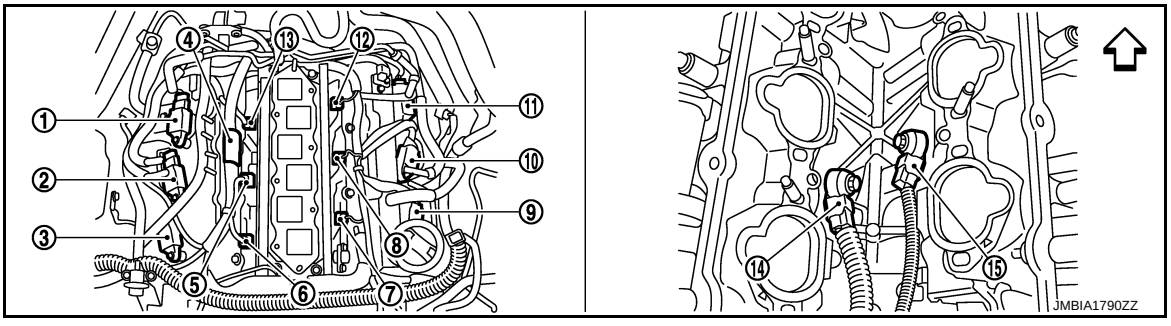
⇦ : Vehicle front

1. Exhaust valve timing control position sensor (bank 1)
2. Camshaft position sensor (bank 1)
3. Camshaft position sensor (bank 2)
4. Exhaust valve timing control position sensor (bank 2)



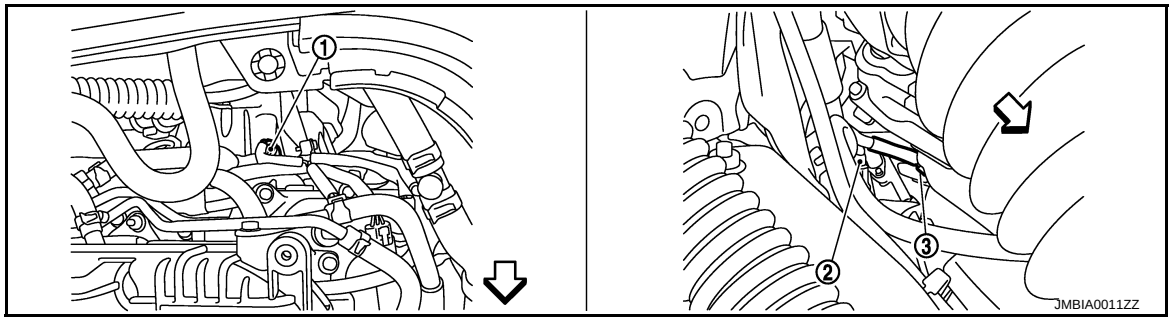
1. Exhaust valve timing control magnet retarder (bank 1) harness connector
2. Intake valve timing control solenoid valve (bank 1) harness connector
3. Intake valve timing control solenoid valve (bank 2) harness connector
4. Exhaust valve timing control magnet retarder (bank 2) harness connector

⇦ : Vehicle front



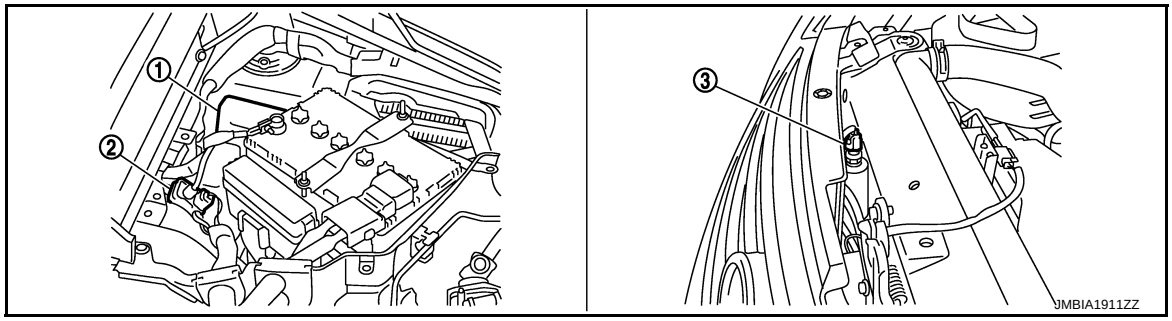
1. Ignition coil No. 5 (with power transistor)
2. Ignition coil No. 3 (with power transistor)
3. Ignition coil No. 1 (with power transistor)
4. Condenser
5. Fuel injector No. 3
6. Fuel injector No. 1
7. Fuel injector No. 2
8. Fuel injector No. 4
9. Ignition coil No. 2 (with power transistor)
10. Ignition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

⇦ : Vehicle front

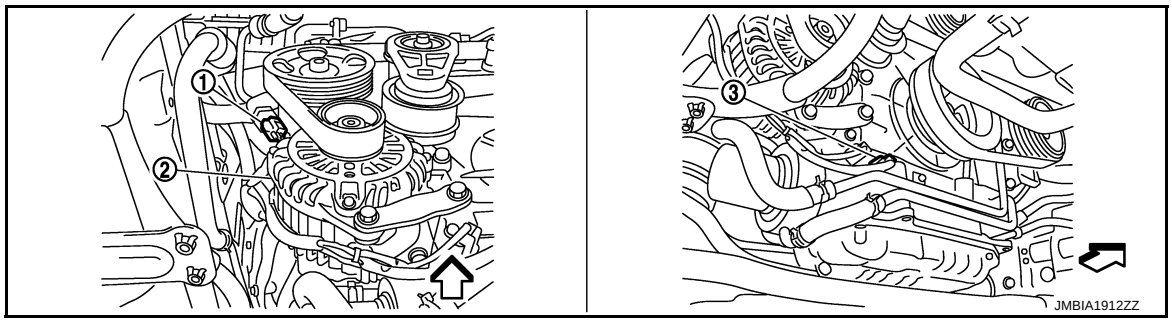


1. Engine coolant temperature sensor 2. A/F sensor 1 (bank 1) 3. Crankshaft position sensor

⇦ : Vehicle front

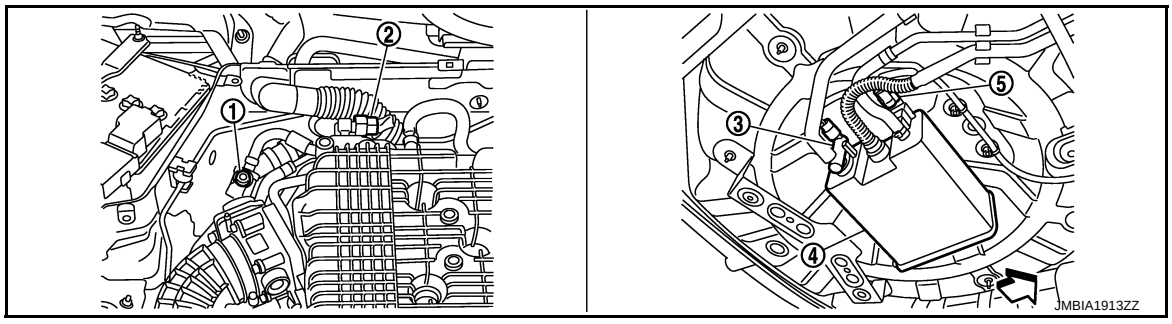


1. IPDM E/R 2. Battery current sensor 3. Refrigerant pressure sensor



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

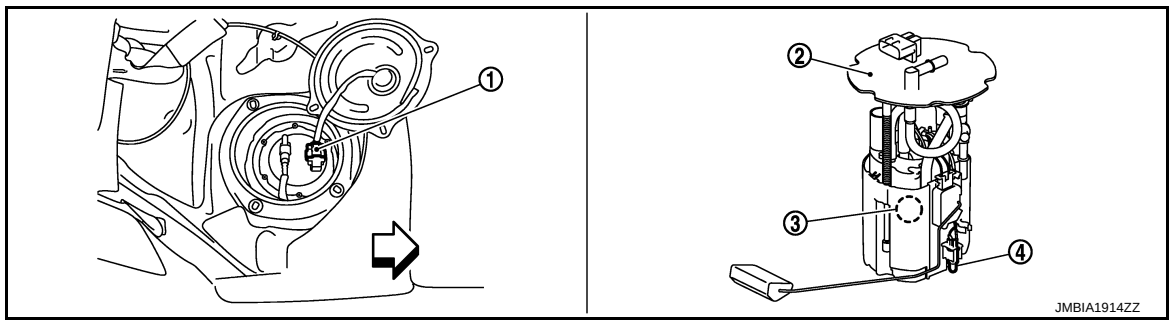
⇦ : Vehicle front



1. EVAP service port 2. EVAP canister purge volume control solenoid valve 3. EVAP canister vent control valve

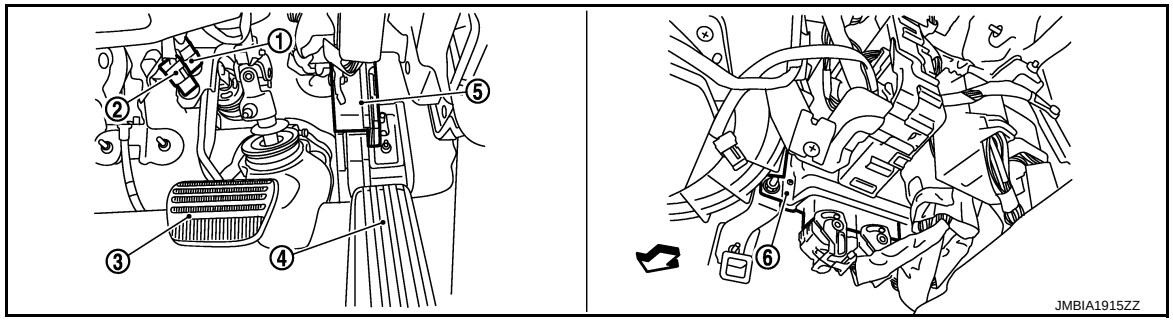
4. EVAP canister
5. EVAP control system pressure sensor

⇦ : Vehicle front



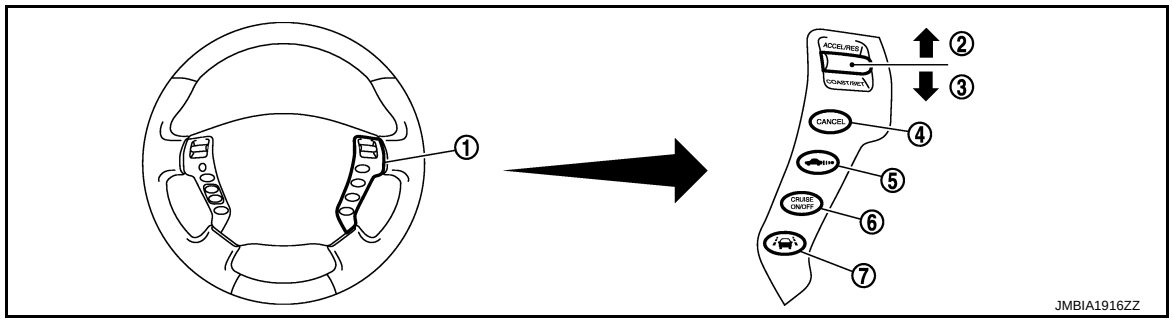
1. Fuel level sensor unit and fuel pump (main) harness connector
2. Fuel level sensor unit and fuel pump (main)
3. Fuel pressure regulator
4. Fuel tank temperature sensor

⇦ : Vehicle front

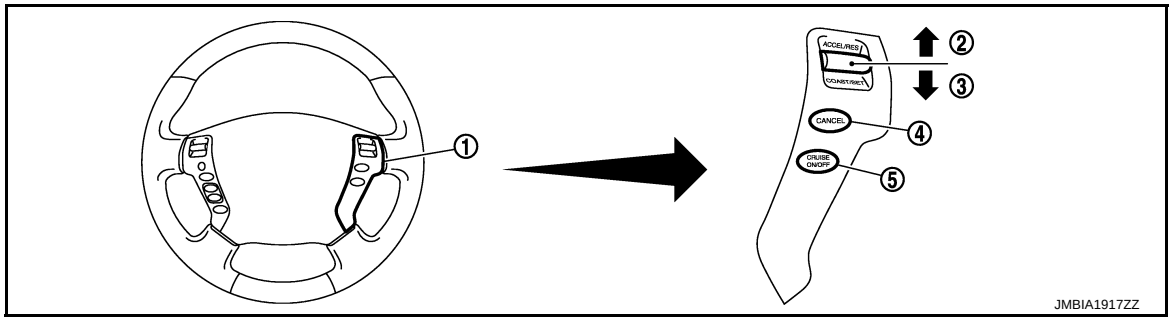


1. Stop lamp switch
2. ASCD brake switch (ASCD models) ICC brake switch (ICC models)
3. Brake pedal
4. Accelerator pedal
5. Accelerator pedal position sensor
6. ECM

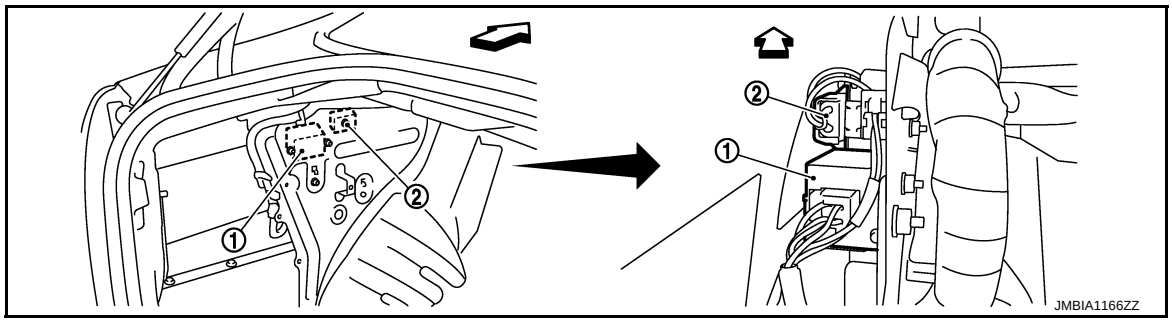
⇦ : Vehicle front



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

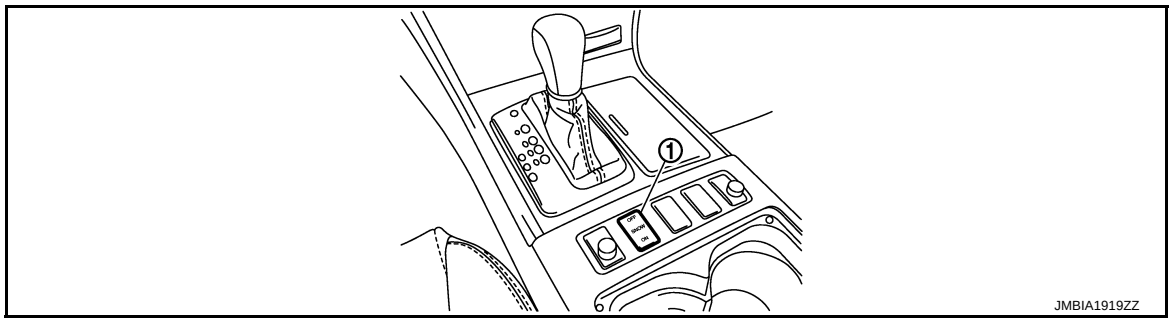


1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. MAIN switch



1. FPCM
2. Dropping resistor

⇦ : Vehicle front



1. Snow mode switch

Component Description

INFOID:0000000005353377

Component	Reference
Camshaft position sensor	EC-346, "Description"
Crankshaft position sensor	EC-340, "Description"
Engine coolant temperature sensor	EC-220, "Description"
Intake valve timing control solenoid valve	EC-185, "Description"

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Diagnosis Description

INFOID:0000000005353378

INTRODUCTION

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

Emission-related diagnostic information	Diagnostic service
Diagnostic Trouble Code (DTC)	Service $03 of SAE J1979
Freeze Frame data	Service $02 of SAE J1979
System Readiness Test (SRT) code	Service $01 of SAE J1979
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Service $07 of SAE J1979
1st Trip Freeze Frame data	—
Test values and Test limits	Service $06 of SAE J1979
Calibration ID	Service $09 of SAE J1979

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

×: Applicable —: Not applicable

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

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

The malfunction indicator lamp (MIL) on the instrument panel illuminates when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-663, "Fail-safe".)

TWO TRIP DETECTION LOGIC

When a malfunction is detected for the first time, 1st trip DTC and 1st trip Freeze Frame data are stored in the ECM memory. The MIL will not illuminate at this stage. <1st trip>

If the same malfunction is detected again during the next drive, the DTC and Freeze Frame data are stored in the ECM memory, and the MIL illuminates. The MIL illuminates at the same time when the DTC is stored. <2nd trip> The “trip” in the “Two Trip Detection Logic” means a driving mode in which self-diagnosis is performed during vehicle operation. Specific on board diagnostic items will cause the ECM to illuminate or blink the MIL, and store DTC and Freeze Frame data, even in the 1st trip, as shown below.

×: Applicable —: Not applicable

Items	MIL				DTC		1st trip DTC	
	1st trip		2nd trip		1st trip displaying	2nd trip displaying	1st trip displaying	2nd trip displaying
	Blinking	Illuminate	Blinking	Illuminate				
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected	×	—	—	—	—	—	×	—
Misfire (Possible three way catalyst damage) — DTC: P0300 - P0306 is being detected	—	—	×	—	—	×	—	—
One trip detection diagnoses (Refer to EC-667, "DTC Index".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

DTC AND FREEZE FRAME DATA

DTC and 1st Trip DTC

The 1st trip DTC (whose number is the same as the DTC number) is displayed for the latest self-diagnostic result obtained. If the ECM memory was cleared previously, and the 1st trip DTC did not 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 illuminate (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL illuminates. In other words, the DTC is stored in the ECM memory and the MIL illuminates when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is saved 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 illuminate the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.
Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in “How to Erase DTC and 1st Trip DTC”.
For malfunctions in which 1st trip DTCs are displayed, refer to EC-667, "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-III.
1st trip DTC is specified in Service $07 of SAE J1979. 1st trip DTC detection occurs without illuminating the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.
When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to EC-18, "Work Flow". Then perform DTC Confirmation Procedure or Component Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

Freeze Frame Data and 1st Trip Freeze Frame Data

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short-term fuel trim, long-term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-III or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-III screen, not on the GST.
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 1st trip freeze frame data is stored in the ECM memory along with the 1st trip DTC. There is no priority for 1st trip freeze frame data and it is updated each time a different 1st trip DTC is detected. However, once freeze frame data (2nd trip detection/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 - P0306 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. Procedures for clearing the ECM memory are described in “How to Erase DTC and 1st Trip DTC”.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-III

CONSULT-III displays the DTC in “SELF DIAGNOSTIC RESULT” mode. Examples: P0340, P0850, P1148, etc.

These DTCs are prescribed by SAE J2012.
(CONSULT-III also displays the malfunctioning component or system.)
Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be [0].
If a 1st trip DTC is stored in the ECM, the time data will be [1t].

With GST

GST (Generic Scan Tool) displays the DTC in Diagnostic Service $03. Examples: P0340, P0850, P1148, etc.
These DTCs are prescribed by SAE J2012.
1st trip DTC is displayed in Diagnostic Service $07.

No Tools

The number of blinks of the MIL in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC. Example: 0340, 0850, 1148, etc.
These DTCs are controlled by NISSAN.

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

Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be [0].
If a 1st trip DTC is stored in the ECM, the time data will be [1t].

How to Erase DTC and 1st Trip DTC

With CONSULT-III

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition 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-667, "DTC Index"), skip step 1.

1. Erase DTC in TCM. Refer to AT-47, "OBD-II Diagnostic Trouble Code (DTC)".
2. Select “ENGINE” with CONSULT-III.
3. Select “SELF-DIAG RESULTS”.
4. Touch “ERASE”. (DTC in ECM will be erased.)

With GST

NOTE:

- **If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.**

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

No Tools

NOTE:

- If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.

1. Erase DTC in ECM. Refer to HOW TO ERASE DIAGNOSTIC TEST MODE II (SELF-DIAGNOSTIC RESULTS).

- **If the battery is disconnected, the emission-related diagnostic information will be cleared within 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

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

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

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Service $01 of SAE J1979.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.

If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.
Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.

NOTE:
The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.
If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.

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

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

SRT item (CONSULT-III indication)	Performance Priority*	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420, P0430
EVAP SYSTEM	2	EVAP control system purge flow monitoring	P0441
	1	EVAP control system	P0442
	2	EVAP control system	P0456
HO2S	2	Air fuel ratio (A/F) sensor 1	P0133, P0153
		Heated oxygen sensor 2	P0137, P0157
		Heated oxygen sensor 2	P0138, P0158
		Heated oxygen sensor 2	P0139, P0159

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

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

Self-diagnosis result		Example				
		Diagnosis	Ignition cycle ← ON → OFF ← ON → OFF ← ON → OFF ← ON →			
All OK	Case 1	P0400	OK (1)	— (1)	OK (2)	— (2)
		P0402	OK (1)	— (1)	— (1)	OK (2)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“CMPLT”	“CMPLT”	“CMPLT”	“CMPLT”
	Case 2	P0400	OK (1)	— (1)	— (1)	— (1)
		P0402	— (0)	— (0)	OK (1)	— (1)
		P1402	OK (1)	OK (2)	— (2)	— (2)
		SRT of EGR	“INCMP”	“INCMP”	“CMPLT”	“CMPLT”

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

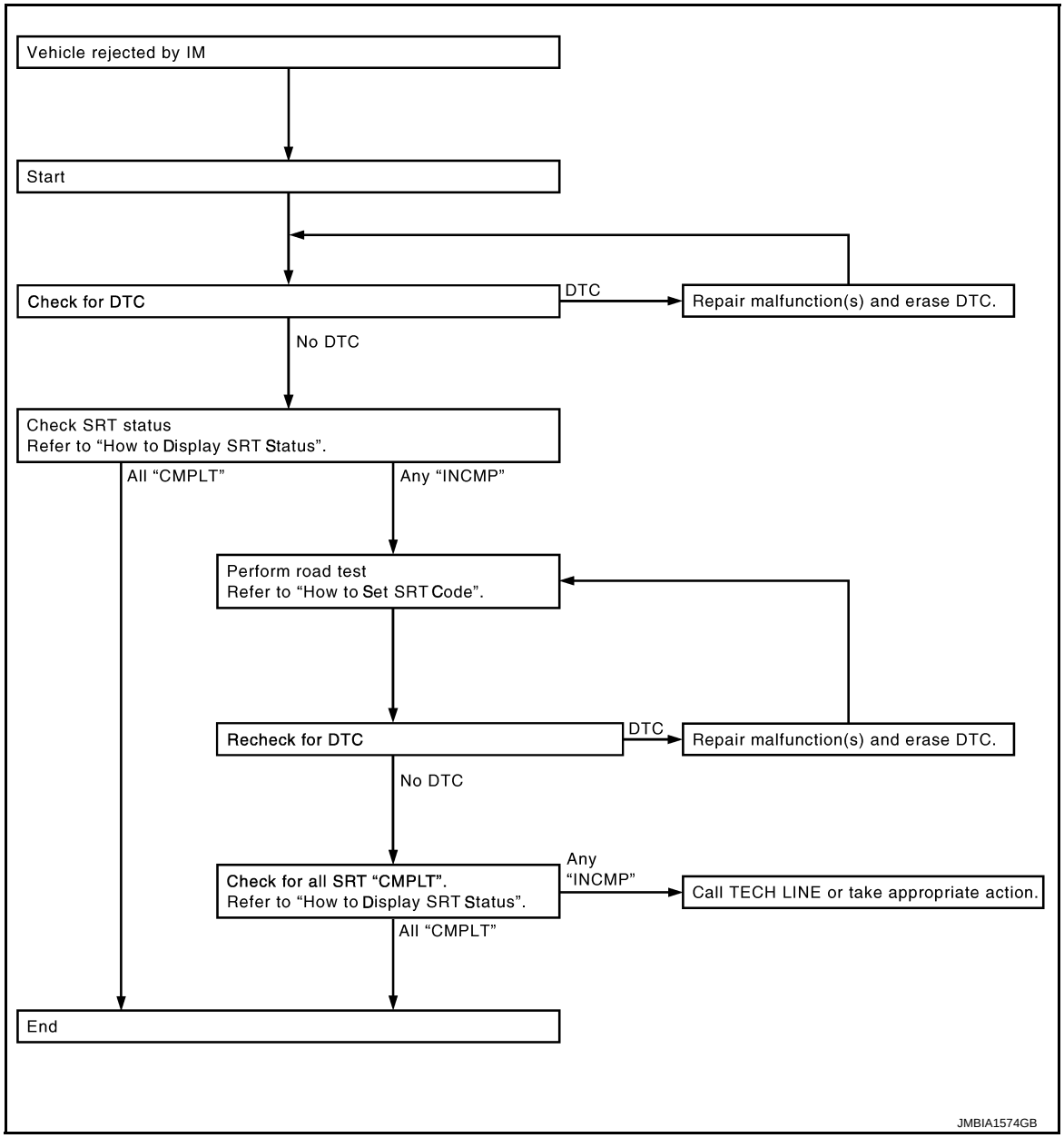
- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.
- The emissions inspection requires “CMPLT” of the SRT only with OK self-diagnosis results.
- During SRT driving pattern, the 1st trip DTC (NG) is detected prior to “CMPLT” of SRT and the self-diagnosis 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”.

SRT Service Procedure

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



How to Display SRT Status

WITH CONSULT-III

Selecting “SRT STATUS” in “DTC CONFIRMATION” mode with CONSULT-III.

For items whose SRT codes are set, “CMPLT” is displayed on the CONSULT-III screen; for items whose SRT codes are not set, “INCMP” is displayed.

NOTE:

Though displayed on the CONSULT-III screen, “HO2S HTR” is not SRT item.

WITH GST

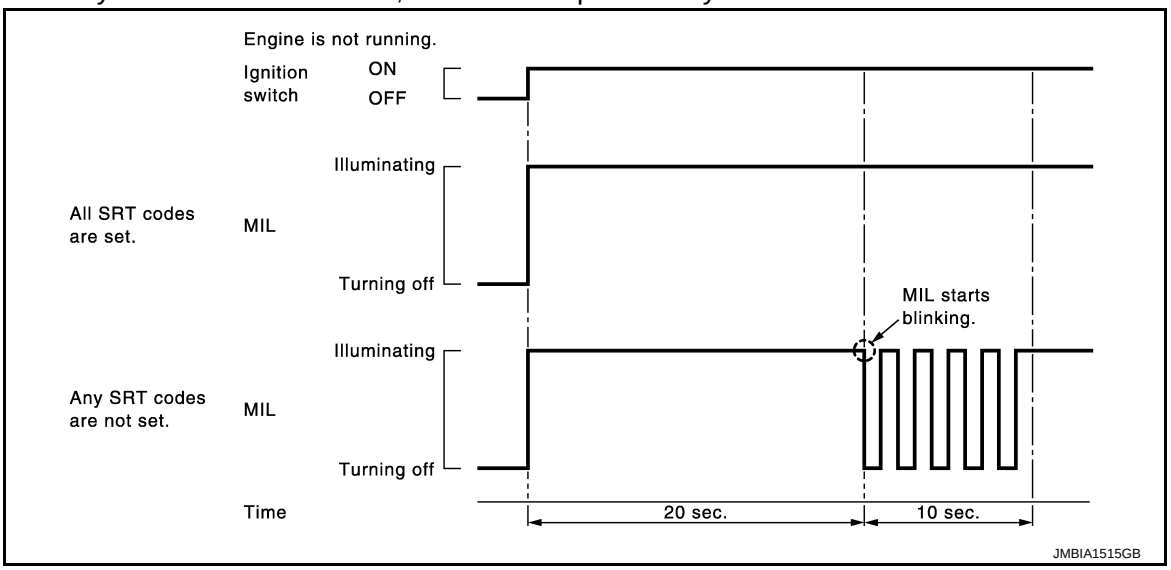
Selecting Service $01 with GST (Generic Scan Tool)

NO TOOLS

A SRT code itself cannot be displayed, however SRT status can.

1. Turn ignition switch ON and wait 20 seconds.
2. SRT status is indicated as shown below.
   - When all SRT codes are set, MIL illuminates continuously.

- When any SRT codes are not set, MIL will blink periodically for 10 seconds.

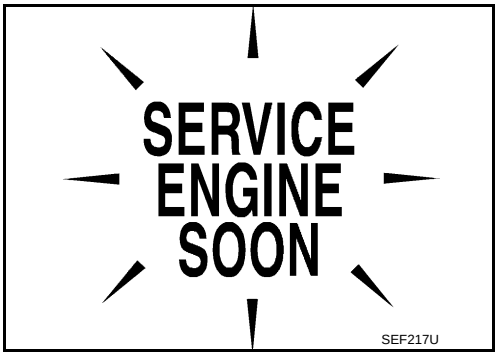


MALFUNCTION INDICATOR LAMP (MIL)

Description

The MIL is located on the combination meter.

1. The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not illuminate, check MIL circuit. Refer to EC-626, "Component Function Check".
2. When the engine is started, the MIL should turn off.
   If the MIL remains on, the on board diagnostic system has detected an engine system malfunction.



On Board Diagnostic System Function

The on board diagnostic system has the following three functions.

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

Diagnostic Test Mode I — Bulb Check

In this mode, the MIL on the instrument panel should stay ON. If it remains OFF, check MIL circuit. Refer to EC-626, "Component Function Check".

Diagnostic Test Mode I — Malfunction Warning

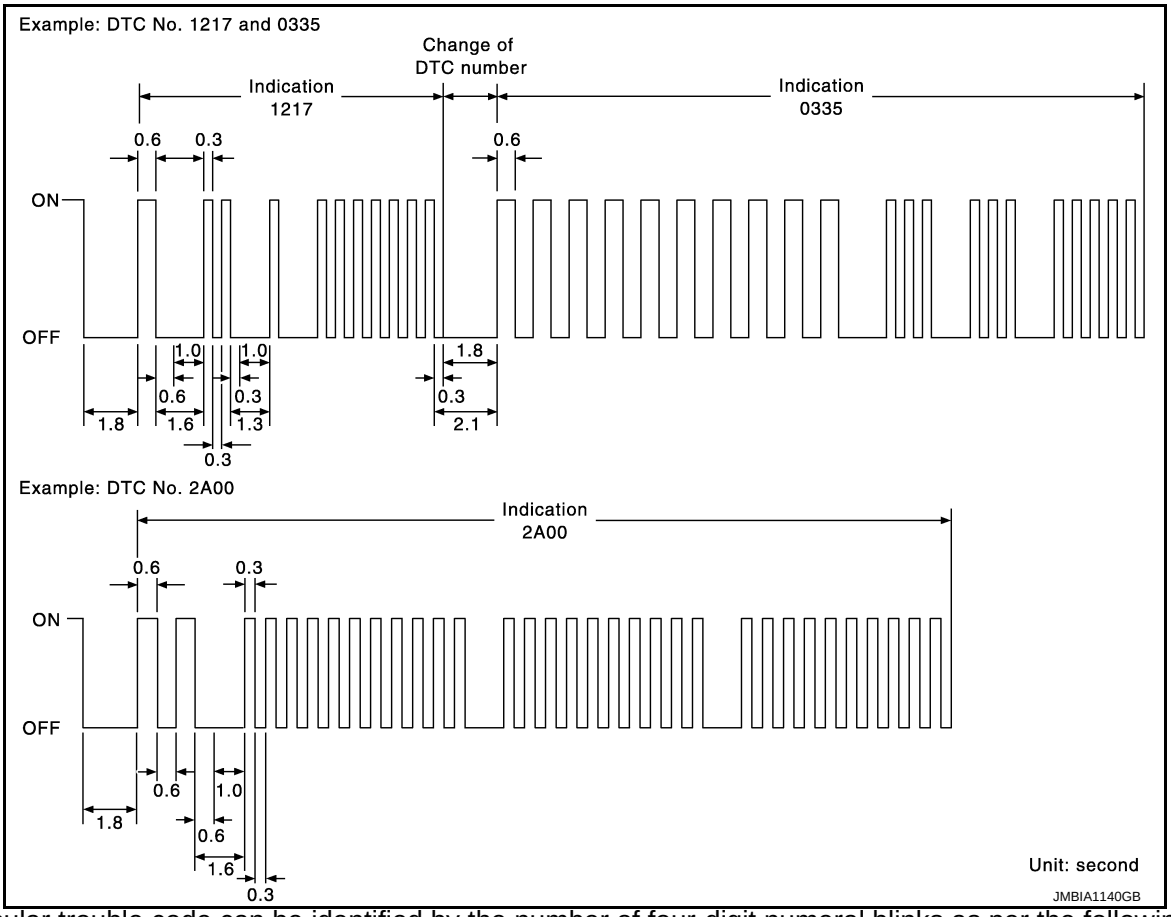
MIL	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

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

Diagnostic Test Mode II — Self-diagnostic Results

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the 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 diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These uniden-

tified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



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

Number	0	1	2	3	4	5	6	7	8	9	A	B	C	D	E	F
Blinks	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 blinks on and off is 1.2 seconds consisting of an ON (0.6-second) - OFF (0.6-second) cycle.
The 100th-digit numeral and lower digit numerals consist of a 0.3-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. (See EC-667, "DTC Index")

How to Switch Diagnostic Test Mode

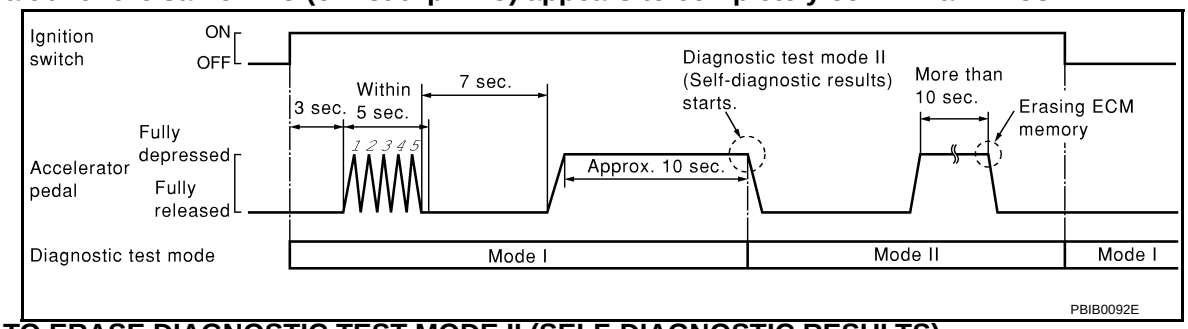
NOTE:
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**
- **ECM always returns to Diagnostic Test Mode I after the ignition switch is turned OFF.**

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

1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
2. Repeat the following procedure quickly 5 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 Diagnostic Test Mode II (Self-diagnostic results).
   NOTE:
   Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



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

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

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

OBD System Operation Chart

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. A 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-III will count the number of times the vehicle is driven.
- The 1st trip DTC is not displayed when the self-diagnosis results in OK for the 2nd trip.

Summary Chart

Items	Fuel Injection System	Misfire	Other
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)

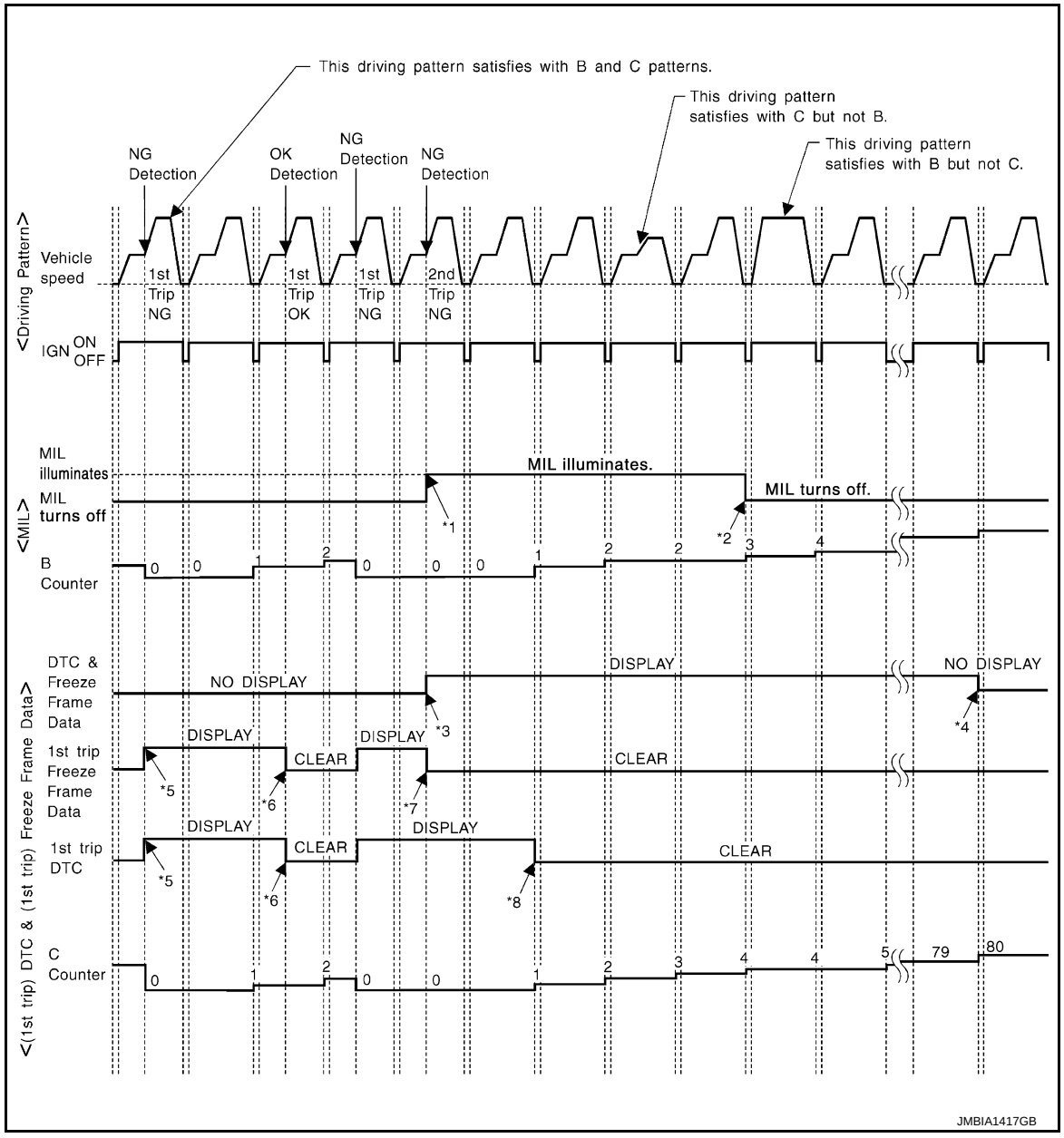
For details about patterns B and C under “Fuel Injection System” and “Misfire”, see “EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”.

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 illuminate.

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

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

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

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

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

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

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

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

Driving pattern B means the vehicle operation as per the following:

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

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

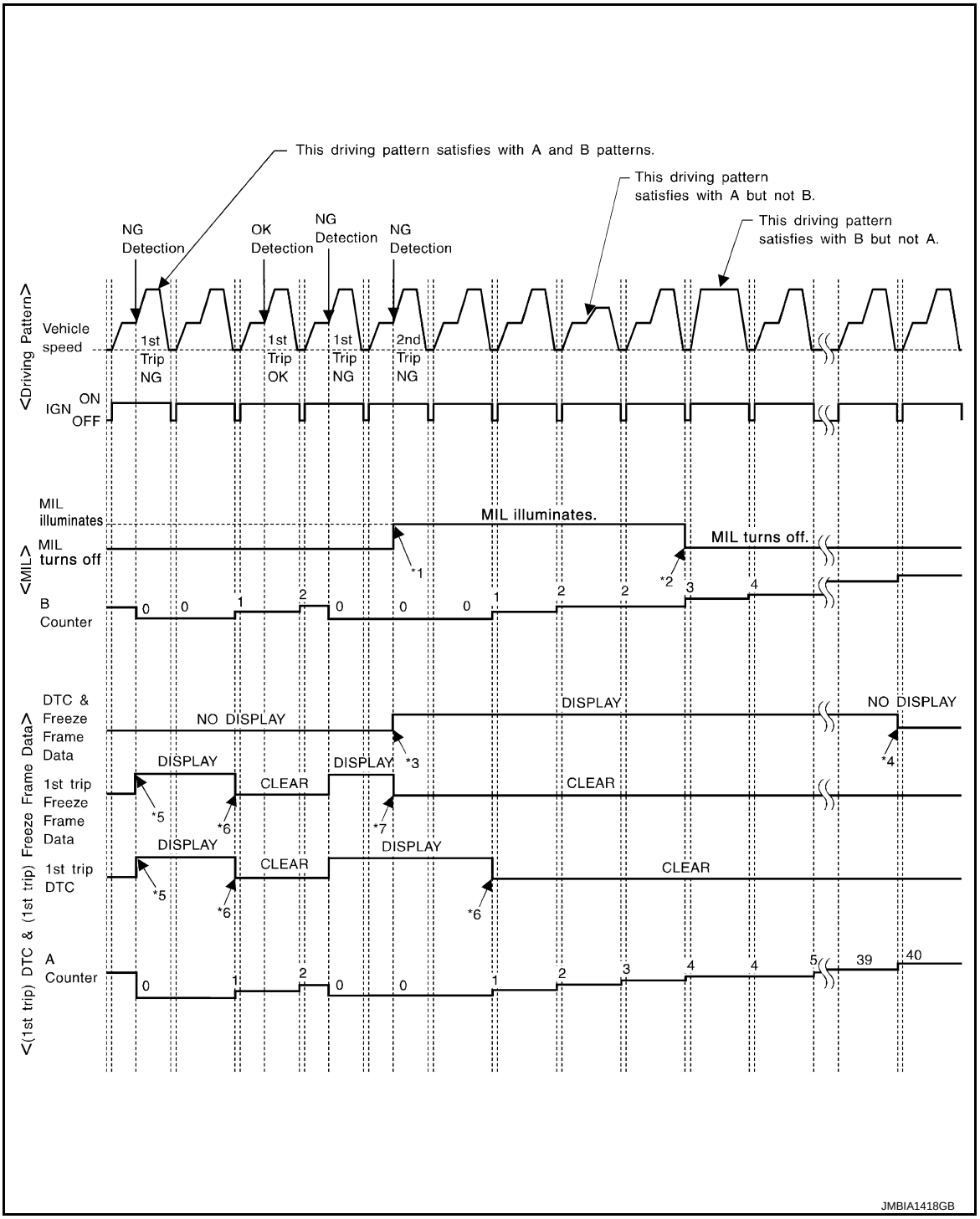
<Driving Pattern C>
Driving pattern C means operating vehicle as per the following:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine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

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

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

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

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



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

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

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

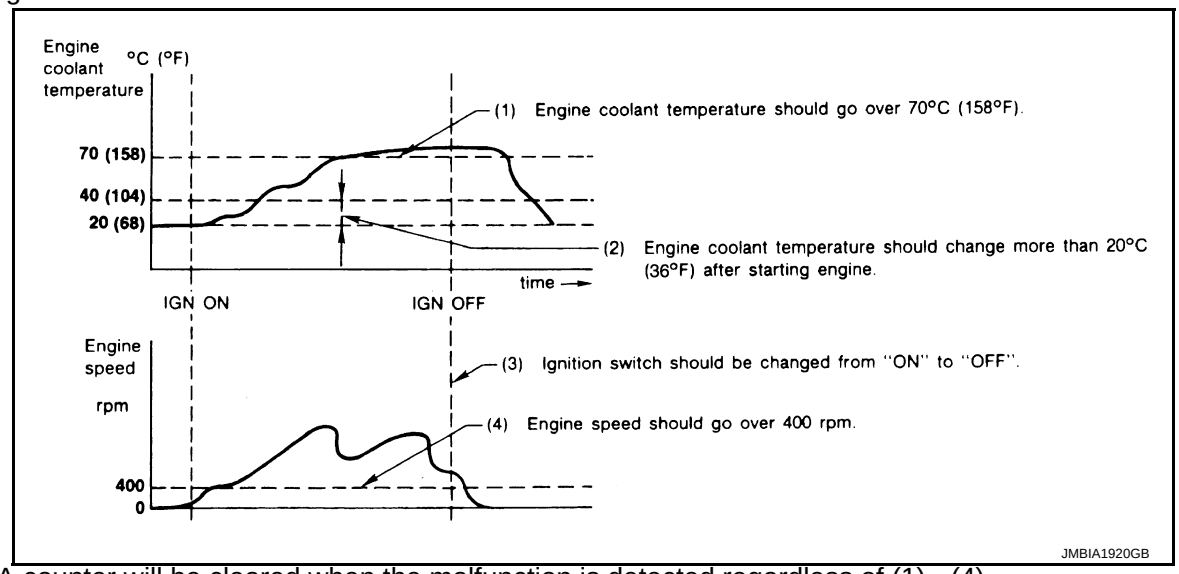
*4: The DTC and the freeze frame data will not be displayed any longer after vehicle is driven 40 times (pattern A) without the same malfunction. (The DTC and the freeze frame data still remain in ECM.)

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

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

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

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



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

<Driving Pattern B>
Driving pattern B means operating vehicle as per following:
All components and systems should be monitored at least once by the OBD system.

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

CONSULT-III Function

INFOID:0000000005353379

FUNCTION

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

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

- Diagnostic trouble codes
- 1st trip diagnostic trouble codes
- Freeze frame data

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

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			DIAGNOSTIC TEST MODE						
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor		×	×	×			
		Camshaft position sensor		×	×	×			
		Mass air flow sensor		×		×			
		Engine coolant temperature sensor		×	×	×	×		
		Engine oil temperature sensor		×		×			
		Air fuel ratio (A/F) sensor 1		×		×		×	×
		Heated oxygen sensor 2		×		×		×	×
		Vehicle speed signal		×	×	×			
		Accelerator pedal position sensor		×		×			
		Throttle position sensor		×	×	×			
		Fuel tank temperature sensor		×		×	×		
		EVAP control system pressure sensor		×		×			
		Intake air temperature sensor		×	×	×			
		Knock sensor		×					
		Refrigerant pressure sensor				×			
		Air conditioner switch				×			
		Park/neutral position (PNP) signal		×		×			
		Stop lamp switch		×		×			
		Power steering pressure sensor		×		×			
		Battery voltage				×			
		Load signal				×			
		Exhaust valve timing control position sensor		×		×			
		Fuel level sensor		×		×			
		Battery current sensor		×		×			
		ICC steering switch		×		×			
		ASCD steering switch		×		×			
		ICC brake switch		×		×			
		ASCD brake switch		×		×			
		Snow mode switch				×			

Item			DIAGNOSTIC TEST MODE						
			WORK SUPPORT	SELF-DIAGNOSTIC RESULTS		DATA MONITOR	ACTIVE TEST	DTC & SRT CONFIRMATION	
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Fuel injector				×	×		
		Power transistor (Ignition timing)				×	×		
		Throttle control motor relay		×		×			
		Throttle control motor		×					
		EVAP canister purge volume control solenoid valve		×		×	×		×
		FPCM		×		×	×		
		Air conditioner relay				×			
		Fuel pump relay	×			×	×		
		Fuel pump control module (FPCM)				×			
		Cooling fan relay		×		×	×		
		Air fuel ratio (A/F) sensor 1 heater		×		×		×*3	
		Heated oxygen sensor 2 heater		×		×		×*3	
		EVAP canister vent control valve	×	×		×	×		
		Intake valve timing control solenoid valve		×		×	×		
		Alternator				×	×		
		Exhaust valve timing control magnet retarder	×	×		×	×		
		Calculated load value			×	×			

×: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-III screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-121, "Diagnosis Description".

*3: Always “CMPLT” is displayed.

WORK SUPPORT MODE

Work Item

WORK ITEM	CONDITION	USAGE
FUEL PRESSURE RELEASE	• Fuel pump will stop by touching “START” during idling. Crank a few times after engine stalls.	When releasing fuel pressure from fuel line
IDLE AIR VOL LEARN	• The idle air volume that keeps the engine within the specified range is memorized in ECM.	When learning the idle air volume
SELF-LEARNING CONT	• The coefficient of self-learning control mixture ration returns to the original coefficient.	When clearing mixture ratio self-learning value

WORK ITEM	CONDITION	USAGE
EVAP SYSTEM CLOSE	Close the EVAP canister vent control valve in order to make EVAP system close under the following conditions. • Ignition switch ON • Engine not running • Ambient temperature is above 0°C (32°F). • No vacuum and no high pressure in EVAP system • Fuel tank temperature. 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-III will discontinue it and display appropriate instruction. **NOTE:** **When starting engine, CONSULT-III may display “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, even when using a charged battery.**	When detecting EVAP vapor leak in the EVAP system
VIN REGISTRATION	• In this mode, VIN is registered in ECM.	When registering VIN in ECM
EXH V/T CONTROL LEARN	• In this mode, operation to learn exhaust valve timing control magnet retarder characteristic.	When learning the exhaust valve timing control
TARGET IDLE RPM ADJ*	• Idle condition	When setting target idle speed
TARGET IGN TIM ADJ*	• Idle condition	When adjusting target ignition timing

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

SELF-DIAG RESULTS MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-667, "DTC Index".

Freeze Frame Data and 1st Trip Freeze Frame Data

Freeze frame data item*	Description
DTC	• The engine control component part/control system has a trouble code that is displayed as DTC. (Refer to EC-667, "DTC Index".)
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	
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.

Freeze frame data item*	Description
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

Monitored Item

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor and camshaft position sensor.	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated. • When engine is running, specification range is indicated in “SPEC”.
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 unifed meter and A/C amp. 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.	

Monitored item	Unit	Description	Remarks
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.
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.	
BRAKE SW	ON/OFF	• Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1 INJ PULSE-B2	msec	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.
IGN TIMING	BTDC	• Indicates the ignition timing computed by ECM according to the input signals.	• When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	• “Calculated load value” indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g·m/s	• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
INT/V TIM (B1) INT/V TIM (B2)	°CA	• Indicates [°CA] of intake camshaft advance angle.	
EXH/V TIM B1 EXH/V TIM B2	°CA	• Indicates [°CA] of exhaust camshaft retard angle.	

Monitored item	Unit	Description	Remarks
INT/V SOL (B1) INT/V SOL (B2)	%	• 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.	
VTC DTY EX B1 VTC DTY EX B2	%	• The control value of the exhaust valve timing control magnet retarder (determined by ECM according to the input signals) is indicated. • The retard angle becomes larger as the value increases.	
TP SEN 1-B2 TP SEN 2-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.
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.	
FPCM	HI/LOW	• The control condition of the fuel pump control module (FPCM) (determined by the ECM according to the input signals) is indicated.	
VENT CONT/V	ON/OFF	• The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open	
THRTL RELAY	ON/OFF	• Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
HO2S2 HTR (B1) HO2S2 HTR (B2)	ON/OFF	• Indicates [ON/OFF] condition of heated oxygen sensor 2 heater determined by ECM according to the input signals.	
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 the snow mode switch signal.	
ENG OIL TEMP	°C or °F	• The engine oil temperature (determined by the signal voltage of the engine oil temperature sensor) is displayed.	
TRVL AFTER MIL	km or mile	• Distance traveled while MIL is activated.	
A/F S1 HTR (B1) A/F S1 HTR (B2)	%	• 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.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	

Monitored item	Unit	Description	Remarks
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from unifed meter and A/C amp. is displayed.	
SET VHCL SPD	km/h or mph	• The preset vehicle speed is displayed.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	
RESUME/ACC SW	ON/OFF	• Indicates [ON/OFF] condition from RESUME/ACCELERATE switch signal.	
SET SW	ON/OFF	• Indicates [ON/OFF] condition from SET/COAST switch signal.	
BRAKE SW1	ON/OFF	• Indicates [ON/OFF] condition from ASCD brake switch signal.	
BRAKE SW2	ON/OFF	• Indicates [ON/OFF] condition of stop lamp switch signal.	
DIST SW	ON/OFF	• Indicates [ON/OFF] condition from DISTANCE switch signal.	
VHCL SPD CUT	NON/CUT	• Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low compared with the ASCD set speed, and ASCD operation is cut off.	
LO SPEED CUT	NON/CUT	• Indicates the vehicle cruise condition. NON: Vehicle speed is maintained at the ASCD set speed. CUT: Vehicle speed decreased to excessively low, and ASCD operation is cut off.	
AT OD MONITOR	ON/OFF	• Indicates [ON/OFF] condition of A/T O/D according to the input signal from the TCM.	
AT OD CANCEL	ON/OFF	• Indicates [ON/OFF] condition of A/T O/D cancel request signal.	
CRUISE LAMP	ON/OFF	• Indicates [ON/OFF] condition of CRUISE indicator determined by the ECM according to the input signals.	
SET LAMP	ON/OFF	• Indicates [ON/OFF] condition of SET indicator determined by the ECM according to the input signals.	
EXH V/T LEARN	YET/CMPLT	• Display the condition of Exhaust Valve Timing Control Learning YET: Exhaust Valve Timing Control Learning has not been performed yet. CMPLT: Exhaust Valve Timing Control Learning has already been performed successfully.	
BAT CUR SEN	mV	• The signal voltage of battery current sensor is displayed.	
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.	

Monitored item	Unit	Description	Remarks
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.”.	
ALT DUTY	%	• Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	
FPCM DR VOLT	V	• The voltage between fuel pump and FPCM is displayed	

NOTE:

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
FUEL INJECTION	• Engine: Return to the original non-standard condition • Change the amount of fuel injection using CONSULT-III.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Air fuel ratio (A/F) sensor 1
IGNITION TIMING	• Engine: Return to the original non-standard condition • Timing light: Set • Retard the ignition timing using CONSULT-III.	If malfunctioning symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.
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-III.	Engine runs rough or stops.	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil
ENG COOLANT TEMP	• Engine: Return to the original non-standard condition • Change the engine coolant temperature using CONSULT-III.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Engine coolant temperature sensor • Fuel injector
FUEL PUMP RELAY	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay ON and OFF using CONSULT-III and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connectors • Fuel pump relay
PURG VOL CONT/V	• Engine: After warming up, run engine at 1,500 rpm. • Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.	Engine speed changes according to the opening percent.	• Harness and connectors • Solenoid valve
FUEL/T TEMP SEN	• Change the fuel tank temperature using CONSULT-III.		

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
VENT CONTROL/V	• Ignition switch: ON (Engine stopped) • Turn solenoid valve ON and OFF with the CONSULT-III and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connectors • Solenoid valve
FPCM	• Engine: Returns to the original trouble condition • Select “LOW” and “HI” with CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • FPCM
INT V/T ASSIGN ANGLE	• Engine: Return to the original non-standard condition • Change intake valve timing using CONSULT-III.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve
EXH V/T ASSIGN ANGLE	• Engine: Return to the original non-standard condition • Change exhaust valve timing using CONSULT-III.	If malfunctioning symptom disappears, see CHECK ITEM.	• Harness and connectors • Exhaust valve timing control magnet retarder
FAN DUTY CONTROL*	• Ignition switch: ON • Change duty ratio using CONSULT-III.	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-III.	Battery voltage changes.	• Harness and connectors • IPDM E/R • Alternator

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

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to EC-121, "Diagnosis Description".

SRT WORK SUPPORT Mode

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

DTC WORK SUPPORT Mode

Test mode	Test item	Corresponding DTC No.	Reference page
EVAPORATIVE SYSTEM	EVP SML LEAK P0442/P1442*	P0442	EC-363
		P0455	EC-410
	EVP V/S LEAK P0456/P1456*	P0456	EC-416
	PURG VOL CN/V P1444	P0443	EC-369
	PURG FLOW P0441	P0441	EC-358
A/F SEN1	A/F SEN1 (B1) P1278/P1279	P0133	EC-256
	A/F SEN1 (B1) P1276	P0130	EC-237
	A/F SEN1 (B2) P1288/P1289	P0153	EC-256
	A/F SEN1 (B2) P1286	P0150	EC-237
HO2S2	HO2S2 (B1) P1146	P0138	EC-273
	HO2S2 (B1) P1147	P0137	EC-264
	HO2S2 (B1) P0139	P0139	EC-285
	HO2S2 (B2) P1166	P0158	EC-273
	HO2S2 (B2) P1167	P0157	EC-264
	HO2S2 (B2) P0159	P0159	EC-285

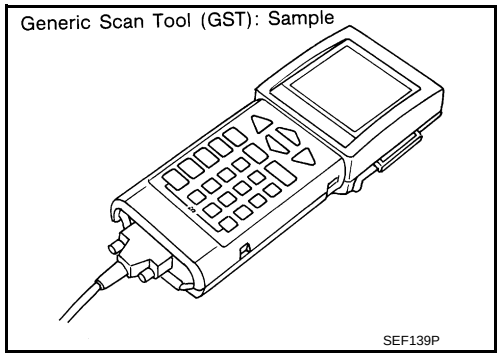
*: DTC P1442 and P1456 does not apply to S51 models but appears in DTC Work Support Mode screens.

Diagnosis Tool Function

INFOID:0000000005353380

DESCRIPTION

Generic Scan Tool (OBD II scan tool) complying with SAE J1978 has 8 different functions explained below.
ISO15765-4 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



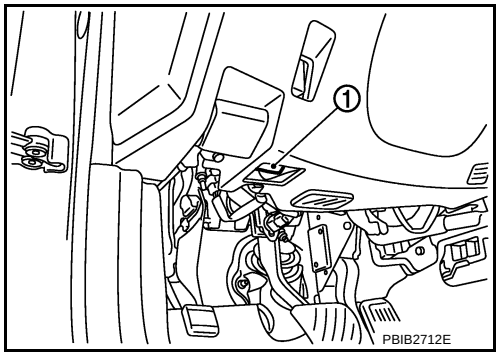
FUNCTION

Diagnostic Service		Function
Service $01	READINESS TESTS	This diagnostic service gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
Service $02	(FREEZE DATA)	This diagnostic service gains access to emission-related data value that were stored by ECM during the freeze frame. For details, refer to EC-667, "DTC Index".
Service $03	DTCs	This diagnostic service gains access to emission-related power train trouble codes which were stored by ECM.
Service $04	CLEAR DIAG INFO	This diagnostic service can clear all emission-related diagnostic information. This includes: • Clear number of diagnostic trouble codes (Service $01) • Clear diagnostic trouble codes (Service $03) • Clear trouble code for freeze frame data (Service $01) • Clear freeze frame data (Service $02) • Reset status of system monitoring test (Service $01) • Clear on board monitoring test results (Service $06 and $07)
Service $06	(ON BOARD TESTS)	This diagnostic service accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
Service $07	(ON BOARD TESTS)	This diagnostic service enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
Service $08	—	This diagnostic service can close EVAP system in ignition switch ON position (Engine stopped). When this diagnostic service is performed, EVAP canister vent control valve can be closed. In the following conditions, this diagnostic service cannot function. • Low ambient temperature • Low battery voltage • Engine running • Ignition switch OFF • Low fuel temperature • Too much pressure is applied to EVAP system
Service $09	(CALIBRATION ID)	This diagnostic service enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

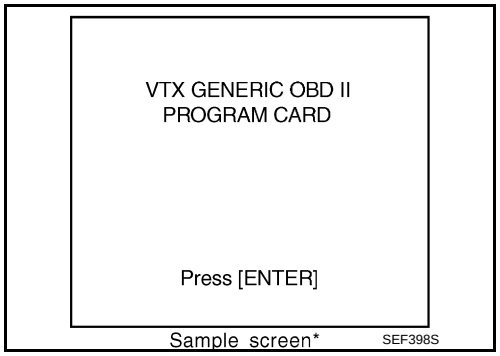
INSPECTION PROCEDURE

1. Turn ignition switch OFF.

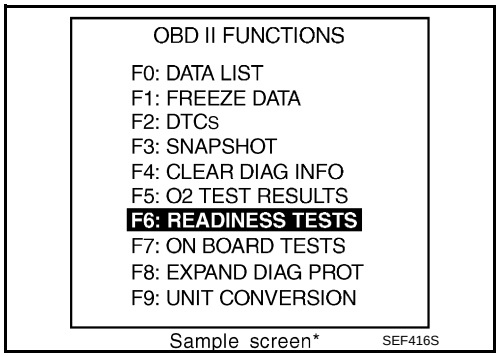
2. Connect “GST” to data link connector (1), which is located under LH dash panel near the hood opener handle.



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



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



COMPONENT DIAGNOSIS

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000005353381

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” in “DATA MONITOR” mode of CONSULT-III 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:0000000005353382

1. PRECONDITIONING

Check that all of the following conditions are satisfied.
TESTING CONDITION
- Vehicle driven distance: More than 5,000 km (3,107 miles)
- Barometric pressure: 98.3 - 104.3 kPa (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 SE 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-III
NOTE:
Perform “SPEC” in “DATA MONITOR” mode in maximum scale display.
1. Perform EC-22, "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-III.
3. Check that monitor items are within the SP value.

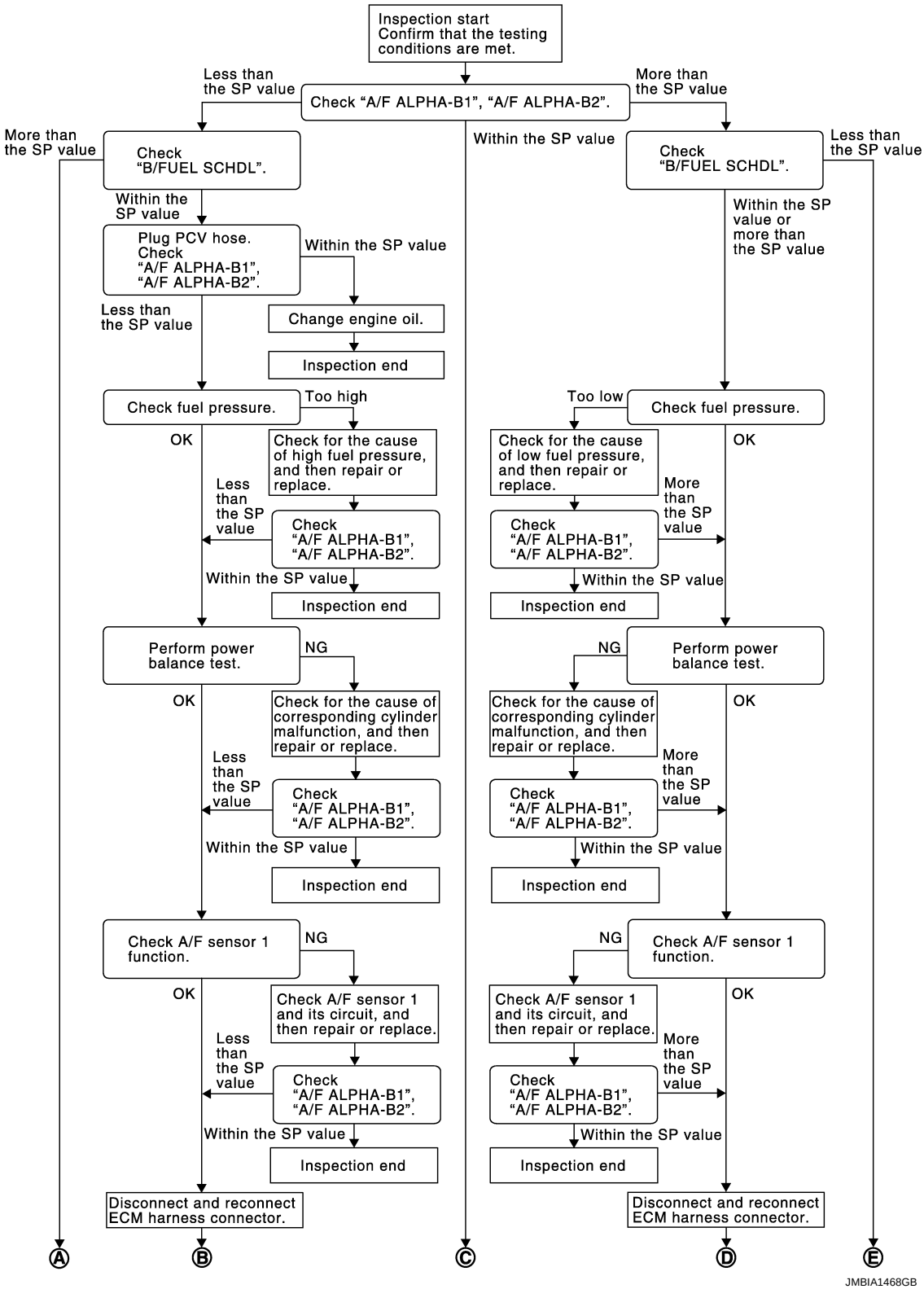
Is the measurement value within the SP value?

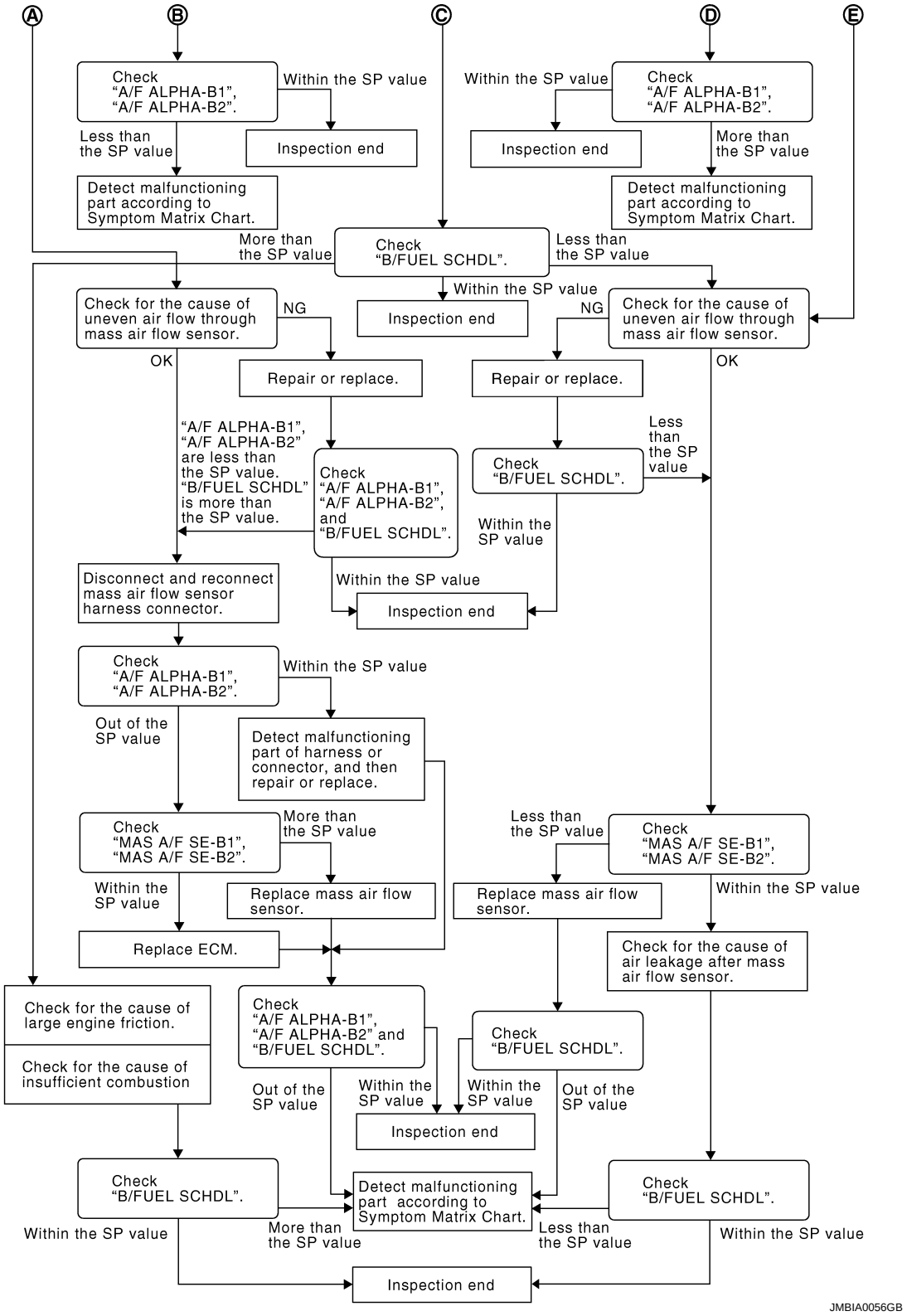
YES >> INSPECTION END
NO >> Go to EC-147, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353383

OVERALL SEQUENCE





DETAILED PROCEDURE

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

With CONSULT-III

1. Start engine.
2. Confirm that the testing conditions are met. Refer to EC-146, "Component Function Check".
3. Select "A/F ALPHA-B1", "A/F ALPHA-B2" in "SPEC" of "DATA MONITOR" mode, and check that each indication is within the SP value.

NOTE:
Check “A/F ALPHA-B1”, “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 check that the indication is within the SP value.

Is the measurement value within the SP value?

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

3. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> GO TO 6.
NO-1 >> More than the SP value: GO TO 6.
NO-2 >> Less than the SP value: GO TO 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 check that each indication is within the SP value.

Is the measurement value within the SP value?

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

5. CHANGE ENGINE OIL

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

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

>> INSPECTION END

6. CHECK FUEL PRESSURE

Check fuel pressure. (Refer to EC-692, "Inspection".)

Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

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

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

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

Is the measurement value within the SP value?

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

9. 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 below.
- Ignition coil and its circuit (Refer to EC-617, "Component Function Check".)
- Fuel injector and its circuit (Refer to EC-598, "Component Function Check".)
- Intake air leakage
- Low compression pressure (Refer to EM-96, "On-Vehicle Service".)

Is the inspection result normal?

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

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

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

Is the measurement value within the SP value?

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

12. CHECK A/F SENSOR 1 FUNCTION

Perform all DTC CONFIRMATION PROCEDURE related with A/F sensor 1.
- For DTC P0130, P0150, refer to EC-237, "DTC Logic".
- For DTC P0131, P0151, refer to EC-244, "DTC Logic".
- For DTC P0132, P0152, refer to EC-250, "DTC Logic".
- For DTC P0133, P0153, refer to EC-256, "DTC Logic".
- For DTC P2A00, P2A03, refer to EC-575, "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 check 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 check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-680, "Symptom Table".

17. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO-1 >> More than the SP value: GO TO 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 check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> “B/FUEL SCHDL” is more, “A/F ALPHA-B1”, “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 check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-208, "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 check 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, and then GO TO 29.

24. REPLACE ECM

1. Replace ECM.
2. Go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> GO TO 29.

25. CHECK INTAKE SYSTEM

Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal 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 check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Less than the SP value: GO TO 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 check that the indication is within the SP value.

Is the measurement value within the SP value?

YES >> GO TO 28.
NO >> Less than the SP value: Replace malfunctioning mass air flow sensor, and then GO TO 30.

28. CHECK INTAKE SYSTEM

Check for the cause of air leak after the mass air flow sensor. Refer to the following.
- Disconnection, looseness, and cracks in air duct
- Looseness of oil filler cap
- Disconnection of oil level gauge
- Open stuck, breakage, hose disconnection, or cracks 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 check that each indication is within the SP value.

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-680, "Symptom Table".

30. CHECK “B/FUEL SCHDL”

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

Is the measurement value within the SP value?

YES >> INSPECTION END
NO >> Detect malfunctioning part according to EC-680, "Symptom Table".

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description

INFOID:0000000005353384

Intermittent incidents may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of intermittent incidents occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common Intermittent Incidents Report Situations

STEP in Work Flow	Situation
2	The CONSULT-III is used. The SELF-DIAG RESULTS screen shows time data other than [0] or [1t].
3 or 4	The symptom described by the customer does not recur.
5	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
10	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnosis Procedure

INFOID:0000000005353385

1.INSPECTION START

Erase (1st trip) DTCs. Refer to EC-667, "DTC Index".

>> GO TO 2.

2.CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

3.SEARCH FOR ELECTRICAL INCIDENT

Perform GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident", “INCIDENT SIMULATION TESTS”.

Is the inspection result normal?

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

4.CHECK CONNECTOR TERMINALS

Refer to GI-23, "How to Check Terminal", “HOW TO PROBE CONNECTORS”, “How to Check Enlarged Contact Spring of Terminal”.

Is the inspection result normal?

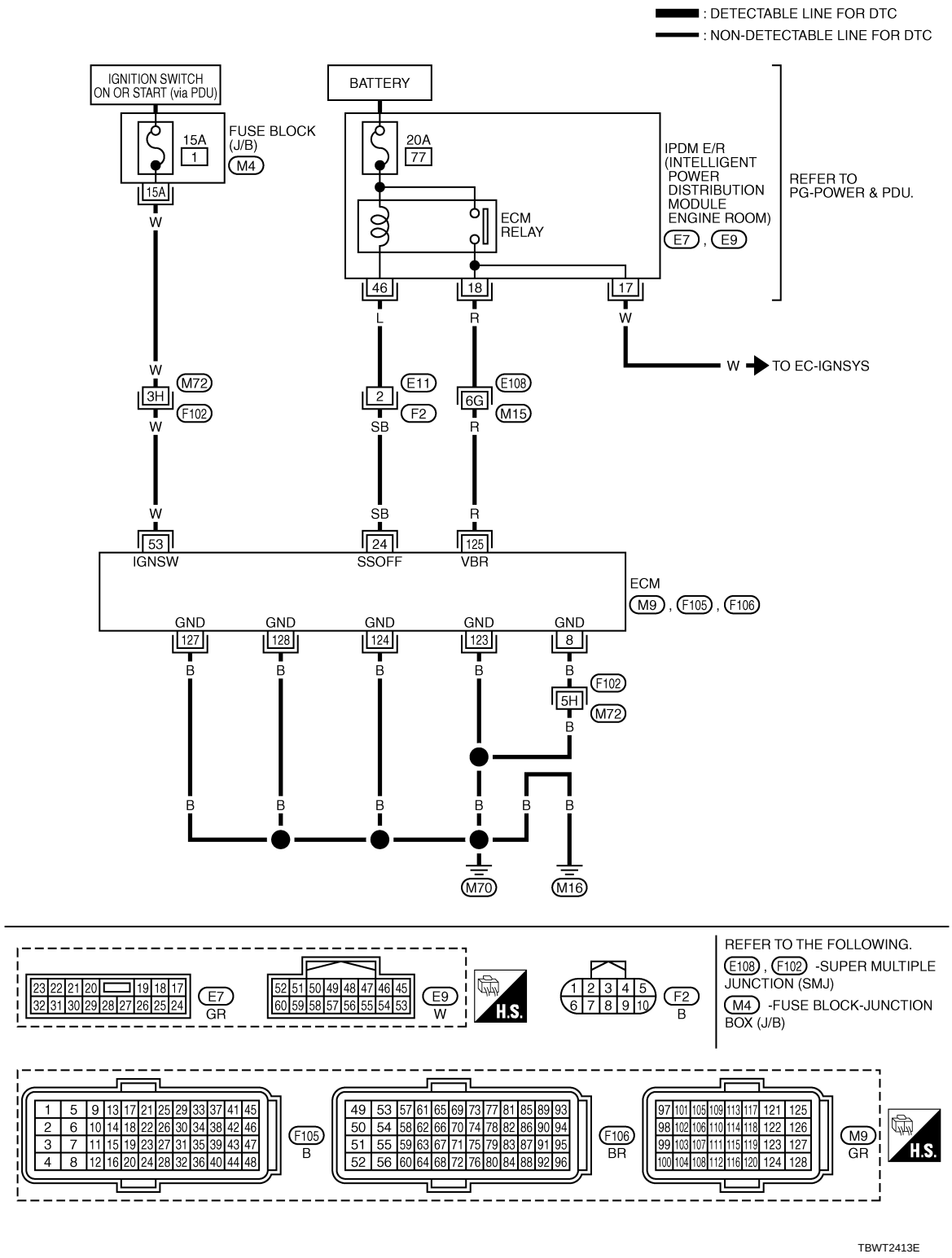
YES >> **INSPECTION END**
NO >> Repair or replace connector.

POWER SUPPLY AND GROUND CIRCUIT

Wiring Diagram

INFOID:0000000005353386

EC-MAIN-01



TBWT2413E

Diagnosis Procedure

INFOID:0000000005353387

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.

2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK ECM GROUND CIRCUIT FOR OPEN AND SHORT

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

ECM		Ground	Continuity
Connector	Terminal		
F105	8	Ground	Existed
M9	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.

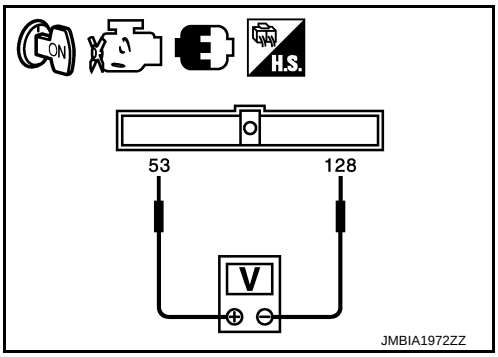
3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F102, M72
- 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	
F106	53	M9	128	Battery voltage

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

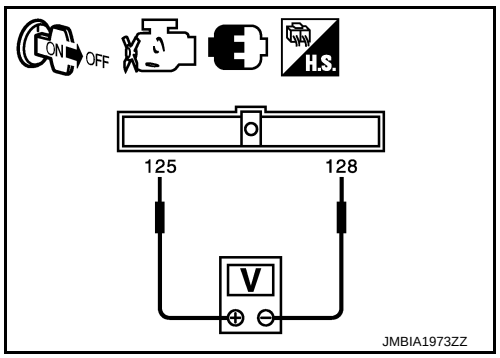
Check the following.
- Harness connectors M72, F102
- Fuse block (J/B) connector M4
- 15 A fuse (No. 1)
- Harness for open or short between ECM and fuse

>> 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 per the following.



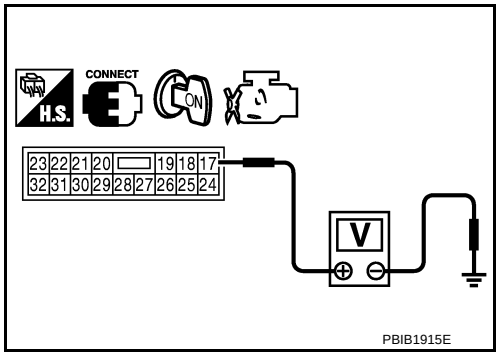
ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
M9	125	128	After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop to approximately 0 V.

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	17	Ground	Battery voltage

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace IPDM E/R.

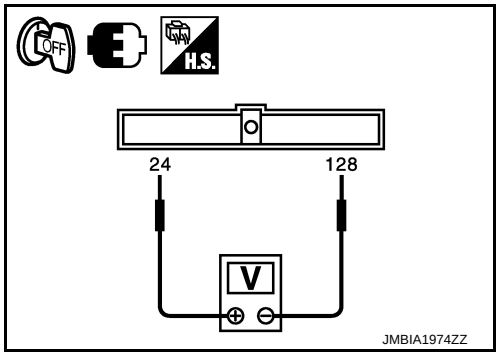
8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> 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 per the following.



ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F105	24	M9	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	
F105	24	E9	46	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 E11, F2
- 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 20 A FUSE

1. Disconnect 20 A fuse (No. 77) from IPDM E/R.
2. Check 20 A fuse.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace 20 A fuse.

13. 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	
M9	125	E7	18	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 connectors E108, M15
- 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 EC-154, "Description".

Is the inspection result normal?

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

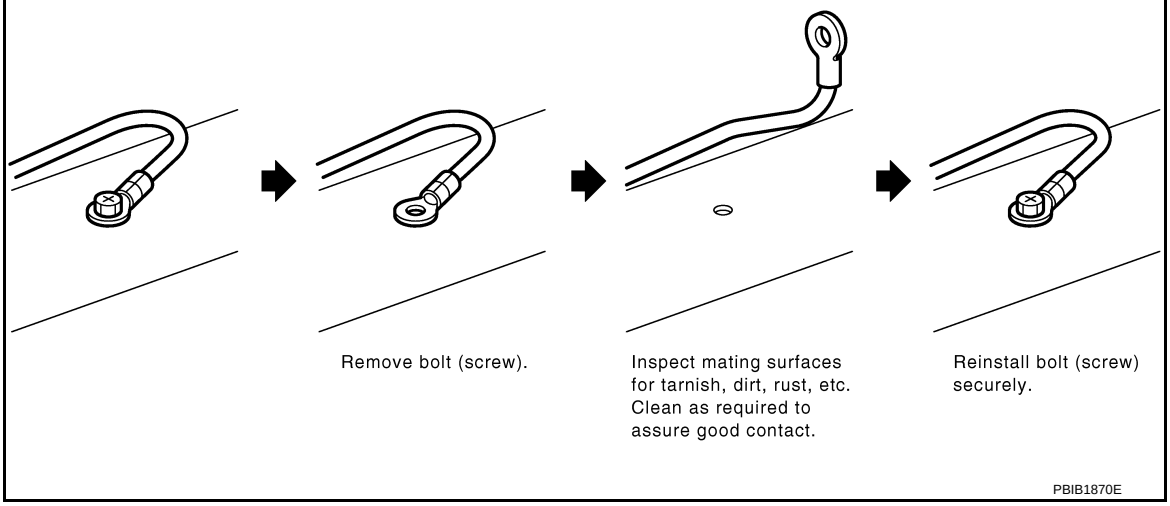
Ground Inspection

INFOID:0000000005353388

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.
Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.
When inspecting a ground connection follow these rules:
- Remove the ground bolt or screw.
- Inspect all mating surfaces for tarnish, dirt, rust, etc.
- Clean as required to assure good contact.
- Reinstall bolt or screw securely.

- Inspect for “add-on” accessories which may be interfering with the ground circuit.
- If several wires are crimped into one ground eyelet terminal, check for proper crimps. Make sure all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet make sure no ground wires have excess wire insulation.

Ground Inspection



U0101 CAN COMM CIRCUIT

Description

INFOID:0000000005353389

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:0000000005353390

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 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.

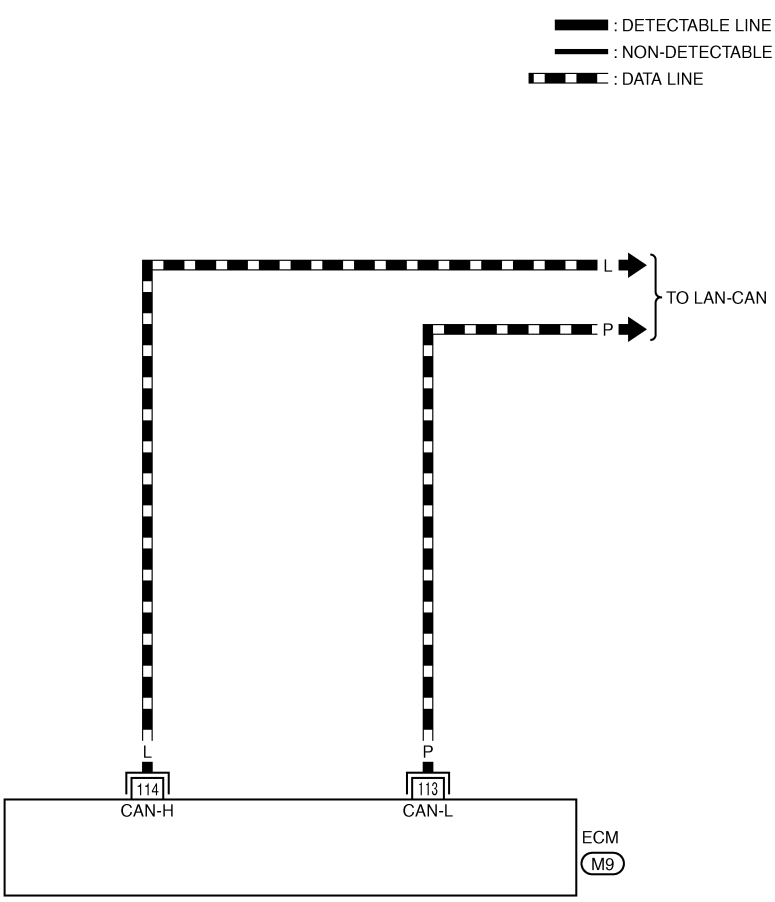
Is DTC detected?

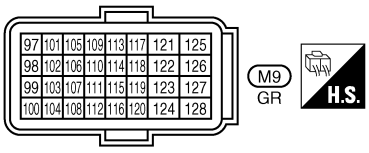
YES >> EC-161, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353391

EC-CAN-01





TBWT2414E

Diagnosis Procedure

INFOID:0000000005353392

Go to LAN-29, "CAN System Specification Chart".

U0164 CAN COMM CIRCUIT

Description

INFOID:0000000005353393

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:0000000005353394

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0164	Lost communication with Unified meter and A/C amp.	When ECM is not transmitting or receiving CAN communication signal of OBD (emission-related diagnosis) with Unified meter and A/C amp. for 2 seconds or more.	• CAN communication line between Unified meter and A/C amp. and ECM • CAN communication line 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.

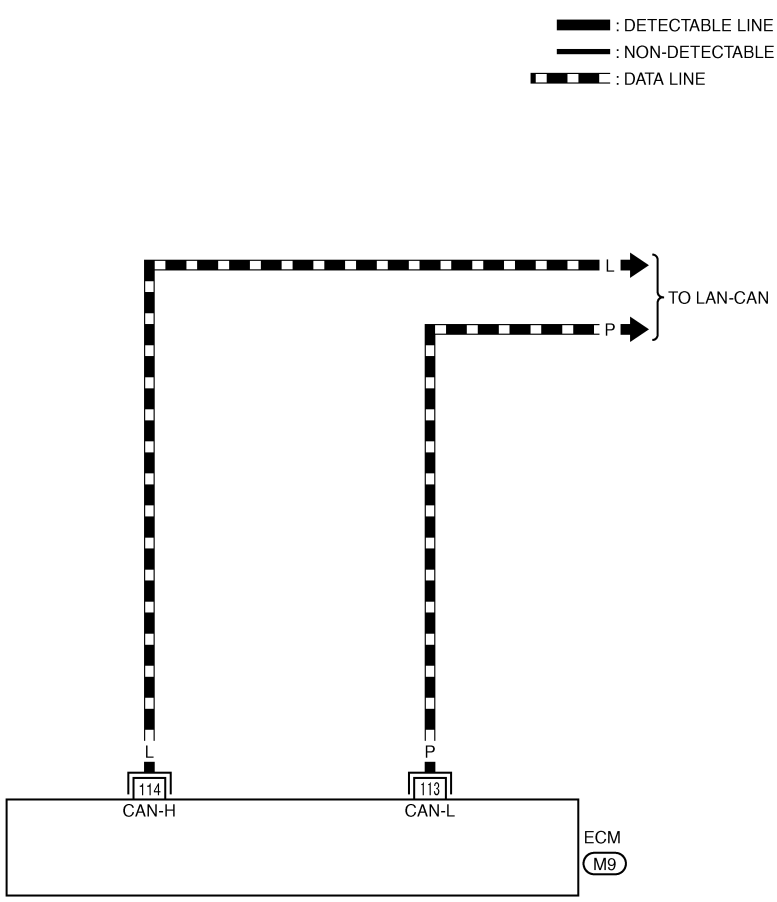
Is DTC detected?

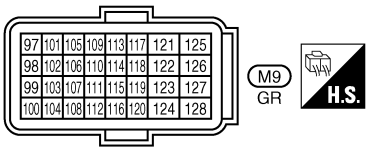
YES >> EC-163, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353395

EC-CAN-01





TBWT2414E

Diagnosis Procedure

INFOID:0000000005353396

Go to LAN-29, "CAN System Specification Chart".

U1001 CAN COMM CIRCUIT

Description

INFOID:0000000005353397

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:0000000005353398

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 1st trip DTC.

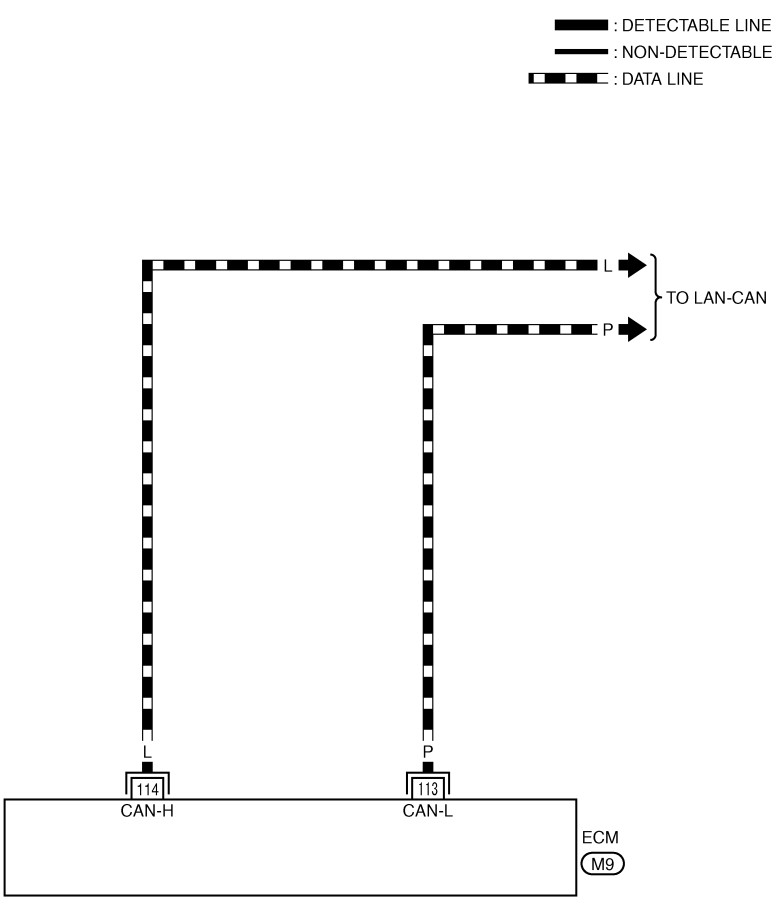
Is 1st trip DTC detected?

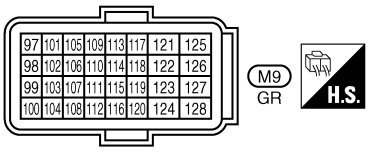
YES >> EC-165, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353399

EC-CAN-01





TBWT2414E

Diagnosis Procedure

INFOID:0000000005353400

Go to LAN-29, "CAN System Specification Chart".

P0011, P0021 IVT CONTROL

DTC Logic

INFOID:0000000005353401

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".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0011	Intake valve timing (IVT) control performance (bank 1)	There is a gap between angle of target and phase-control angle degree.	• Crankshaft position sensor • Camshaft position sensor • IVT 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 (IVT) 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

With CONSULT-III

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

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

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

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-167, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

1. Select “DATA MONITOR” mode with CONSULT-III.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 3,175 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:
Always drive vehicle at a safe speed.

3. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-167, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

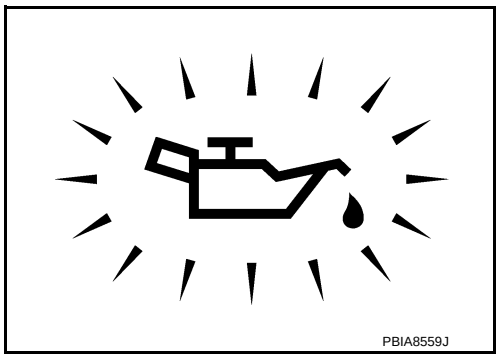
INFOID:0000000005353402

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-5, "Inspection".
NO >> GO TO 2.


PBIA8559J

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-168, "Component Inspection".

Is the inspection result normal?

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

3. CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-345, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Replace crankshaft position sensor.

4. CHECK CAMSHAFT POSITION SENSOR

Refer to EC-352, "Component Inspection".

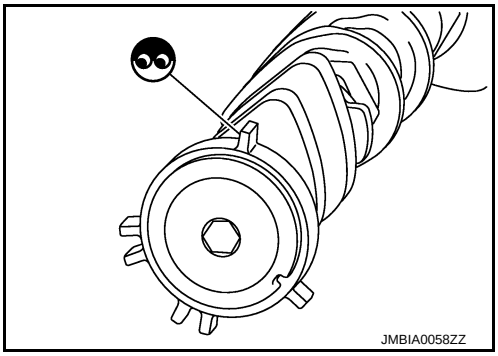
Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning camshaft position sensor.

5. CHECK CAMSHAFT (INTAKE)

Check the following.

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



Is the inspection result normal?

YES >> GO TO 6.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.

6. CHECK TIMING CHAIN INSTALLATION

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

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

YES >> Check timing chain installation. Refer to EM-60, "Removal and Installation".
NO >> GO TO 7.

7. CHECK LUBRICATION CIRCUIT

Perform “Inspection of Camshaft Sprocket (INT) Oil Groove”. Refer to EM-79, "Removal and Installation".

Is the inspection result normal?

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

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

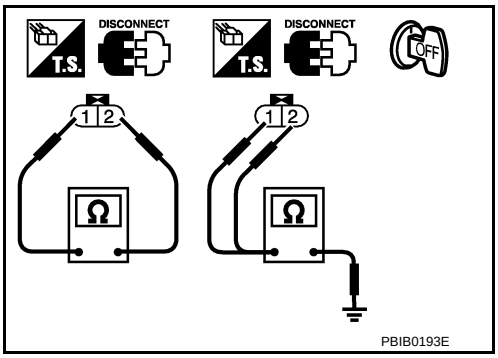
>> INSPECTION END

Component Inspection

INFOID:0000000005353403

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

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



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

Is the inspection result normal?

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

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

1. Remove intake valve timing control solenoid valve.

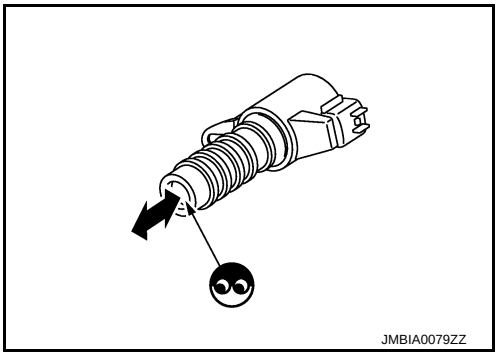
2. Apply 12 V between intake valve timing control solenoid valve terminals 1 and 2, and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:

Never apply 12 V 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.

P0014, P0024 EVT CONTROL

DTC Logic

INFOID:0000000005353404

DTC DETECTION LOGIC

NOTE:

- **If DTC P0014 or P0024 is displayed with DTC P0078, P0084 first perform trouble diagnosis for DTC P0078, P0084. Refer to EC-190, "DTC Logic".**
- **If DTC P0014 or P0024 is displayed with DTC P1078, P1084 first perform trouble diagnosis for DTC P1078, P1084. Refer to EC-453, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0014	Exhaust valve timing (EVT) control performance (bank 1)	There is a gap between angle of target and phase-control angle degree.	• Crankshaft position sensor • Camshaft position sensor • EVT control position sensor • EVT control magnet retarder • Accumulation of debris to the signal pick-up portion of the camshaft • Timing chain installation • EVT control pulley assembly
P0024	Exhaust valve timing (EVT) 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

With CONSULT-III

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

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

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

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-171, "Diagnosis Procedure"
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

1. Select “DATA MONITOR” mode with CONSULT-III.
2. Maintain the following conditions for at least 20 consecutive seconds.

ENG SPEED	1,700 - 2,950 rpm (A constant rotation is maintained.)
COOLAN TEMP/S	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

CAUTION:
Always drive vehicle at a safe speed.

3. Check 1st trip DTC.

With GST
Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

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

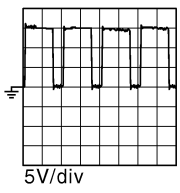
Diagnosis Procedure

INFOID:0000000005353405

1. CHECK FUNCTION OF EXHAUST VALVE TIMING (EVT) CONTROL

With CONSULT-III
1. Turn ignition switch ON.
2. Select “EXH V/T ASSIGN ANGLE” in “ACTIVE TEST” mode with CONSULT-III.
3. Start engine and keep the engine speed at 2,500 rpm, then touch “START”.
4. Check that the values of “EXH/V TIM B1” and “EXH/V TIM B2” change when touching “UP” or “DOWN”.

Without CONSULT-III
1. Start engine and rev engine up above 1,500 rpm.
2. Read the voltage signal between ECM harness connector terminals as per the following with an oscilloscope.

ECM				Voltage signal
+		–		
Connector	Terminal	Connector	Terminal	
F105	6 [EVT control magnet retarder (bank 1) signal]	M9	128	 JMBIA0034GB
	7 [EVT control magnet retarder (bank 2) signal]			

Is the inspection result normal?

YES >> GO TO 10.
NO >> GO TO 2.

2. CHECK EVT CONTROL MAGNET RETARDER

Refer to EC-172, "Component Inspection".

Is the inspection result normal?

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

3. REPLACE EVT CONTROL MAGNET RETARDER

1. Replace malfunctioning EVT control magnet retarder.
2. Perform EC-29, "EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement".

>> INSPECTION END

4.CHECK EVT CONTROL POSITION SENSOR

Refer to EC-459, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning EVT control position sensor.

5.CHECK CRANKSHAFT POSITION SENSOR

Refer to EC-345, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace crankshaft position sensor.

6.CHECK CAMSHAFT POSITION SENSOR

Refer to EC-352, "Component Inspection".

Is the inspection result normal?

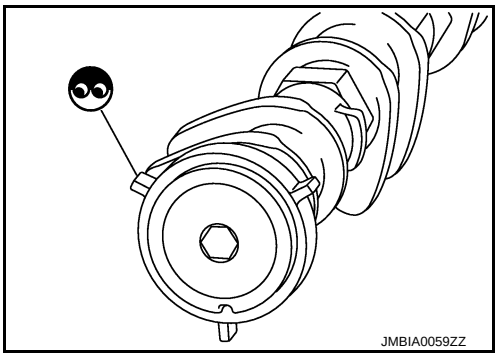
YES >> GO TO 7.
NO >> Replace malfunctioning camshaft position sensor.

7.CHECK CAMSHAFT (EXH)

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



8.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-60, "Removal and Installation".
NO >> GO TO 9.

9.REPLACE EVT CONTROL PULLEY ASSEMBLY

1. Replace exhaust valve timing control pulley assembly and EVT control magnet retarder. Refer to EM-49, "Removal and Installation" and EM-79, "Removal and Installation".
2. Perform EC-29, "EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement".

>> INSPECTION END

10.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

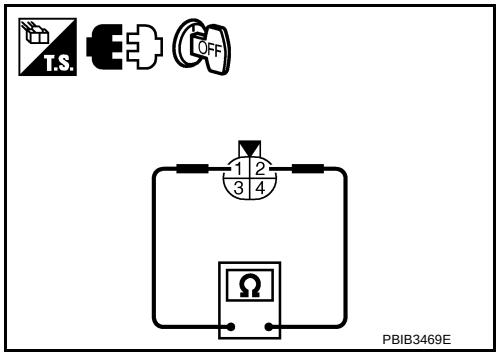
INFOID:0000000005353406

1.CHECK EXHAUST VALVE TIMING CONTROL MAGNET RETARDER

1. Turn ignition switch OFF.
2. Disconnect exhaust valve timing control magnet retarder harness connector.

3. Check resistance between exhaust valve timing control magnet retarder terminals as per the following.

Terminals	Resistance
1 and 2	9.0 - 11.0 Ω [at 20°C (68°F)]



Is the inspection result normal?

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

2. REPLACE EXHAUST VALVE TIMING CONTROL MAGNET RETARDER

1. Replace malfunctioning exhaust valve timing control magnet retarder.
2. Perform EC-29, "EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement".

>> INSPECTION END

P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

Description

INFOID:0000000005353407

SYSTEM DESCRIPTION

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

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

DTC Logic

INFOID:0000000005353408

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.

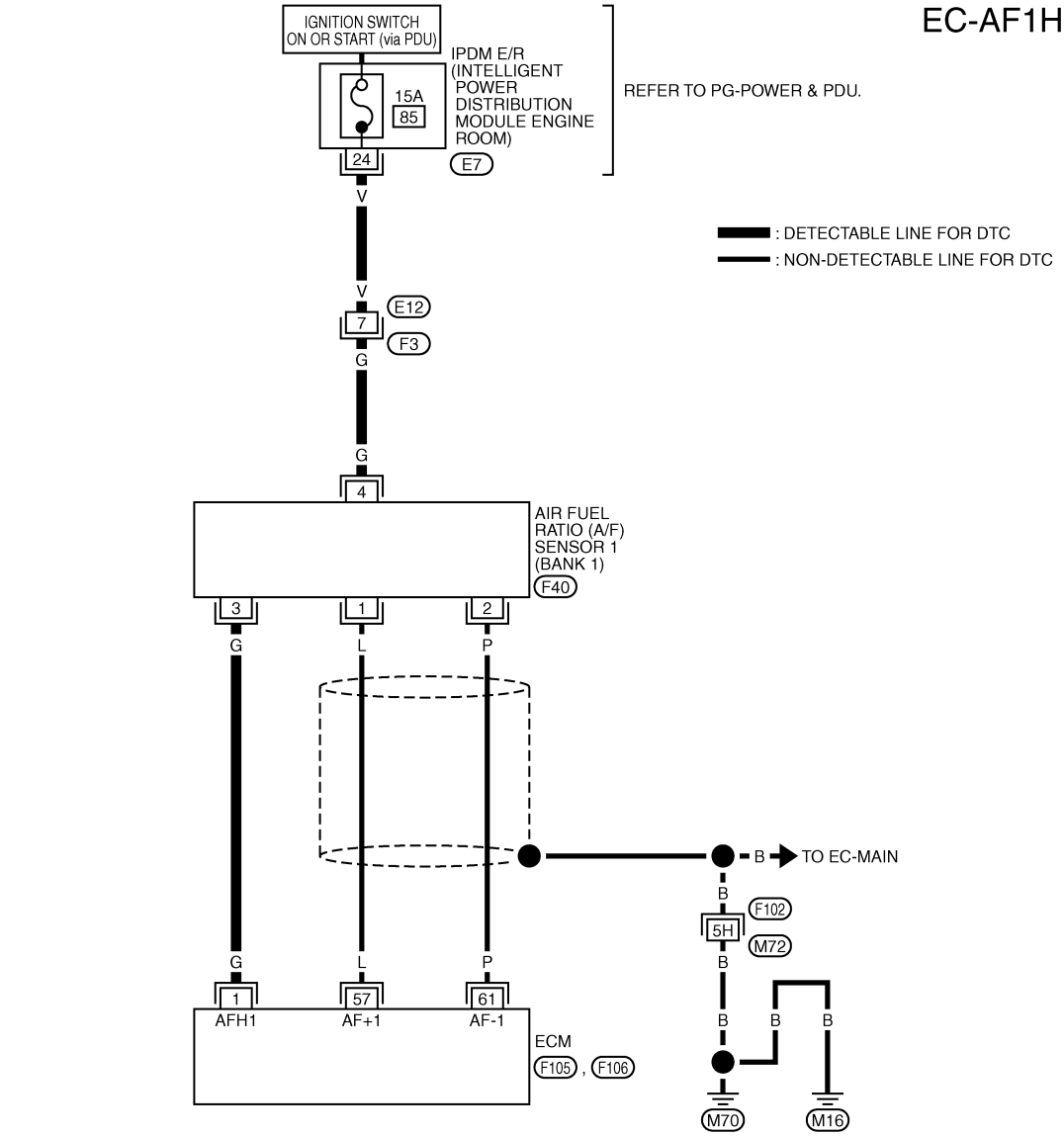
Is 1st trip DTC detected?

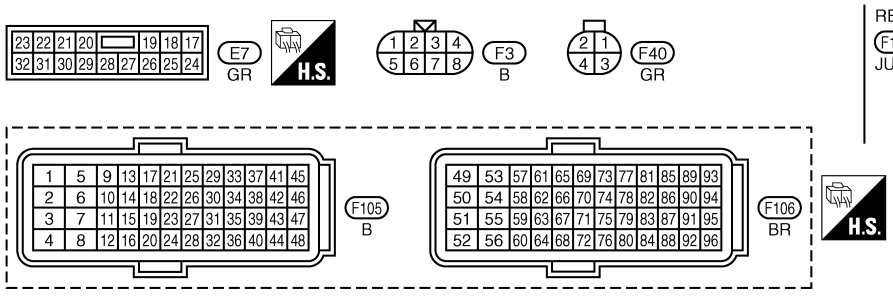
YES >> Go to EC-176, "Diagnosis Procedure".
NG >> INSPECTION END

Wiring Diagram

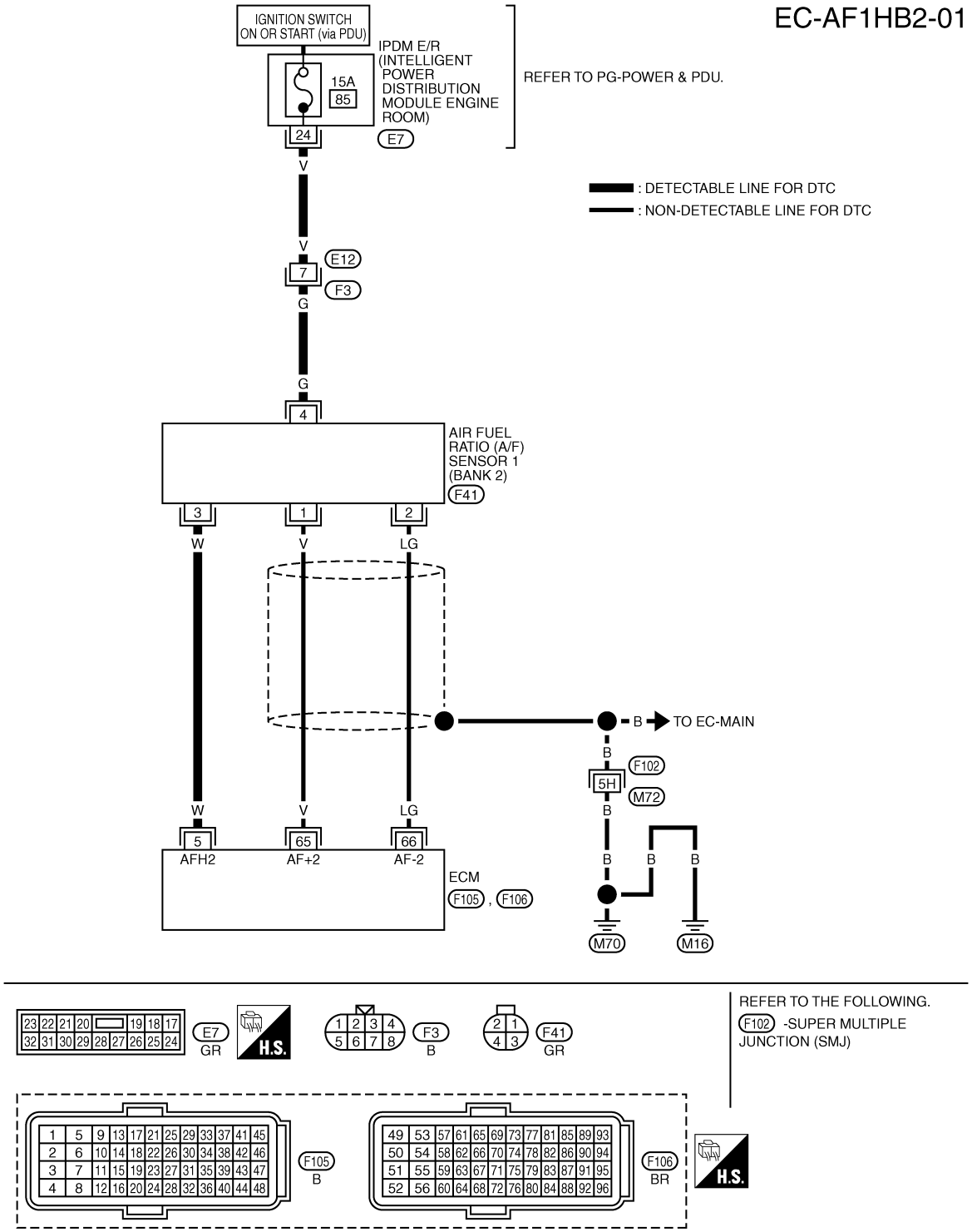
INFOID:0000000005353409

EC-AF1HB1-01





TBWT2415E



TBWT2416E

Diagnosis Procedure

INFOID:0000000005353410

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

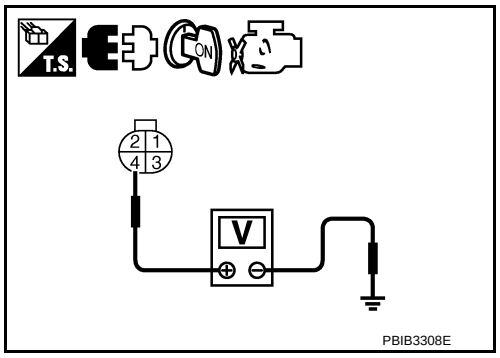
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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		
P0031, P0032	1	F40	4	Ground	Battery voltage
P0051, P0052	2	F41	4		

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- 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	F40	3	F105	1	Existed
P0051, P0052	2	F41	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-178, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1.

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 EC-154, "Description".

>> Repair or replace malfunctioning part.

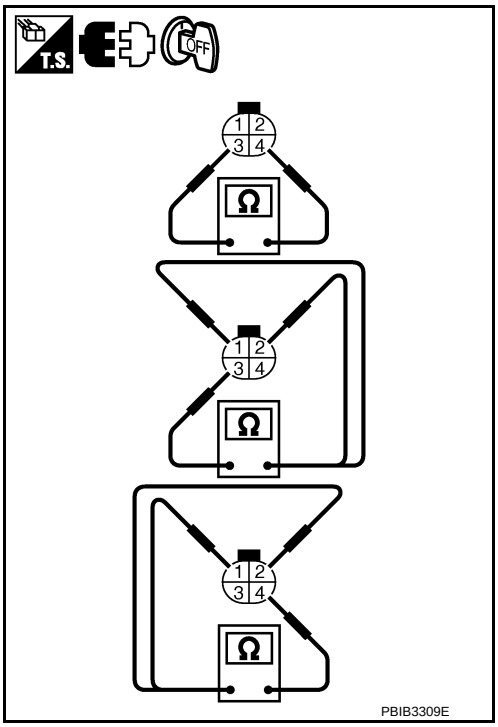
Component Inspection

INFOID:0000000005353411

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 per the following.

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



Is the inspection result normal?

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

2.REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1.

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:0000000005353412

SYSTEM DESCRIPTION

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

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

OPERATION

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

DTC Logic

INFOID:0000000005353413

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.

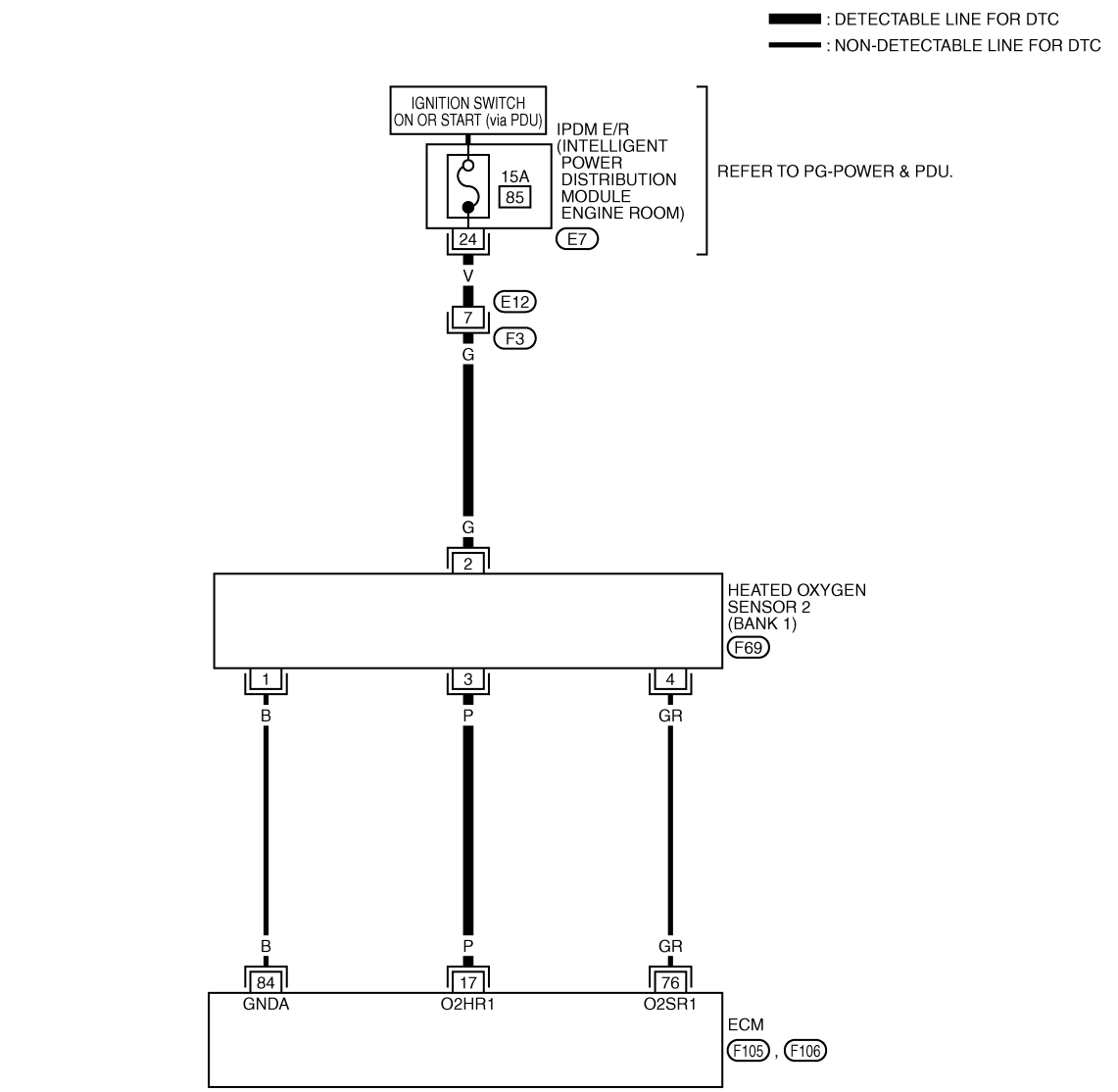
Is 1st trip DTC detected?

YES >> Go to EC-182, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

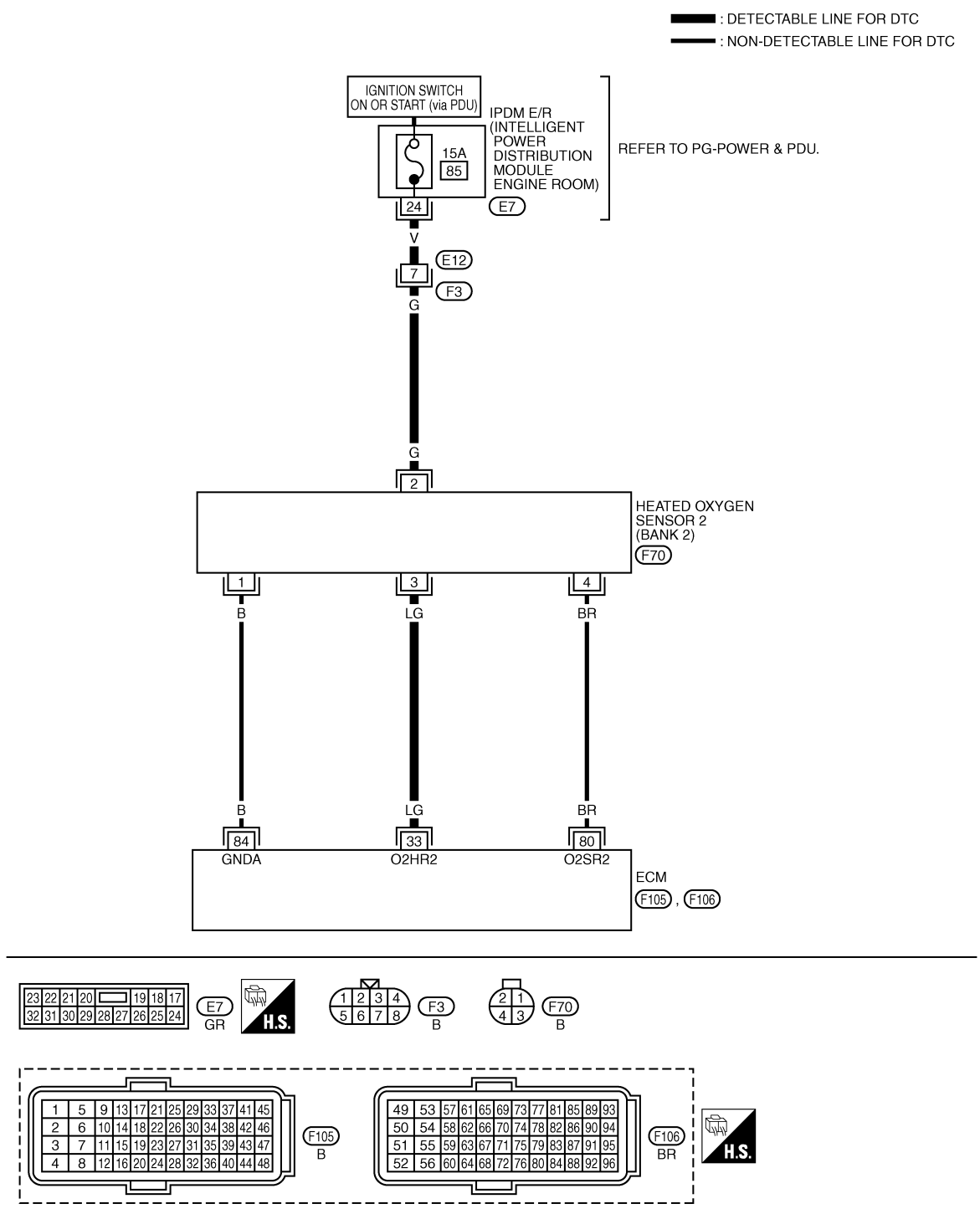
INFOID:0000000005353414

EC-O2H2B1-01



TBWT2417E

EC-O2H2B2-01



TBWT2418E

Diagnosis Procedure

INFOID:0000000005353415

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

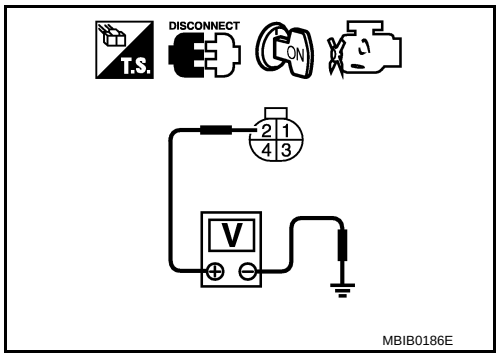
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

2. CHECK HEATED OXYGEN SENSOR 2 (HO2S2) POWER SUPPLY CIRCUIT

1. Disconnect 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	F69	2	Ground	Battery voltage
P0057, P0058	2	F70	2		

Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- Harness for open or short between HO2S2 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	F69	3	F105	17	Existed
P0057, P0058	2	F70	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.

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

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

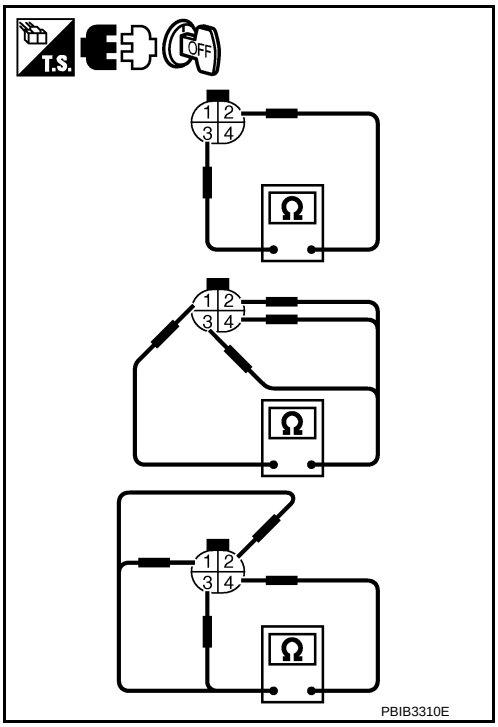
Component Inspection

INFOID:0000000005353416

1.CHECK HEATED OXYGEN SENSOR 2 (HO2S2) HEATER

1. Turn ignition switch OFF.
2. Disconnect HO2S2 harness connector.
3. Check resistance between HO2S2 terminals as per the following.

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



Is the inspection result normal?

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

2.REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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).**

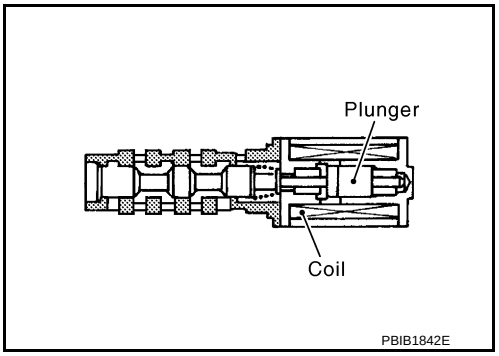
>> INSPECTION END

P0075, P0081 IVT CONTROL SOLENOID VALVE

Description

INFOID:0000000005353417

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 timing.
The shorter pulse width retards valve timing.
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:0000000005353418

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.

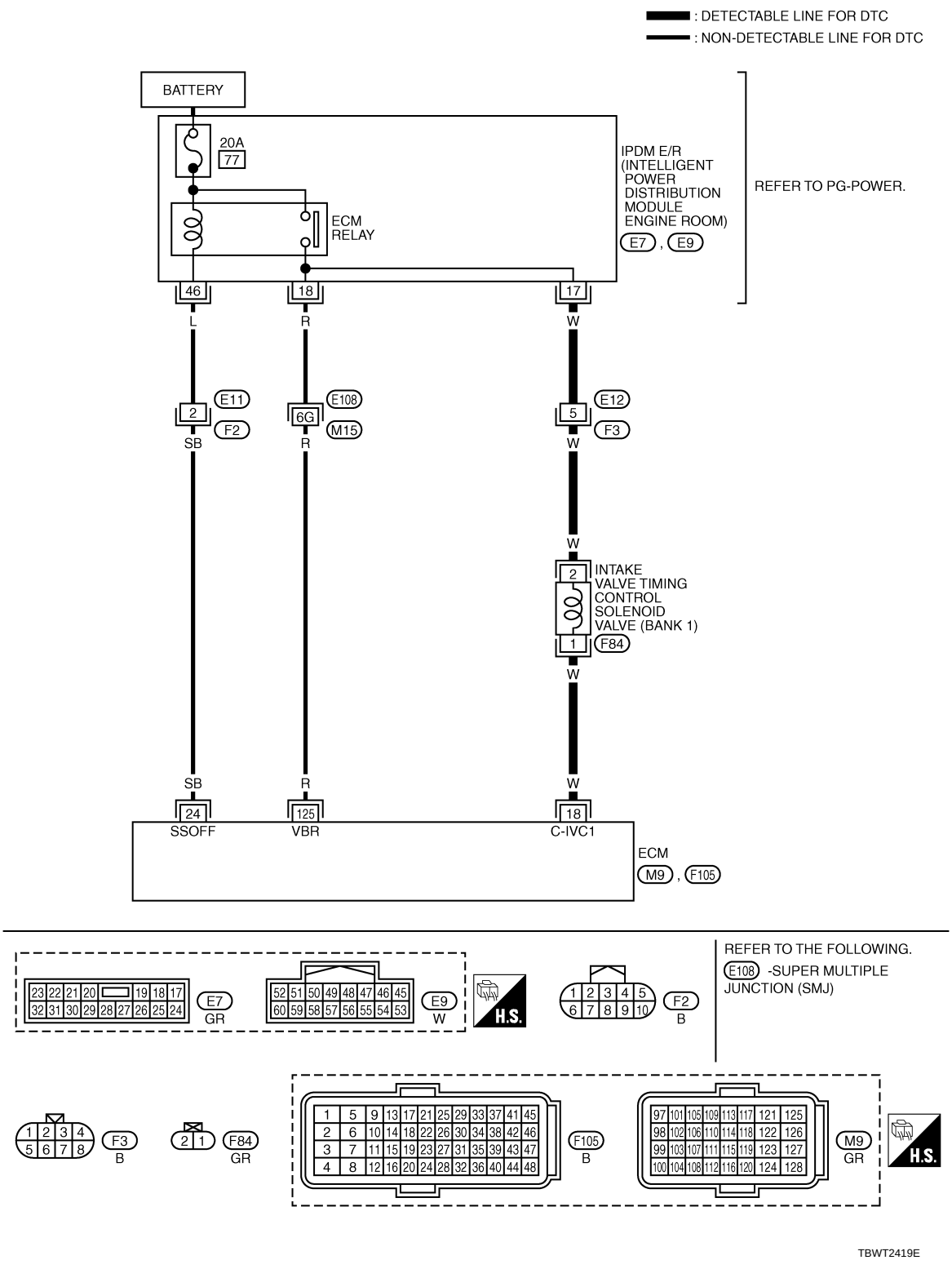
Is 1st trip DTC detected?

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

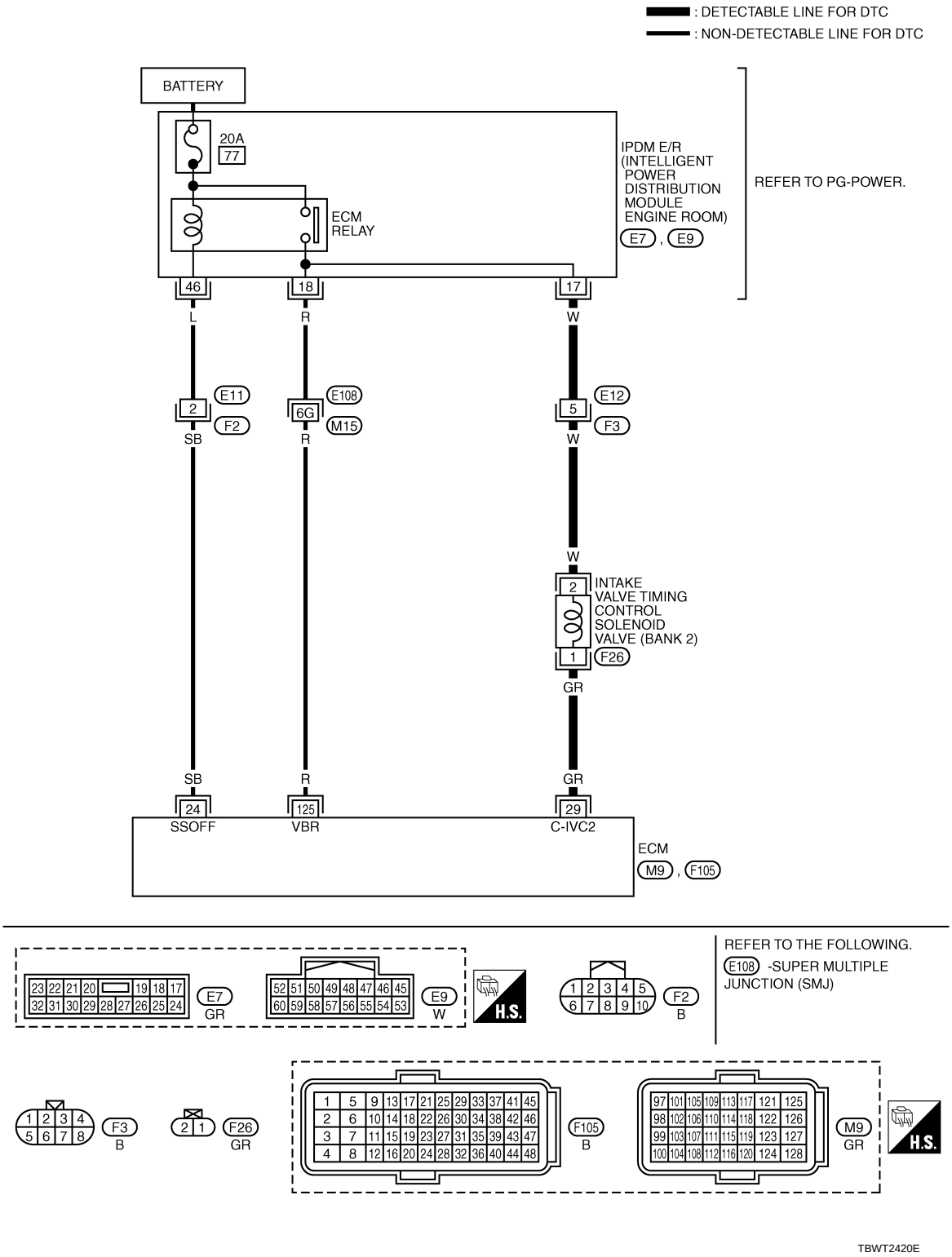
Wiring Diagram

INFOID:0000000005353419

EC-IVCB1-01



EC-IVCB2-01



TBWT2420E

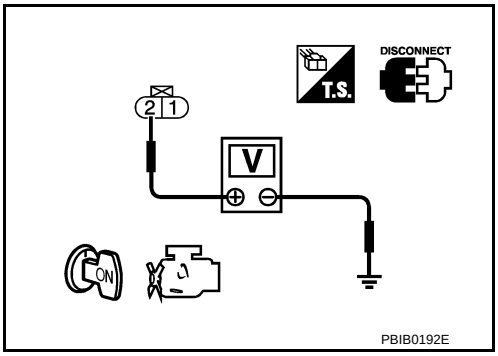
Diagnosis Procedure

INFOID:0000000005353420

1. CHECK INTAKE VALVE TIMING (IVT) CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect IVT control solenoid valve harness connector.
3. Turn ignition switch ON.

4. Check the voltage between IVT control solenoid valve harness connector and ground.



DTC	IVT control solenoid valve			Ground	Voltage
	Bank	Connector	Terminal		
P0075	1	F84	2	Ground	Battery voltage
P0081	2	F26	2		

Is the inspection result normal?

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

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- Harness for open or short between IVT control solenoid valve and IPDM E/R

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

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

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

DTC	IVT control solenoid valve			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0075	1	F84	1	F105	18	Existed
P0081	2	F26	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 IVT CONTROL SOLENOID VALVE

Refer to EC-188, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning IVT control solenoid valve.

5. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

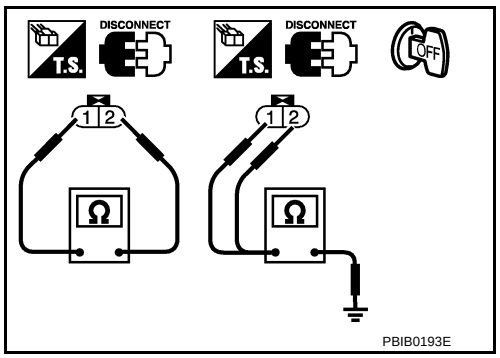
Component Inspection

INFOID:0000000005353421

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-I

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.

3. Check resistance between intake valve timing control solenoid valve terminals as per the following.



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

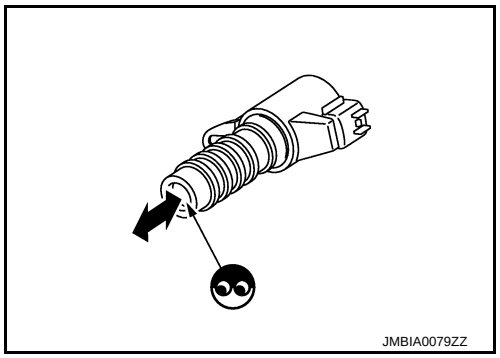
Is the inspection result normal?

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

2. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE-II

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

CAUTION:
Never apply 12 V 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?

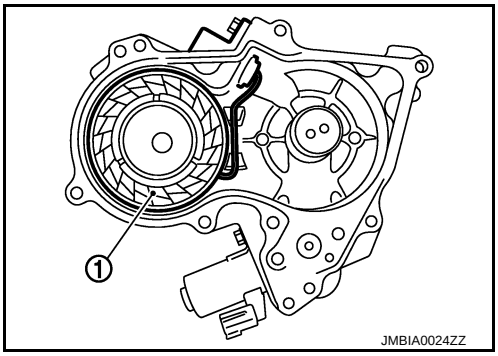
YES >> INSPECTION END
NO >> Replace malfunctioning intake valve timing control solenoid valve.

P0078, P0084 EVT CONTROL MAGNET RETARDER

Description

INFOID:0000000005353422

Exhaust valve timing control magnet retarder (1) controls the shut/open timing of the exhaust valve by ON/OFF pulse duty signals sent from the ECM.
The longer pulse width retards valve timing.
The shorter pulse width advances valve timing.



DTC Logic

INFOID:0000000005353423

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0078	Exhaust valve timing control magnet retarder (bank 1) circuit	An improper voltage is sent to the ECM through exhaust valve timing control magnet retarder.	• Harness or connectors (Exhaust valve timing control magnet retarder circuit is open or shorted.) • Exhaust valve timing control magnet retarder
P0084	Exhaust valve timing control magnet retarder (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.

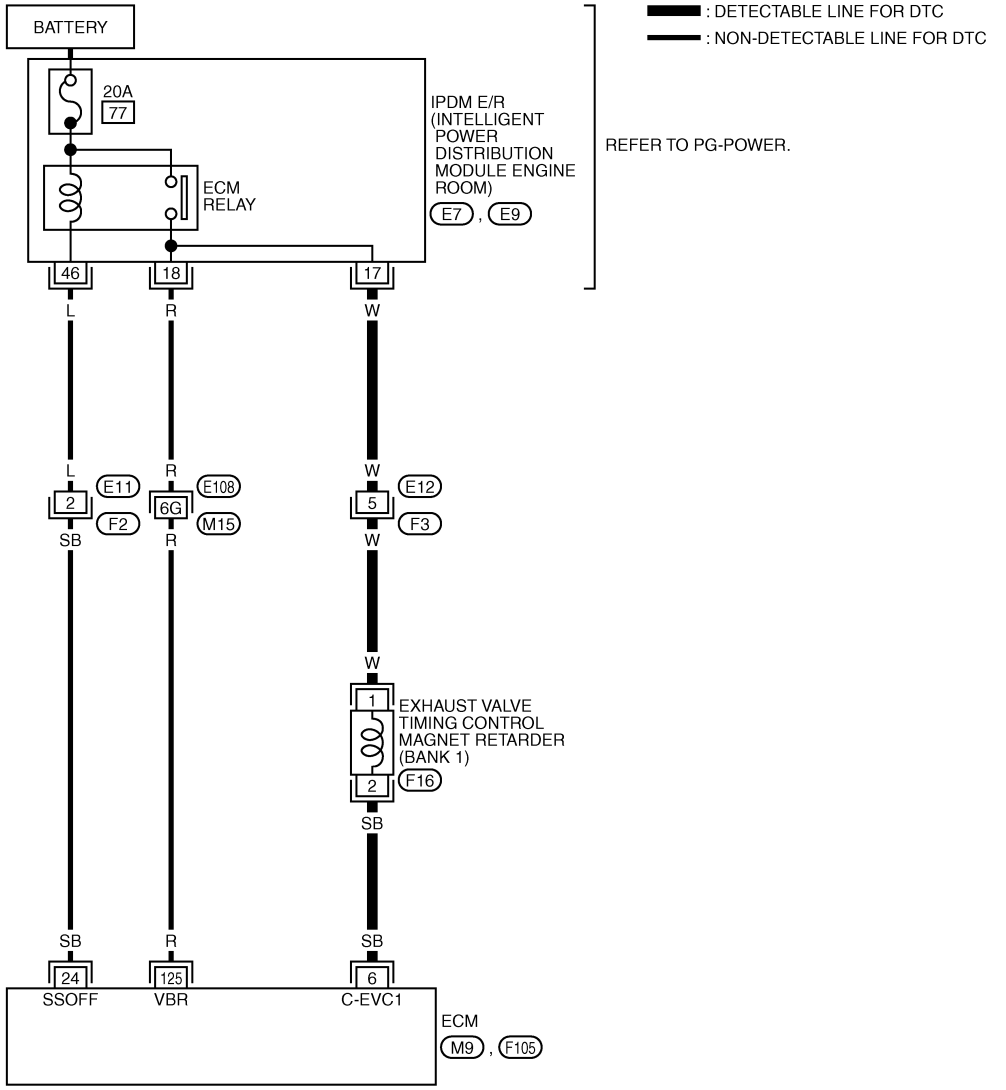
Is 1st trip DTC detected?

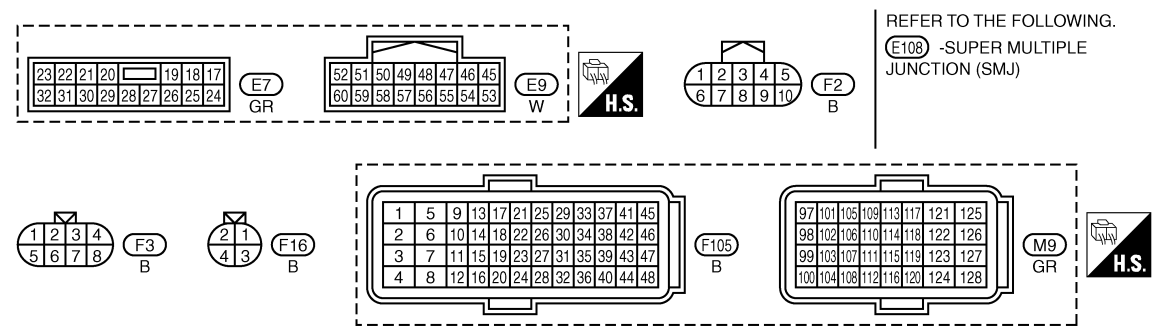
YES >> Go to EC-192, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353424

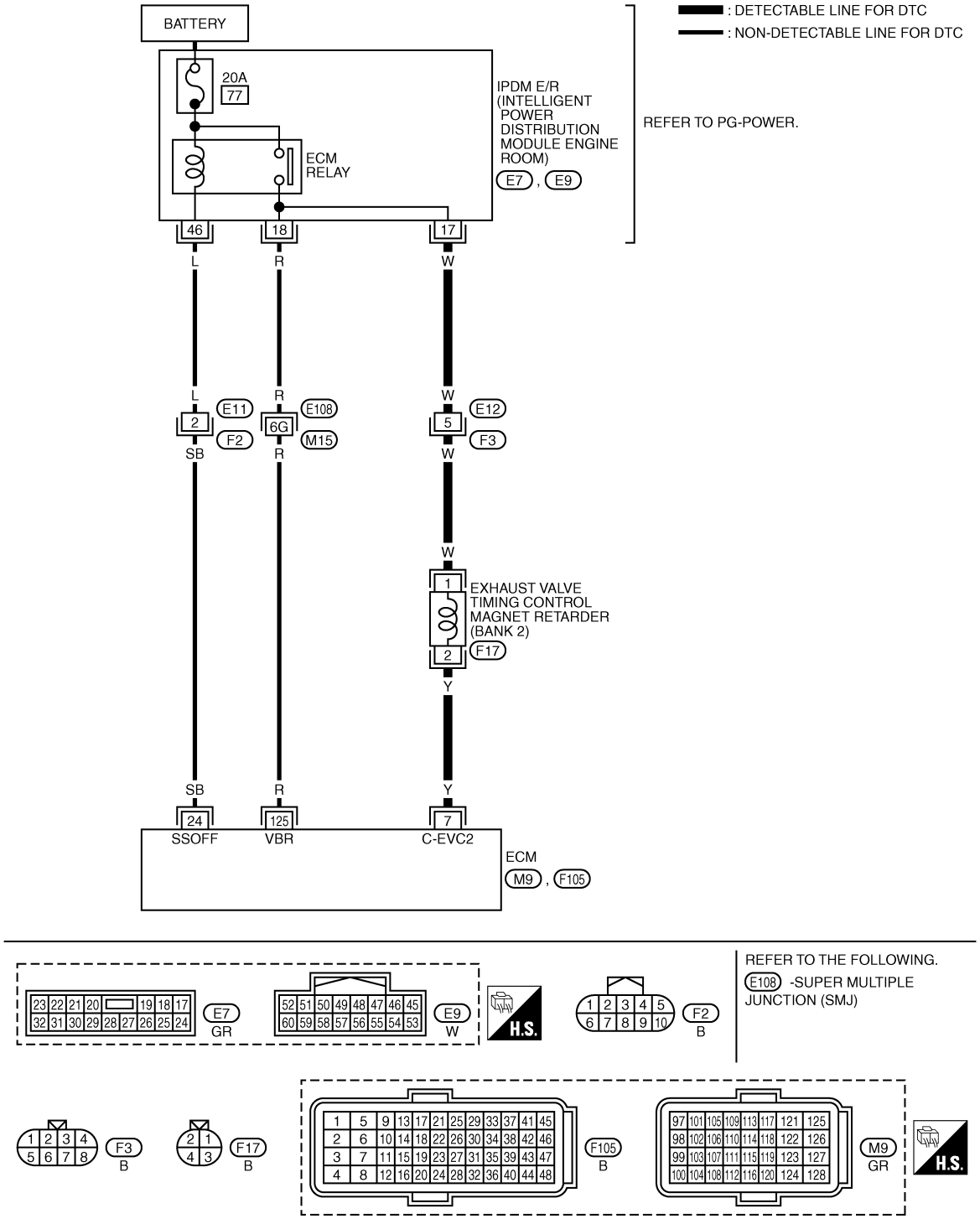
EC-EVCB1-01





TBWT2421E

EC-EVCB2-01



TBWT2422E

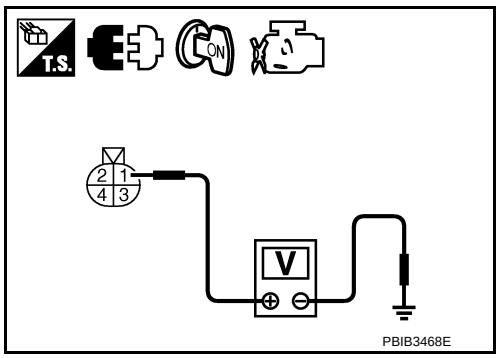
Diagnosis Procedure

INFOID:0000000005353425

1. CHECK EXHAUST VALVE TIMING (EVT) CONTROL MAGNET RETARDER POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVT control magnet retarder harness connector.
3. Turn ignition switch ON.

4. Check the voltage between EVT control magnet retarder harness connector and ground.



DTC	EVT control magnet retarder			Ground	Voltage
	Bank	Connector	Terminal		
P0078	1	F16	1	Ground	Battery voltage
P0084	2	F17	1		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- Harness for open or short between EVT control magnet retarder and IPDM E/R

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

3.CHECK EVT CONTROL MAGNET RETARDER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	EVT control magnet retarder			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0078	1	F16	2	F105	6	Existed
P0084	2	F17	2		7	

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 EVT CONTROL MAGNET RETARDER

Refer to EC-193, "Component Inspection".

Is the inspection result normal?

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

5.REPLACE EVT CONTROL MAGNET RETARDER

1. Replace malfunctioning EVT control magnet retarder.
2. Perform EC-29, "EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement".

>> INSPECTION END

6.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

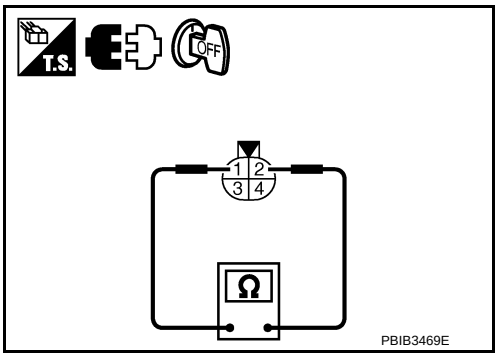
INFOID:0000000005353426

1.CHECK EXHAUST VALVE TIMING CONTROL MAGNET RETARDER

1. Turn ignition switch OFF.

2. Disconnect exhaust valve timing control magnet retarder harness connector.
3. Check resistance between exhaust valve timing control magnet retarder terminals as per the following.

Terminals	Resistance
1 and 2	9.0 - 11.0 Ω [at 20°C (68°F)]



Is the inspection result normal?

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

2. REPLACE EXHAUST VALVE TIMING CONTROL MAGNET RETARDER

1. Replace malfunctioning exhaust valve timing control magnet retarder.
2. Perform EC-29, "EXHAUST VALVE TIMING CONTROL LEARNING : Special Repair Requirement".

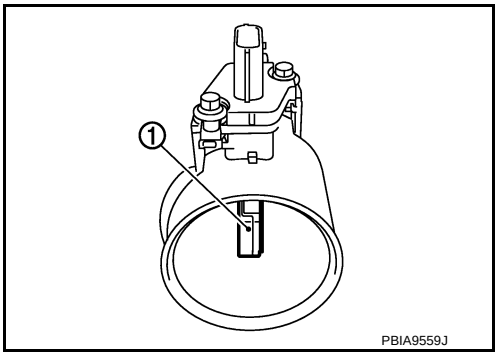
>> INSPECTION END

P0101, P010B MAF SENSOR

Description

INFOID:0000000005353427

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:0000000005353428

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101	Mass air flow sensor (bank 1) circuit range/ performance	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor • EVAP control system pressure sensor
		B)	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.) • Intake air leaks • Mass air flow sensor • EVAP control system pressure sensor • Intake air temperature sensor
P010B	Mass air flow sensor (bank 2) circuit range/ performance	A)	A high voltage from the sensor is sent to ECM under light load driving condition.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor • EVAP control system pressure sensor
		B)	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.) • Intake air leaks • Mass air flow sensor • EVAP control system pressure sensor • 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.

NOTE:
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 FOR MALFUNCTION A

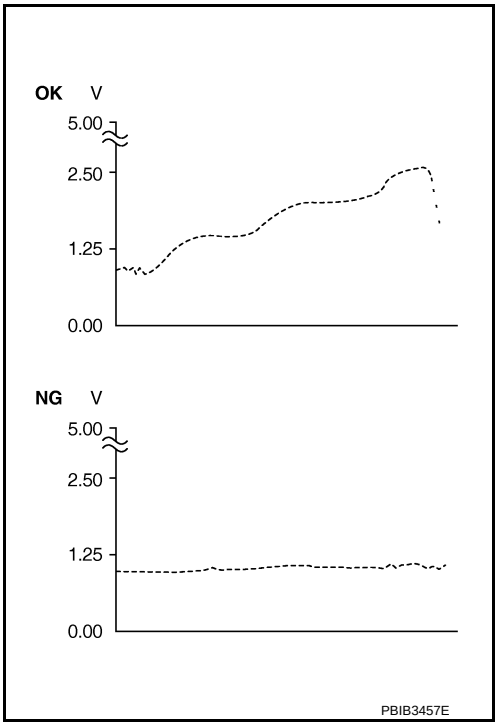
1. Start engine and warm it up to normal operating temperature.
2. Run engine for at least 10 seconds at idle speed.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-199, "Diagnosis Procedure".
NO-1 >> With CONSULT-III: GO TO 3.
NO-2 >> With GST: GO TO 5.

3. CHECK MASS AIR FLOW SENSOR FUNCTION

1. Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to EC-199, "Diagnosis Procedure".
2. Select “MAS A/F SE-B1/B2” in “DATA MONITOR” mode with CONSULT-III.
3. Check the voltage of “MAS A/F SE-B1/B2”.
4. Increases engine speed to approximately 4,000 rpm.
5. Monitor the linear voltage rise in response to engine speed increases.



Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-199, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

1. Maintain the following conditions for at least 5 consecutive seconds.

ENG SPEED	More than 1,400 rpm
TP SEN 1-B1	More than 1 V
TP SEN 2-B1	More than 1 V
TP SEN 1-B2	More than 1 V
TP SEN 2-B2	More than 1 V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

CAUTION:
Always drive vehicle at a safe speed.

2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-199, "Diagnosis Procedure".
NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

With GST

Perform component function check. Refer to EC-197, "Component Function Check".

NOTE:

Use component function check to check the overall function of the mass air flow 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-199, "Diagnosis Procedure".

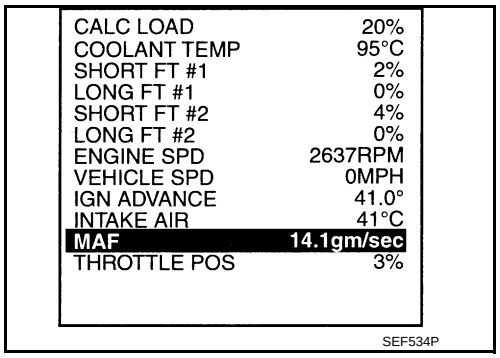
Component Function Check

INFOID:0000000005353429

1. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

With GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Check the mass air flow sensor signal with Service $01.
4. Check for linear mass air flow sensor signal value rise in response to increases to approximately 4,000 rpm in engine speed.



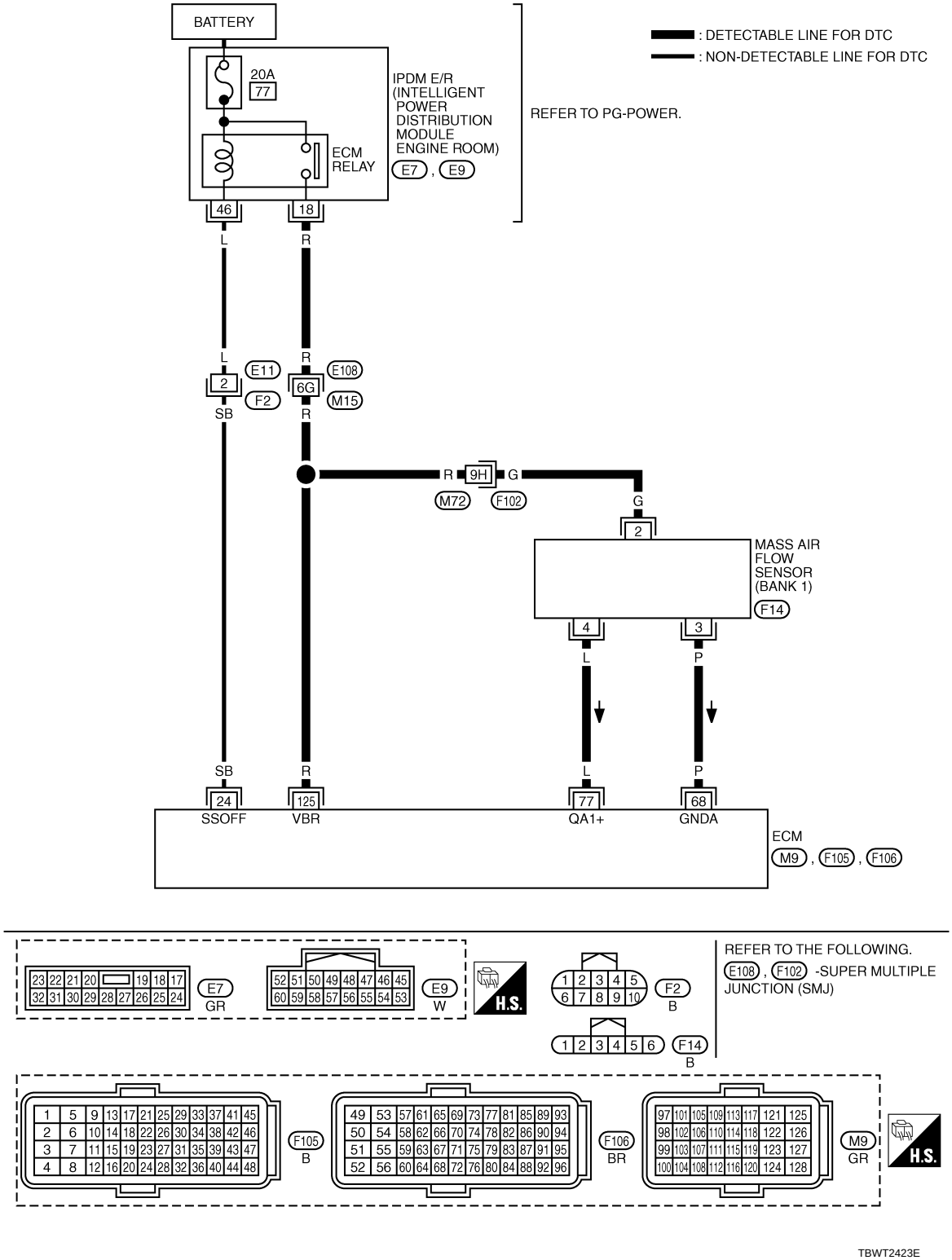
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-199, "Diagnosis Procedure".

Wiring Diagram

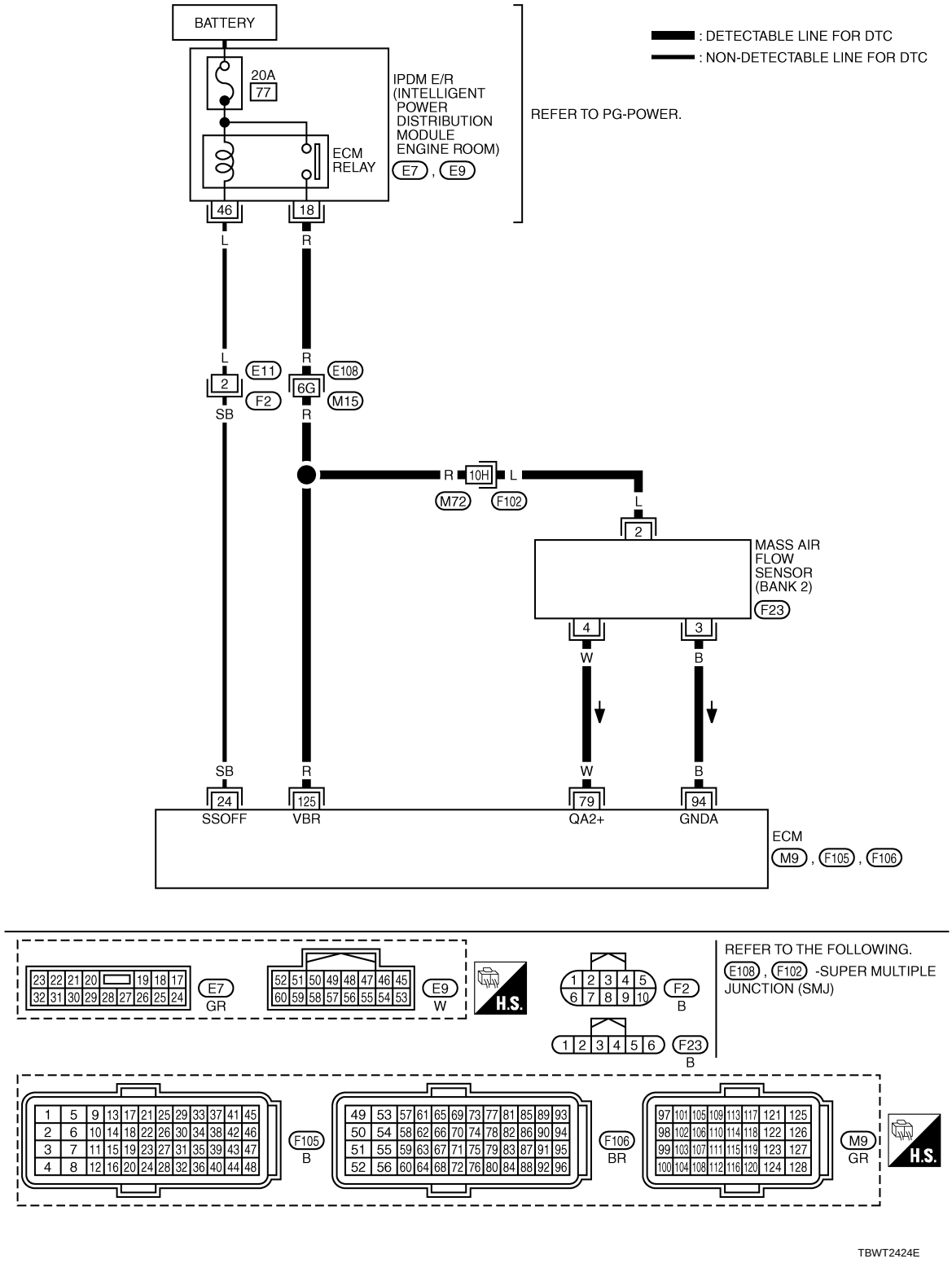
INFOID:0000000005353430

EC-MAFSB1-01



TBWT2423E

EC-MAFSB2-01



TBWT2424E

Diagnosis Procedure

INFOID:0000000005353431

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-195, "DTC Logic".

Which malfunction is detected?

A >> GO TO 3.
B >> GO TO 2.

2.CHECK INTAKE SYSTEM

Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

Is the inspection result normal?

YES >> GO TO 3.
NO >> Reconnect the parts.

3.CHECK GROUND CONNECTION

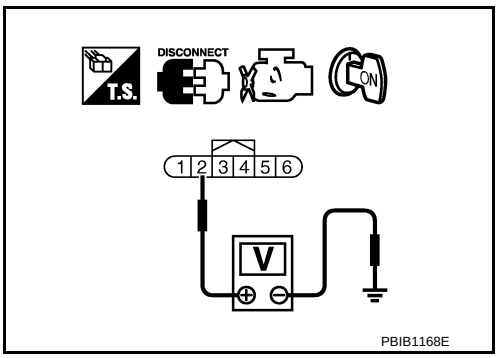
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

4.CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect 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		
P0101	1	F14	2	Ground	Battery voltage
P010B	2	F23	2		

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors F102, M72
- Harness for open or short between MAF sensor and ECM
- Harness for open or short between MAF 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	
P0101	1	F14	3	F106	68	Existed
P010B	2	F23	3		94	

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, 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	
P0101	1	F14	4	F106	77	Existed
P010B	2	F23	4		79	

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8. CHECK INTAKE AIR TEMPERATURE SENSOR

Check intake air temperature sensor (bank 1).
Refer to EC-216, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace MAF sensor (bank 1) (with intake air temperature sensor).

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP control system pressure sensor.

10. CHECK MAF SENSOR

Refer to EC-201, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning MAF sensor.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

INFOID:0000000005353432

1. CHECK MASS AIR FLOW (MAF) SENSOR-I

With CONSULT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

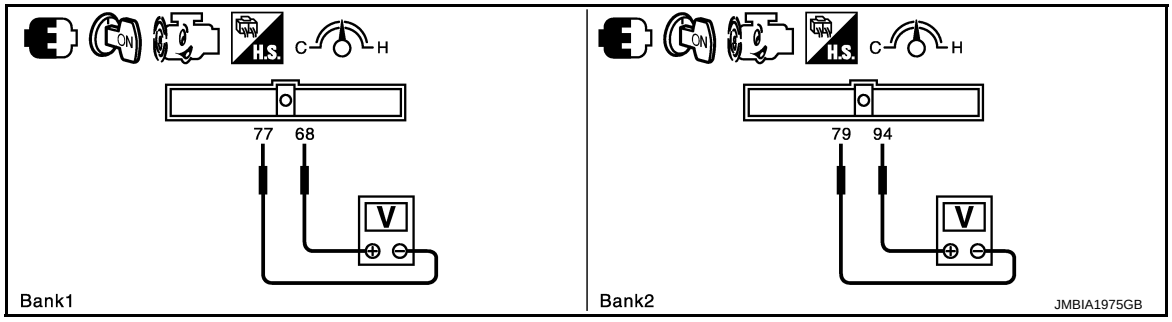
Monitor item	Condition	Indication (V)
MAS A/F SE-B1 MAS A/F SE-B2	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
	Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.

3. Start engine and warm it up to normal operating temperature.
4. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F106	77 [MAF sensor (bank 1) signal]	68	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 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.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 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 MAF SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through MAF sensor. Refer to the following.

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

Is the inspection result normal?

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

3. CHECK MAF SENSOR-II

With CONSULT-III

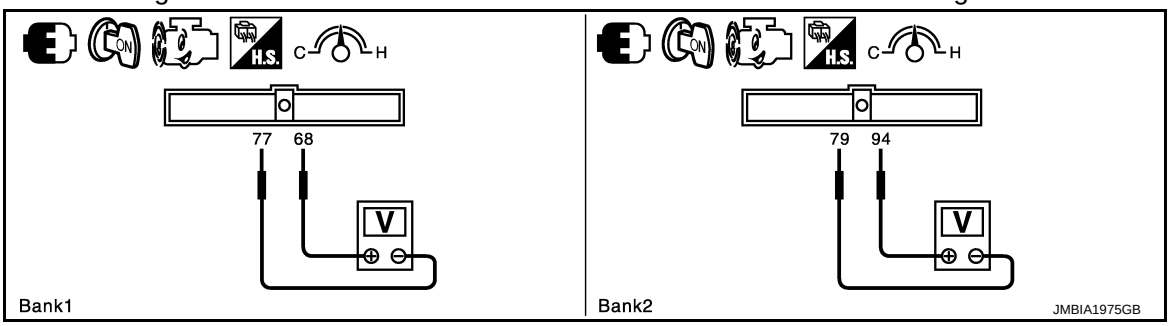
1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT-III and select “DATA MONITOR” mode.
4. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

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.)	0.9 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
	Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Without CONSULT-III

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



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F106	77 [MAF sensor (bank 1) signal]	68	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 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.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Is the inspection result normal?

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

4. CHECK MAF SENSOR-III

With CONSULT-III

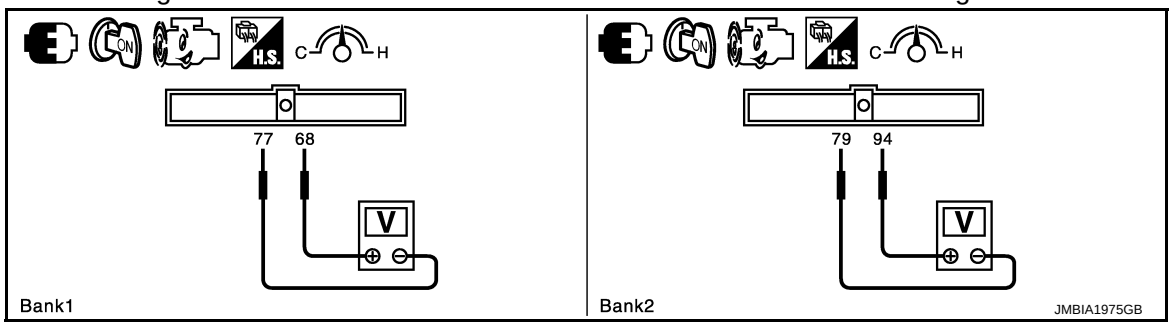
1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

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.)	0.9 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
	Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect MAF 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		
F106	77 [MAF sensor (bank 1) signal]	68	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 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.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Is the inspection result normal?

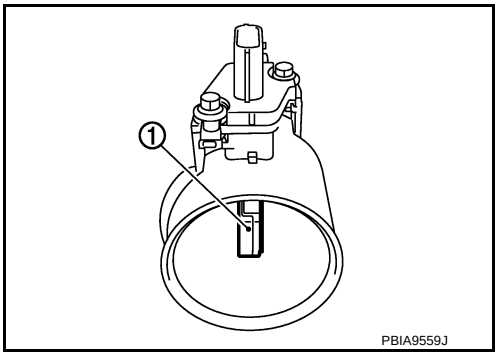
YES >> INSPECTION END
NO >> Clean or replace malfunctioning MAF sensor.

P0102, P0103, P010C, P010D MAF SENSOR

Description

INFOID:0000000005353433

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:0000000005353434

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-208, "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-208, "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.

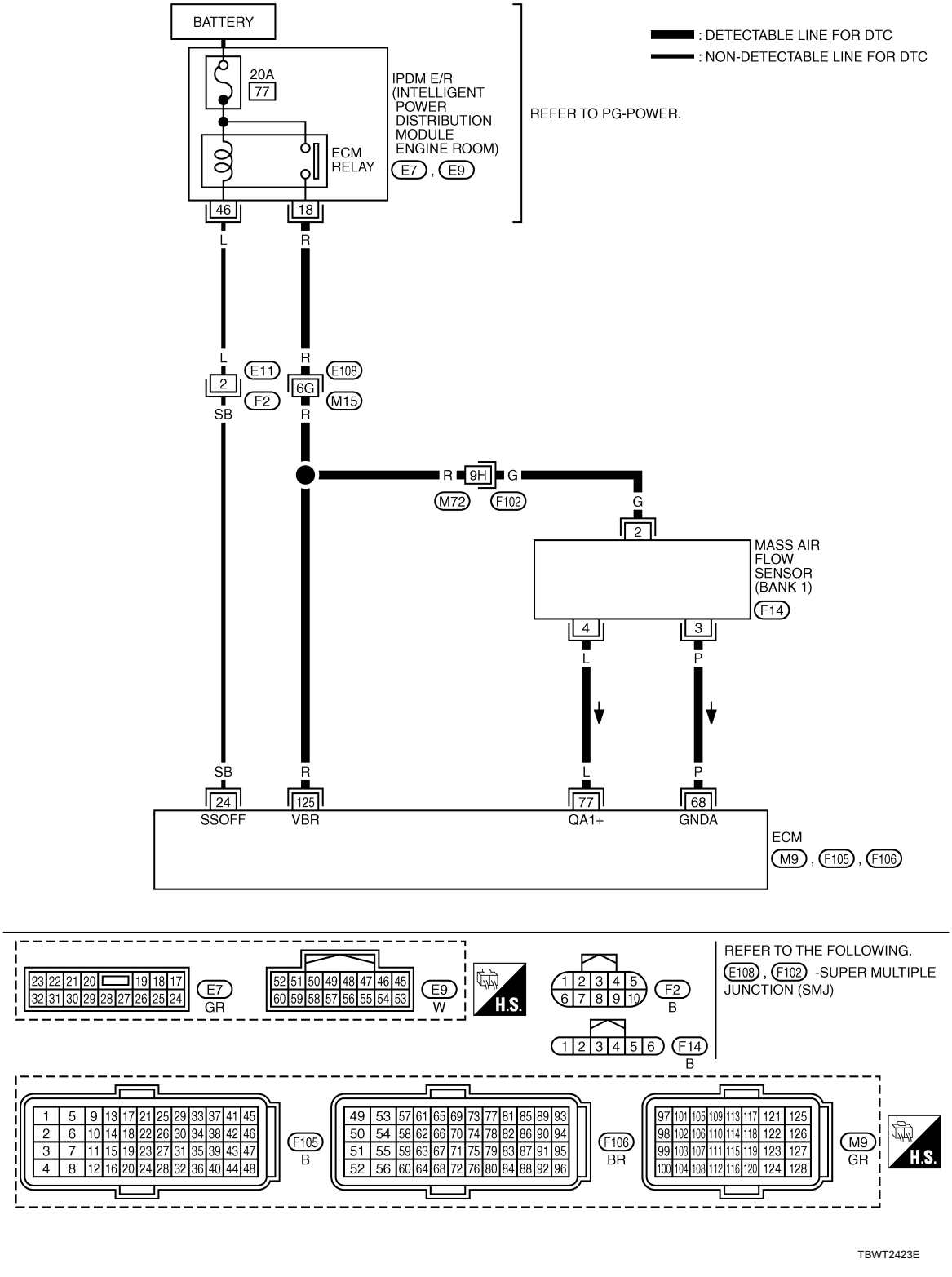
Is DTC detected?

YES >> Go to EC-208, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

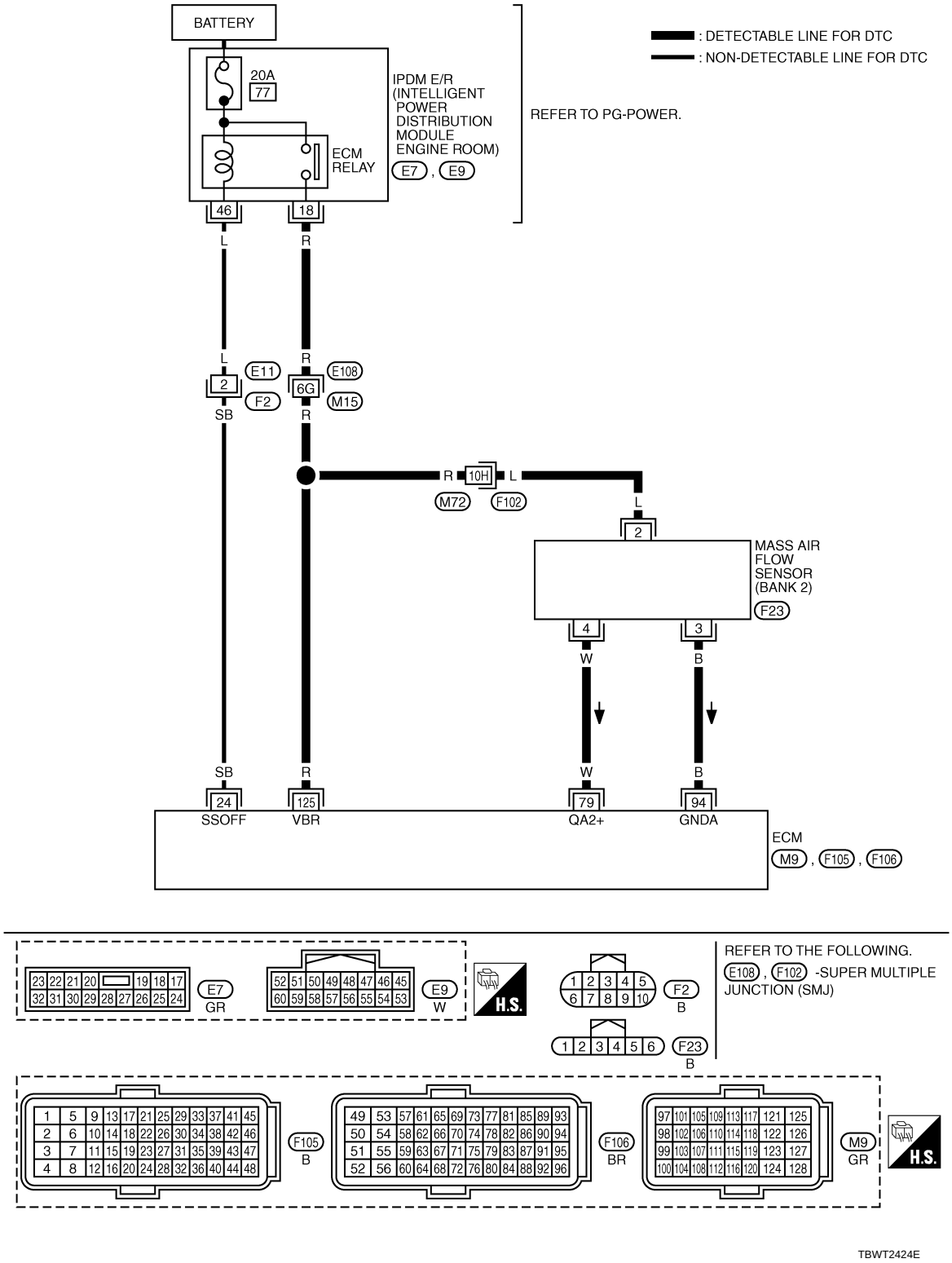
INFOID:0000000005353435

EC-MAFSB1-01



TBWT2423E

EC-MAFSB2-01



TBWT2424E

Diagnosis Procedure

INFOID:0000000005353436

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

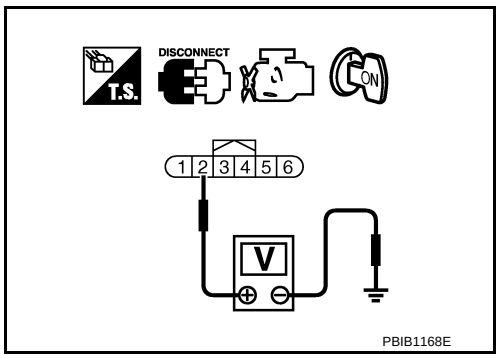
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

4. CHECK MASS AIR FLOW (MAF) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect 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	F14	2	Ground	Battery voltage
P010C, P010D	2	F23	2		

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors F102, M72
- Harness for open or short between MAF sensor and ECM
- Harness for open or short between MAF 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	F14	3	F106	68	Existed
P010C, P010D	2	F23	3		94	

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

Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair open circuit, 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	F14	4	F106	77	Existed
P010C, P010D	2	F23	4		79	

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

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

8.CHECK MAF SENSOR

Refer to EC-210, "Component Inspection".

Is the inspection result normal?

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

9.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

INFOID:0000000005353437

1.CHECK MASS AIR FLOW (MAF) SENSOR-I

With CONSULT-III

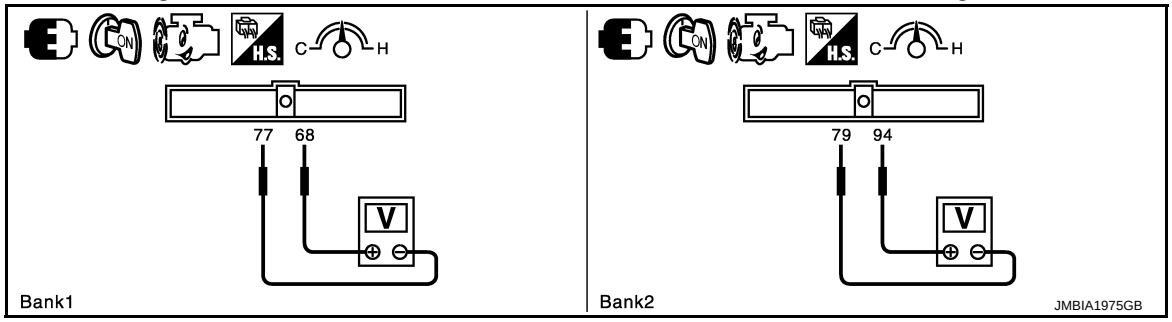
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

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.)	0.9 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
	Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Without CONSULT-III

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



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F106	77 [MAF sensor (bank 1) signal]	68	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 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.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 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 MAF SENSOR

1. Turn ignition switch OFF.
2. Check for the cause of uneven air flow through MAF sensor. Refer to the following.

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

Is the inspection result normal?

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

3. CHECK MAF SENSOR-II

With CONSULT-III

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT-III and select “DATA MONITOR” mode.
4. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

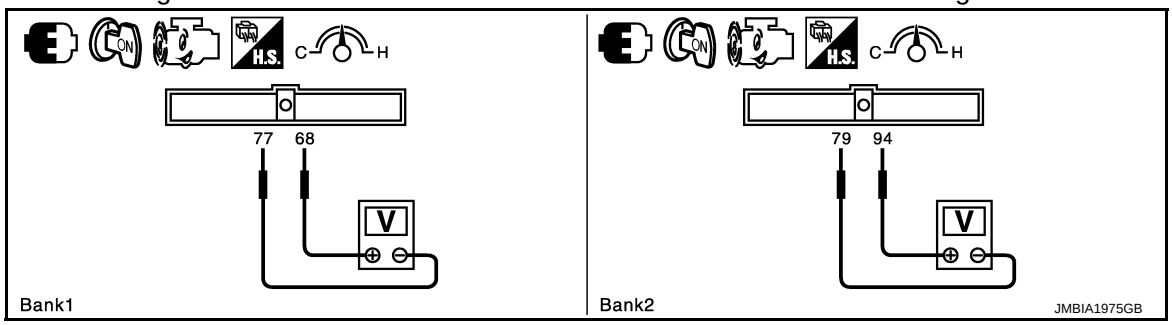
Monitor item	Condition	Indication (V)
MAS A/F SE-B1 MAS A/F SE-B2	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
	Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Without CONSULT-III

1. Repair or replace malfunctioning part.
2. Start engine and warm it up to normal operating temperature.

3. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F106	77 [MAF sensor (bank 1) signal]	68	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 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.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Is the inspection result normal?

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

4. CHECK MAF SENSOR-III

With CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect MAF sensor harness connector and reconnect it again.
3. Start engine and warm it up to normal operating temperature.
4. Connect CONSULT-III and select “DATA MONITOR” mode.
5. Select “MAS A/F SE-B1” and “MAS A/F SE-B2”, and check the indication.

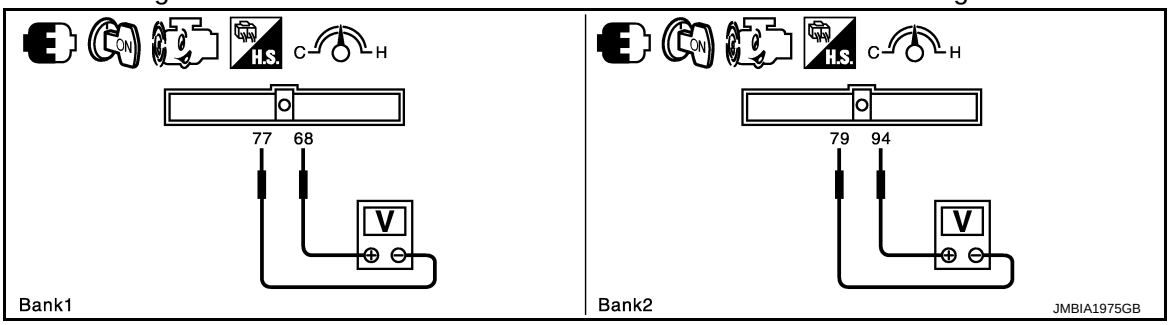
Monitor item	Condition	Indication (V)
MAS A/F SE-B1 MAS A/F SE-B2	Ignition switch ON (Engine stopped.)	Approx. 0.4
	Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
	2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
	Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect MAF 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		
F106	77 [MAF sensor (bank 1) signal]	68	Ignition switch ON (Engine stopped.)	Approx. 0.4
			Idle (Engine is warmed-up to normal operating temperature.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 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.)	0.9 - 1.2
			2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 1.9
			Idle to approx. 4,000 rpm	0.9 - 1.2 to approx. 2.4*

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

Is the inspection result normal?

YES >> INSPECTION END
NO >> Clean or replace malfunctioning MAF sensor.

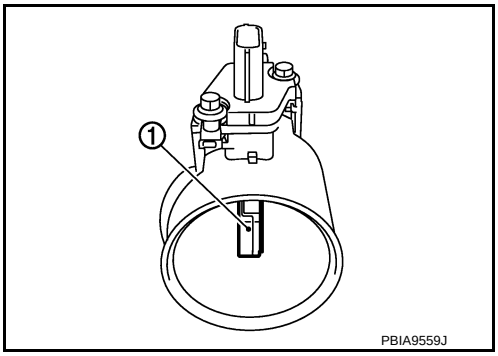
P0112, P0113 IAT SENSOR

Description

INFOID:0000000005353438

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.

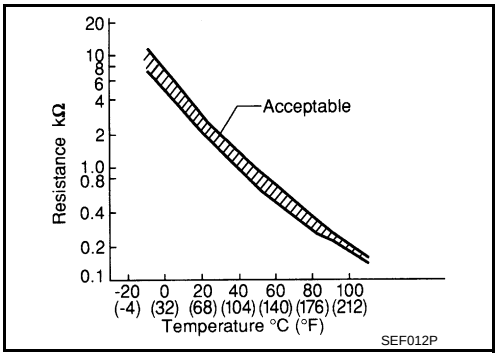
NOTE:
ECM uses only the intake air temperature sensor (bank 1) for engine control and self-diagnosis. It does not use the intake air temperature sensor (bank 2).



<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:0000000005353439

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112	Intake air temperature 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 temperature sensor
P0113	Intake air temperature sensor (bank 1) 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.

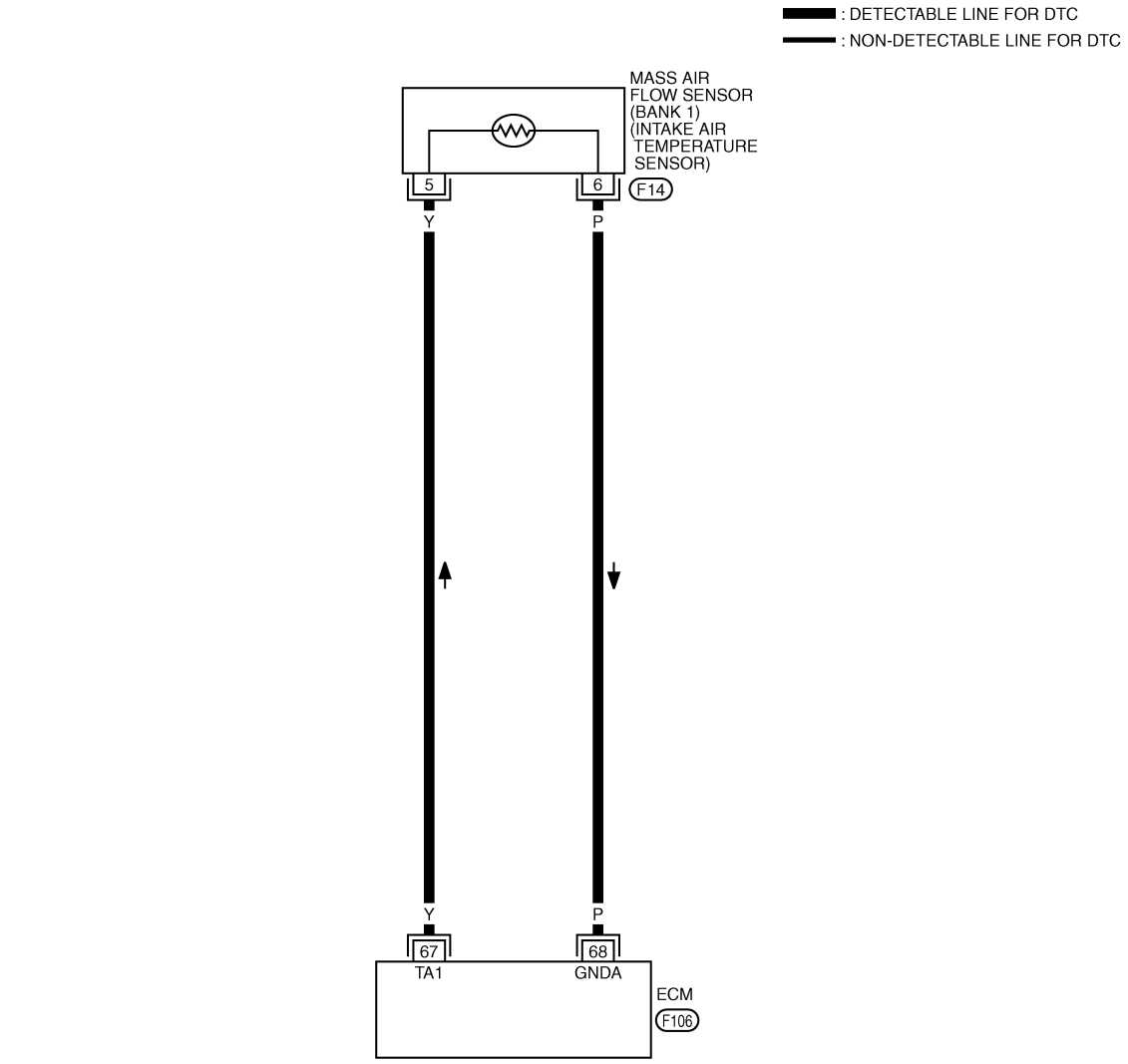
Is 1st trip DTC detected?

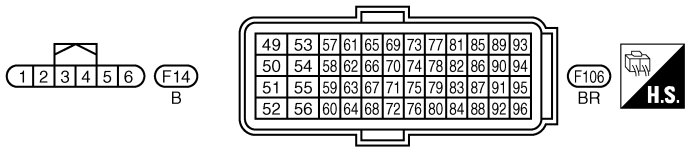
YES >> Go to EC-215, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353440

EC-IATSB1-01





TBWT2425E

Diagnosis Procedure

INFOID:0000000005353441

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

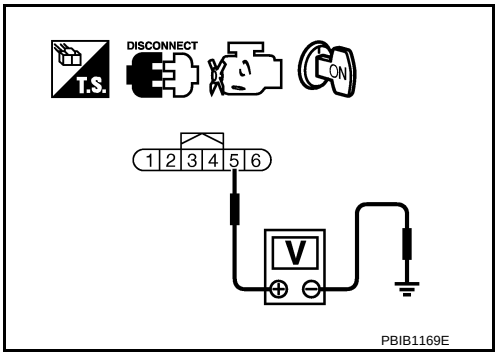
Is the inspection result normal?

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

2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

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

MAF sensor (bank 1)		Ground	Voltage (V)
Connector	Terminal		
F14	5	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 MAF sensor (bank 1) harness connector and ECM harness connector.

MAF sensor (bank 1)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F14	6	F106	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-216, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace MAF sensor (with intake air temperature sensor) (bank 1).

5.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

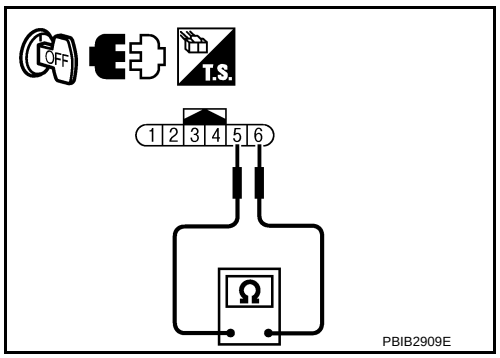
Component Inspection

INFOID:0000000005353442

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 per the following.



Terminals	Condition		Resistance (kΩ)
5 and 6	Temperature [°C (°F)]	25 (77)	1.800 - 2.200

Is the inspection result normal?

YES >> INSPECTION END

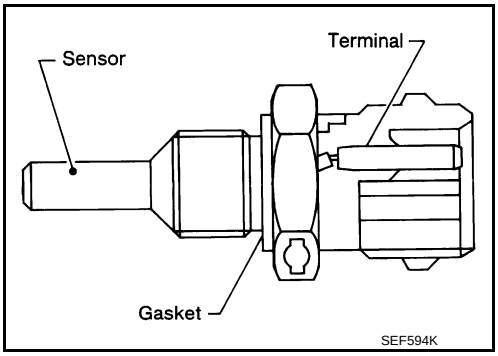
NO >> Replace mass air flow sensor (with intake air temperature sensor) (bank 1).

P0116 ECT SENSOR

Description

INFOID:0000000005353443

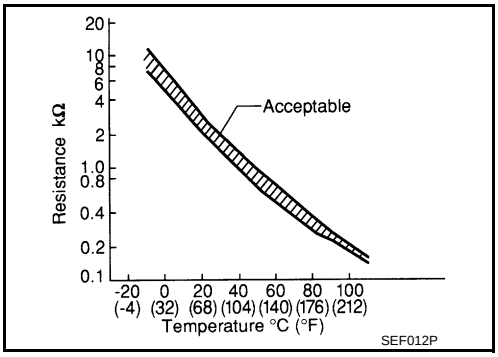
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 71 (Engine coolant temperature sensor) and 84 (Sensor ground).



DTC Logic

INFOID:0000000005353444

DTC DETECTION LOGIC

NOTE:
If DTC P0116 is displayed with DTC P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-220, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0116	Engine coolant temperature sensor circuit range/performance	Engine coolant temperature signal from engine coolant temperature sensor does not fluctuate, even when some time has passed after starting the engine with pre-warming up condition.	• Harness or connectors (High or low resistance in the circuit) • Engine coolant 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.

TEST CONDITION:
Before performing the following procedure, do not add fuel.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and warm it up to normal operating temperature.
2. Rev engine up to 2,000 rpm for more than 10 minutes.
3. Move the vehicle to a cool place, then stop engine.

4. Check resistance between “fuel level sensor unit and fuel pump (main)” terminals 4 and 5.
5. Soak the vehicle until the resistance between “fuel level sensor unit and fuel pump (main)” terminals 4 and 5 becomes 0.5 kΩ higher than the value measured before soaking.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   Soak time changes depending on ambient air temperature. It may take several hours.
6. Start engine and let it idle for 5 minutes.
7. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-219, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353445

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-219, "Component Inspection".

Is the inspection result normal?

OK >> GO TO 3.
NG >> Replace engine coolant temperature sensor.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

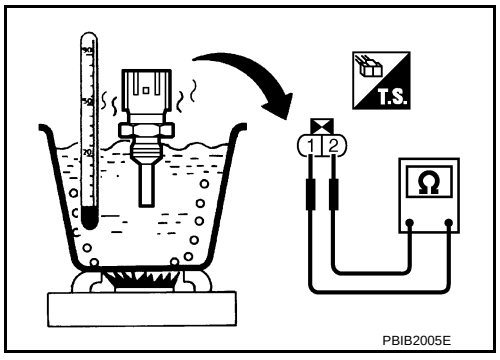
>> **INSPECTION END**

Component Inspection

INFOID:0000000005353446

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



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

Is the inspection result normal?

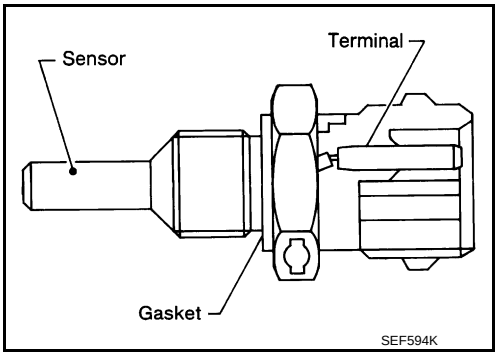
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

P0117, P0118 ECT SENSOR

Description

INFOID:0000000005353447

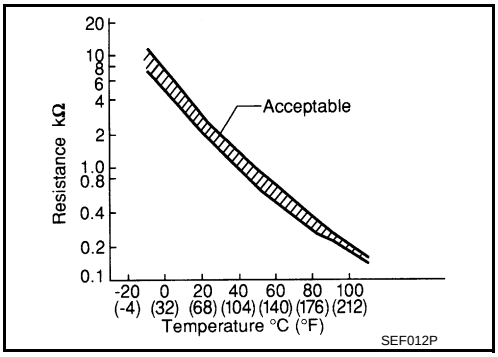
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 71 (Engine coolant temperature sensor) and 84 (Sensor ground).



DTC Logic

INFOID:0000000005353448

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.

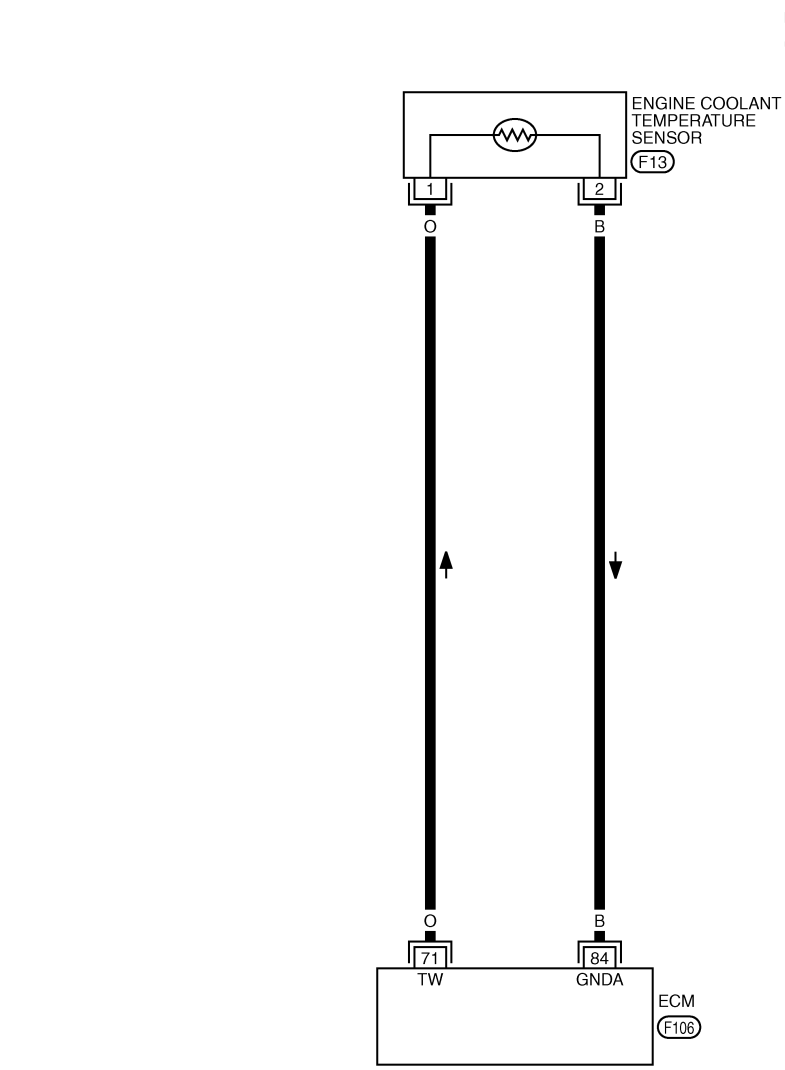
Is DTC detected?

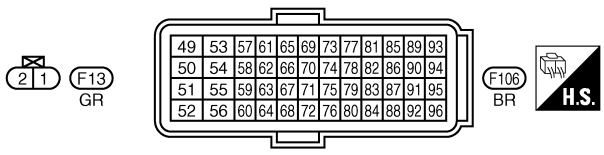
YES >> Go to EC-221, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353449

EC-ECTS-01





TBWT2427E

Diagnosis Procedure

INFOID:0000000005353450

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

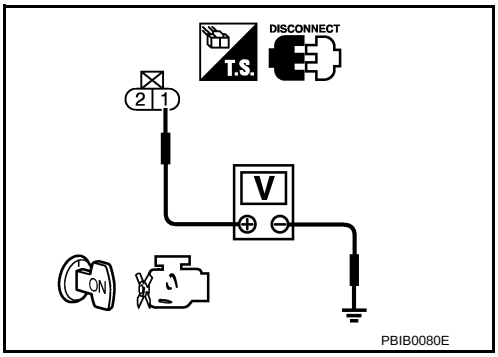
Is the inspection result normal?

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

2. CHECK ENGINE COOLANT TEMPERATURE (ECT) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect 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		
F13	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 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	
F13	2	F106	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 ECT SENSOR

Refer to EC-222, "Component Inspection".

Is the inspection result normal?

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

5. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

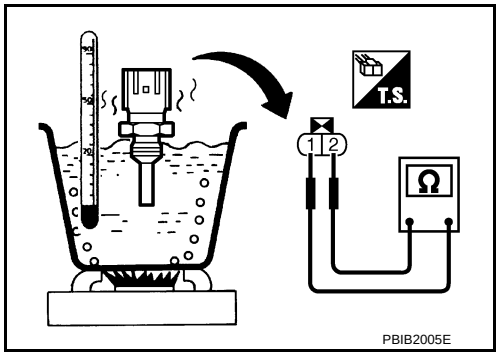
Component Inspection

INFOID:0000000005353451

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

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



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

Is the inspection result normal?

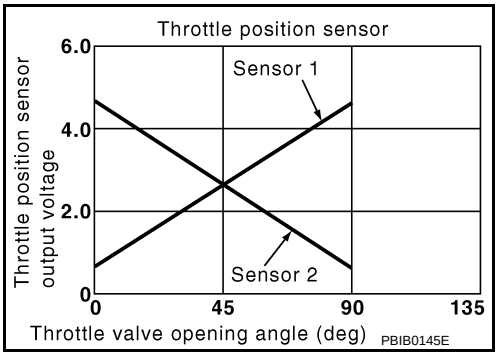
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

P0122, P0123, P0227, P0228 TP SENSOR

Description

INFOID:0000000005353452

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 signal to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and controls the throttle valve opening angle in response to driving conditions via the throttle control motor.



DTC Logic

INFOID:0000000005353453

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-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122	Throttle position (TP) 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 (TP) sensor 2 (bank 1) circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	
P0227	Throttle position (TP) sensor 2 (bank 2) circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	
P0228	Throttle position (TP) 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.

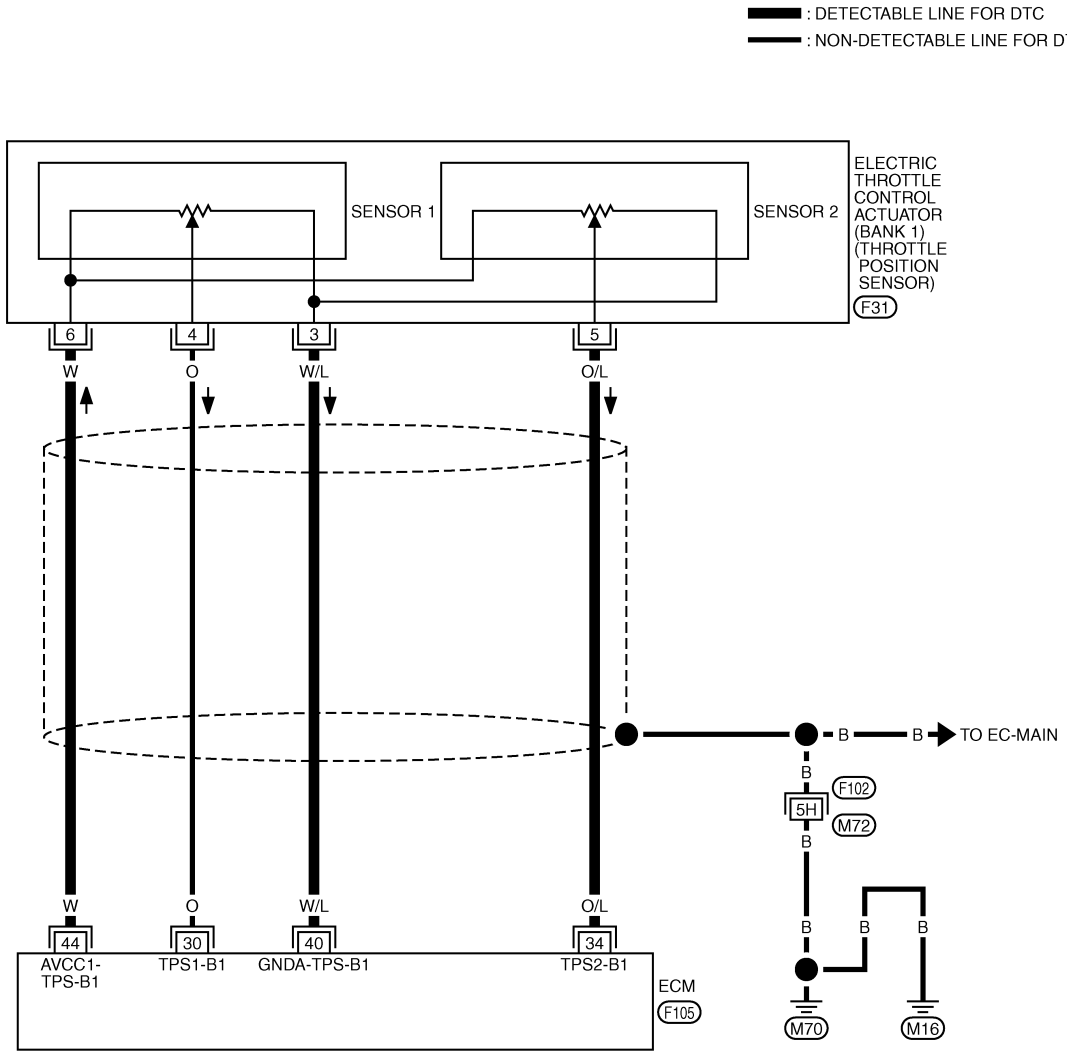
Is DTC detected?

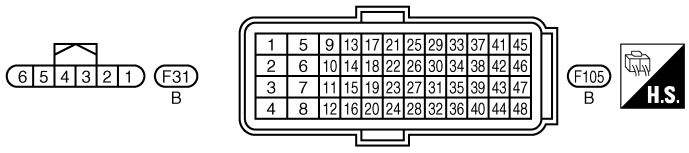
YES >> Go to EC-226, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353454

EC-TPS2B1-01

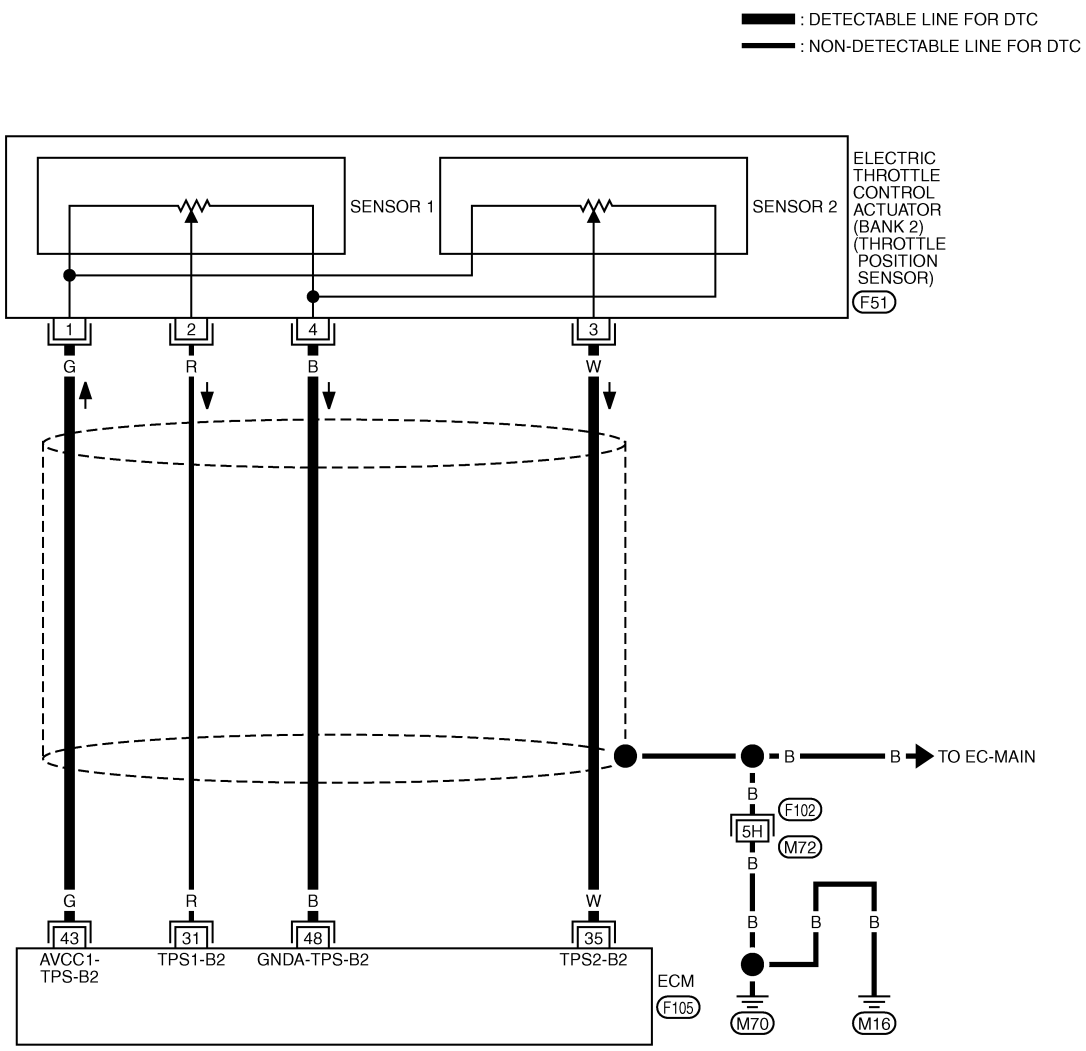


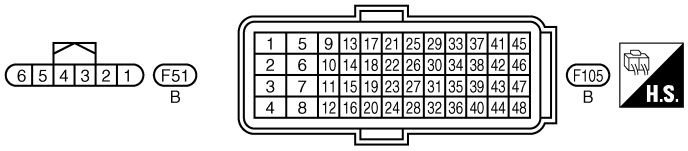


REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT2428E

EC-TPS2B2-01





REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT2429E

Diagnosis Procedure

INFOID:0000000005353455

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

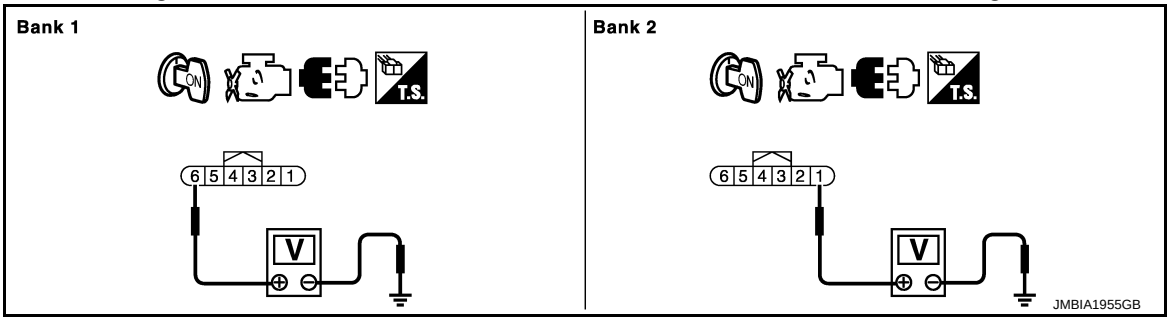
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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	F31	6	Ground	Approx. 5
P0227, P0228	2	F51	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	F31	3	F105	40	Existed
P0227, P0228	2	F51	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	F31	5	F105	34	Existed
P0227, P0228	2	F51	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-228, "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.
2. Go to EC-229, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

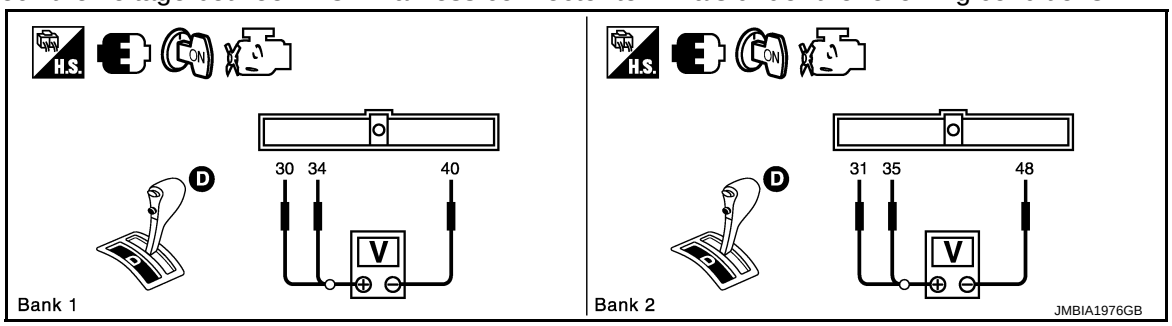
>> INSPECTION END

Component Inspection

INFOID:0000000005353456

1. CHECK THROTTLE POSITION (TP) SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F105	30 [TP sensor 1 (bank 1)]	40	Accelerator pedal: Fully released	More than 0.36
			Accelerator pedal: Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48	Accelerator pedal: Fully released	More than 0.36
			Accelerator pedal: Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40	Accelerator pedal: Fully released	Less than 4.75
			Accelerator pedal: Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48	Accelerator pedal: Fully released	Less than 4.75
			Accelerator pedal: 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.
2. Go to EC-229, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353457

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

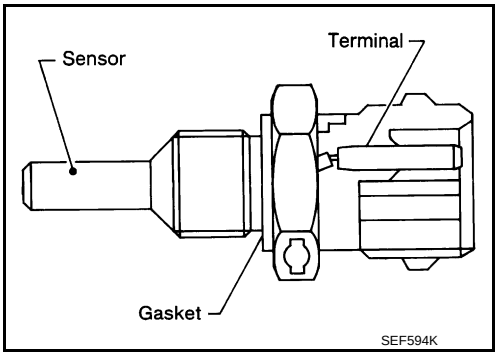
>> END

P0125 ECT SENSOR

Description

INFOID:0000000005353458

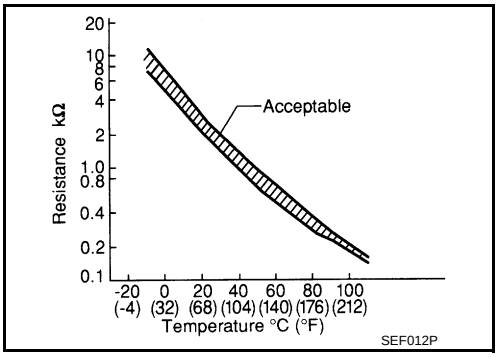
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The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



<Reference data>

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

*: These data are reference values and are measured between ECM terminals 71 (Engine coolant temperature sensor) and 84 (Sensor ground).



DTC Logic

INFOID:0000000005353459

DTC DETECTION LOGIC

NOTE:

- **If DTC P0125 is displayed with DTC P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-220, "DTC Logic".**
- **If DTC P0125 is displayed with DTC P0116, first perform the trouble diagnosis for DTC P0116. Refer to EC-218, "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

With CONSULT-III

1. Turn ignition switch ON.

2. Select “DATA MONITOR” mode with CONSULT-III.
3. Check that “COOLAN TEMP/S” is above 10°C (50°F).

With GST

Follow the procedure “With CONSULT-III” above.

Is the temperature above 10°C (50°F)?

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

3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

1. Start engine and run it for 65 minutes at idle speed.
   If “COOLAN TEMP/S” increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
   CAUTION:
   Never overheat engine.
2. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> EC-231, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353460

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-231, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace engine coolant temperature sensor.

3. CHECK THERMOSTAT OPERATION

When the engine is cold [lower than 70°C (158°F)] condition, grasp lower radiator hose and confirm that the engine coolant does not flow.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Repair or replace thermostat. Refer to CO-26, "Removal and Installation".

4. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

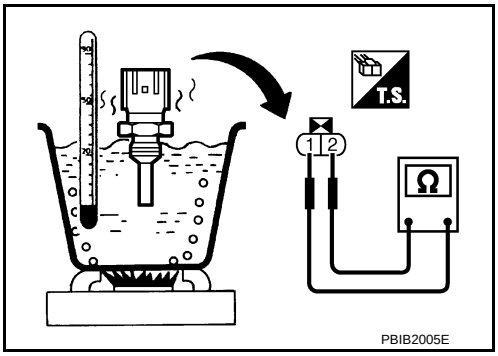
Component Inspection

INFOID:0000000005353461

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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

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



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

Is the inspection result normal?

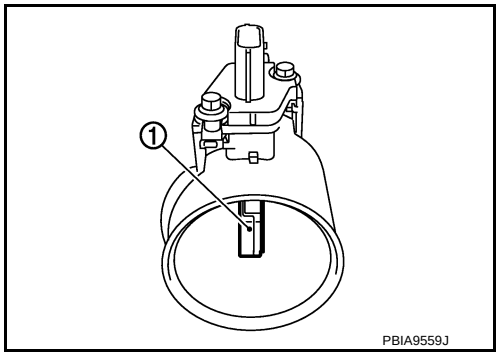
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

P0127 IAT SENSOR

Description

INFOID:0000000005353462

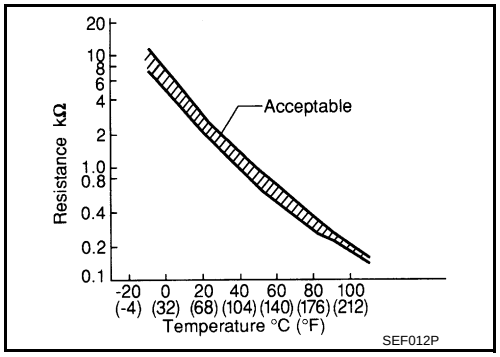
The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases in response to the rise in temperature.
NOTE:
ECM uses only the intake air temperature sensor (bank 1) for engine control and self-diagnosis. It does not use the intake air temperature sensor (bank 2).



<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:0000000005353463

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

With CONSULT-III
1. Wait until engine coolant temperature is less than 96°C (205°F)
- Turn ignition switch ON.
- Select “DATA MONITOR” mode with CONSULT-III.
- 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-III.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
   CAUTION:
   Always drive vehicle at a safe speed.
6. Check 1st trip DTC.

With GST
Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-234, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353464

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-234, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace mass air flow sensor (bank 1) (with intake air temperature sensor).

3.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

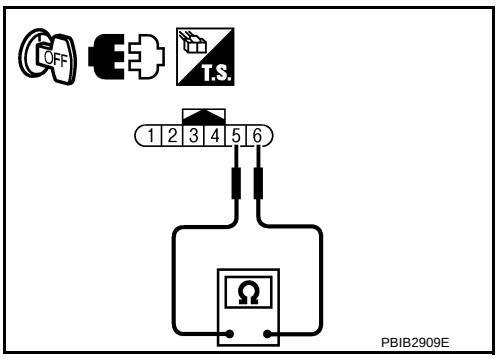
Component Inspection

INFOID:0000000005353465

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 per the following.

Terminals	Condition		Resistance (kΩ)
5 and 6	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).

P0128 THERMOSTAT FUNCTION

DTC Logic

INFOID:0000000005353466

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 DTC P0300, P0301, P0302, P0303, P0304, P0305, P0306. Refer to EC-329, "DTC Logic".

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.

This is due to a leak in the seal or the thermostat being stuck open.

DTC No.	Trouble diagnosis 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

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:

- **For best results, perform at ambient temperature of –10°C (14°F) or higher.**
- **For best results, perform at engine coolant temperature of –10°C (14°F) to 56°C (133°F).**
- **Before performing the following procedure, do not add fuel.**

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

1. Turn A/C switch OFF.
2. Turn blower fan switch OFF.
3. Turn ignition switch ON.
4. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
5. Check the indication of “COOLAN TEMP/S”.
   If it is below 56°C (133°F), go to the next step.
   If it is above 56°C (133°F), cool engine down to less than 56°C (133°F). Then go to next step.
6. Start engine and drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	More than 56 km/h (35 MPH)

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

If “COOLAN TEMP/S” increases to more than 75°C (167°F) with in 10 minutes, turn ignition switch OFF because the test result will be OK.

7. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-236, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353467

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-236, "Component Inspection".

Is the inspection result normal?

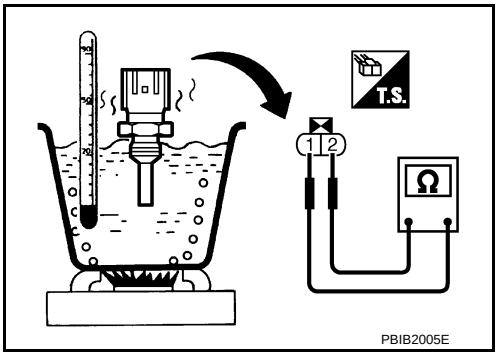
YES >> INSPECTION END
NO >> Replace engine coolant temperature sensor.

Component Inspection

INFOID:0000000005353468

1. CHECK ENGINE COOLANT TEMPERATURE SENSOR

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



Terminals	Condition		Resistance (kΩ)
1 and 2	Temperature [°C (°F)]	20 (68)	2.1 - 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 coolant temperature sensor.

P0130, P0150 A/F SENSOR 1

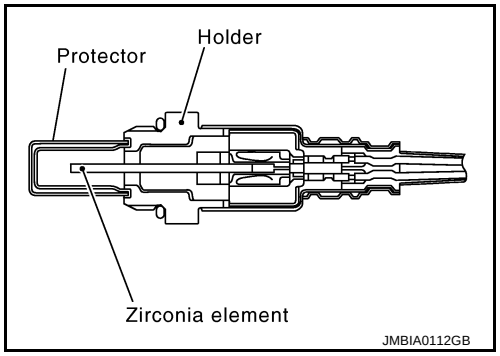
Description

INFOID:0000000005353469

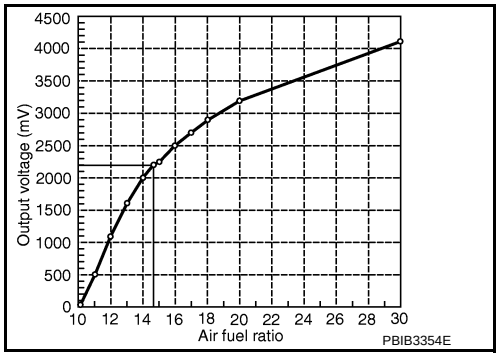
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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



DTC Logic

INFOID:0000000005353470

DTC DETECTION LOGIC

To judge malfunctions, the diagnosis checks that the air fuel ratio (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 it idle for 2 minutes.
3. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-241, "Diagnosis Procedure".
NO-1 >> With CONSULT-III: GO TO 3.
NO-2 >> With GST: GO TO 7.

3. CHECK A/F SENSOR 1 FUNCTION

With CONSULT-III

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-III.
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-241, "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-III.
2. Touch “START”.
3. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III 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-III 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-III screen?

YES >> INSPECTION END
NO >> Go to EC-241, "Diagnosis Procedure".

7. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

With GST

Perform component function check. Refer to EC-239, "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-241, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353471

1. PERFORM COMPONENT FUNCTION CHECK

With GST

1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift the selector lever position to D, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   Never apply brake when releasing the accelerator pedal.
4. Repeat steps 2 and 3 for 5 times.
5. Stop the vehicle and turn ignition switch OFF.
6. Wait at least 10 seconds and restart engine.
7. Repeat steps 2 and 3 for 5 times.
8. Stop the vehicle and connect GST to the vehicle.
9. Check 1st trip DTC.

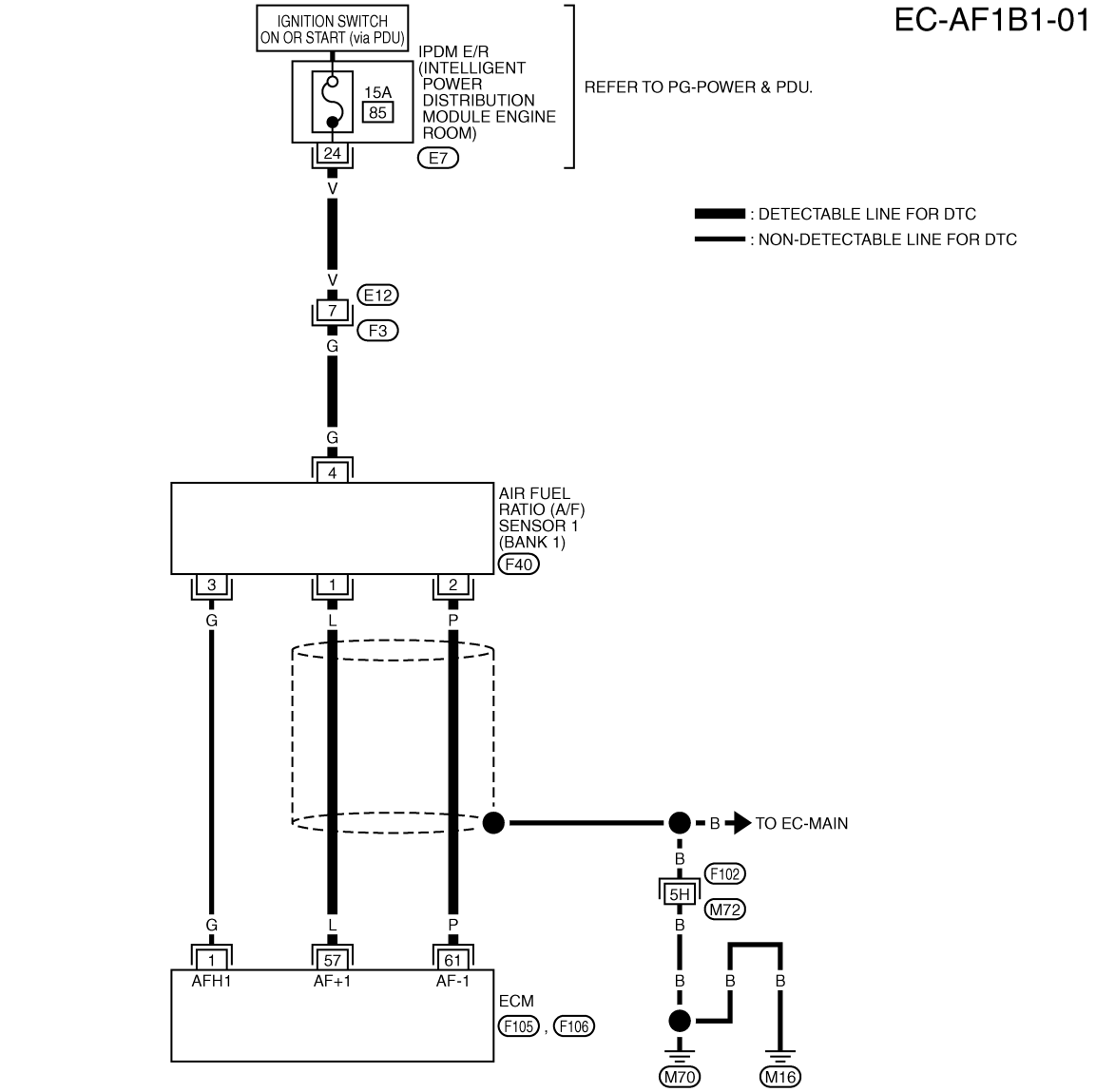
Is 1st trip DTC detected?

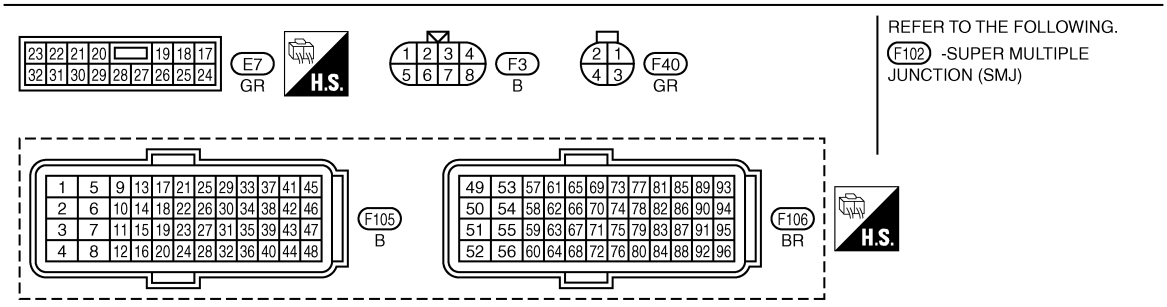
YES >> Go to EC-241, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

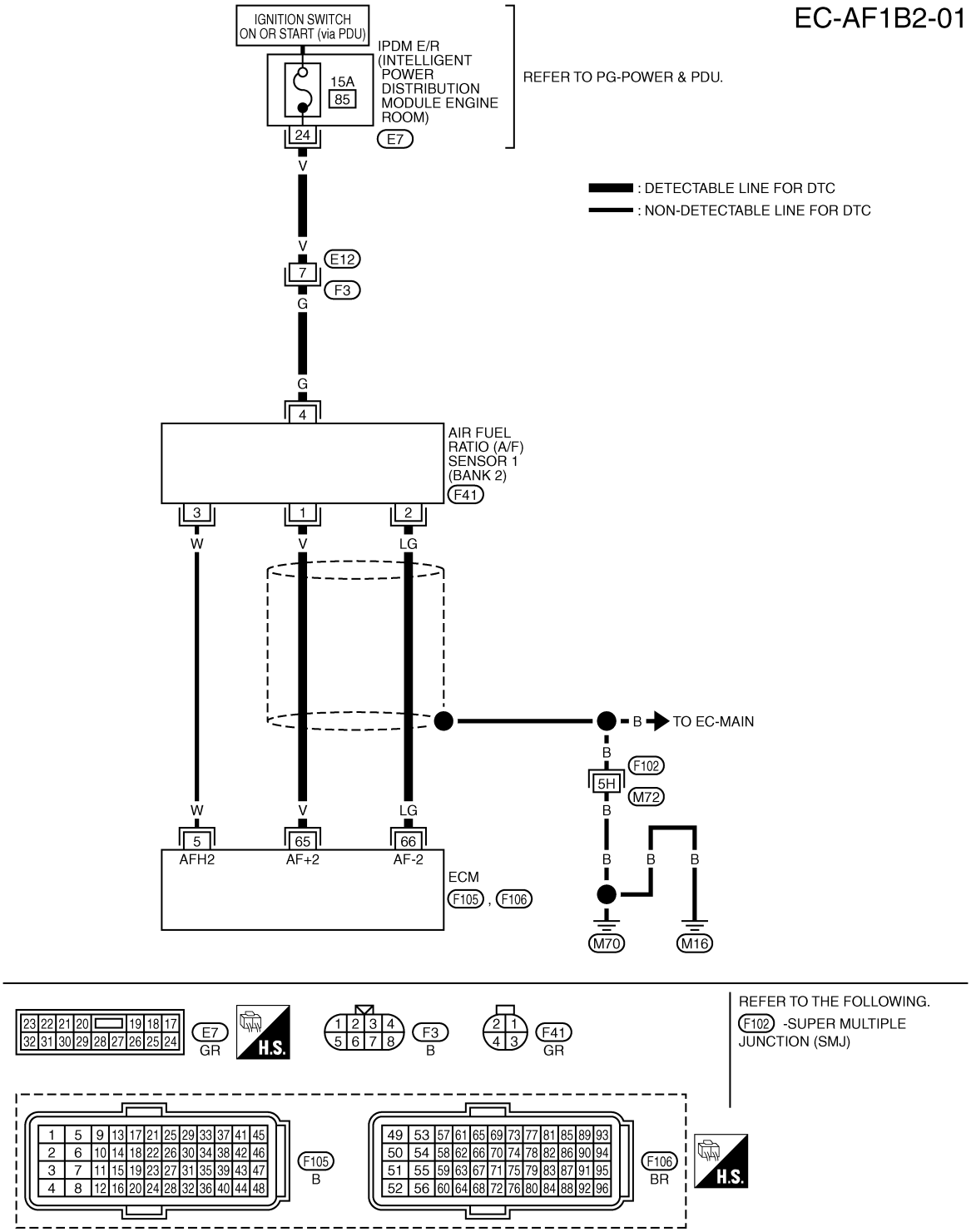
INFOID:0000000005353472

EC-AF1B1-01





TBWT2430E



TBWT2431E

Diagnosis Procedure

INFOID:0000000005353473

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

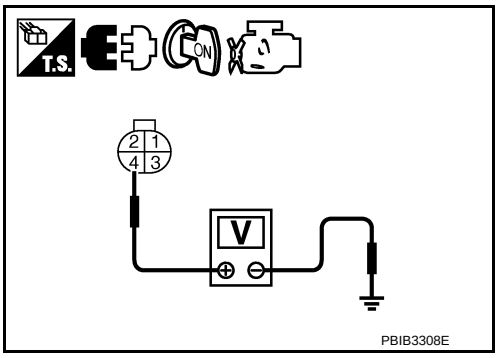
YES >> GO TO 2.

NO >> Repair or replace ground connections.

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	F40	4	Ground	Battery voltage
P0150	2	F41	4		



Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- 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	F40	1	F106	57	Existed
			2		61	
P0150	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0130	1	F40	1	Ground	Not existed
			2		
P0150	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0130	F106	57	Ground	Not existed
		61		
P0150		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 EC-154, "Description".

Is the inspection result normal?

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

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1.

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

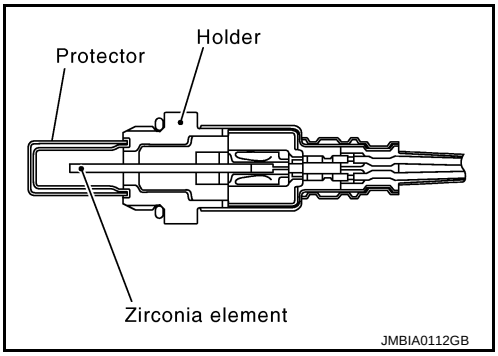
Description

INFOID:0000000005353474

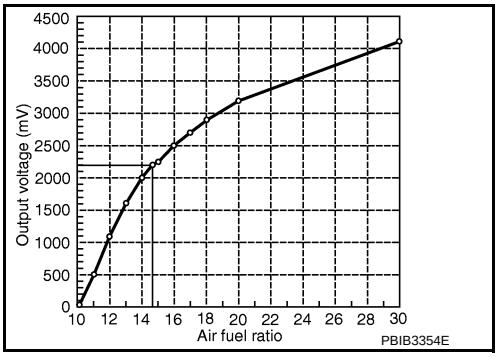
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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



DTC Logic

INFOID:0000000005353475

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the air fuel ratio (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

With CONSULT-III

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-III.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.

With GST

Follow the procedure “With CONSULT-III” above.

Is the indication constantly approx. 0 V?

YES >> Go to EC-247, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

1. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
2. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
3. Maintain the following conditions for approximately 20 consecutive seconds.

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

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

4. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

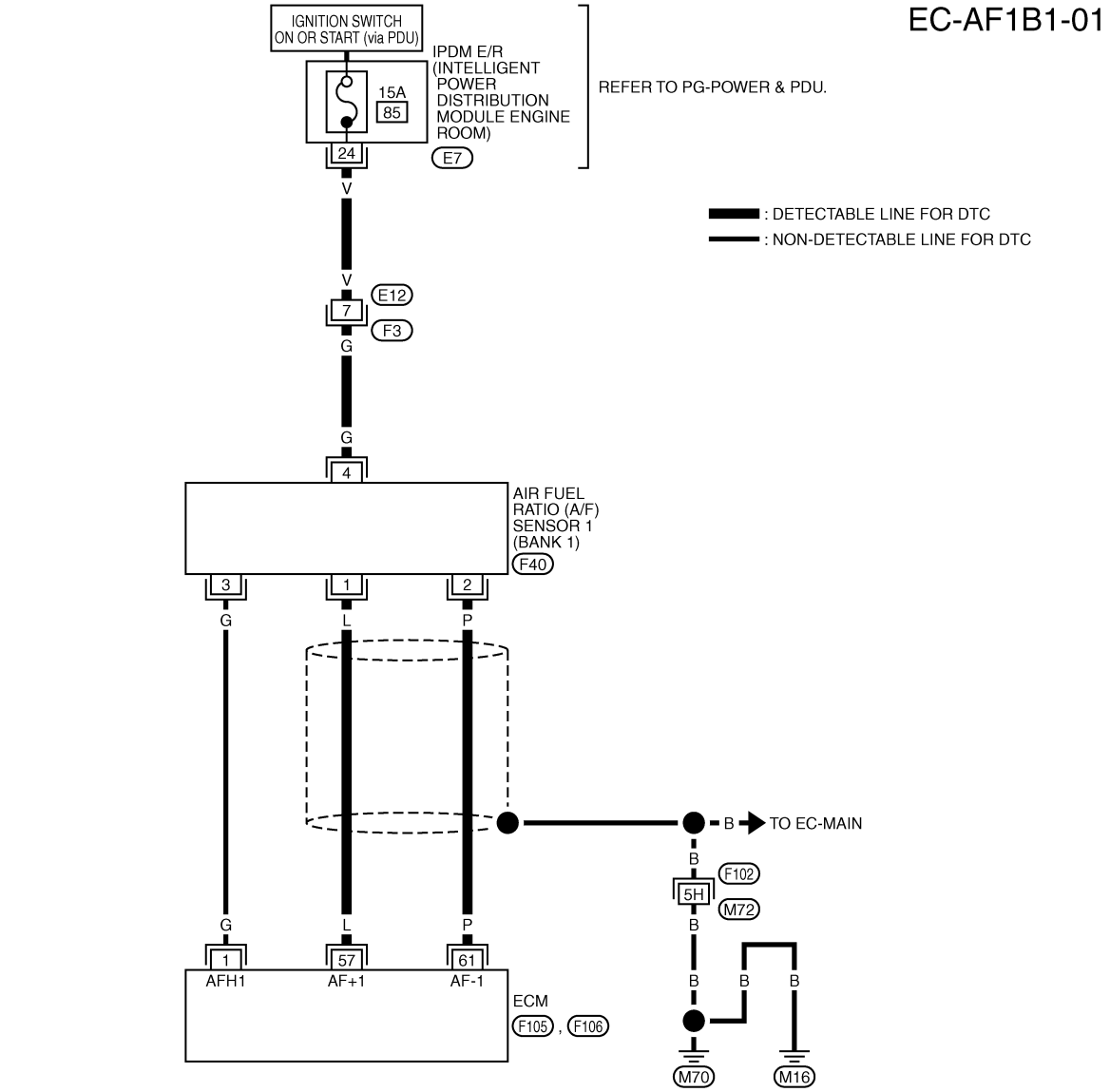
Is 1st trip DTC detected?

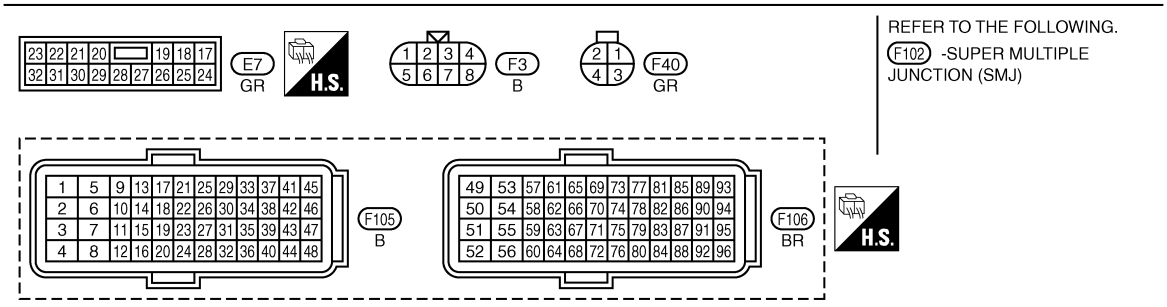
YES >> Go to EC-247, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353476

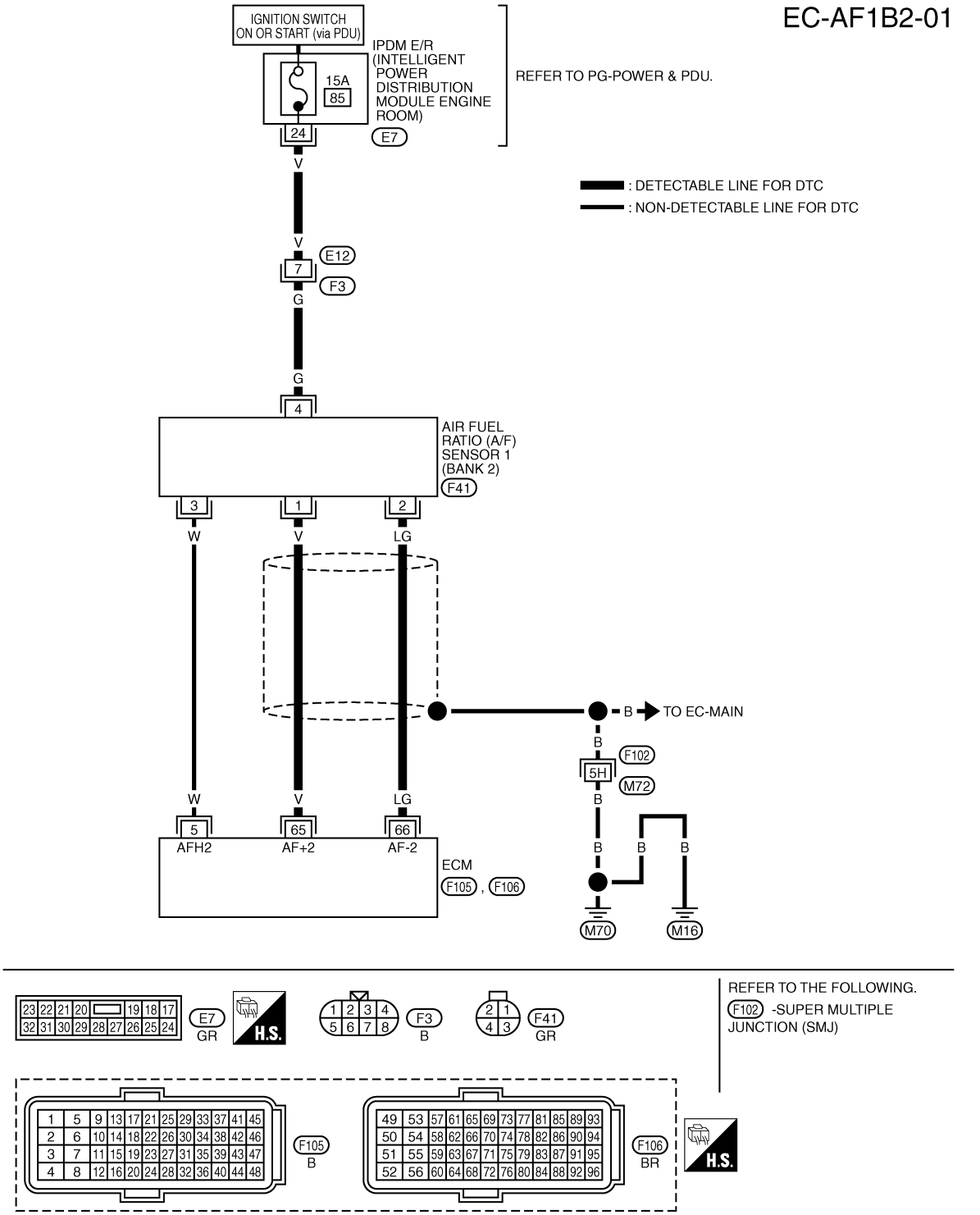
EC-AF1B1-01





TBWT2430E

EC-AF1B2-01



TBWT2431E

Diagnosis Procedure

INFOID:0000000005353477

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

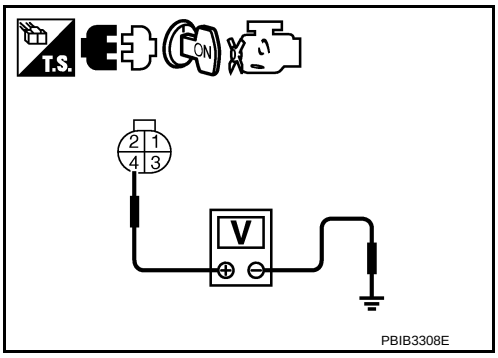
YES >> GO TO 2.

NO >> Repair or replace ground connections.

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		
P0131	1	F40	4	Ground	Battery voltage
P0151	2	F41	4		



Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- 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	
P0131	1	F40	1	F106	57	Existed
			2		61	
P0151	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0131	1	F40	1	Ground	Not existed
			2		
P0151	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0131	F106	57	Ground	Not existed
		61		
P0151		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 EC-154, "Description".

Is the inspection result normal?

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

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1.

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

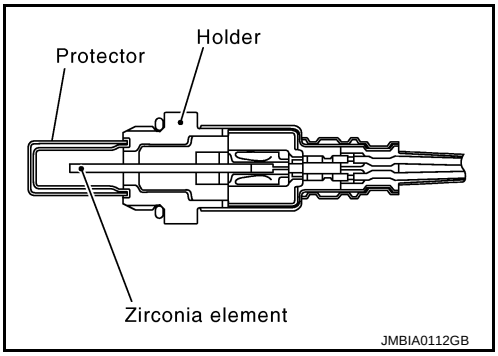
Description

INFOID:0000000005353478

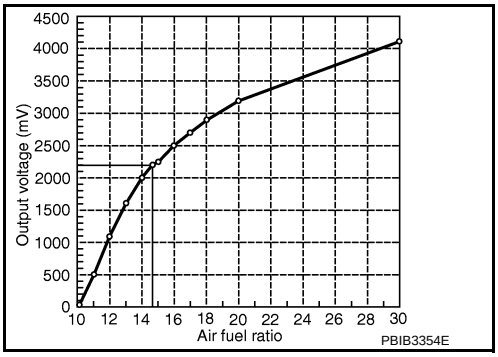
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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



DTC Logic

INFOID:0000000005353479

DTC DETECTION LOGIC

To judge the malfunction, the diagnosis checks that the air fuel ratio (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

With CONSULT-III

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-III.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.

With GST

Follow the procedure “With CONSULT-III” above.

Is the indication constantly approx. 5 V?

YES >> Go to EC-253, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

1. Turn ignition switch OFF, wait at least 10 seconds and then restart engine.
2. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
   CAUTION:
   Always drive vehicle at a safe speed.
3. Maintain the following conditions for approximately 20 consecutive seconds.

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

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

4. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

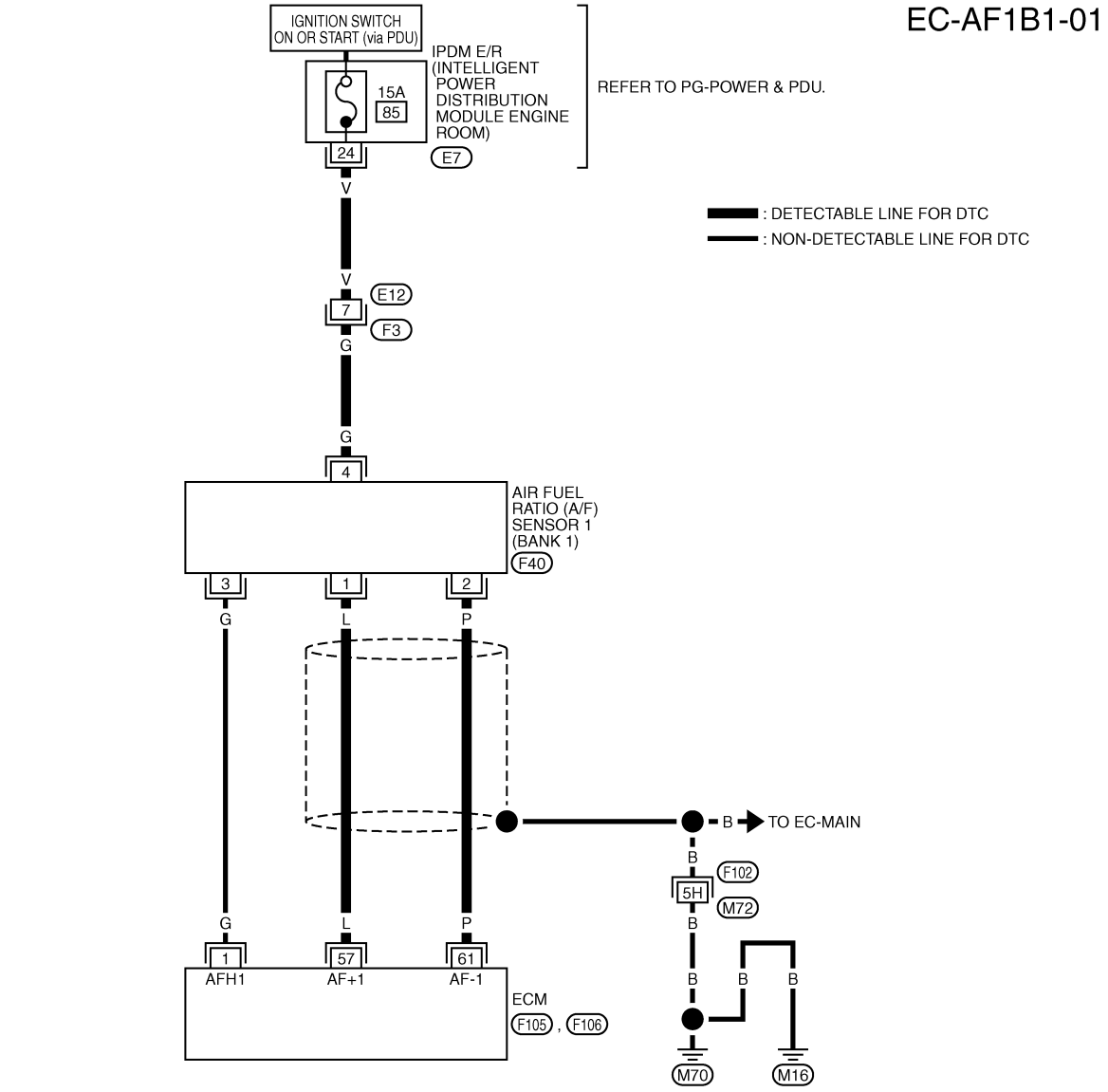
Is 1st trip DTC detected?

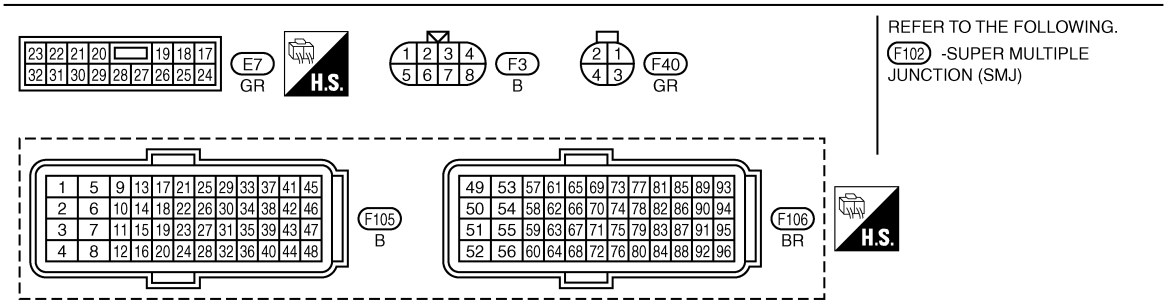
YES >> Go to EC-253, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353480

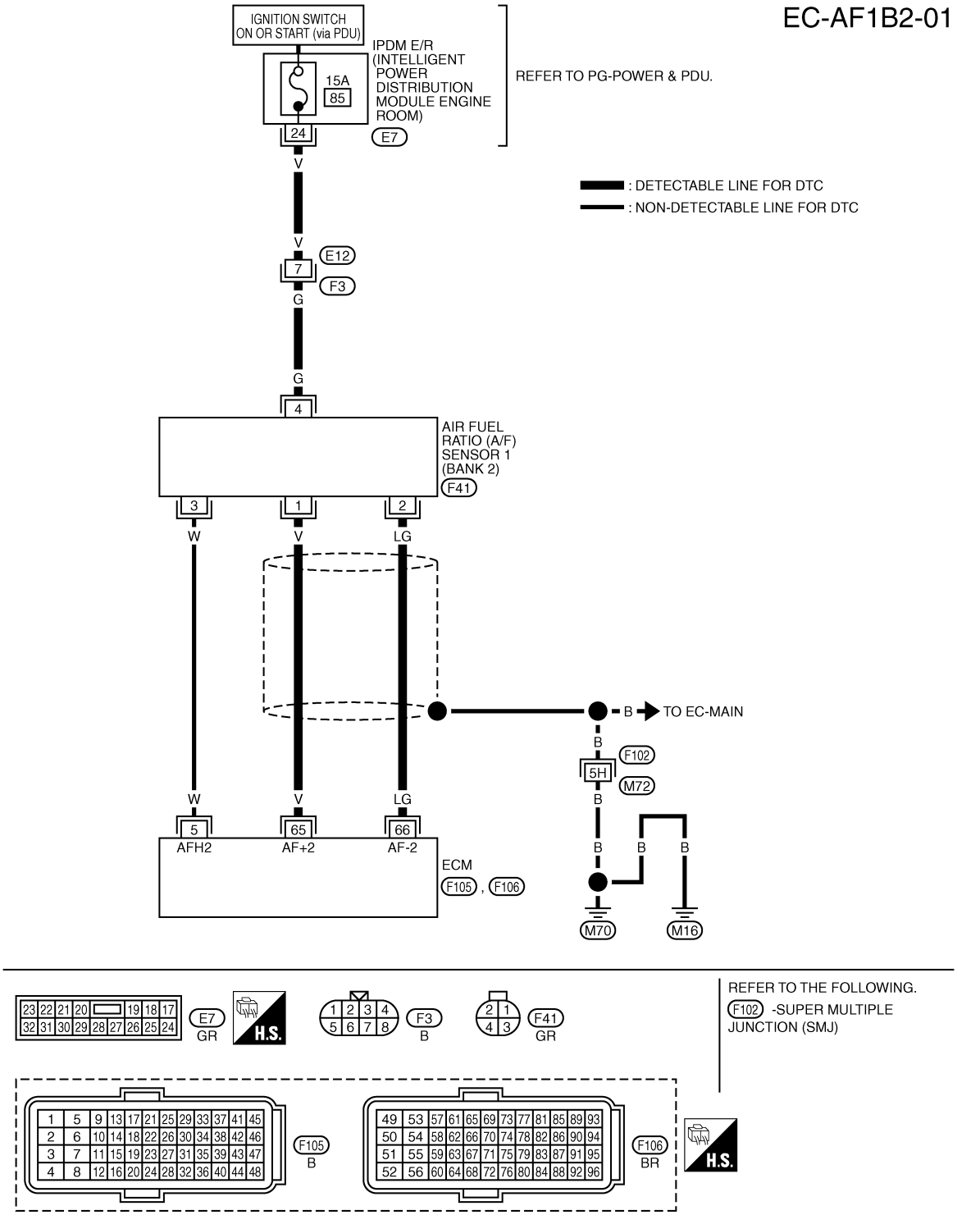
EC-AF1B1-01





TBWT2430E

EC-AF1B2-01



TBWT2431E

Diagnosis Procedure

INFOID:0000000005353481

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

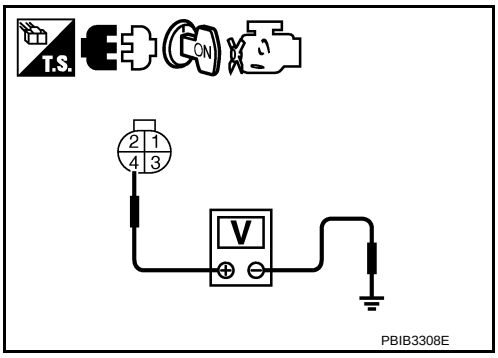
YES >> GO TO 2.

NO >> Repair or replace ground connections.

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		
P0132	1	F40	4	Ground	Battery voltage
P0152	2	F41	4		



Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- 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	
P0132	1	F40	1	F106	57	Existed
			2		61	
P0152	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0132	1	F40	1	Ground	Not existed
			2		
P0152	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0132	F106	57	Ground	Not existed
		61		
P0152		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 EC-154, "Description".

Is the inspection result normal?

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

6. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1.

CAUTION:

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

>> INSPECTION END

P0133, P0153 A/F SENSOR 1

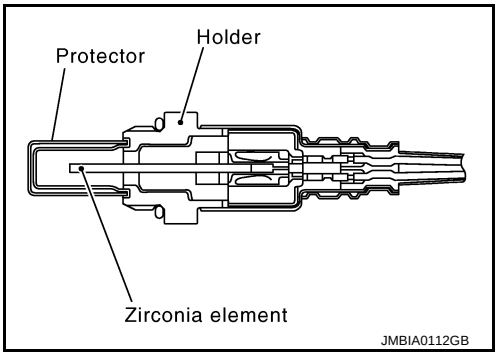
Description

INFOID:0000000005353482

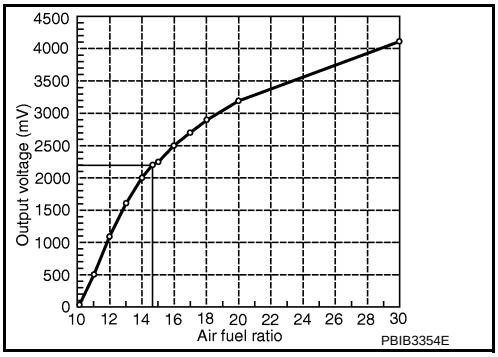
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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



DTC Logic

INFOID:0000000005353483

DTC DETECTION LOGIC

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

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible Cause
P0133	Air fuel ratio (A/F) sensor 1 (bank 1) circuit slow response	• The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leaks • Exhaust gas leaks • PCV • Mass air flow sensor
P0153	Air fuel ratio (A/F) sensor 1 (bank 2) circuit slow response		

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.

Will CONSULT-III be used?

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

2. PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Select “A/F SEN1(B1) P1278/P1279” (for DTC P0133) or “A/F SEN1(B2) P1288/P1289” (for DTC P0153) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT-III.
6. Touch “START”.

Is “COMPLETED” displayed on CONSULT-III screen?

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

3. PERFORM DTC CONFIRMATION PROCEDURE-II

Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-260, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE-II

1. After perform the following procedure, “TESTING” will be displayed on the CONSULT-III screen.

- Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
- Fully release accelerator pedal and then let engine idle for approximately 10 seconds.

If “TESTING” is not displayed after 10 seconds, refer to EC-146, "Component Function Check".

2. Wait for approximately 20 seconds at idle under the condition that “TESTING” is displayed on the CONSULT-III screen.
3. Check that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, refer to EC-146, "Component Function Check".
4. Touch “SELF-DIAG RESULT”.

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-260, "Diagnosis Procedure".

5. CHECK AIR-FUEL RATIO SELF-LEARNING VALUE

With GST

1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Calculate the total value of “Short term fuel trim” and “Long term fuel trim” indications.

Is the total percentage within ±15%?

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

6. DETECT MALFUNCTIONING PART

Check the following.

- Intake air leaks
- Exhaust gas leaks
- Incorrect fuel pressure
- Lack of fuel
- Fuel injector
- Incorrect PCV hose connection
- PCV valve
- Mass air flow sensor

>> Repair or replace malfunctioning part.

7. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
3. Let engine idle for 1 minute.
4. Increase the engine speed up to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
5. Fully release accelerator pedal and then let engine idle for approximately 1 minute.
6. Check 1st trip DTC.

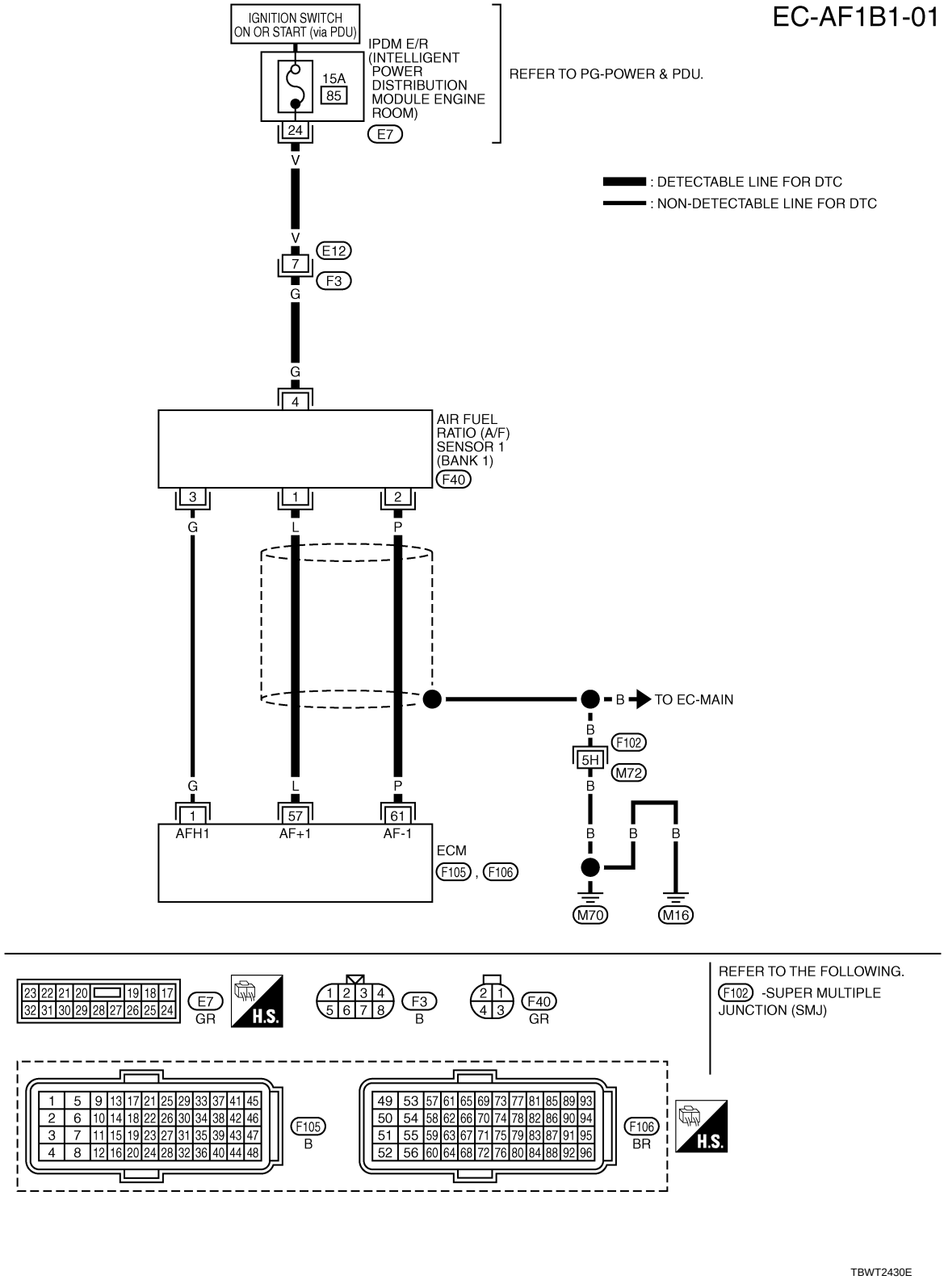
Is 1st trip DTC detected?

YES >> Go to EC-260, "Diagnosis Procedure".
NO >> INSPECTION END

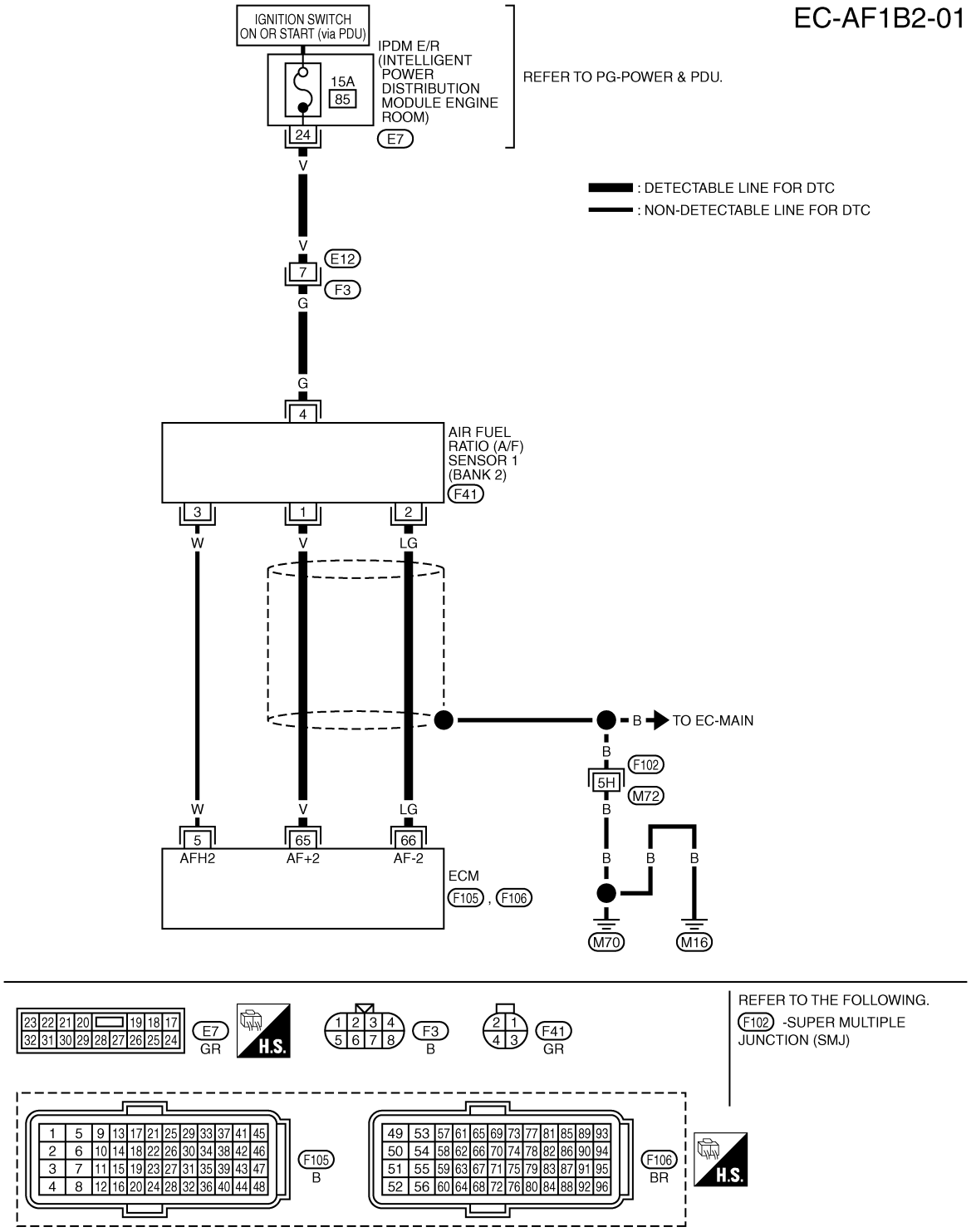
Wiring Diagram

INFOID:0000000005353484

EC-AF1B1-01



TBWT2430E



TBWT2431E

Diagnosis Procedure

INFOID:0000000005353485

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

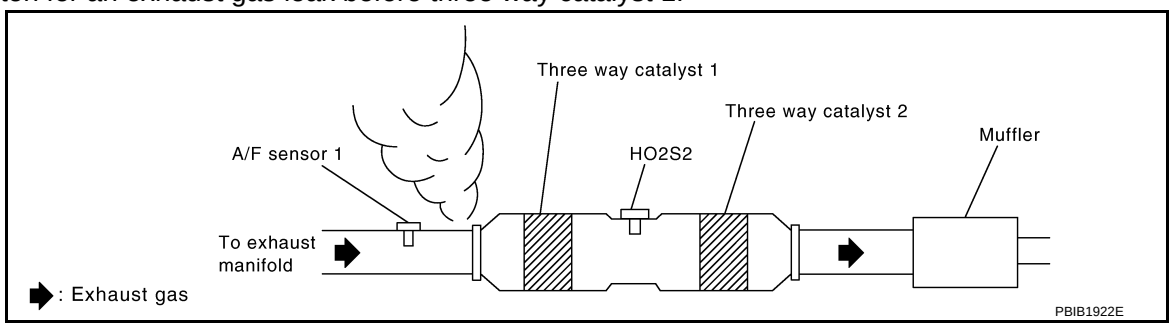
2. RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

Loosen and retighten the A/F sensor 1. Refer to EM-24, "Removal and Installation".

>> 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 malfunctioning part.
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 malfunctioning part.
NO >> GO TO 5.

5. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

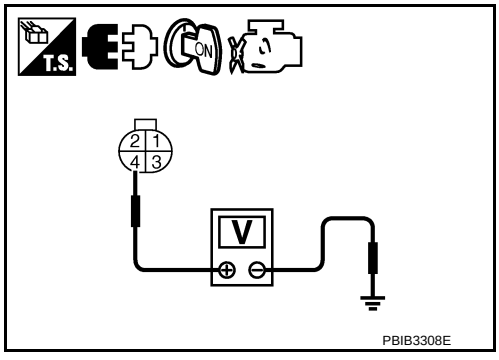
Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-294, "DTC Logic" or EC-301, "DTC Logic".
NO >> GO TO 6.

6. CHECK 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		
P0133	1	F40	4	Ground	Battery voltage
P0153	2	F41	4		



Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- 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	
P0133	1	F40	1	F106	57	Existed
			2		61	
P0153	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0133	1	F40	1	Ground	Not existed
			2		
P0153	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0133	F106	57	Ground	Not existed
		61		
P0153		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 A/F SENSOR 1 HEATER

Refer to EC-178, "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-201, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning mass air flow sensor.

11. CHECK PCV VALVE

Refer to EC-635, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Repair or replace PCV valve.

12. CHECK INTERMITTENT INCIDENT

Perform EC-154, "Description".

Is the inspection result normal?

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

13. REPLACE A/F SENSOR 1

Replace malfunctioning A/F sensor 1.

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).**

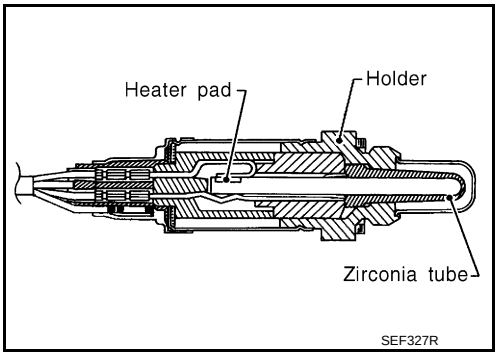
>> INSPECTION END

P0137, P0157 HO2S2

Description

INFOID:0000000005353486

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.

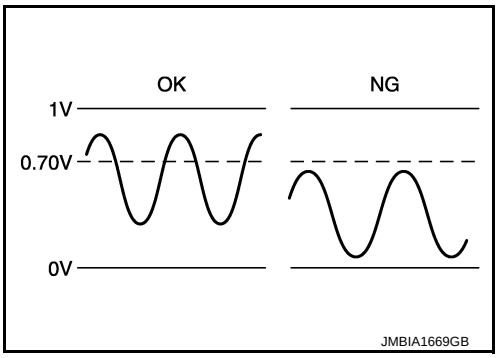


DTC Logic

INFOID:0000000005353487

DTC DETECTION LOGIC

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst 1 causes the longer switching time. To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137	Heated oxygen sensor 2 (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.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.

Will CONSULT-III be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III
TESTING CONDITION:
For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30 °C (32 to 86 °F).

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

3. Turn ignition switch ON
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT-III.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1147” (for DTC P0137) or “HO2S2 (B2) P1167” (for DTC P0157) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
11. Follow the instruction of CONSULT-III display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-268, "Diagnosis Procedure".
CANNOT BE DIAGNOSED>>GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 2.

4.PERFORM COMPONENT FUNCTION CHECK

With GST
Perform component function check. Refer to EC-265, "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?

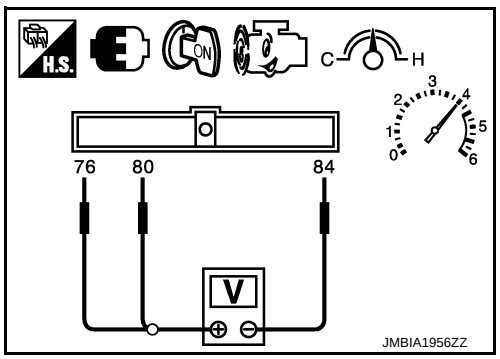
YES >> INSPECTION END
NO >> Go to EC-268, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353488

1.PERFORM COMPONENT FUNCTION CHECK-I

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



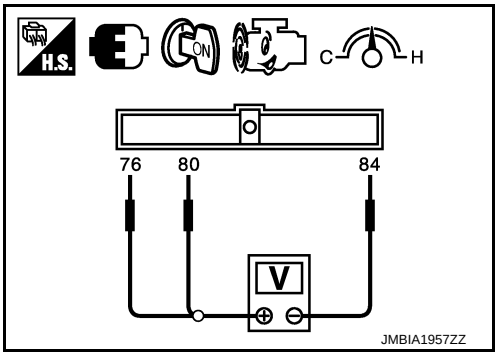
DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F106	76	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.70 V at least once during this procedure.
P0157		80			

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.



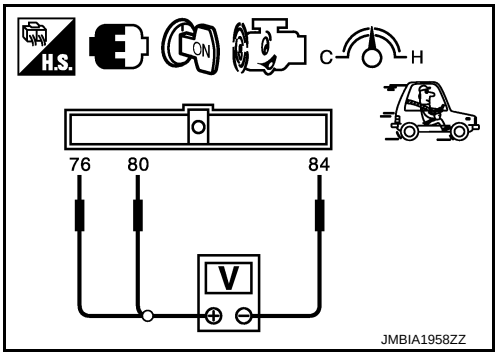
DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0137	F106	76	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.70 V at least once during this procedure.
P0157		80			

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	F106	76	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.70 V at least once during this procedure.
P0157		80			

Is the inspection result normal?

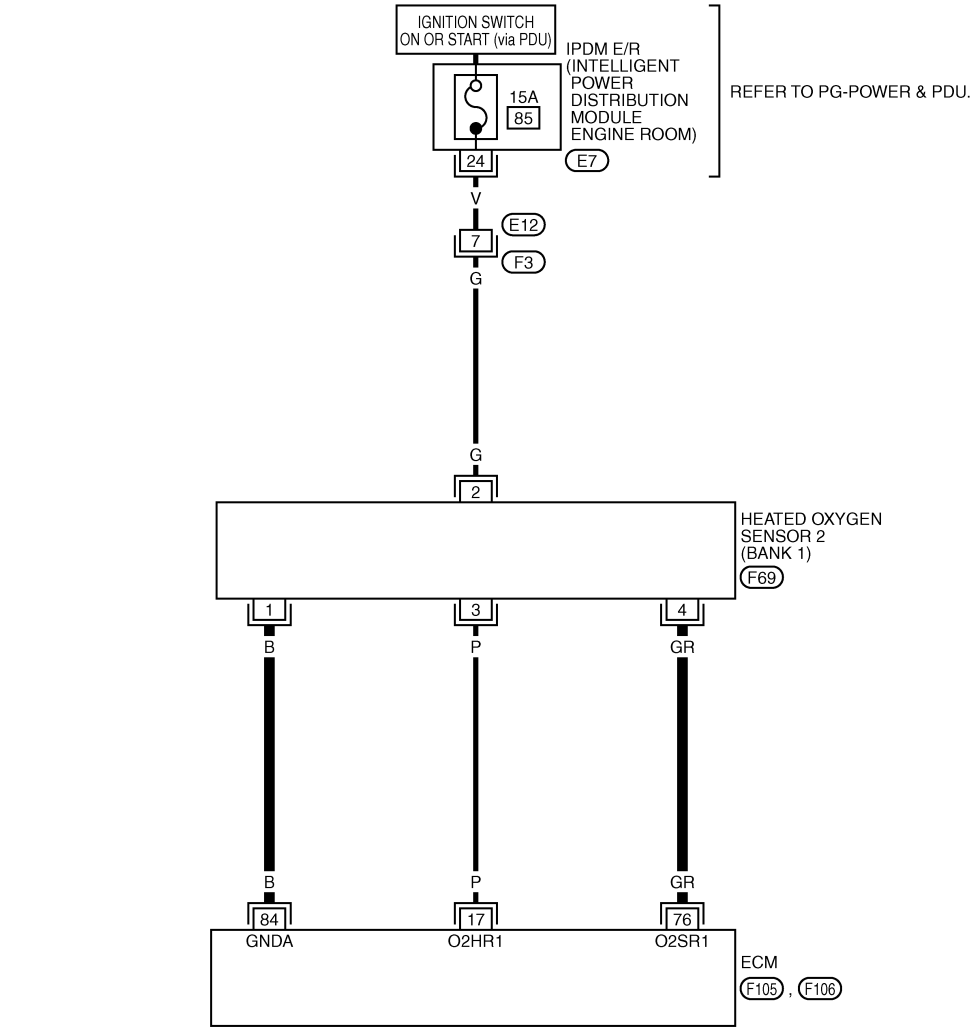
YES >> INSPECTION END
NO >> Go to EC-268, "Diagnosis Procedure".

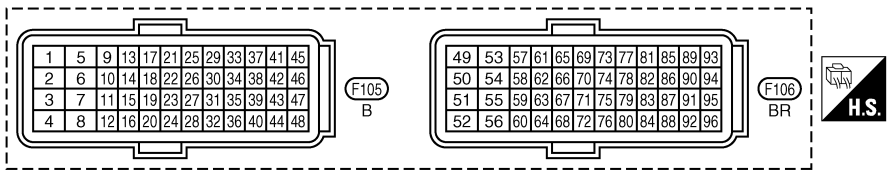
Wiring Diagram

INFOID:0000000005353489

EC-O2S2B1-01

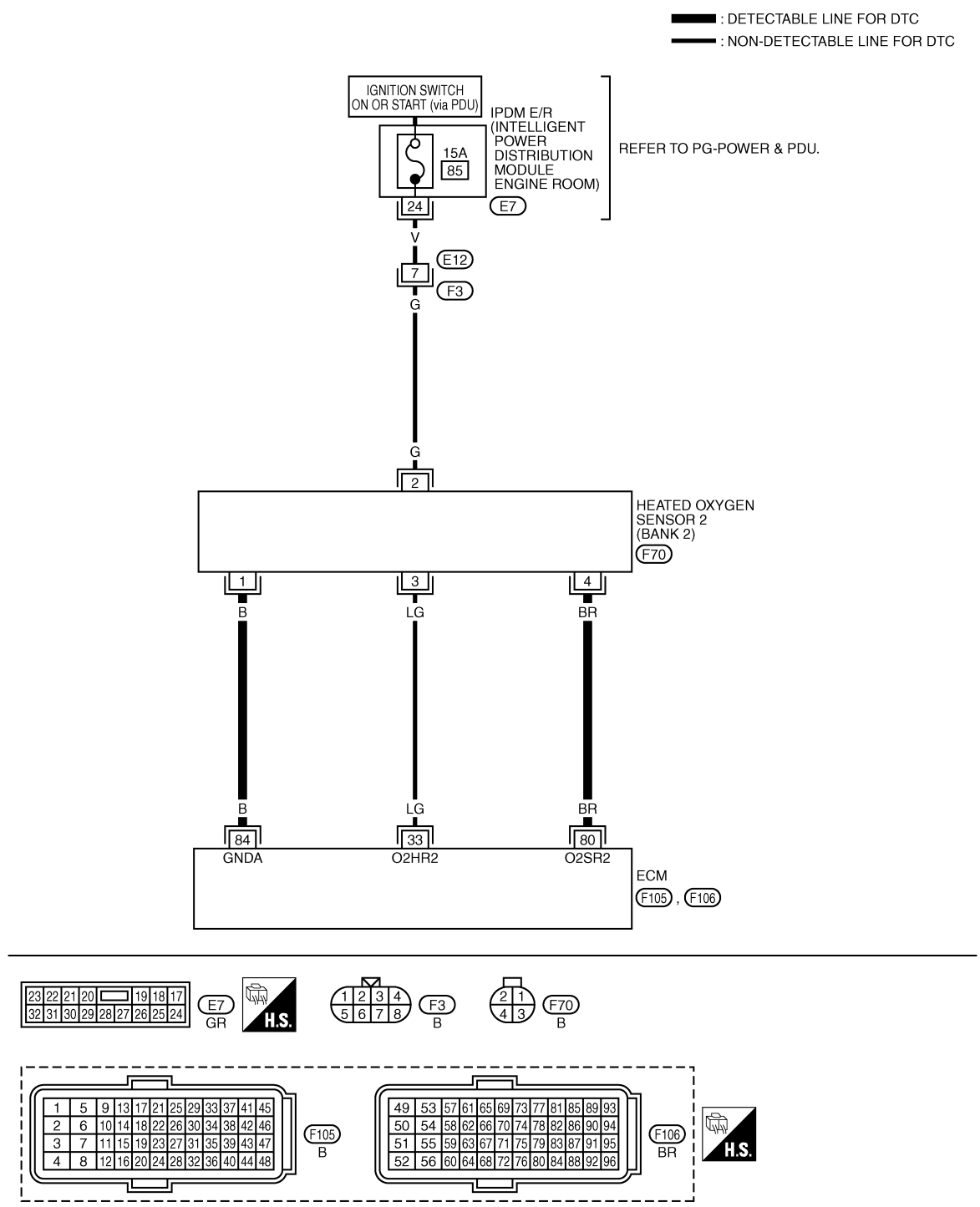
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





TBWT2432E

EC-O2S2B2-01



TBWT2433E

Diagnosis Procedure

INFOID:0000000005353490

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

2. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171 or P0174 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to EC-294, "DTC Logic".
NO >> GO TO 3.

3. CHECK HEATED OXYGEN SENSOR 2 (HO2S2) GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0137	1	F69	1	F106	84	Existed
P0157	2	F70	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	F69	4	F106	76	Existed
P0157	2	F70	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0137	1	F69	4	Ground	Not existed
P0157	2	F70	4		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0137	F106	76	Ground	Not existed
P0157		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-270, "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.

CAUTION:

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

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

INFOID:0000000005353491

1. INSPECTION START

Will CONSULT-III be used?

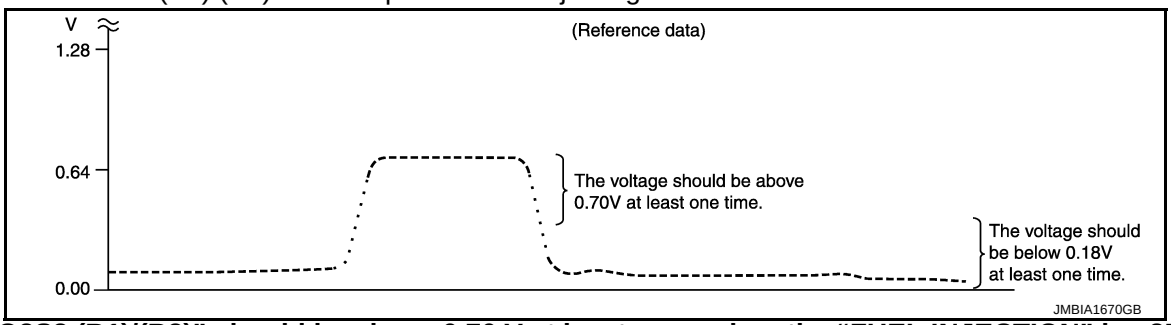
Will CONSULT-III be used?

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

2. CHECK HEATED OXYGEN SENSOR 2 (HO2S2)

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.70 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?

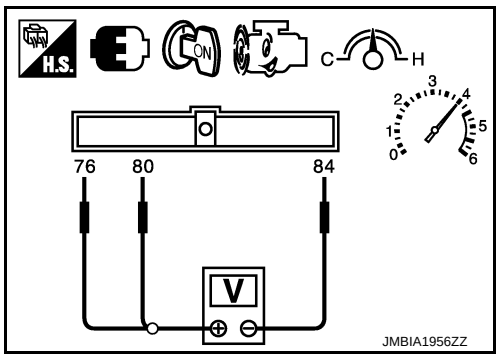
YES >> INSPECTION END
NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.

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



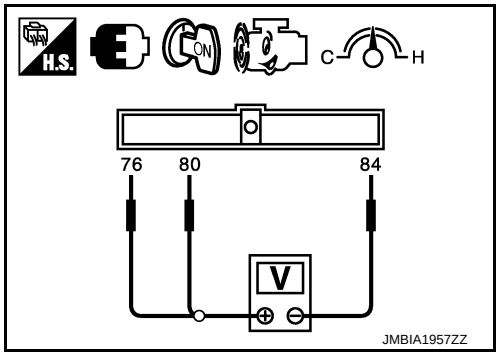
ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F106	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.70 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 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.



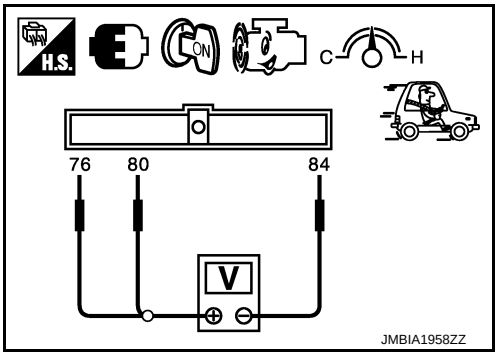
ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F106	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.70 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

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		
F106	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.70 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.

CAUTION:

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

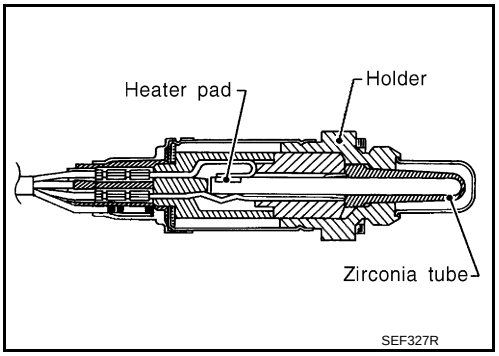
>> INSPECTION END

P0138, P0158 HO2S2

Description

INFOID:0000000005353492

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

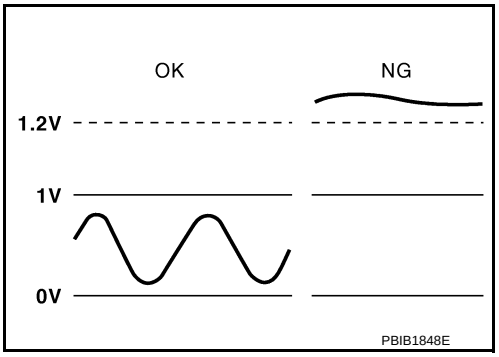
INFOID:0000000005353493

DTC DETECTION LOGIC

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

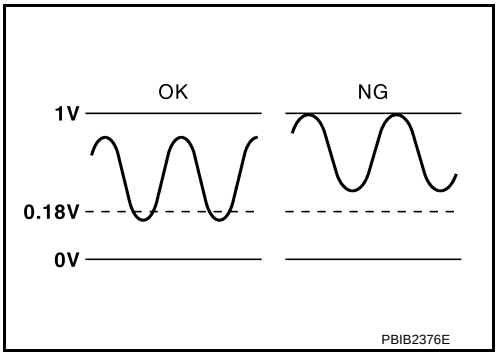
MALFUNCTION A

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge the malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0138	Heated oxygen sensor 2 (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-278, "Diagnosis Procedure".
NO-1 >> With CONSULT-III: GO TO 3.
NO-2 >> With GST: GO TO 5.

3.PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B

With CONSULT-III

NOTE:

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

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT-III.
8. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P1146” (for DTC P0138) or “HO2S2 (B2) P1166” (for DTC P0158) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
11. Follow the instruction of CONSULT-III display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-278, "Diagnosis Procedure".
CANNOT BE DIAGNOSED>>GO TO 4.

4. PERFORM DTC CONFIRMATION PROCEDURE FOR MALFUNCTION B AGAIN

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

>> GO TO 3.

5. PERFORM COMPONENT FUNCTION CHECK FOR MALFUNCTION B

With GST

Perform component function check. Refer to EC-275, "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-278, "Diagnosis Procedure".

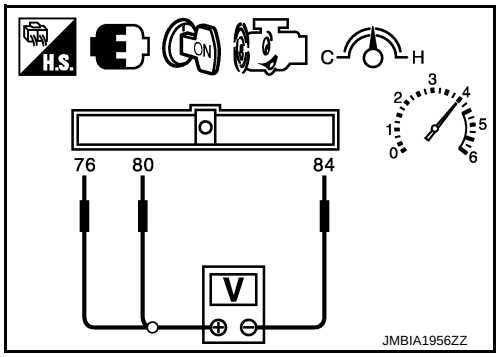
Component Function Check

INFOID:0000000005353494

1. PERFORM COMPONENT FUNCTION CHECK-I

With GST

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



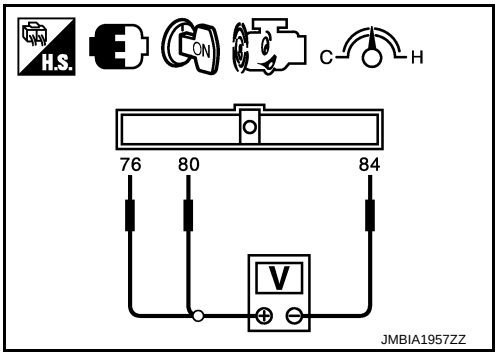
DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F106	76	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be below 0.18 V at least once during this procedure.
P0158		80			

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.



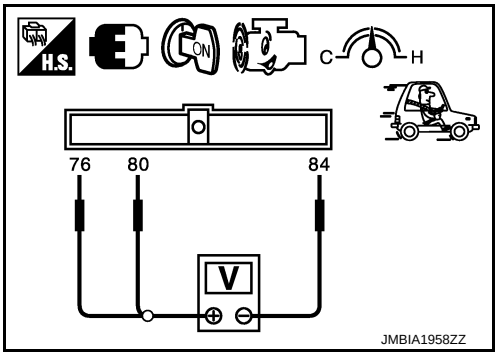
DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0138	F106	76	84	Keeping engine at idle for 10 minutes	The voltage should be below 0.18 V at least once during this procedure.
P0158		80			

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	F106	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			

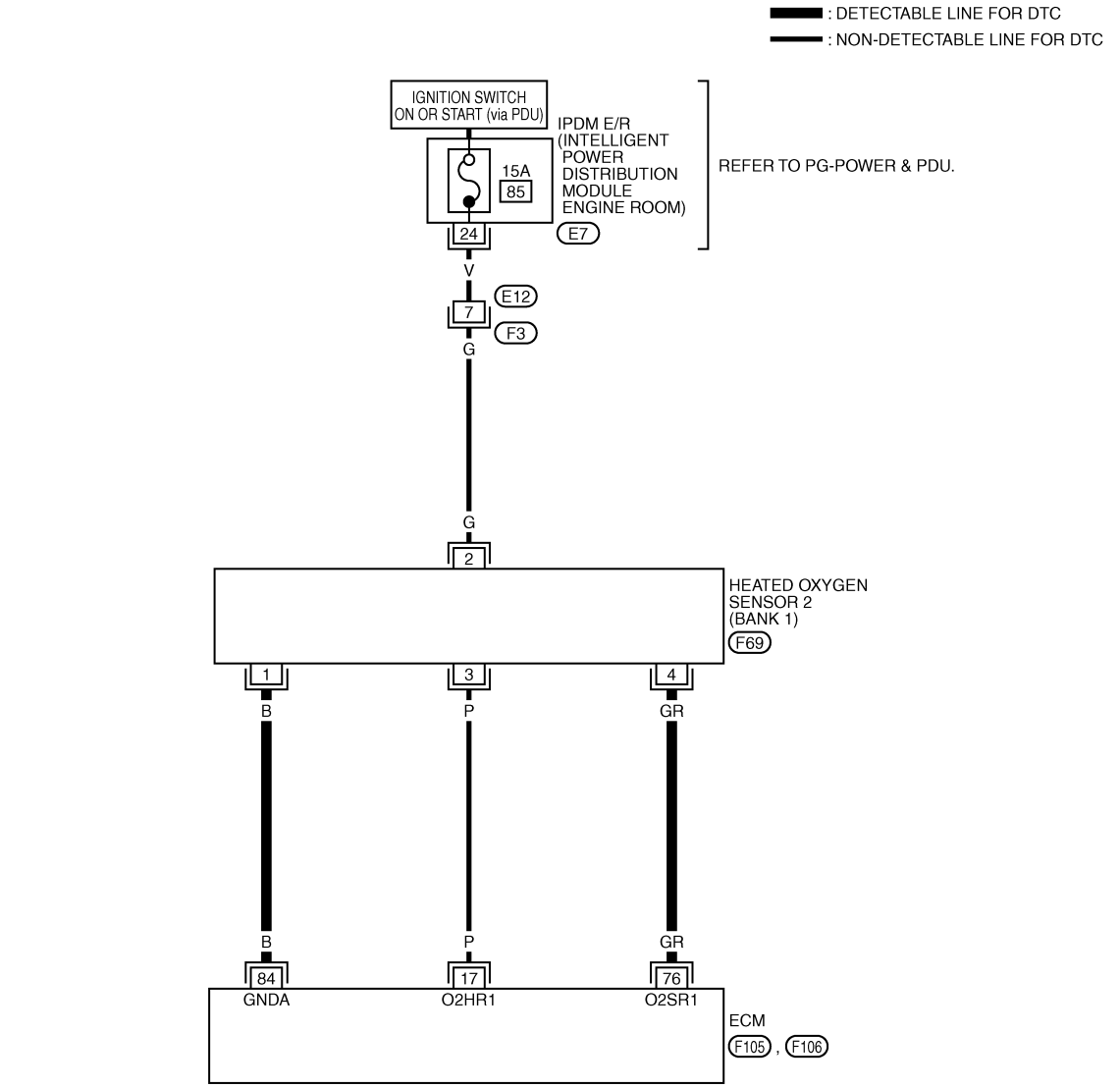
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-278, "Diagnosis Procedure".

Wiring Diagram

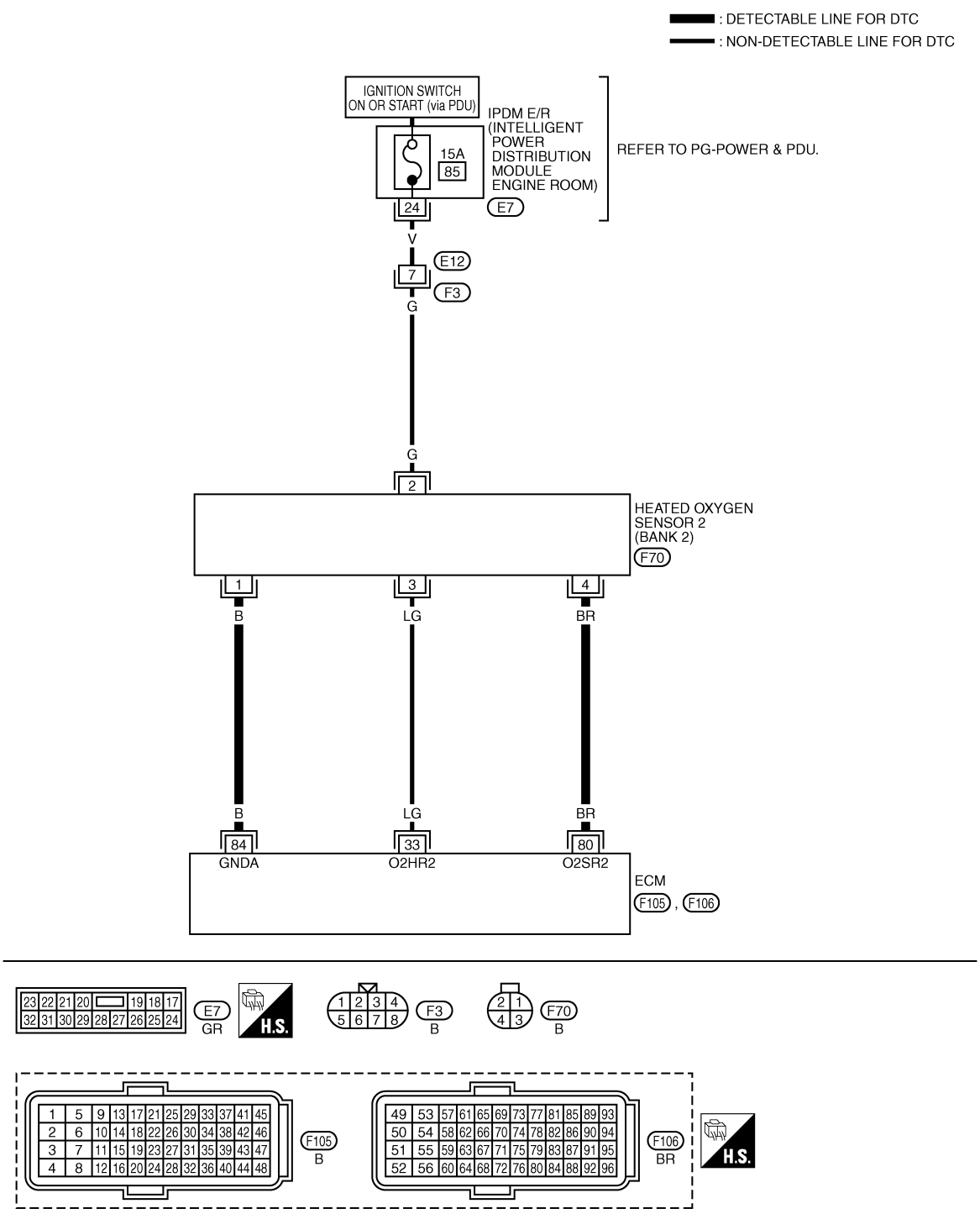
INFOID:0000000005353495

EC-O2S2B1-01



TBWT2432E

EC-O2S2B2-01



TBWT2433E

Diagnosis Procedure

INFOID:0000000005353496

1. INSPECTION START

Confirm the detected malfunction (A or B). Refer to EC-273, "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 connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2 (HO2S2) CONNECTOR FOR WATER

1. Disconnect HO2S2 harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

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

4. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Disconnect 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	F69	1	F106	84	Existed
P0158	2	F70	1			

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 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	F69	4	F106	76	Existed
P0158	2	F70	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0138	1	F69	4	Ground	Not existed
P0158	2	F70	4		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0138	F106	76	Ground	Not existed
P0158		80		

3. Also check harness for short to power.

Is the inspection result normal?

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

6. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-281, "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.

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

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

9. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace ground connections.

10. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0172 or P0175 detected? Is it difficult to start engine?

YES >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-301, "DTC Logic".
NO >> GO TO 11.

11. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0138	1	F69	1	F106	84	Existed
P0158	2	F70	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	F69	4	F106	76	Existed
P0158	2	F70	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0138	1	F69	4	Ground	Not existed
P0158	2	F70	4		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0138	F106	76	Ground	Not existed
P0158		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-281, "Component Inspection".

Is the inspection result normal?

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

14. REPLACE HEATED OXYGEN SENSOR 2

Replace malfunctioning heated oxygen sensor 2.

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

15. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

INFOID:0000000005353497

1. INSPECTION START

Will CONSULT-III be used?

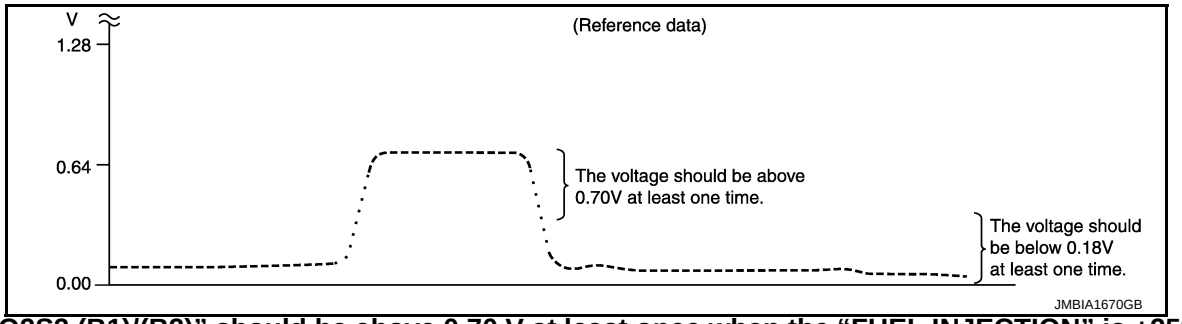
Will CONSULT-III be used?

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

2. CHECK HEATED OXYGEN SENSOR 2 (HO2S2)

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.70 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%.

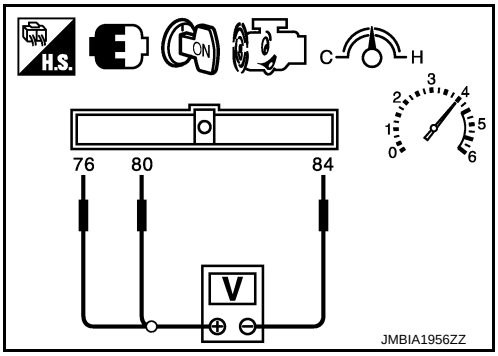
Is the inspection result normal?

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

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

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



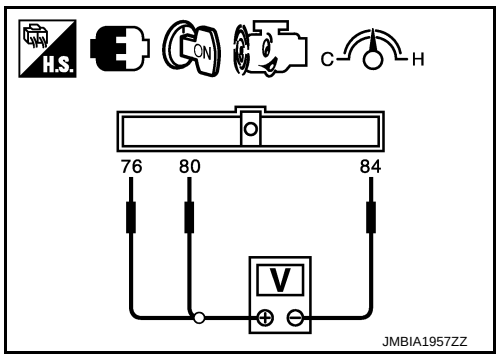
ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F106	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.70 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 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.



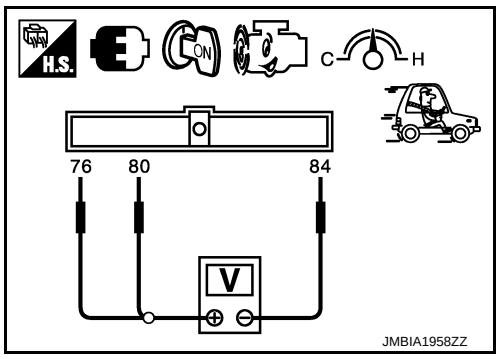
ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F106	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.70 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

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		
F106	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.70 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.

CAUTION:

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

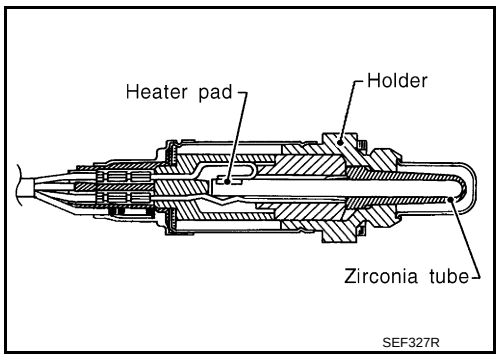
>> INSPECTION END

P0139, P0159 HO2S2

Description

INFOID:0000000005353498

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.

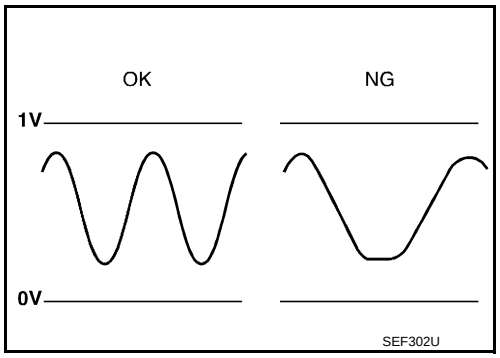


DTC Logic

INFOID:0000000005353499

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	It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leaks
P0159	Heated oxygen sensor 2 (bank 2) circuit slow response		

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.

Will CONSULT-III be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III
TESTING CONDITION:
For better results, perform "DTC WORK SUPPORT" at a temperature of 0 to 30 °C (32 to 86 °F).

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

3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “DATA MONITOR” mode with CONSULT-III.
8. Make sure that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P0139” or “HO2S2 (B2) P0159” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
11. Start engine and follow the instruction of CONSULT-III display.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-289, "Diagnosis Procedure".
CANNOT BE DIAGNOSED>>GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

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

>> GO TO 2.

4. PERFORM COMPONENT FUNCTION CHECK

With GST
Perform component function check. Refer to EC-286, "Component Function Check".
NOTE:
Use component function check to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

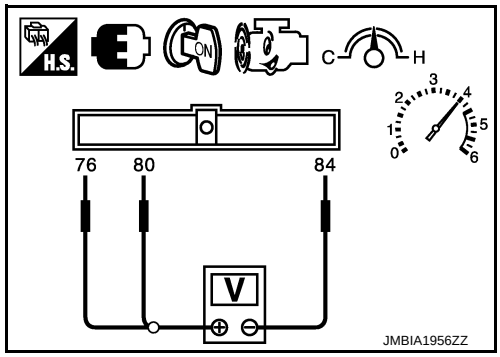
YES >> INSPECTION END
NO >> Go to EC-289, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353500

1. PERFORM COMPONENT FUNCTION CHECK-I

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



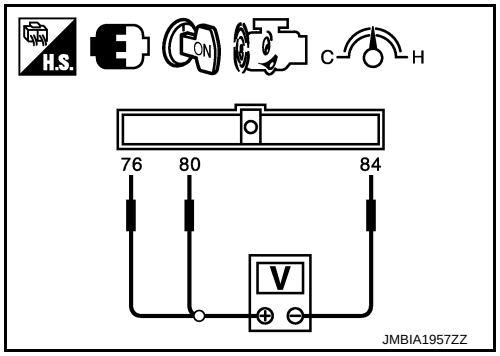
DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F106	76	84	Revving up to 4,000 rpm under no load at least 10 times	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		80			

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.



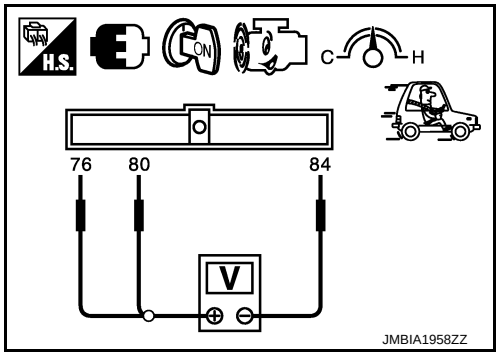
DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0139	F106	76	84	Keeping engine at idle for 10 minutes	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		80			

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	F106	76	84	Coasting from 80 km/h (50 MPH) in D position	A change of voltage should be more than 0.24 V for 1 second during this procedure.
P0159		80			

Is the inspection result normal?

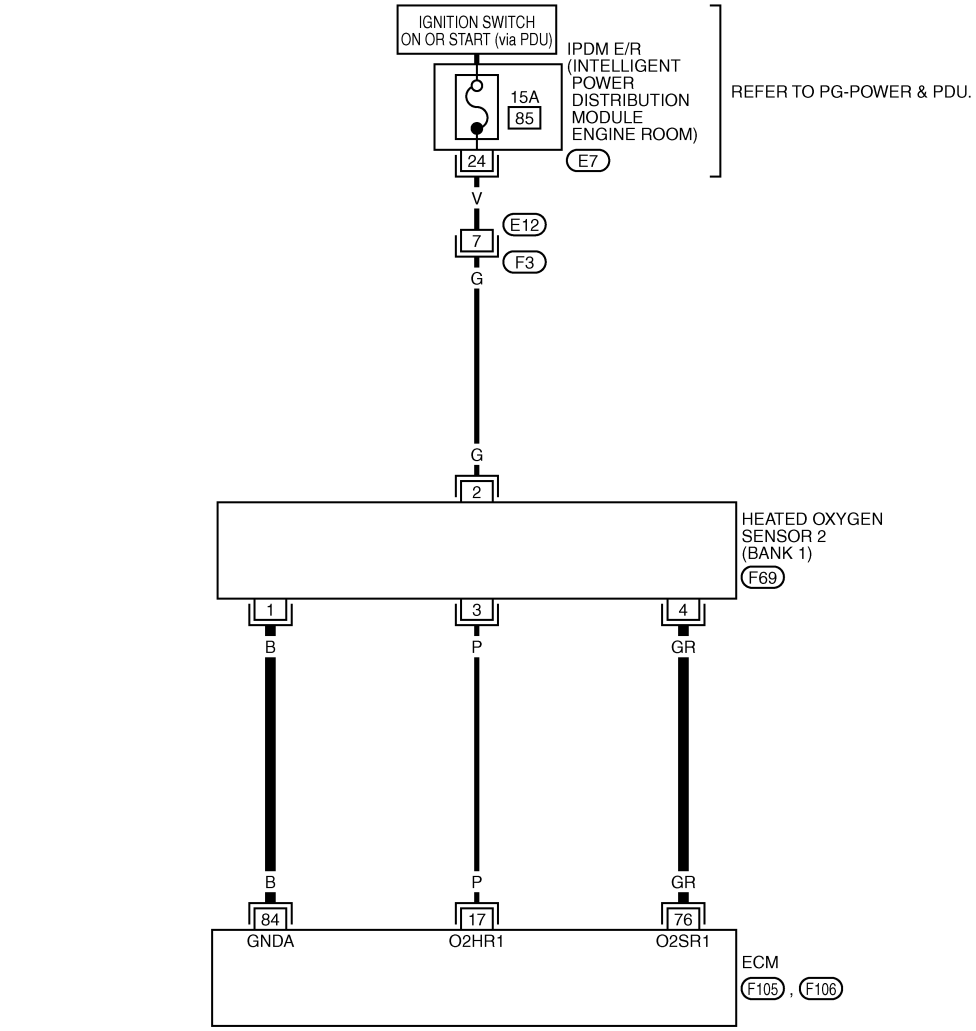
YES >> INSPECTION END
NO >> Go to EC-289, "Diagnosis Procedure".

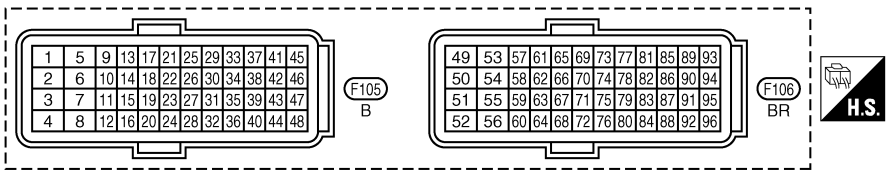
Wiring Diagram

INFOID:0000000005353501

EC-O2S2B1-01

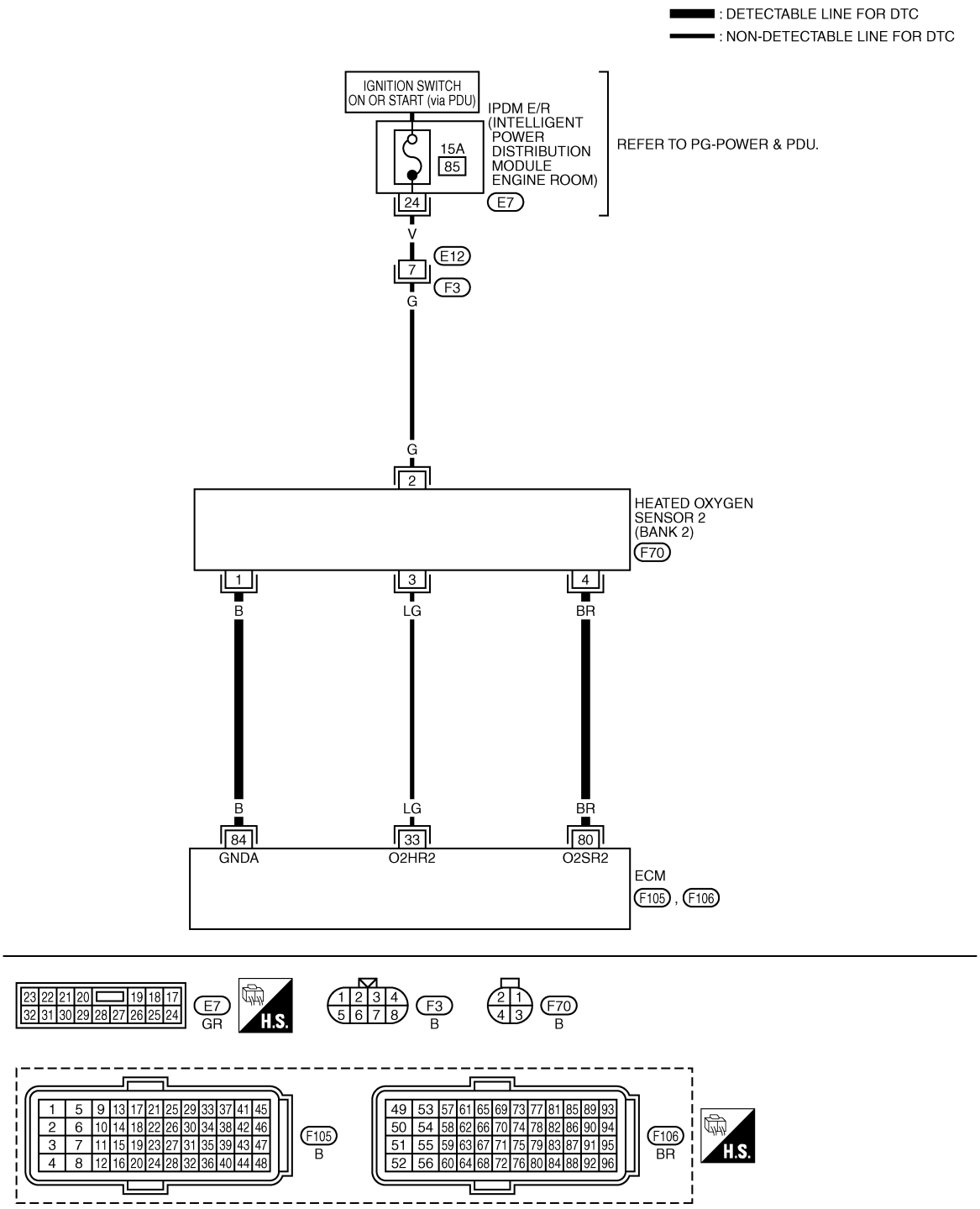
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





TBWT2432E

EC-O2S2B2-01



TBWT2433E

Diagnosis Procedure

INFOID:0000000005353502

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

2. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, 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-294, "DTC Logic" or EC-301, "DTC Logic".
NO >> GO TO 3.

3. CHECK HEATED OXYGEN SENSOR 2 (HO2S2) GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	HO2S2			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0139	1	F69	1	F106	84	Existed
P0159	2	F70	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	F69	4	F106	76	Existed
P0159	2	F70	4		80	

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

DTC	HO2S2			Ground	Continuity
	Bank	Connector	Terminal		
P0139	1	F69	4	Ground	Not existed
P0159	2	F70	4		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0139	F106	76	Ground	Not existed
P0159		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-291, "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.

CAUTION:

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

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

INFOID:0000000005353503

1. INSPECTION START

Will CONSULT-III be used?

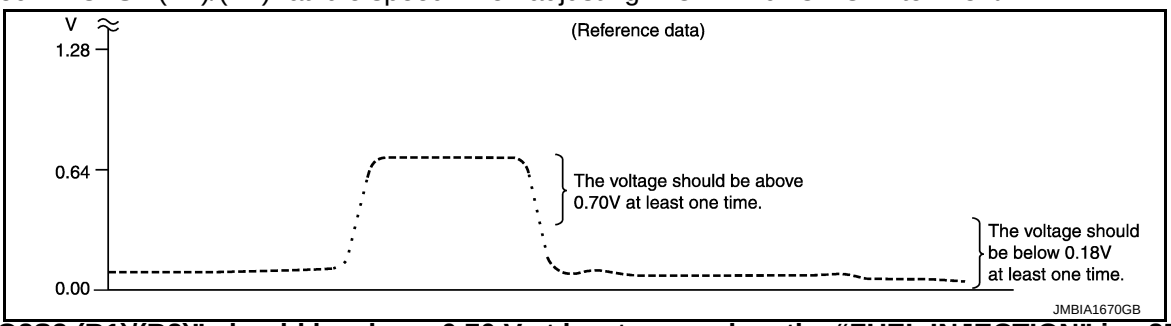
Will CONSULT-III be used?

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

2. CHECK HEATED OXYGEN SENSOR 2 (HO2S2)

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
5. Let engine idle for 1 minute.
6. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-III.
7. Check “HO2S2 (B1)/(B2)” at idle speed when adjusting “FUEL INJECTION” to ±25%.



“HO2S2 (B1)/(B2)” should be above 0.70 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?

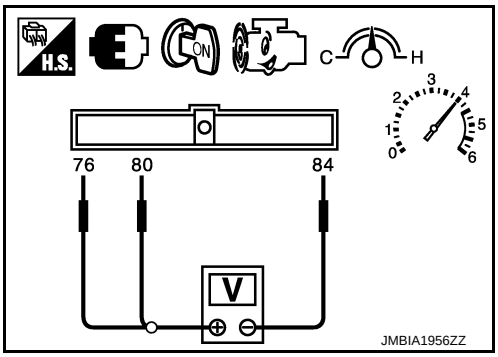
YES >> INSPECTION END
NO >> GO TO 6.

3. CHECK HEATED OXYGEN SENSOR 2-I

Without CONSULT-III

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.

4. Let engine idle for 1 minute.
5. Check the voltage between ECM harness connector terminals under the following condition.



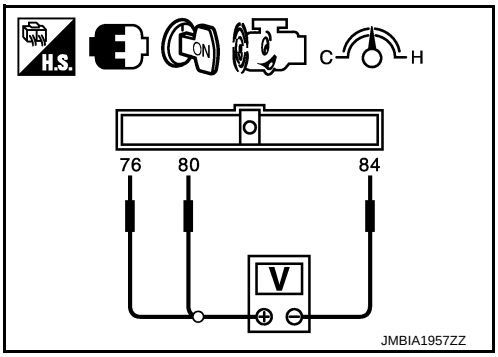
ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F106	76 [HO2S2 (bank 1)]	84	Revving up to 4,000 rpm under no load at least 10 times	The voltage should be above 0.70 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 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.



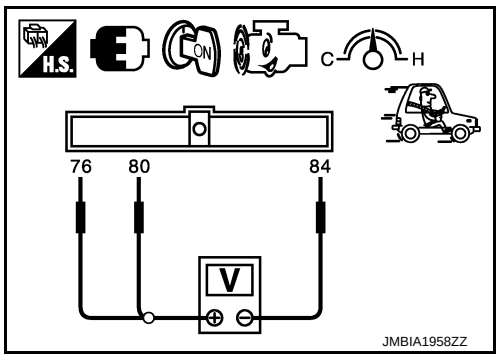
ECM			Condition	Voltage
Connector	+	–		
	Terminal	Terminal		
F106	76 [HO2S2 (bank 1)]	84	Keeping engine at idle for 10 minutes	The voltage should be above 0.70 V at least once during this procedure. The voltage should be below 0.18 V at least once during this procedure.
	80 [HO2S2 (bank 2)]			

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		
F106	76 [HO2S2 (bank 1)]	84	Coasting from 80 km/h (50 MPH) in D position	The voltage should be above 0.70 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.

CAUTION:

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

>> INSPECTION END

P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000005353504

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 air fuel ratio (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-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

Does the engine start?

YES >> Go to EC-297, "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-297, "Diagnosis Procedure".
NO >> GO TO 5.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine.
5. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 – 120 km/h (31 – 75 mph)

CAUTION:
Always drive vehicle at a safe speed.

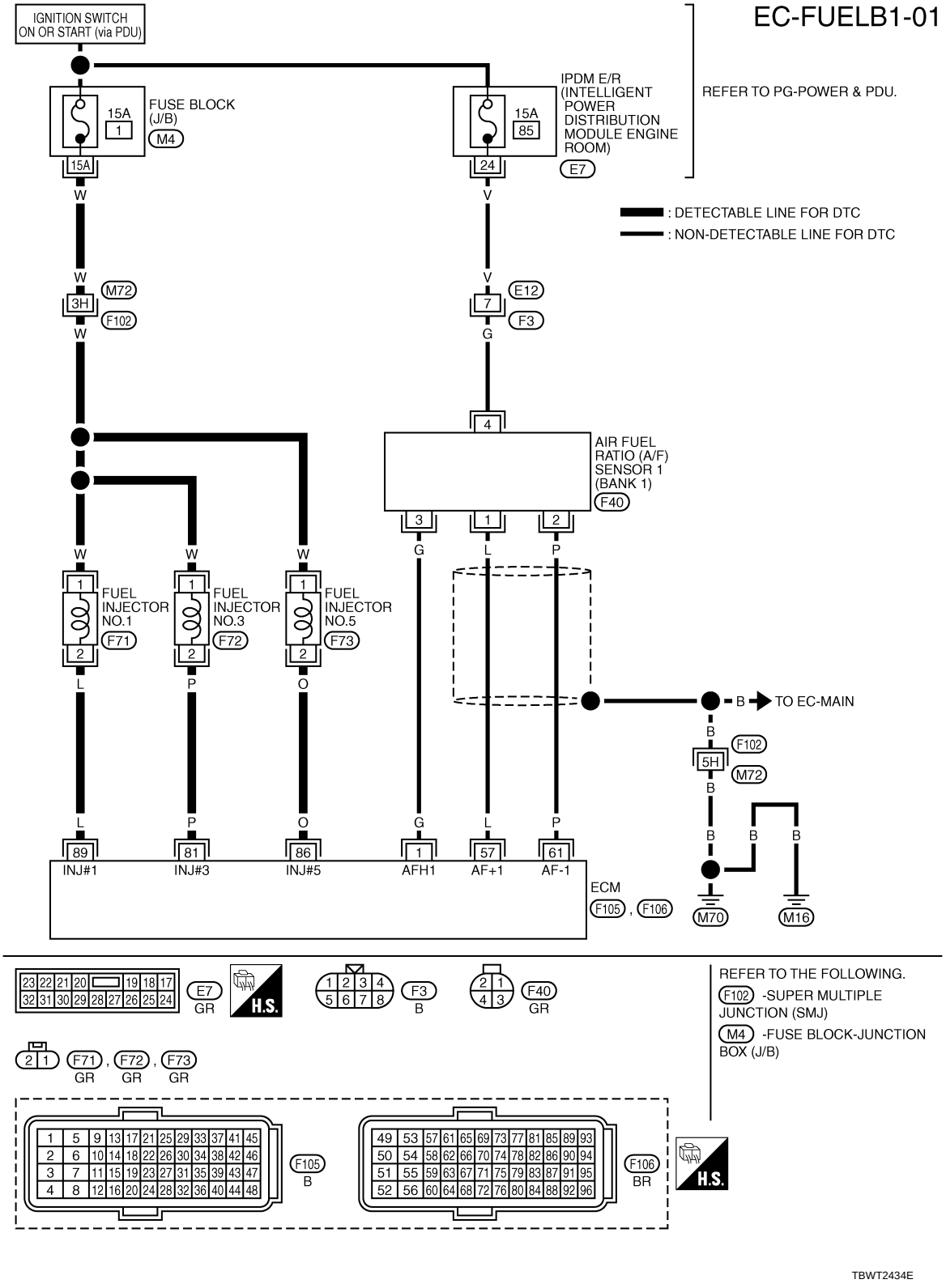
6. Check 1st trip DTC.

Is 1st trip DTC detected?

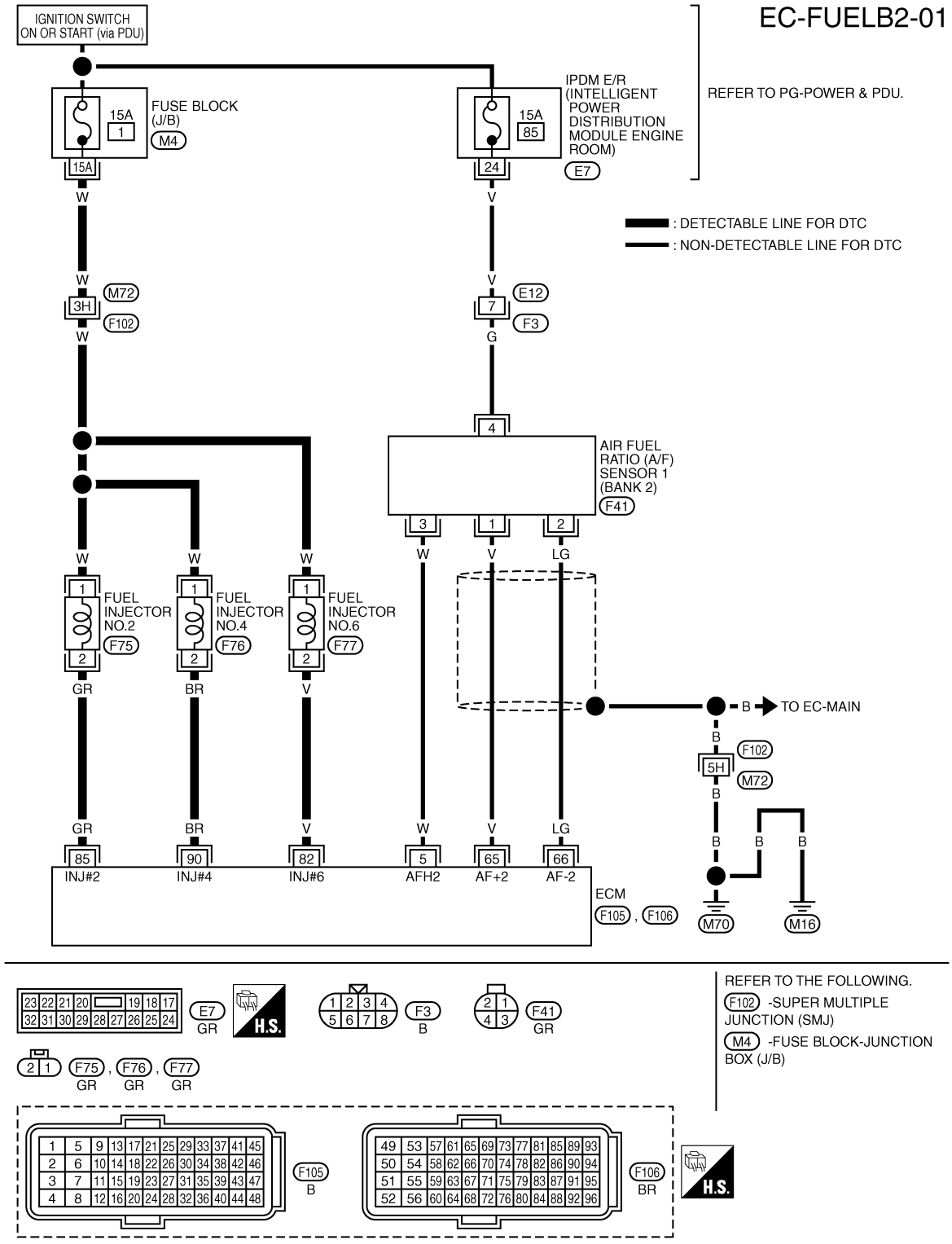
YES >> Go to EC-297, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353505



TBWT2434E



TBWT2435E

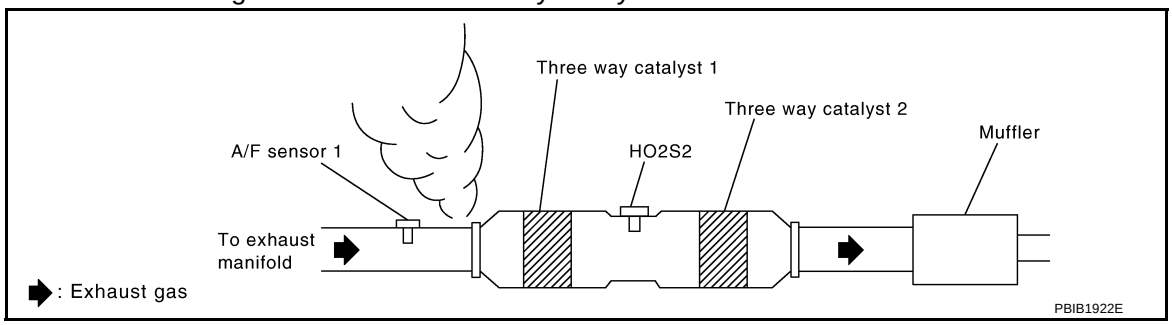
Diagnosis Procedure

INFOID:0000000005353506

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 malfunctioning part.
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 malfunctioning part.
NO >> GO TO 3.

3.CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0171	1	F40	1	F106	57	Existed
			2		61	
P0174	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0171	1	F40	1	Ground	Not existed
			2		
P0174	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0171	F106	57	Ground	Not existed
		61		
P0174		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

Check fuel pressure. Refer to EC-692, "Inspection".

Is the inspection result normal?

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

5. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

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

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.
   For specification, refer to EC-697, "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-697, "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-208, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

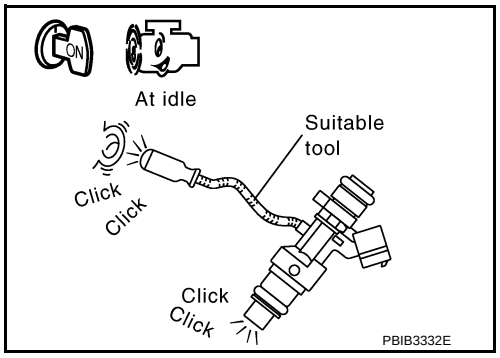
With CONSULT-III

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

Without CONSULT-III

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?

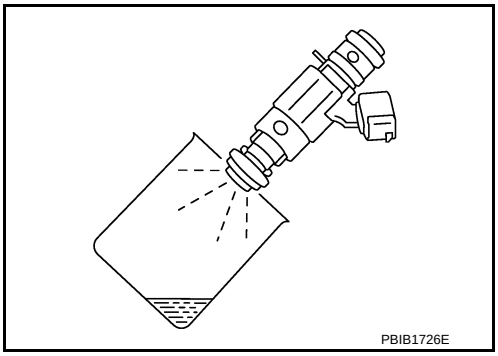
YES >> GO TO 8.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-599, "Diagnosis Procedure".

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-40, "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 approximately 3 seconds.
For DTC P0171, check that fuel sprays out from fuel injectors on bank 1.
For DTC P0174, check 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. Always replace O-ring with new ones.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

DTC Logic

INFOID:0000000005353507

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 air fuel ratio (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-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Start engine.

Is it difficult to start engine?

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

3.RESTART ENGINE

If it is difficult to start engine, the fuel injection system has a malfunction, too.
Crank engine while depressing accelerator pedal.

Does the engine start?

YES >> Go to EC-304, "Diagnosis Procedure".
NO >> Remove spark plugs and check for fouling, etc.

4.PERFORM DTC CONFIRMATION PROCEDURE-II

1. Keep engine idle for at least 5 minutes.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-304, "Diagnosis Procedure".
NO >> GO TO 5.

5.PERFORM DTC CONFIRMATION PROCEDURE-III

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

3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine.
5. Maintain the following conditions for at least 10 consecutive minutes. Hold the accelerator pedal as steady as possible.

VHCL SPEED SE	50 – 120 km/h (31 – 75 mph)

CAUTION:
Always drive vehicle at a safe speed.

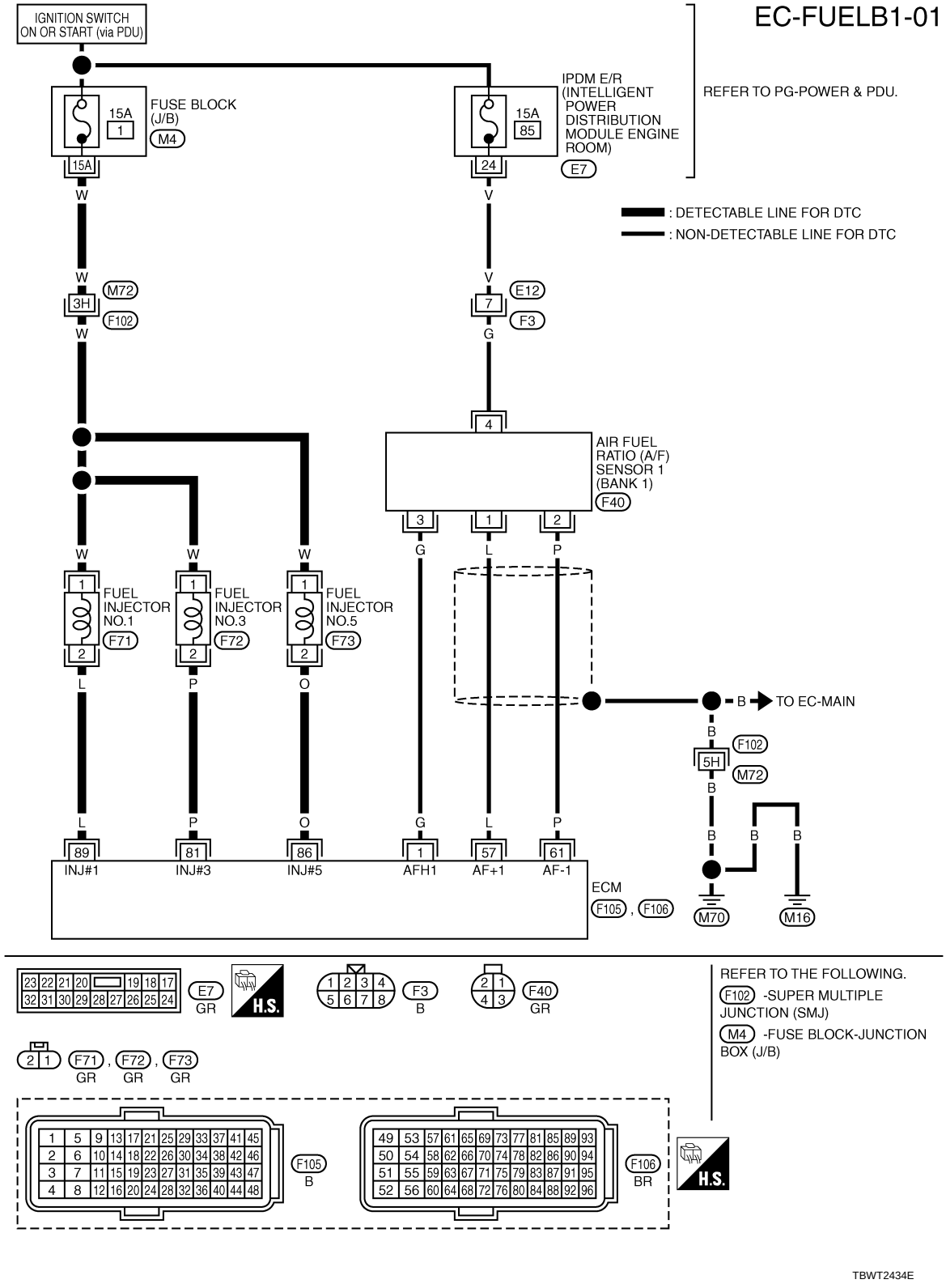
6. Check 1st trip DTC.

Is 1st trip DTC detected?

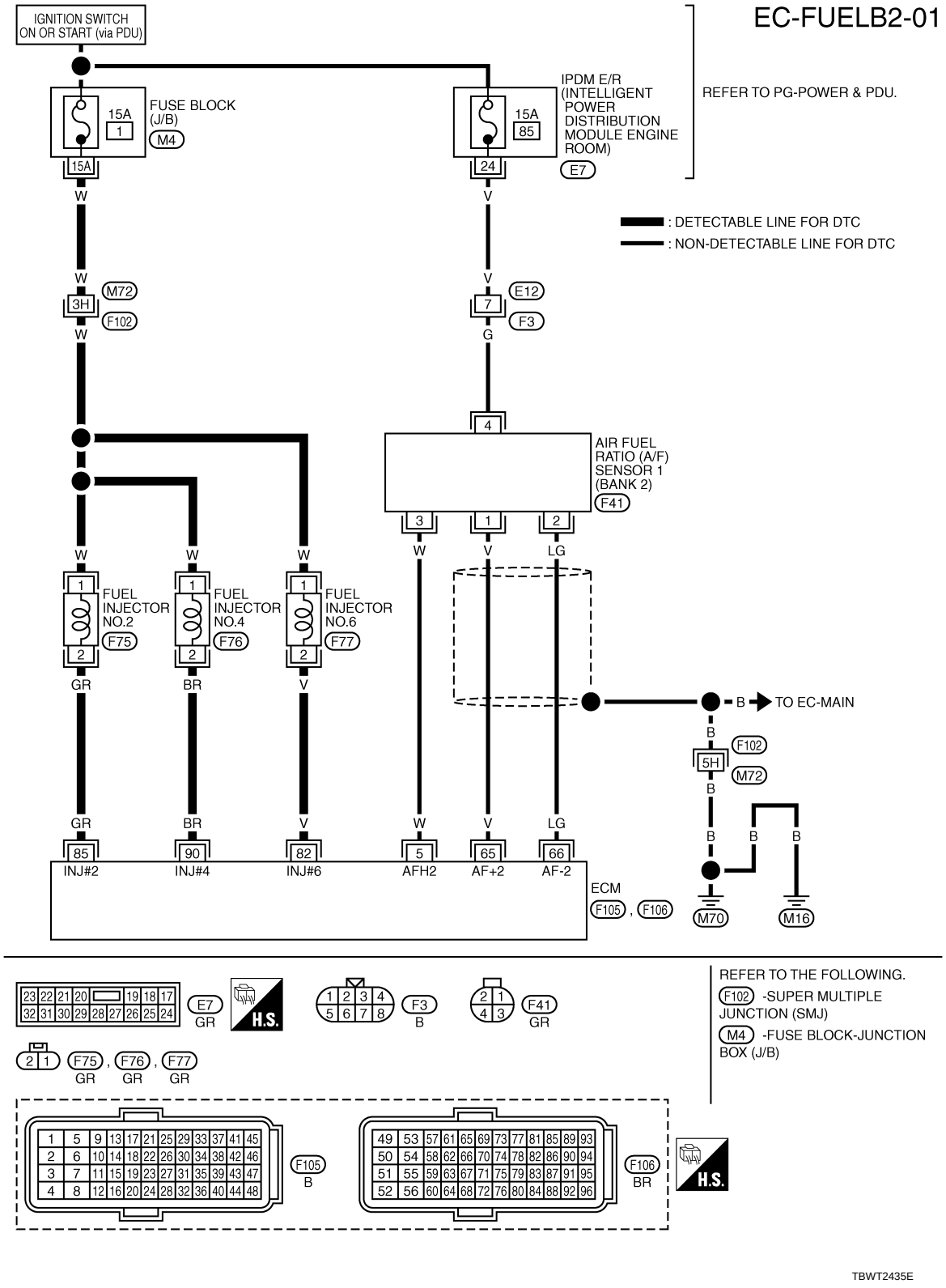
YES >> Go to EC-304, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353508



TBWT2434E



TBWT2435E

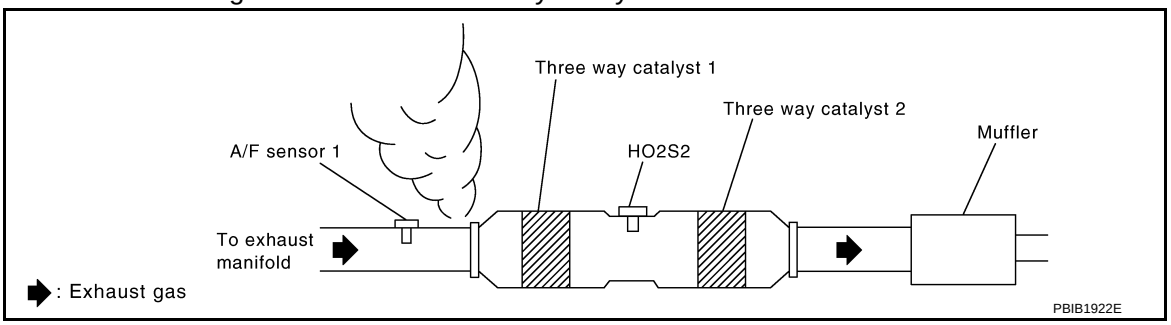
Diagnosis Procedure

INFOID:0000000005353509

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 malfunctioning part.
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 malfunctioning part.
NO >> GO TO 3.

3. CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

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

DTC	A/F sensor 1			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0172	1	F40	1	F106	57	Existed
			2		61	
P0175	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P0172	1	F40	1	Ground	Not existed
			2		
P0175	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P0172	F106	57	Ground	Not existed
		61		
P0175		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

Check fuel pressure. Refer to EC-692, "Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace “fuel filter and fuel pump assembly”.

5. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

1. Install all removed parts.
2. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.
   For specification, refer to EC-697, "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-697, "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-208, "Diagnosis Procedure".

6. CHECK FUNCTION OF FUEL INJECTOR

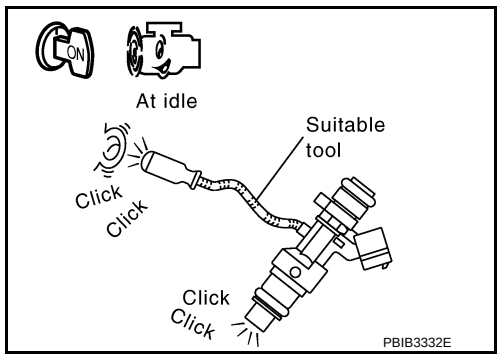
With CONSULT-III

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

Without CONSULT-III

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-599, "Diagnosis Procedure".

7. CHECK FUEL INJECTOR

1. Remove fuel injector assembly. Refer to EM-40, "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 approximately 3 seconds.
   Check that fuel 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. Always replace O-ring with new one.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

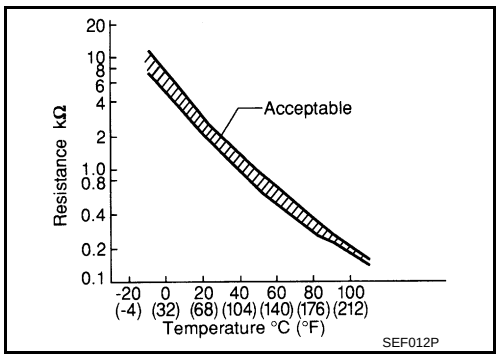
P0181 FTT SENSOR

Description

INFOID:0000000005353510

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:0000000005353511

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181	Fuel tank temperature sensor circuit range/performance	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 sensor circuit is open or shorted) • Fuel tank 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.

>> GO TO 2.

2.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-309, "Diagnosis Procedure".
NO >> GO TO 3.

3.CHECK ENGINE COOLANT TEMPERATURE

With CONSULT-III

1. Select “COOLAN TEMP/S” in “DATA MONITOR” with CONSULT-III.
2. Check “COOLAN TEMP/S” value.

With GST

Follow the procedure “With CONSULT-III” above.

“COOLAN TEMP/S” less than 60°C (140°F)?

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

4.PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

1. Cool engine down until “COOLAN TEMP/S” is less than 60°C (140°F).
2. Wait at least 10 seconds.
3. Check 1st trip DTC.

With GST

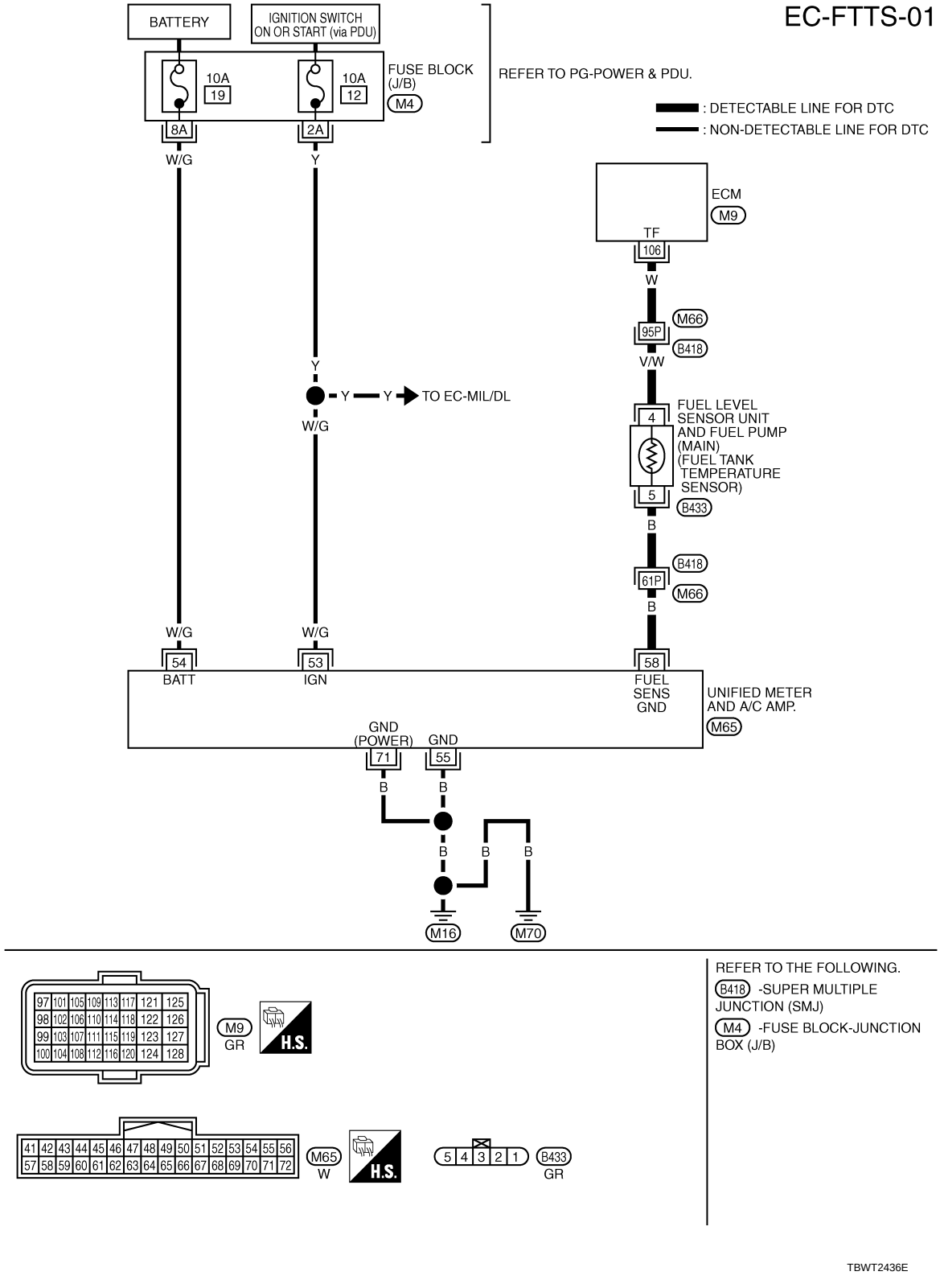
Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-309, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353512



Diagnosis Procedure

INFOID:0000000005353513

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

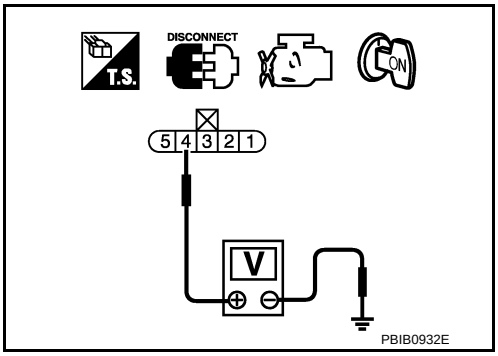
Refer to DI-18, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

3. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump (main)” harness connector.
3. Turn ignition switch ON.
4. Check the voltage between “fuel level sensor unit and fuel pump (main)” harness connector and ground.



Fuel level sensor unit and fuel pump (main)		Ground	Voltage (V)
Connector	Terminal		
B433	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 B418, M66
- Harness for open or short between ECM and “fuel level sensor unit and fuel pump (main)”

>> 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 (main)” harness connector and “unified meter and A/C amp.” harness connector.

Fuel level sensor unit and fuel pump (main)		Unified meter and A/C amp.		Continuity
Connector	Terminal	Connector	Terminal	
B433	5	M65	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 B418, M66
- Harness for open or short between “fuel level sensor unit and fuel pump (main)” 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-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

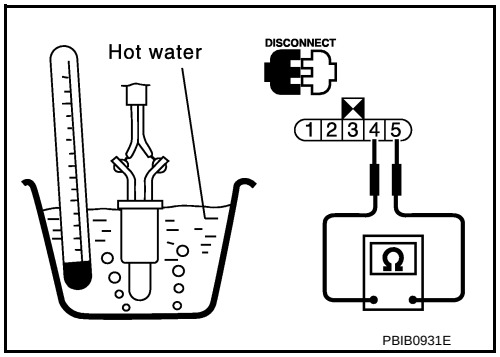
Component Inspection

INFOID:0000000005353514

1. CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump (main)” harness connector.
3. Remove “fuel level sensor unit and fuel pump (main)”.
4. Check resistance between “fuel level sensor unit and fuel pump (main)” 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 (main)”.

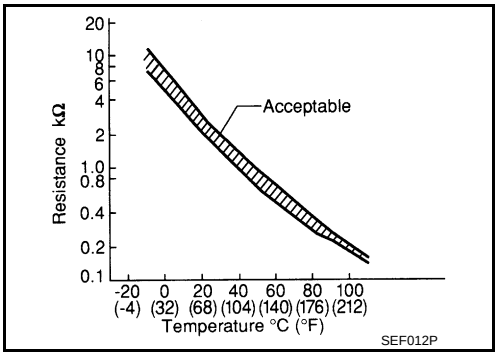
P0182, P0183 FTT SENSOR

Description

INFOID:0000000005353515

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:0000000005353516

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

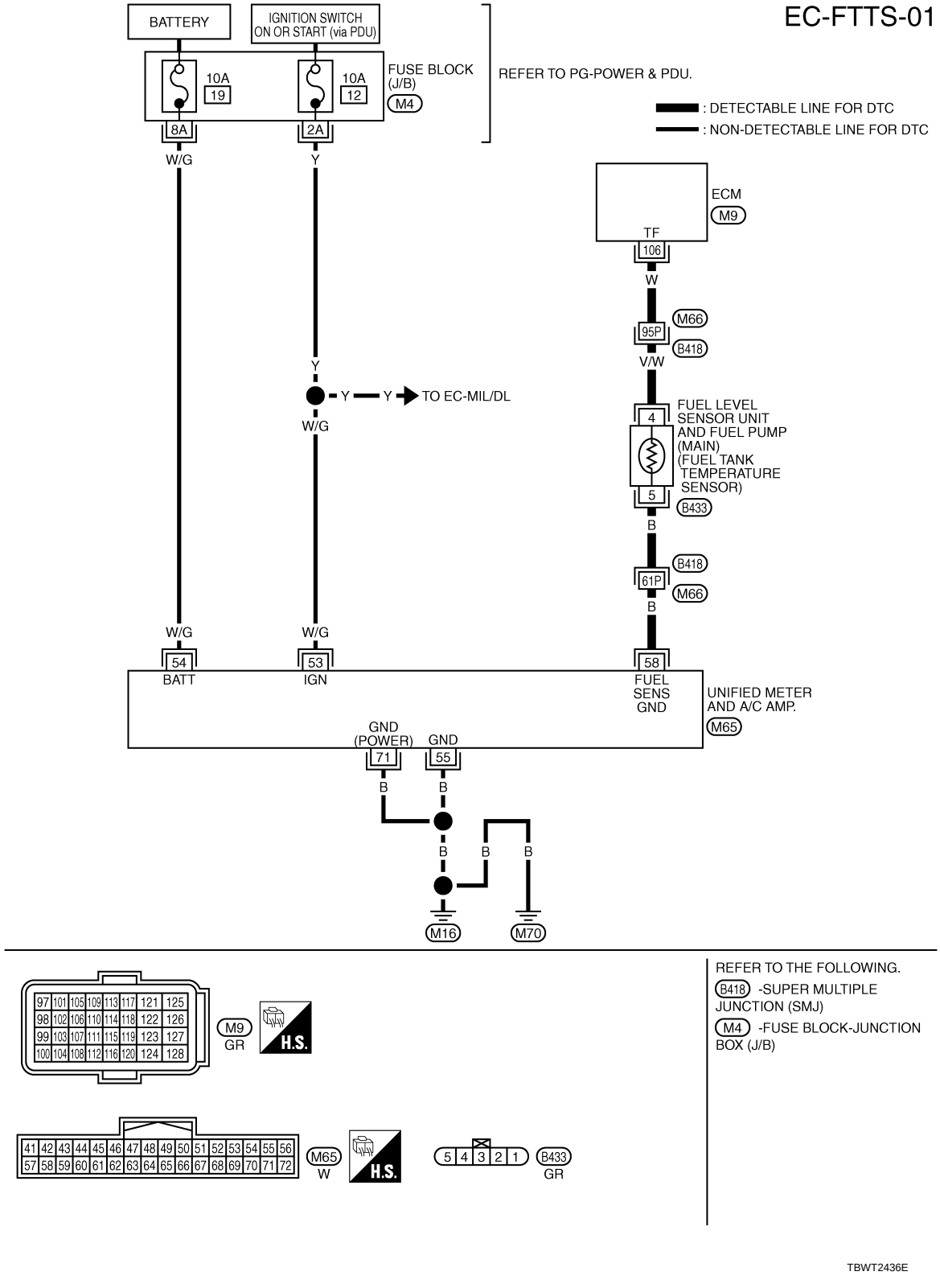
1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-313, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353517



TBWT2436E

Diagnosis Procedure

INFOID:0000000005353518

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

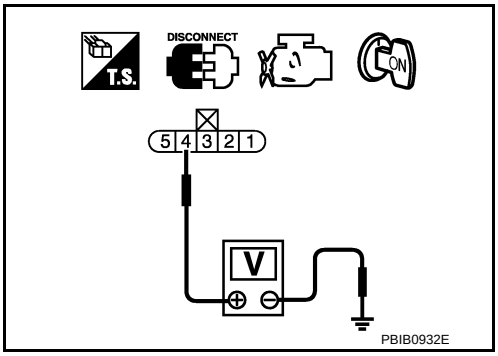
Refer to DI-18, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

3. CHECK FUEL TANK TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump (main)” harness connector.
3. Turn ignition switch ON.
4. Check the voltage between “fuel level sensor unit and fuel pump (main)” harness connector and ground.



Fuel level sensor unit and fuel pump (main)		Ground	Voltage (V)
Connector	Terminal		
B433	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 B418, M66
- Harness for open or short between ECM and “fuel level sensor unit and fuel pump (main)”

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

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 (main)” harness connector and “unified meter and A/C amp.” harness connector.

Fuel level sensor unit and fuel pump (main)		Unified meter and A/C amp.		Continuity
Connector	Terminal	Connector	Terminal	
B433	5	M65	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 B418, M66
- Harness for open or short between “fuel level sensor unit and fuel pump (main)” and “unified meter and A/C amp.”

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

7. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-315, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

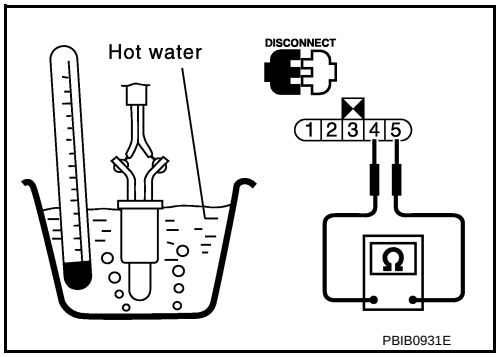
Component Inspection

INFOID:0000000005353519

1. CHECK FUEL TANK TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump (main)” harness connector.
3. Remove “fuel level sensor unit and fuel pump (main)”.
4. Check resistance between “fuel level sensor unit and fuel pump (main)” 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?

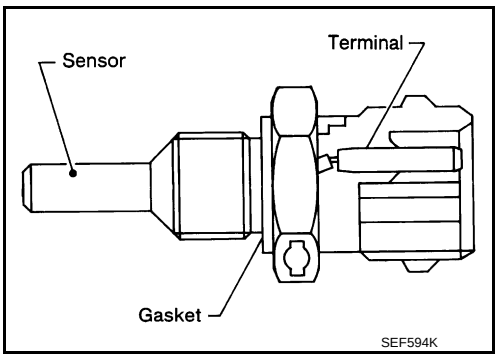
YES >> INSPECTION END
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

P0196 EOT SENSOR

Description

INFOID:0000000005353520

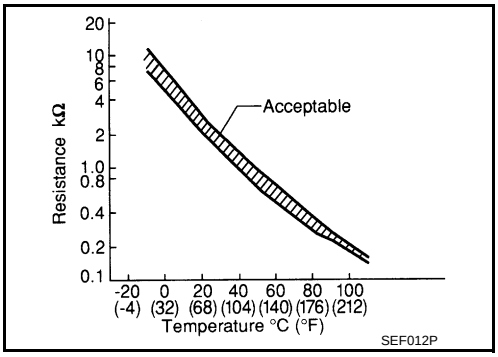
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance 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:0000000005353521

DTC DETECTION LOGIC

NOTE:
If DTC P0196 is displayed with P0197 or P0198, first perform the trouble diagnosis for DTC P0197, P0198. Refer to EC-319, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0196	Engine oil temperature sensor range/performance	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 sensor circuit is open or shorted) • Engine oil 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:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE-I

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-317, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

1. Select “DATA MONITOR” mode with CONSULT-III.
2. Check that “COOLAN TEMP/S” indicates above 70°C (158°F).
   If it is above 70°C (158°F), go to the following steps.
   If it is below 70°C (158°F), warm engine up until “COOLAN TEMP/S” indicates more than 70°C (158°F). Then perform the following steps.
3. Turn ignition switch OFF and soak the vehicle in a cool place.
4. Turn ignition switch ON.
   NOTE:
   Do not turn ignition switch OFF until step 8.
5. Select “DATA MONITOR” mode with CONSULT-III.
6. Check the following.

COOLAN TEMP/S	Below 40°C (104°F)
INT/A TEMP SE	Below 40°C (104°F)
Difference between “COOLAN TEMP/S” and “INT/A TEMP SE”	Within 6°C (11°F)

   If they are within the specified range, perform the following steps.
   If they are out of the specified range, soak the vehicle to meet the above conditions. Then perform the following steps.
   NOTE:
   - **Do not turn ignition switch OFF.**
   - **If it is supposed to need a long period of time, do not deplete the battery.**
7. Start engine and let it idle for 5 minutes.
8. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> EC-317, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353522

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2. CHECK ENGINE OIL TEMPERATURE SENSOR

Refer to EC-318, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace engine oil temperature sensor.

3. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

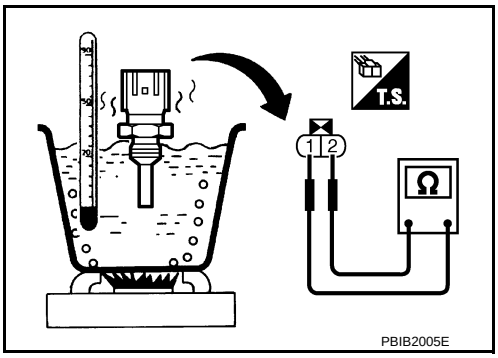
>> INSPECTION END

Component Inspection

INFOID:0000000005353523

1. CHECK ENGINE OIL TEMPERATURE SENSOR

1. Turn ignition switch OFF.
2. Disconnect engine oil temperature sensor harness connector.
3. Remove engine oil temperature sensor.
4. Check resistance between engine oil temperature sensor terminals by heating with hot water as shown in the figure.



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

Is the inspection result normal?

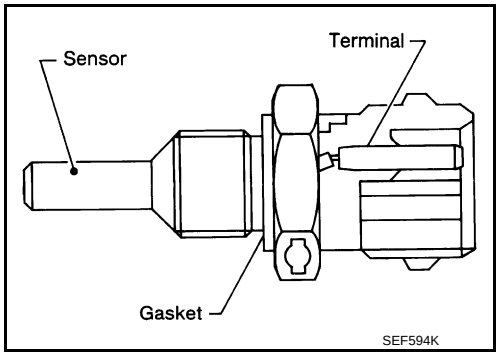
YES >> INSPECTION END
NO >> Replace engine oil temperature sensor.

P0197, P0198 EOT SENSOR

Description

INFOID:0000000005353524

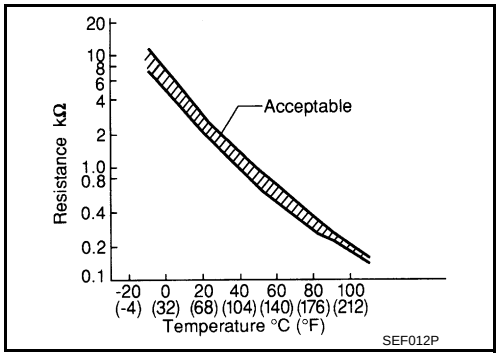
The engine oil temperature sensor is used to detect the engine oil temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine oil temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance 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:0000000005353525

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.

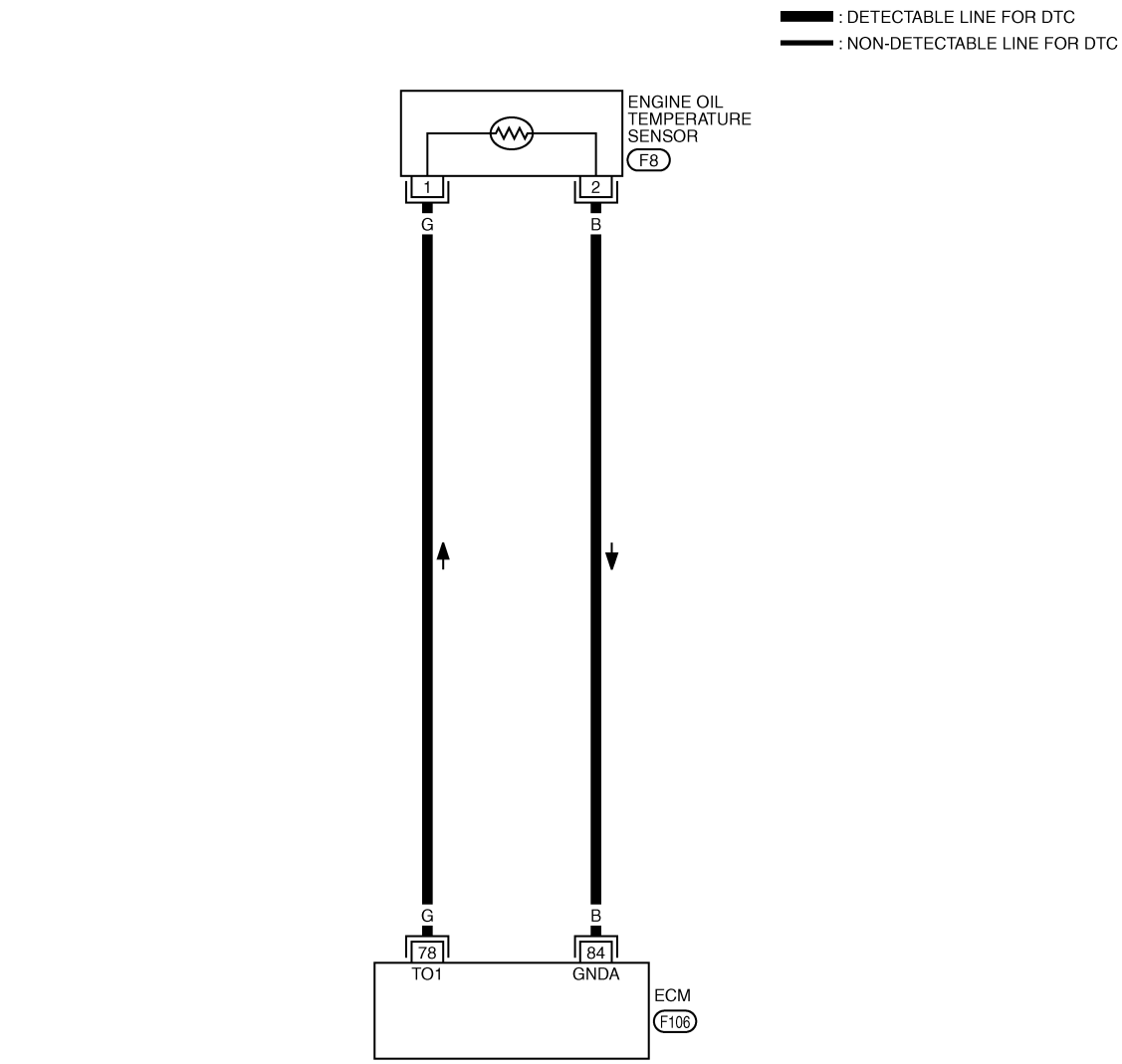
Is 1st trip DTC detected?

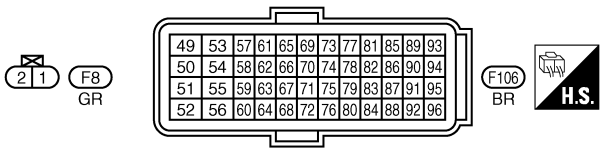
YES >> Go to EC-320, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353526

EC-EOTS-01





TBWT2437E

Diagnosis Procedure

INFOID:0000000005353527

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

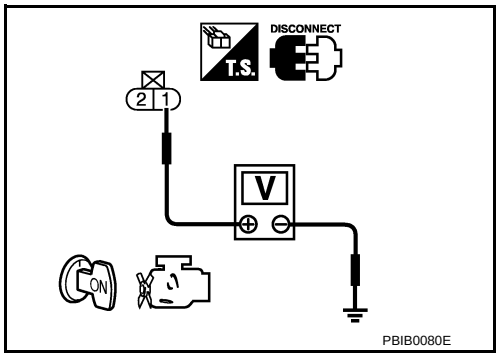
Is the inspection result normal?

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

2.CHECK ENGINE OIL TEMPERATURE (EOT) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect 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		
F8	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	
F8	2	F106	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 EOT SENSOR

Refer to EC-321, "Component Inspection".

Is the inspection result normal?

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

5.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

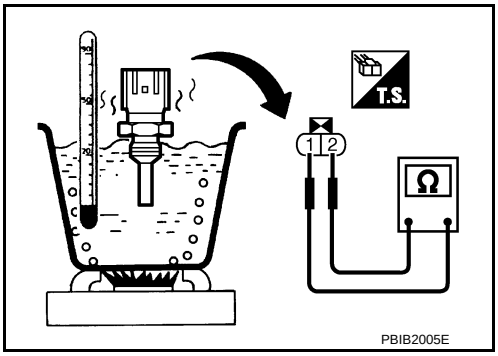
Component Inspection

INFOID:0000000005353528

1.CHECK ENGINE OIL TEMPERATURE SENSOR

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

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



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

Is the inspection result normal?

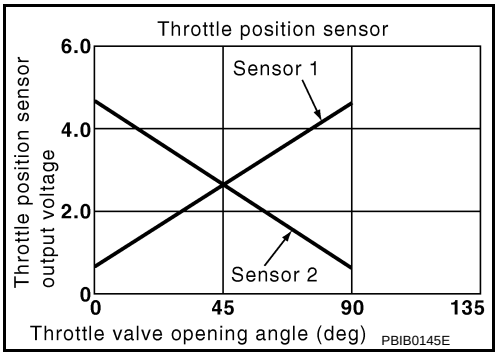
YES >> INSPECTION END
NO >> Replace engine oil temperature sensor.

P0222, P0223, P2132, P2133 TP SENSOR

Description

INFOID:0000000005353529

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



DTC Logic

INFOID:0000000005353530

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-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222	Throttle position (TP) 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 (TP) sensor 1 (bank 1) circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	
P2132	Throttle position (TP) sensor 1 (bank 2) circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	
P2133	Throttle position (TP) 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.

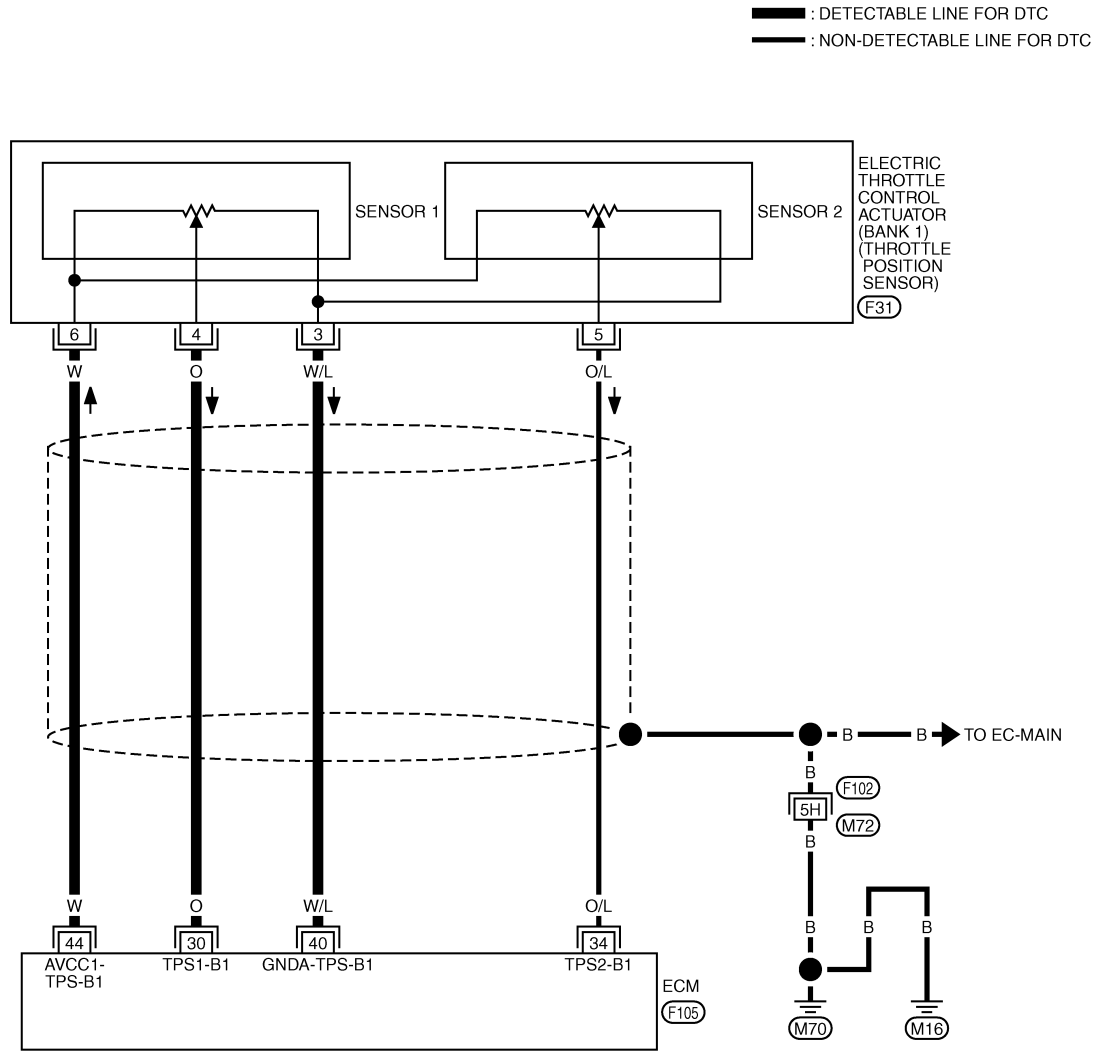
Is DTC detected?

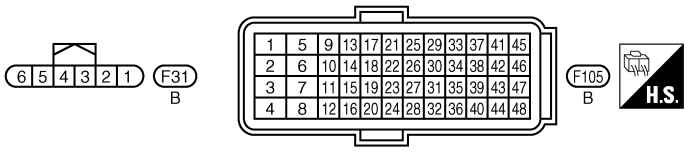
YES >> Go to EC-325, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353531

EC-TPS1B1-01

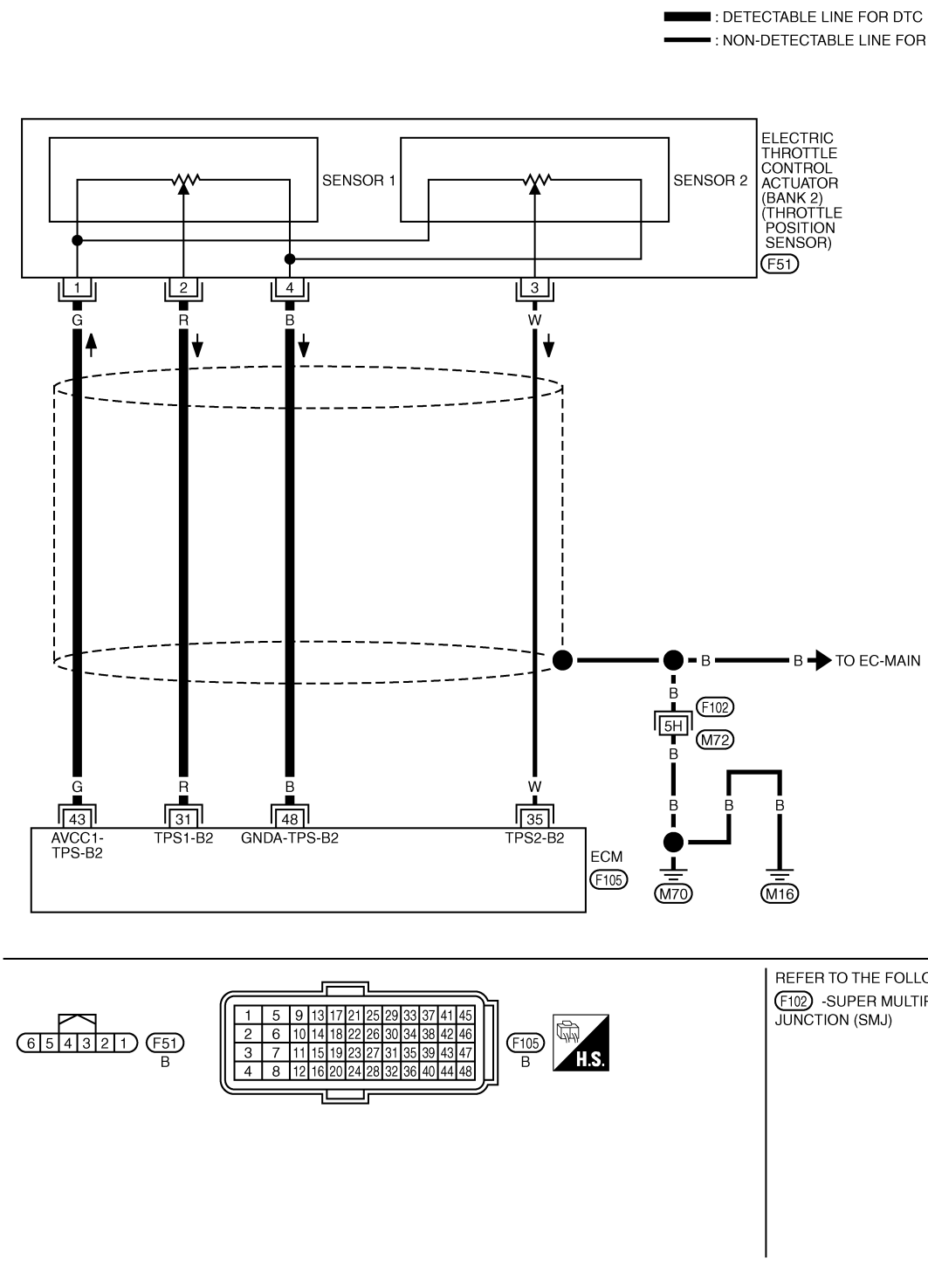




REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT2438E

EC-TPS1B2-01



TBWT2439E

Diagnosis Procedure

INFOID:0000000005353532

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

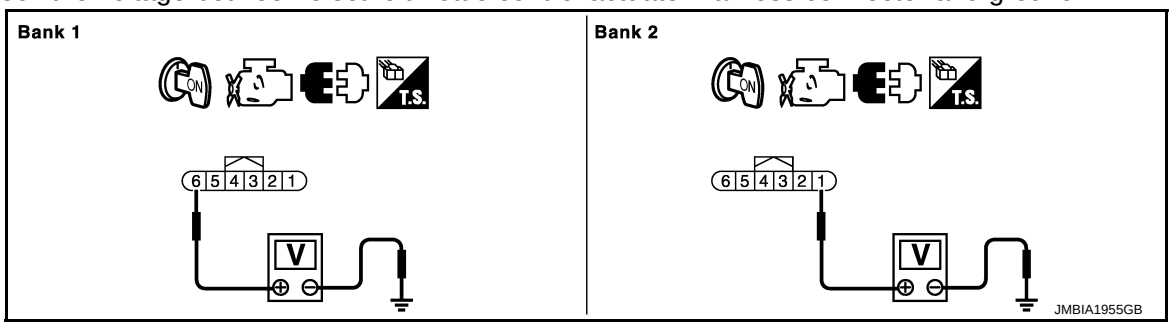
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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	F31	6	Ground	Approx. 5
P2132, P2133	2	F51	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	F31	3	F105	40	Existed
P2132, P2133	2	F51	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	F31	4	F105	30	Existed
P2132, P2133	2	F51	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-327, "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.
2. Go to EC-328, "Special Repair Requirement".

>> INSPECTION END

7. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

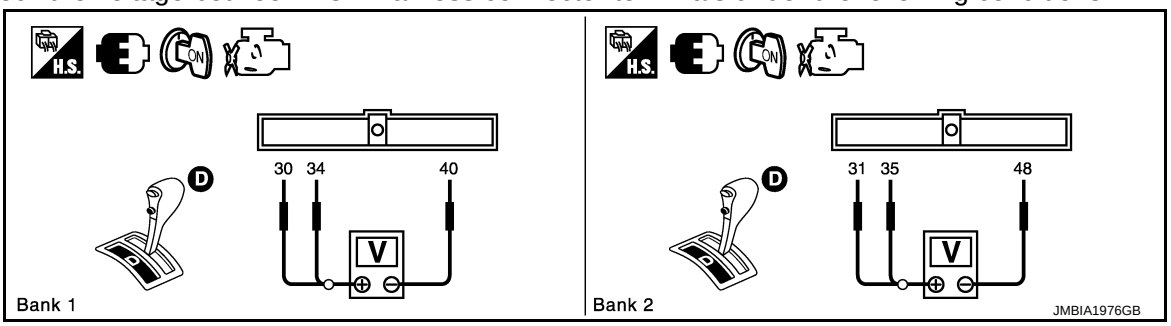
>> INSPECTION END

Component Inspection

INFOID:0000000005353533

1. CHECK THROTTLE POSITION (TP) SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F105	30 [TP sensor 1 (bank 1)]	40	Accelerator pedal: Fully released	More than 0.36
			Accelerator pedal: Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48	Accelerator pedal: Fully released	More than 0.36
			Accelerator pedal: Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40	Accelerator pedal: Fully released	Less than 4.75
			Accelerator pedal: Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48	Accelerator pedal: Fully released	Less than 4.75
			Accelerator pedal: 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.
2. Go to EC-328, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353534

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P0300, P0301, P0302, P0303, P0304, P0305, P0306 MISFIRE

DTC Logic

INFOID:0000000005353535

DTC DETECTION LOGIC

When a misfire occurs, engine speed will fluctuate. If the engine speed fluctuates enough to cause the crankshaft position (CKP) sensor signal to vary, ECM can determine that a misfire is occurring.

Sensor	Input signal to ECM	ECM function
CKP sensor	Engine speed	On board diagnosis of misfire

The misfire detection logic consists of the following two conditions.

1. One Trip Detection Logic (Three Way Catalyst Damage)
   On the 1st trip 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 on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only light when the misfire is detected on a second trip. During this condition, the ECM monitors the CKP sensor signal every 1,000 engine revolutions.
   A misfire malfunction can be detected in any one cylinder or in multiple cylinders.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0300	Multiple cylinder misfires detected	Multiple cylinder misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector circuit is open or shorted • Fuel injector • Intake air leak • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • Air fuel ratio (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 approximately 15 minutes.
6. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-330, "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)
Basic fuel schedule	Basic fuel schedule in 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	Approx. 10 minutes
Around 2,000 rpm	Approx. 5 minutes
More than 3,000 rpm	Approx. 3.5 minutes

5. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-330, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353536

1.CHECK FOR INTAKE AIR LEAK AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leak.
3. Check PCV hose connection.

Is intake air leak detected?

YES >> Discover air leak location and repair.
NO >> GO TO 2.

2.CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 3.
YES-2 >> Without CONSULT-III: GO TO 4.
NO >> Repair or replace malfunctioning part.

3.PERFORM POWER BALANCE TEST

With CONSULT-III

1. Start engine.

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

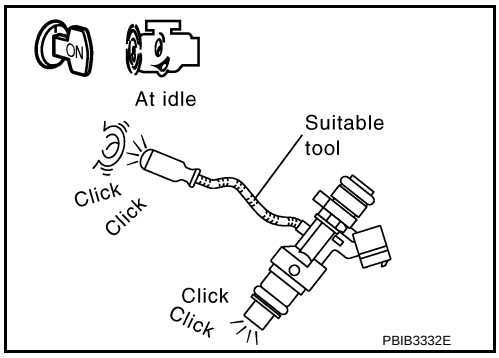
Is the inspection result normal?

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

4. CHECK FUNCTION OF FUEL INJECTOR

1. Start engine and let it idle.
2. Listen to each fuel injector operation.

Clicking sound should be heard.



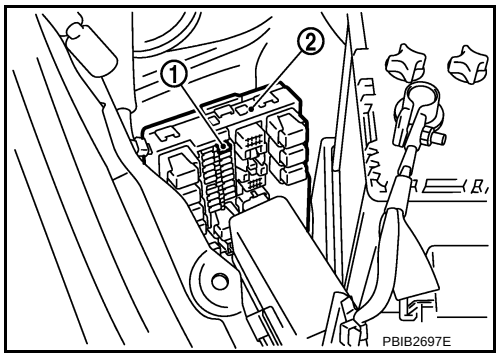
Is the inspection result normal?

YES >> GO TO 5.
NO >> Perform trouble diagnosis for FUEL INJECTOR, refer to EC-599, "Diagnosis Procedure".

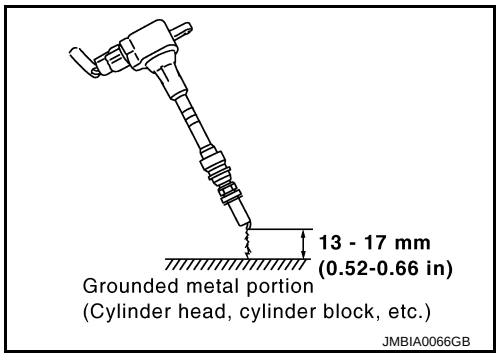
5. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.



CAUTION:

- **Never place to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might 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 known-good spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

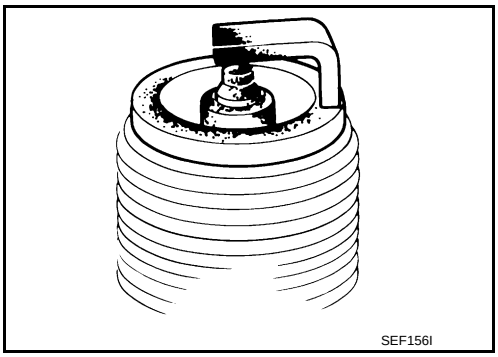
YES >> GO TO 7.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-620, "Diagnosis Procedure".

7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

Is the inspection result normal?

YES >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-16, "Changing Spark Plugs (Iridium-Tipped Type)".
NO >> Repair or clean spark plug. Then GO TO 8.



8. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-16, "Changing Spark Plugs (Iridium-Tipped Type)".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-96, "On-Vehicle Service".

Is the inspection result normal?

YES >> GO TO 10.
NO >> Check pistons, piston rings, valves, valve seats and cylinder head gaskets.

10. CHECK FUEL PRESSURE

1. Install all removed parts.
2. Check fuel pressure. Refer to EC-692, "Inspection".

Is the inspection result normal?

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

11. DETECT MALFUNCTIONING PART

Check fuel hoses and fuel tubes for clogging.

Is the inspection result normal?

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

12. CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.

For procedure, refer to EC-22, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to EC-697, "Idle Speed" and EC-697, "Ignition Timing".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Follow the EC-22, "BASIC INSPECTION : Special Repair Requirement".

13. CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

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

A/F sensor 1			ECM		Continuity
Bank	Connector	Terminal	Connector	Terminal	
1	F40	1	F106	57	Existed
		2		61	
2	F41	1		65	
		2		66	

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

A/F sensor 1			Ground	Continuity
Bank	Connector	Terminal		
1	F40	1	Ground	Not existed
		2		
2	F41	1		
		2		

ECM		Ground	Continuity
Connector	Terminal		
F106	57	Ground	Not existed
	61		
	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-178, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace (malfunctioning) A/F sensor 1.

15. CHECK MASS AIR FLOW SENSOR

With CONSULT-III
Check mass air flow sensor signal in “DATA MONITOR” mode with CONSULT-III.
For specification, refer to EC-697, "Mass Air Flow Sensor".

With GST
Check mass air flow sensor signal in Service $01 with GST.
For specification, refer to EC-697, "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-208, "Diagnosis Procedure".

16. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-680, "Symptom Table".

Is the inspection result normal?

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

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-121, "Diagnosis Description".

>> GO TO 18.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0327, P0328, P0332, P0333 KS

Description

INFOID:0000000005353537

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

DTC Logic

INFOID:0000000005353538

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?

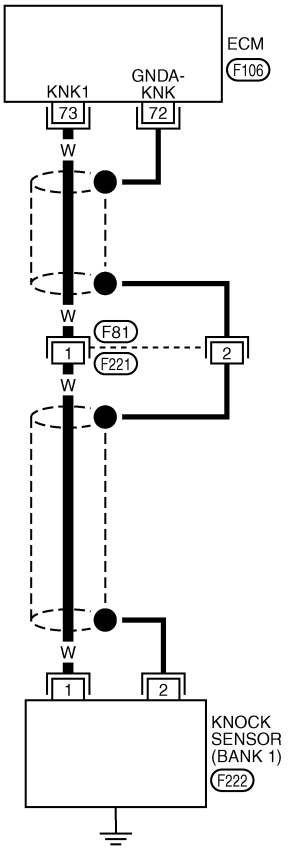
YES >> Go to EC-337, "Diagnosis Procedure".
NO >> INSPECTION END

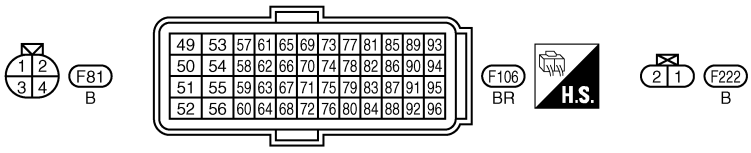
Wiring Diagram

INFOID:0000000005353539

EC-KSB1-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

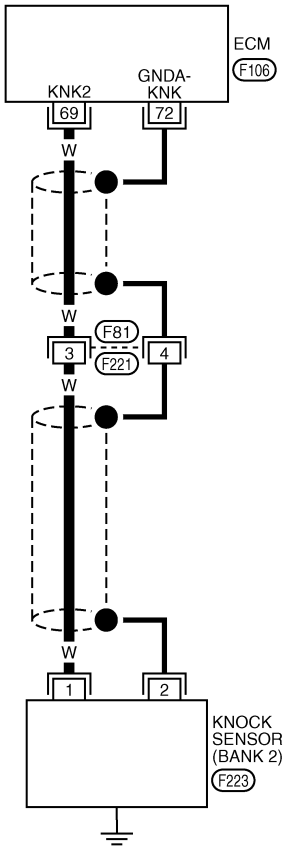


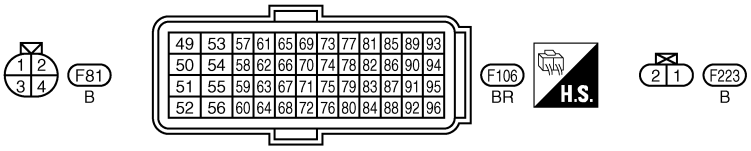


TBWT2440E

EC-KSB2-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





TBWT2441E

Diagnosis Procedure

INFOID:0000000005353540

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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	F222	2	F106	72	Existed
P0332, P0333	2	F223	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 F81, F221
- 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	F222	1	F106	73	Existed
P0332, P0333	2	F223	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 F81, F221
- Harness for open or short between knock sensor and ECM

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

6.CHECK KNOCK SENSOR

Refer to EC-339, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning knock sensor.

7.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

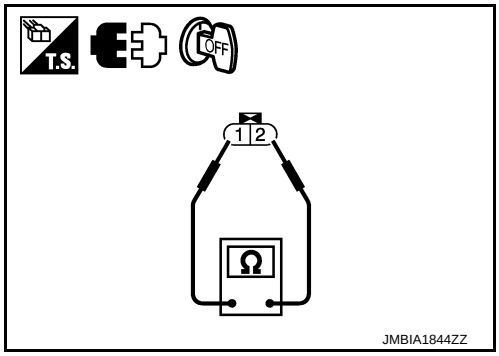
>> INSPECTION END

Component Inspection

INFOID:0000000005353541

1. CHECK KNOCK SENSOR

1. Turn ignition switch OFF.
2. Disconnect knock sensor harness connector.
3. Check resistance between knock sensor terminals as per the following.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.



Terminals	Resistance
1 and 2	Approx. 532 - 588 kΩ [at 20°C (68°F)]

CAUTION:
Never use any knock sensors that have been dropped or physically damaged. Use only new ones.

Is the inspection result normal?

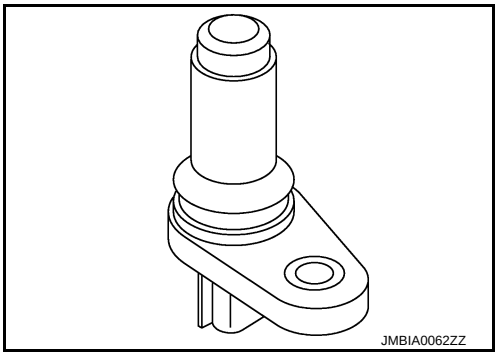
YES >> INSPECTION END
NO >> Replace malfunctioning knock sensor.

P0335 CKP SENSOR

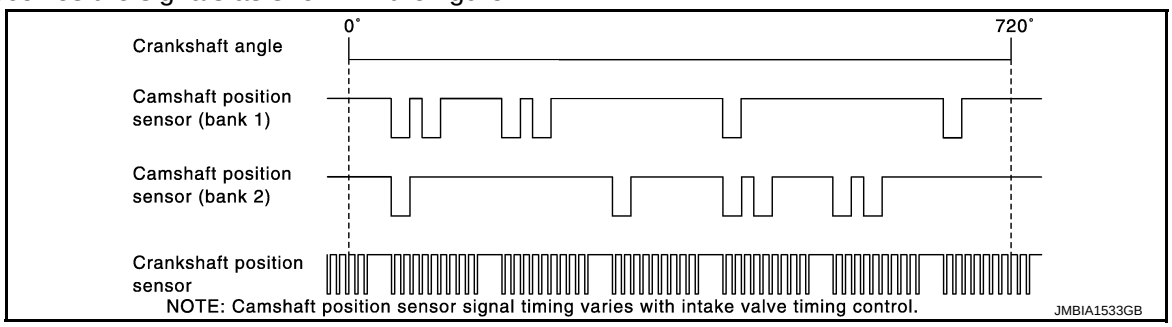
Description

INFOID:0000000005353542

The crankshaft position (CKP) sensor 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.


JMBIA0062ZZ

ECM receives the signals as shown in the figure.



DTC Logic

INFOID:0000000005353543

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335	Crankshaft position (CKP) sensor circuit	• The crankshaft position sensor signal is not detected by the ECM during the first few seconds of engine cranking. • The proper pulse signal from the crankshaft position sensor is not sent to ECM while the engine is running. • The crankshaft position sensor signal is not in the normal pattern during engine running.	• Harness or connectors (CKP sensor circuit is open or shorted.) [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • Battery current sensor • APP sensor • EVAP control system pressure sensor • Refrigerant 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?

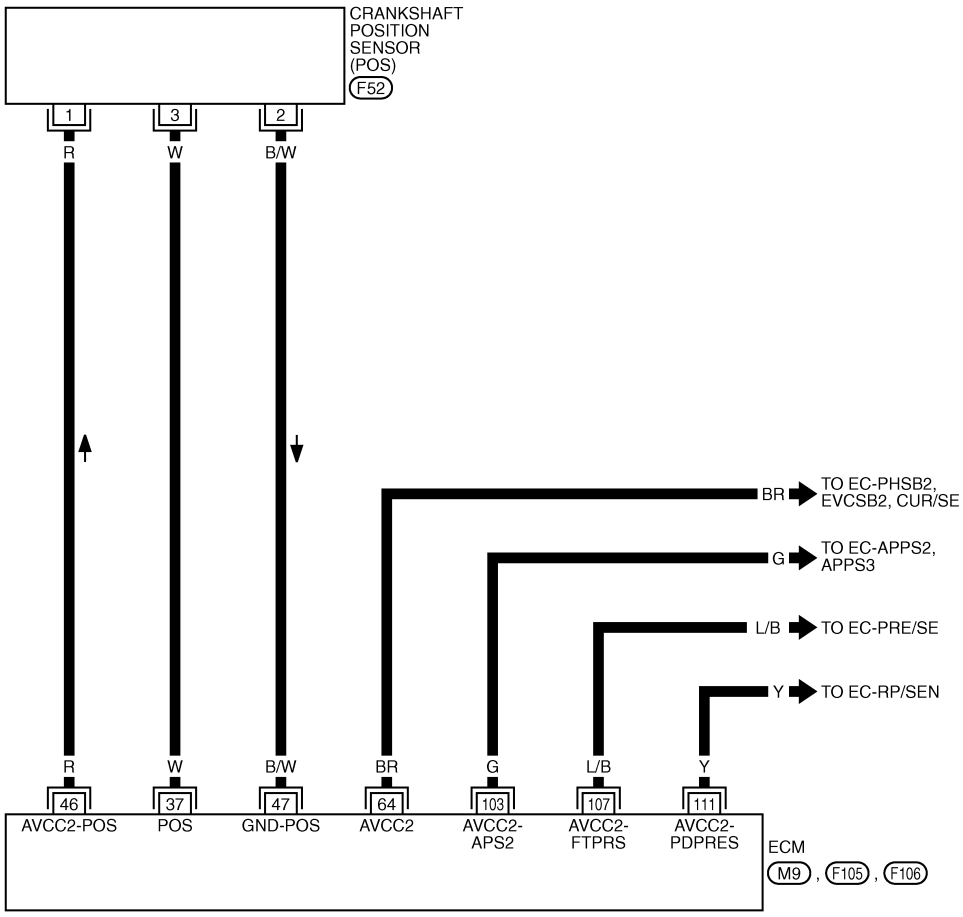
YES >> Go to EC-342, "Diagnosis Procedure".
NO >> INSPECTION END

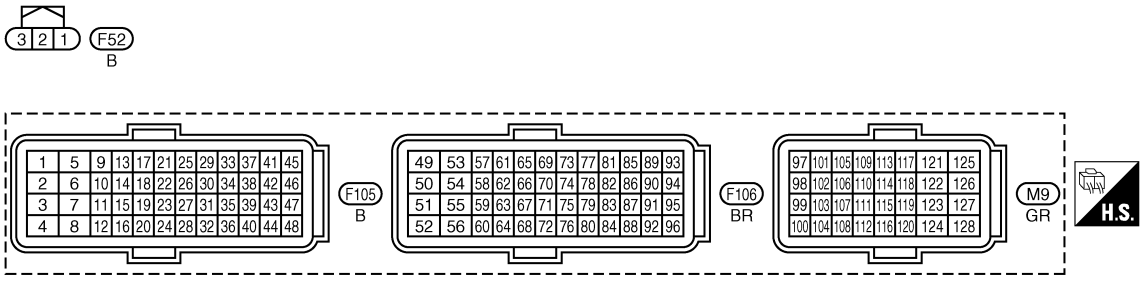
Wiring Diagram

INFOID:0000000005353544

EC-POS-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





TBWT2442E

Diagnosis Procedure

INFOID:0000000005353545

1. CHECK GROUND CONNECTION

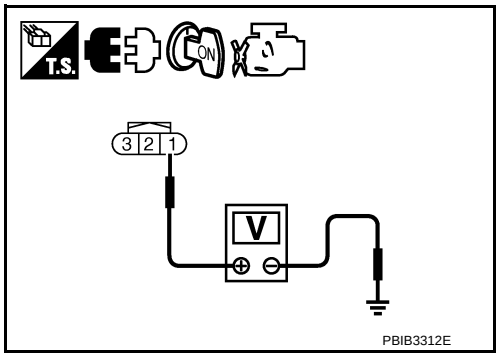
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

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

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



CKP sensor		Ground	Voltage (V)
Connector	Terminal		
F52	1	Ground	Approx. 5

Is the inspection result normal?

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

3. CHECK CKP SENSOR POWER SUPPLY CIRCUIT-II

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

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F52	1	F105	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
F105	46	CKP sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator pedal position (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)

- Battery current sensor (Refer to EC-502, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

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

6.CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

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

7.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

8.CHECK CKP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F52	2	F105	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 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

CKP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F52	3	F105	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 CKP SENSOR

Refer to EC-345, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace crankshaft position sensor.

11.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

Is the inspection result normal?

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

12. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

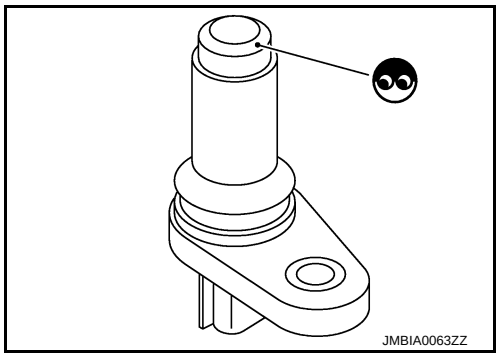
INFOID:0000000005353546

1. CHECK CRANKSHAFT POSITION SENSOR-I

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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace crankshaft position sensor.


JMBIA0063ZZ

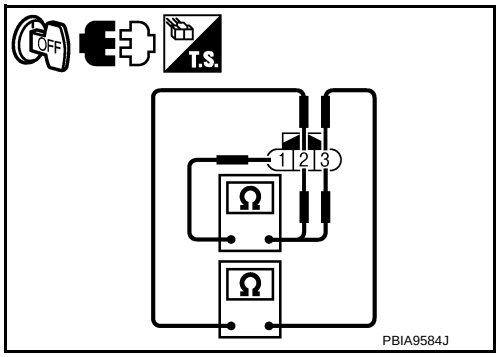
2. CHECK CRANKSHAFT POSITION SENSOR-II

Check resistance between crankshaft position sensor terminals as per the following.

Terminals (Polarity)	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace crankshaft position sensor.



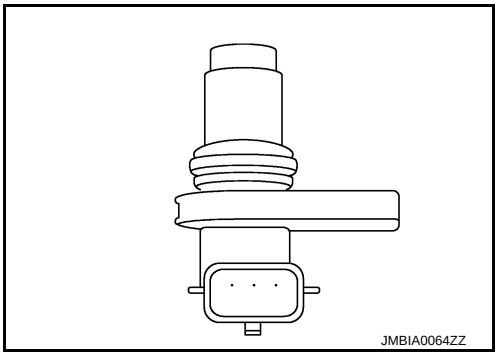
PBIA9584J

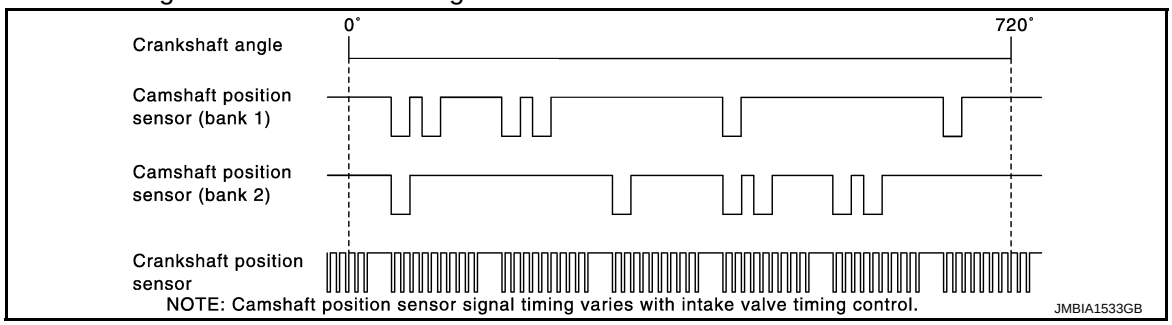
P0340, P0345 CMP SENSOR

Description

INFOID:0000000005353547

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





DTC Logic

INFOID:0000000005353548

DTC DETECTION LOGIC

NOTE:
If DTC P0340 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340	Camshaft position (CMP) sensor (bank 1) circuit	• The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. • The cylinder No. signal is not sent to ECM during engine running. • The cylinder No. signal is not in the normal pattern during engine running.	• Harness or connectors [CMP sensor (bank 1) circuit is open or shorted.] • CMP sensor (bank 1) • Camshaft (INT) • Starter motor • Starting system circuit • Dead (Weak) battery
P0345	Camshaft position (CMP) sensor (bank 2) circuit		• Harness or connectors [CMP sensor (bank 2) circuit is open or shorted.] [Crankshaft position (CKP) sensor circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • CMP sensor (bank 2) • CKP sensor • EVT control position sensor (bank 2) • Battery current sensor • APP sensor • EVAP control system pressure sensor • Refrigerant pressure sensor • 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-349, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE-I

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

Is 1st trip DTC detected?

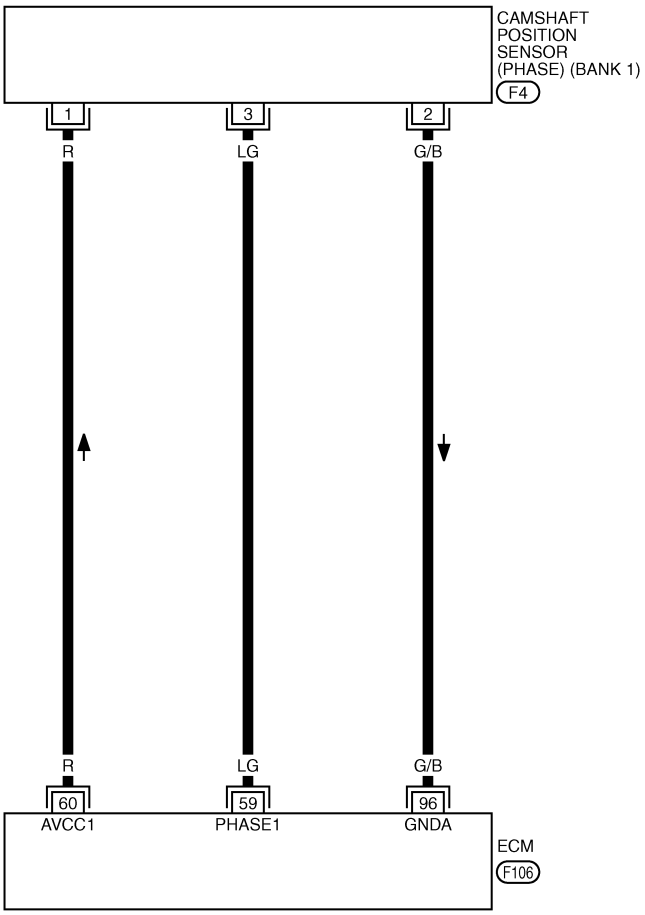
YES >> Go to EC-349, "Diagnosis Procedure".
NO >> INSPECTION END

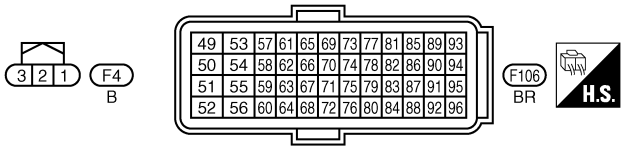
Wiring Diagram

INFOID:0000000005353549

EC-PHSB1-01

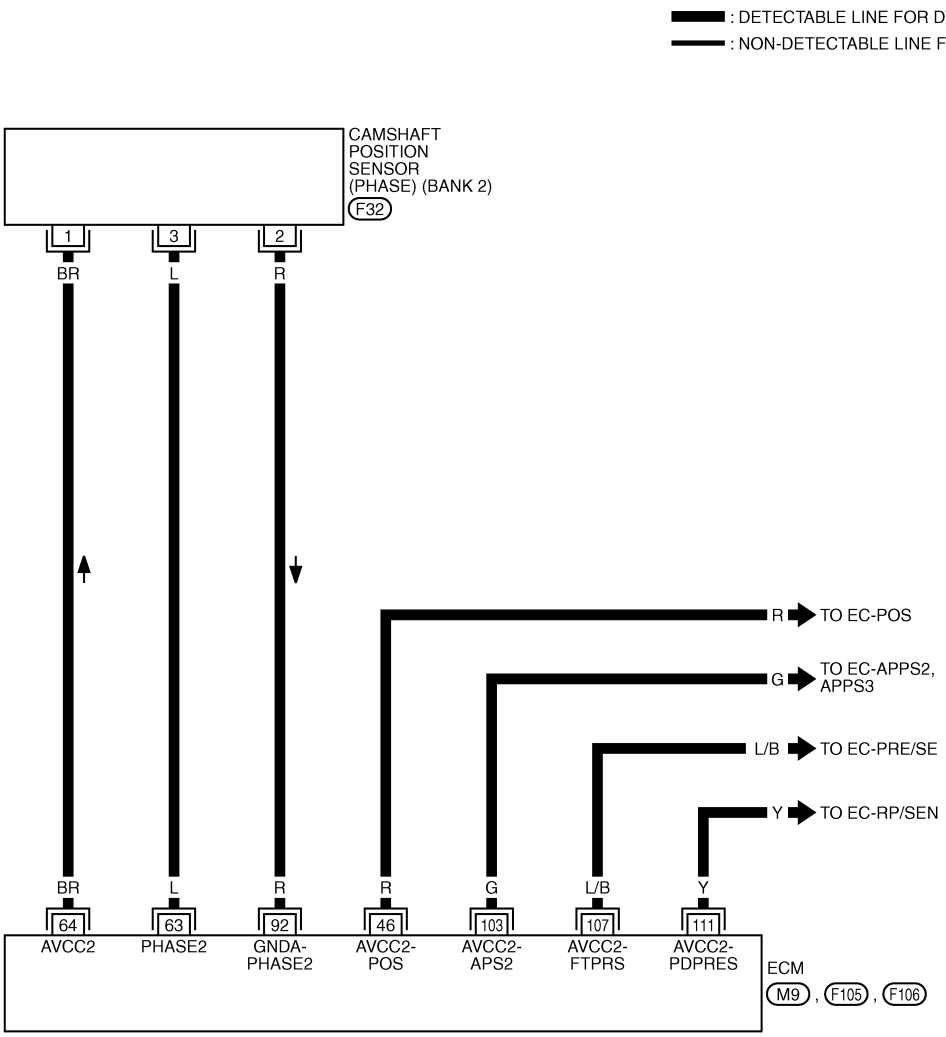
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

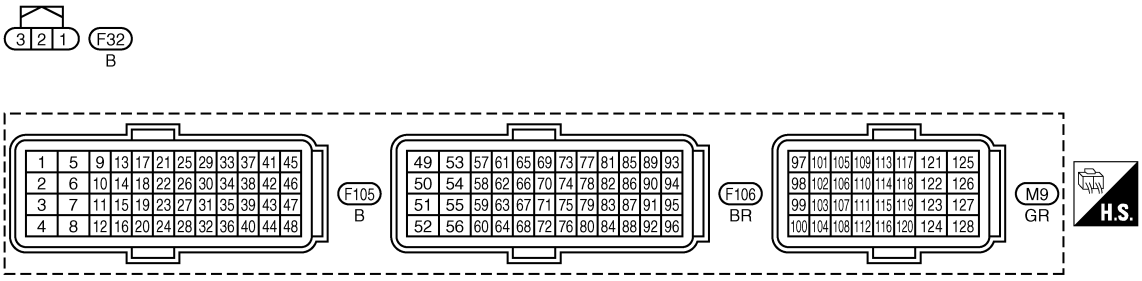




TBWT2443E

EC-PHSB2-01





TBWT2444E

Diagnosis Procedure

INFOID:0000000005353550

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 SC-8, "System Description".)

2.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

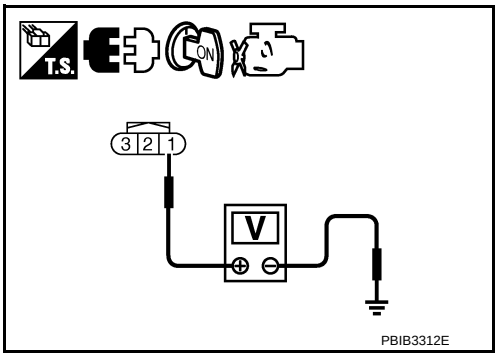
Is the inspection result normal?

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

3.CHECK CAMSHAFT POSITION (CMP) SENSOR POWER SUPPLY CIRCUIT-I

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

DTC	CMP sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P0340	1	F4	1	Ground	Approx. 5
P0345	2	F32	1		



Is the inspection result normal?

YES >> GO TO 9.
NO-1 >> P0340: Repair open circuit, short to ground or short to power in harness or connectors.
NO-2 >> P0345: GO TO 4.

4.CHECK CMP SENSOR POWER SUPPLY CIRCUIT-II

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

CMP sensor			ECM		Continuity
Bank	Connector	Terminal	Connector	Terminal	
2	F32	1	F106	64	Existed

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair open circuit.

5.CHECK CMP SENSOR POWER SUPPLY CIRCUIT-III

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

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	CMP sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator pedal position (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 13.
NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

9. CHECK CMP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	CMP sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F4	2	F106	96	Existed
P0345	2	F32	2		92	

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 CMP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

DTC	CMP sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P0340	1	F4	3	F106	59	Existed
P0345	2	F32	3		63	

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

Is the inspection result normal?

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

11. CHECK CMP SENSOR

Refer to EC-352, "Component Inspection".

Is the inspection result normal?

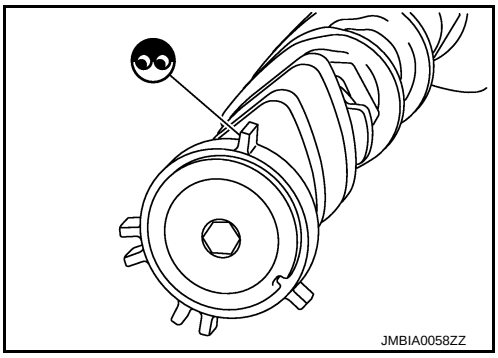
YES >> GO TO 12.
NO >> Replace malfunctioning camshaft position sensor.

12. CHECK CAMSHAFT (INT)

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

Is the inspection result normal?

YES >> GO TO 13.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.


JMBIA0058ZZ

13. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

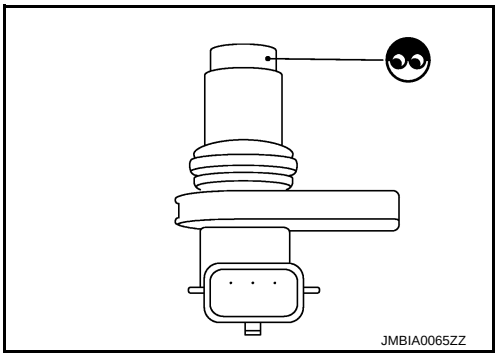
INFOID:0000000005353551

1. CHECK CAMSHAFT POSITION SENSOR-I

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

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning camshaft position sensor.


JMBIA0065ZZ

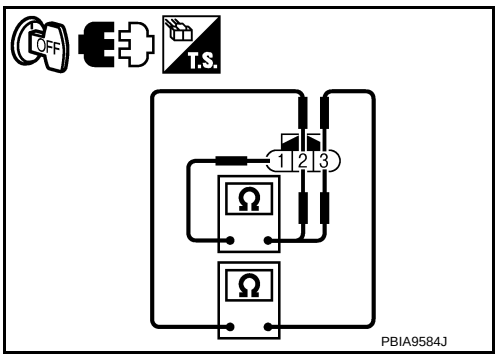
2. CHECK CAMSHAFT POSITION SENSOR-II

Check resistance camshaft position sensor terminals as per the following.

Terminals (Polarity)	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning camshaft position sensor.



PBIA9584J

P0420, P0430 THREE WAY CATALYST FUNCTION

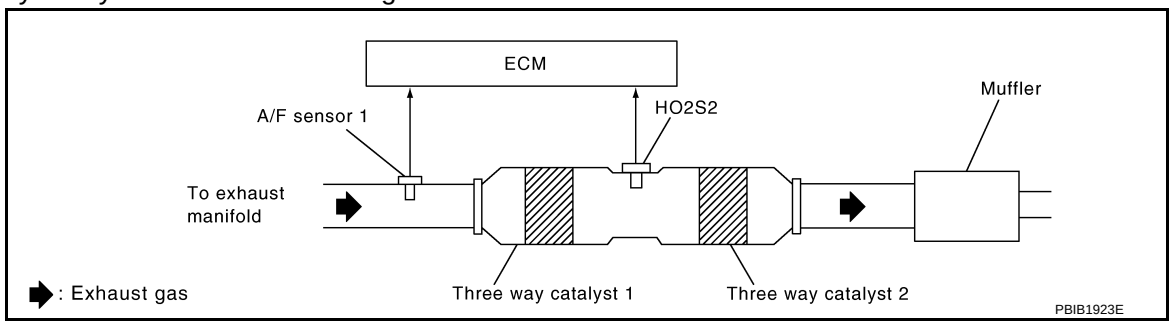
DTC Logic

INFOID:0000000005353552

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 1 does not operate properly. • Three way catalyst 1 does not have enough oxygen storage capacity.	• Three way catalyst 1 • 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.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.

Will CONSULT-III be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III

TESTING CONDITION:

Do not maintain engine speed for more than the specified minutes below.

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to the normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. 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. Check that “COOLAN TEMP/S” indicates more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches to 70°C (158°F).
9. Open engine hood.
10. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-III.

11. Rev engine between 2,000 and 3,000 rpm and hold it for 3 consecutive minutes then release the accelerator pedal completely.
12. Check the indication of “CATALYST”.

Which is displayed on CONSULT-III screen?

CMPLT >> GO TO 5.
INCMP >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Wait 5 seconds at idle.
2. Rev engine between 2,000 and 3,000 rpm and maintain it until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).

Does the indication change to “CMPLT”?

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

4. PERFORM DTC CONFIRMATION PROCEDURE AGAIN

1. Stop engine and cool it down to less than 70°C (158°F).
2. Perform DTC CONFIRMATION PROCEDURE again.

>> GO TO 2.

5. PERFORM DTC CONFIRMATION PROCEDURE-III

Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-355, "Diagnosis Procedure".
NO >> INSPECTION END

6. PERFORM COMPONENT FUNCTION CHECK

With GST

Perform component function check. Refer to EC-354, "Component Function Check".

NOTE:

Use component function check to check the overall function of the three way catalyst 1. 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".

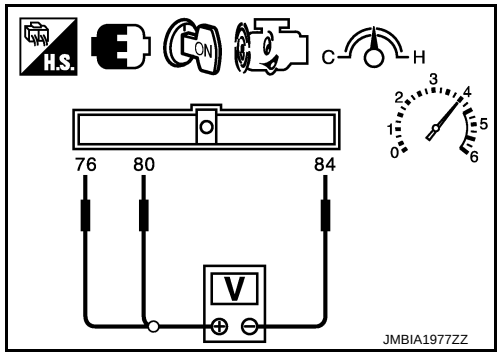
Component Function Check

INFOID:0000000005353553

1. PERFORM COMPONENT FUNCTION CHECK

With GST

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. 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. Open engine hood.
8. Check the voltage between ECM harness connector terminals under the following condition.



DTC	ECM			Condition	Voltage
	Connector	+	–		
		Terminal	Terminal		
P0420	F106	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-355, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353554

1.CHECK EXHAUST SYSTEM

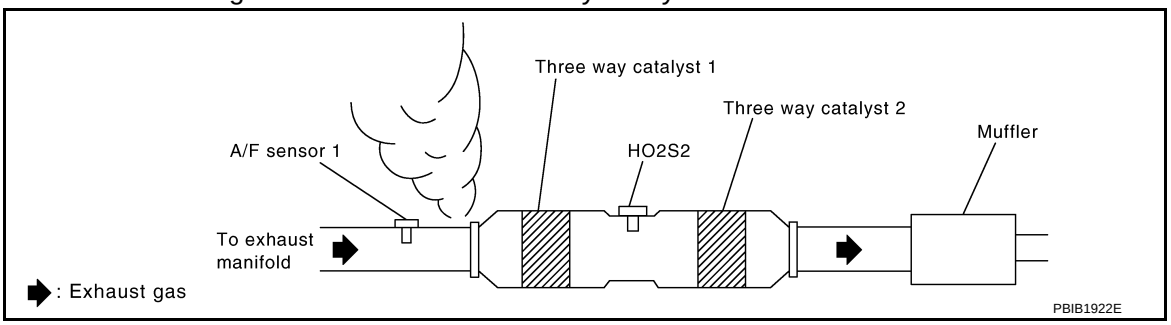
Visually check exhaust tubes and muffler for dents.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK EXHAUST GAS 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 malfunctioning part.
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 malfunctioning part.
NO >> GO TO 4.

4.CHECK IDLE SPEED AND IGNITION TIMING

Check idle speed and ignition timing.
For procedure, refer to EC-22, "BASIC INSPECTION : Special Repair Requirement".
For specification, refer to EC-697, "Idle Speed" and EC-697, "Ignition Timing".

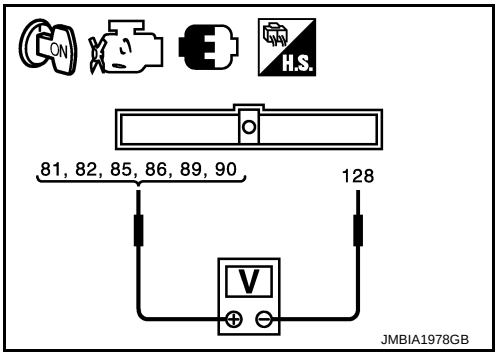
Is the inspection result normal?

YES >> GO TO 5.
NO >> Follow the EC-22, "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	
F106	81	M9	128	Battery voltage
	82			
	85			
	86			
	89			
	90			

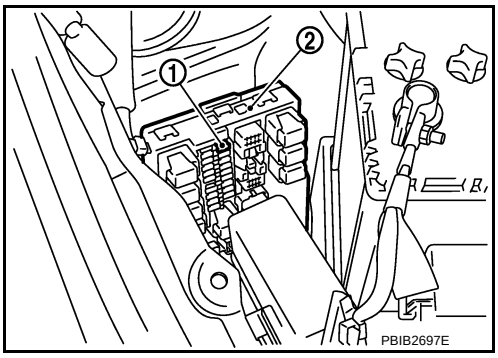
Is the inspection result normal?

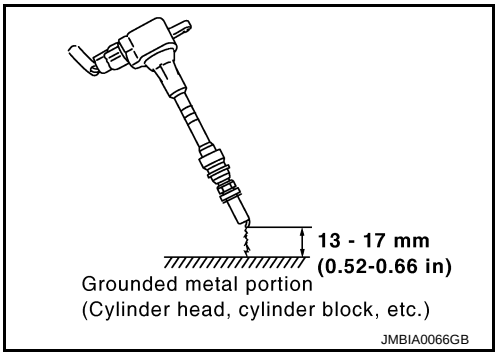
YES >> GO TO 6.
NO >> Perform EC-599, "Diagnosis Procedure".

6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.





Spark should be generated.

CAUTION:

- **Never place to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might 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 known-good spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

Is the inspection result normal?

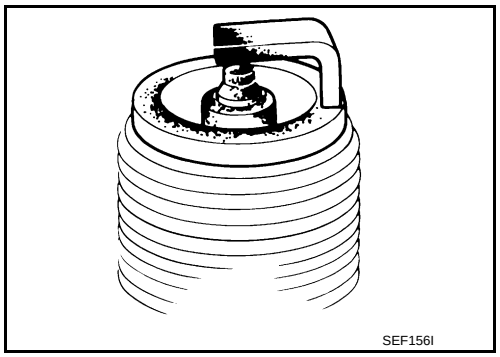
YES >> GO TO 8.
NO >> Check ignition coil, power transistor and their circuits. Refer to EC-620, "Diagnosis Procedure".

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 MA-16, "Changing Spark Plugs (Iridium-Tipped Type)".
NO >> Repair or clean spark plug. Then GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to MA-16, "Changing Spark Plugs (Iridium-Tipped Type)".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel injector assembly.
   Refer to EM-40, "Removal and Installation".
   Keep fuel hose and all fuel injectors connected to fuel tube.
3. Disconnect all ignition coil harness connectors.
4. Reconnect all fuel injector harness connectors disconnected.
5. Turn ignition switch ON.

Does fuel drip from fuel injector?

YES >> Replace the fuel injector(s) from which fuel is dripping.
NO >> GO TO 11.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

YES >> Replace three way catalyst assembly.
NO >> Repair or replace harness or connector.

P0441 EVAP CONTROL SYSTEM

DTC Logic

INFOID:0000000005353555

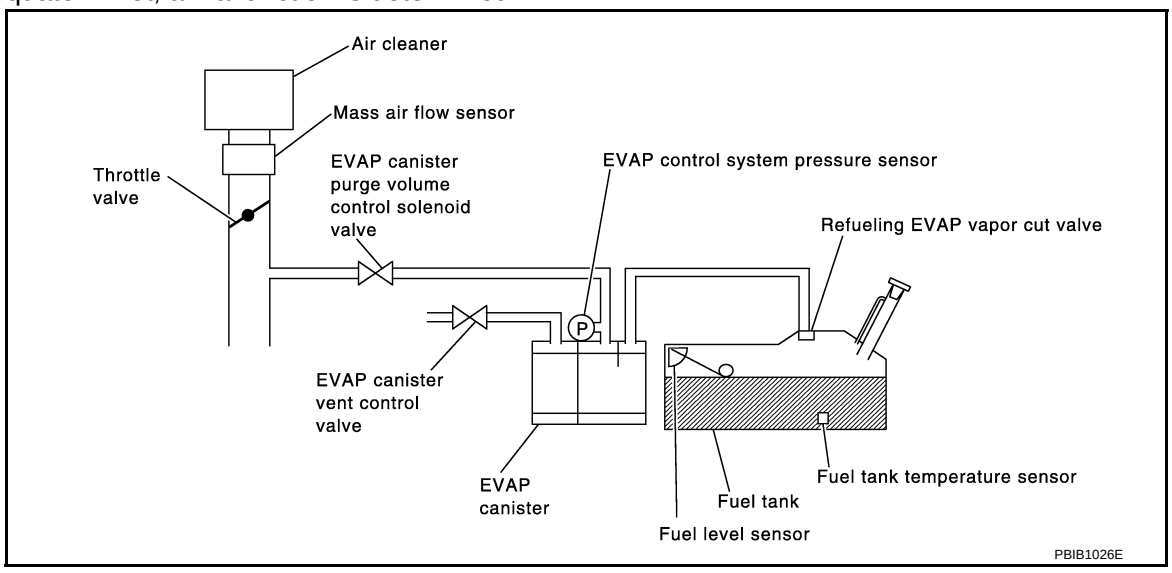
DTC DETECTION LOGIC

NOTE:

If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform trouble diagnosis for other DTC.

In this evaporative emission (EVAP) control system, purge flow occurs during non-closed throttle conditions. Purge volume is related to air intake volume. Under normal purge conditions (non-closed throttle), the EVAP canister purge volume control solenoid valve is open to admit purge flow. Purge flow exposes the EVAP control system pressure sensor to intake manifold vacuum.

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.



DTC No.	Trouble diagnosis name	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.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.

Will CONSULT-III be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE-I

With CONSULT-III
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.
1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and let it idle for at least 70 seconds.
6. Select “PURG FLOW P0441” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
7. Touch “START”.

Is “COMPLETED” displayed on CONSULT-III screen?

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

3.PERFORM DTC CONFIRMATION PROCEDURE-II

When the following conditions are met, “TESTING” will be displayed on the CONSULT-III 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.
NOTE:
If “TESTING” does not change for a long time, retry from step 2.

Is “COMPLETED” displayed on CONSULT-III screen?

YES >> GO TO 4.
NO >> Perform DTC CONFIRMATION PROCEDURE again. GO TO 2.

4.PERFORM DTC CONFIRMATION PROCEDURE-III

Touch “SELF-DIAG RESULTS”.

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-360, "Diagnosis Procedure".

5.PERFORM COMPONENT FUNCTION CHECK

With GST
Perform component function check. Refer to EC-359, "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-360, "Diagnosis Procedure".

Component Function Check

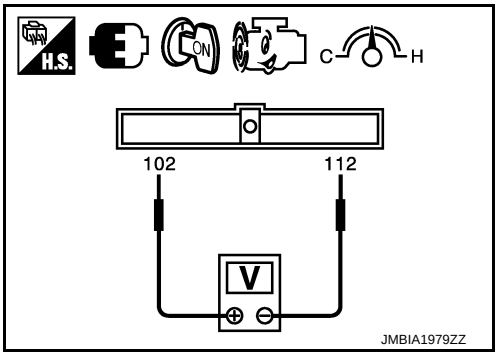
INFOID:0000000005353556

1.PERFORM COMPONENT FUNCTION CHECK

With GST
1. Lift up drive wheels.
2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.

3. Turn ignition switch OFF and wait at least 10 seconds.
4. 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 under the following condition.

ECM		
Connector	+	–
	Terminal	Terminal
M9	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 6) for at least 1 second.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-360, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353557

1.CHECK EVAP CANISTER

1. Turn ignition switch OFF.
2. Check EVAP canister for cracks.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 2.
YES-2 >> Without CONSULT-III: GO TO 3.
NO >> Replace EVAP canister.

2.CHECK PURGE FLOW

With CONSULT-III

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-III.
4. Touch “Qd” and “Qu” on CONSULT-III screen to adjust “PURG VOL CONT/V” opening and check vacuum existence.

PURG VOL CONT/V	Vacuum
100%	Existed
0%	Not existed

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

3. CHECK PURGE FLOW

Without CONSULT-III

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-86, "System Diagram".
4. Start engine and let it idle.
   Do not depress accelerator pedal even slightly.
5. Check vacuum gauge indication before 60 seconds pass after starting engine.

Vacuum should not exist.

6. Rev engine up to 2,000 rpm after 100 seconds pass after starting engine.

Vacuum should exist.

Is the inspection result normal?

YES >> GO TO 7.
NO >> GO TO 4.

4. CHECK EVAP PURGE LINE

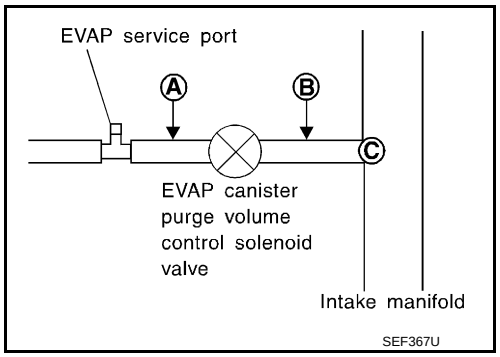
1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
   Refer to EC-86, "System Diagram".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Repair EVAP purge line.

5. CHECK EVAP PURGE HOSE AND PURGE PORT

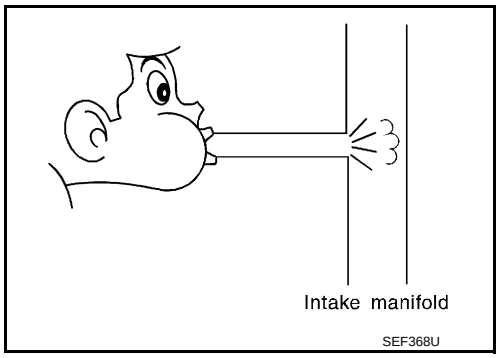
1. Disconnect purge hoses connected to EVAP service port **A** and EVAP canister purge volume control solenoid valve **B**.
2. Blow air into each hose and EVAP purge port **C**.



3. Check that air flows freely.

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 6.
YES-2 >> Without CONSULT-III: GO TO 7.
NO >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-374, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve.

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.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-395, "DTC Logic" for DTC P0452, EC-402, "DTC Logic" for DTC P0453.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP control system pressure sensor.

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 11.
NO >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-382, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace EVAP canister vent control valve.

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-86, "System Diagram".

Is the inspection result normal?

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

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0442 EVAP CONTROL SYSTEM

DTC Logic

INFOID:0000000005353558

DTC DETECTION LOGIC

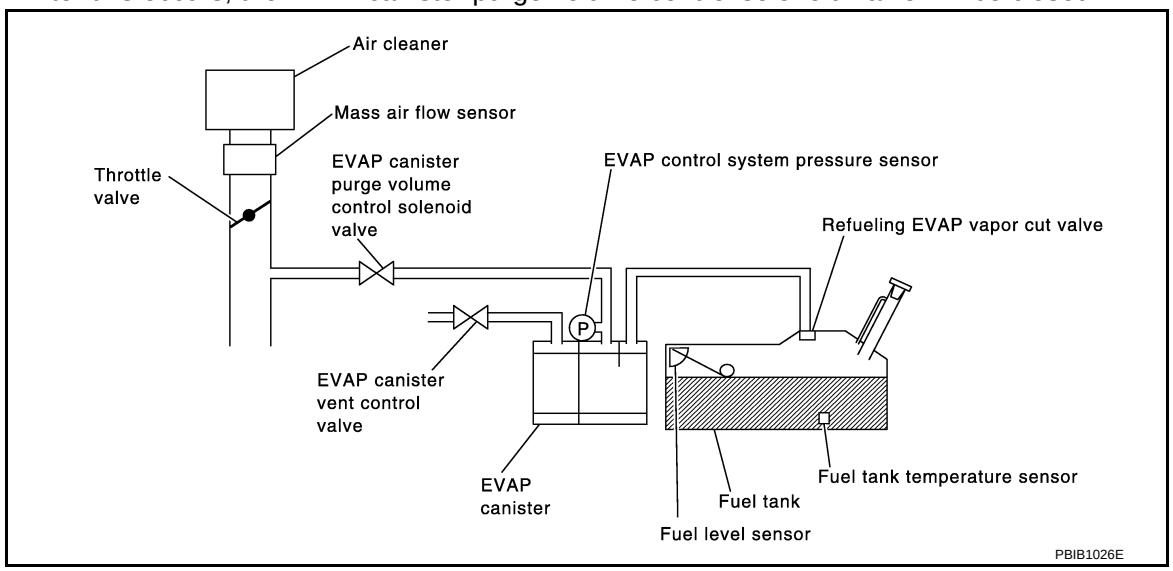
NOTE:

If DTC P0442 is displayed with DTC P0456, first perform the trouble diagnosis for DTC P0456. Refer to EC-416, "DTC Logic".

This diagnosis detects leaks in the EVAP purge line using engine intake manifold vacuum.

If pressure does not increase, the ECM will check for leaks in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.

The EVAP canister vent control valve is closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve will then be opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	• Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or does not close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Fuel level sensor and the circuit • Refueling EVAP vapor cut valve • ORVR system leaks

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 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:
Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

Will CONSULT-III be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III
TESTING CONDITION:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
4. Check that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5. Select “EVP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
   Follow the instructions displayed.
   NOTE:
   If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-22, "BASIC INSPECTION : Special Repair Requirement".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-364, "Diagnosis Procedure".

3.PERFORM DTC CONFIRMATION PROCEDURE

With GST
NOTE:
Be sure to read the explanation of Driving Pattern in EC-671, "How to Set SRT Code" before driving vehicle.

1. Start engine.
2. Drive vehicle according to Driving Pattern.
3. Stop vehicle.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Turn ignition switch ON.
8. Check 1st trip DTC.

Is 1st trip DTC displayed?

YES-1 >> P0441: Go to EC-360, "Diagnosis Procedure".
YES-2 >> P0442: Go to EC-364, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353559

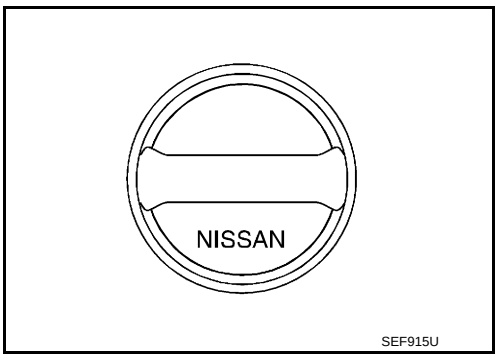
1.CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. 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-368, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filler cap with a genuine one.

5. CHECK FOR EVAP LEAK

Refer to EC-693, "Inspection".

Is there any leak in EVAP line?

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

6. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
  Refer to EC-695, "Removal and Installation".
- EVAP canister vent control valve.
  Refer to EC-382, "Component Inspection".

Is the inspection result normal?

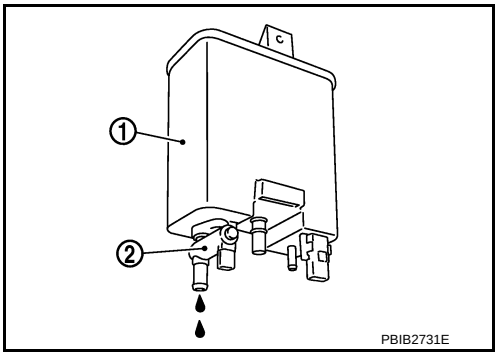
YES >> GO TO 7.
NO >> Repair or replace EVAP canister vent control valve and O-ring.

7. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from the EVAP canister?

YES >> GO TO 8.
NO-1 >> With CONSULT-III: GO TO 10.
NO-2 >> Without CONSULT-III: GO TO 11.

8. 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 2.0 kg (4.0 lb).

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 10.
YES-2 >> Without CONSULT-III: 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.

10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

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.
4. Touch “Qu” on CONSULT-III screen to increase “PURG VOL CONT/V” opening to 100%.
5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

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

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-III

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.
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-86, "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-374, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP canister purge volume control solenoid valve.

14. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor.

16. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-86, "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-630, "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 neck tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-633, "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 DI-24, "Electrical Component Inspection".

Is the inspection result normal?

YES >> GO TO 22.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

22.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

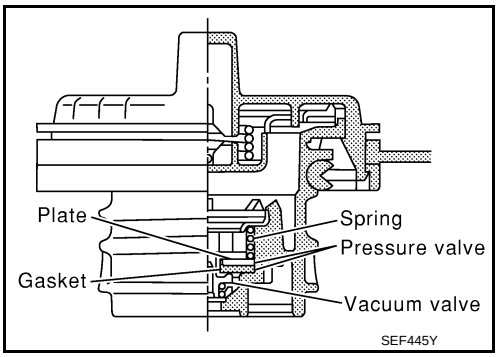
>> INSPECTION END

Component Inspection

INFOID:0000000005353560

1.CHECK FUEL FILLER CAP

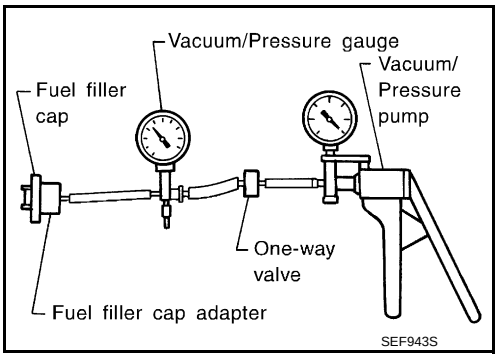
1. Turn ignition switch OFF.
2. Remove fuel filler cap.
3. Wipe clean valve housing.



4. Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
5. Check valve opening pressure and vacuum.

Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)**

Vacuum: **−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)**



Is the inspection result normal?

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

2.REPLACE FUEL FILLER CAP

Replace fuel filler cap.

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

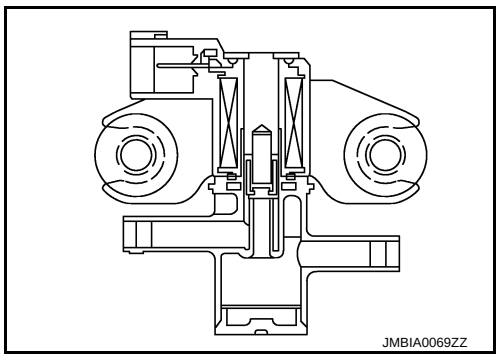
>> INSPECTION END

P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000005353561

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:0000000005353562

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.

Will CONSULT-III be used?

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

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

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-III.
7. Touch “START”.
8. Start engine and let it idle until “TESTING” on CONSULT-III 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-III screen?

OK >> INSPECTION END
NG >> Go to EC-371, "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.

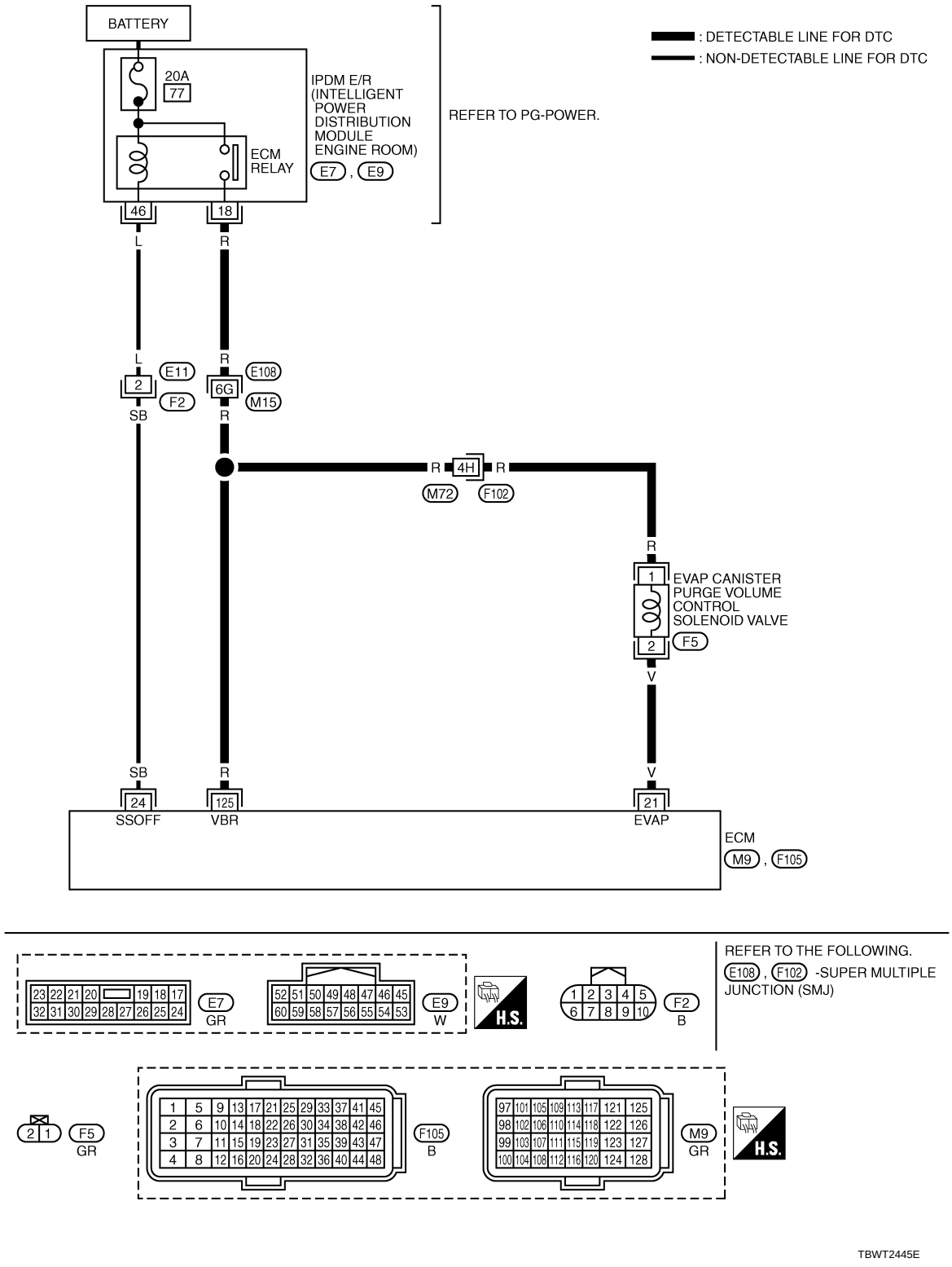
Is 1st trip DTC displayed?

YES >> Go to EC-371, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353563

EC-PGC/V-01



TBWT2445E

Diagnosis Procedure

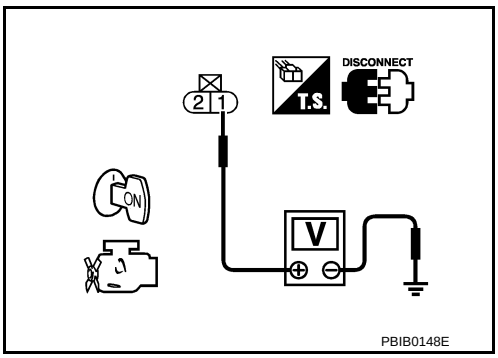
INFOID:0000000005353564

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		
F5	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 E108, M15
- Harness connectors F102, M72
- 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	
F5	2	F105	21	Existed

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

Is the inspection result normal?

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

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace EVAP control system pressure sensor.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 6.
YES-2 >> Without CONSULT-III: GO TO 7.
NO >> Replace EVAP control system pressure sensor.

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

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-III. 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-374, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 9.
NO >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-382, "Component Inspection".

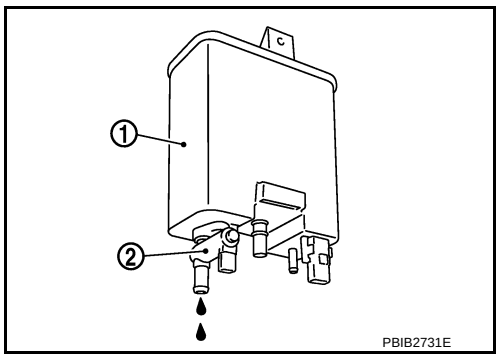
Is the inspection result normal?

YES >> GO TO 10.
NO >> Replace EVAP canister vent control valve.

10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from the EVAP canister?

YES >> GO TO 11.
NO >> GO TO 13.

11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.0 lb).

Is the inspection result normal?

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

12. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

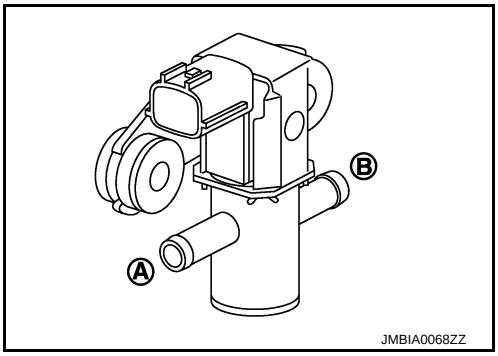
Component Inspection

INFOID:0000000005353565

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

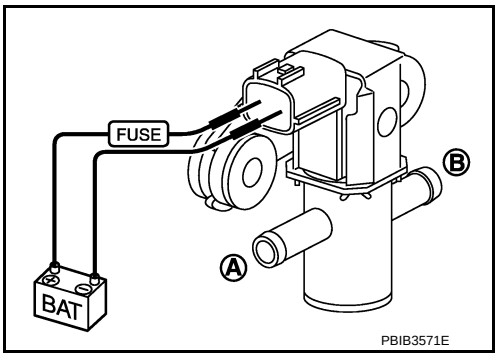
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Turn ignition switch ON.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III.
6. Touch “Qd” and “Qu” on CONSULT-III screen to adjust “PURG VOL CONT/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END

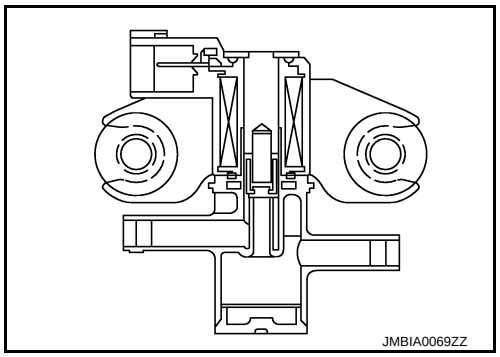
NO >> Replace EVAP canister purge volume control solenoid valve

P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000005353566

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:0000000005353567

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.

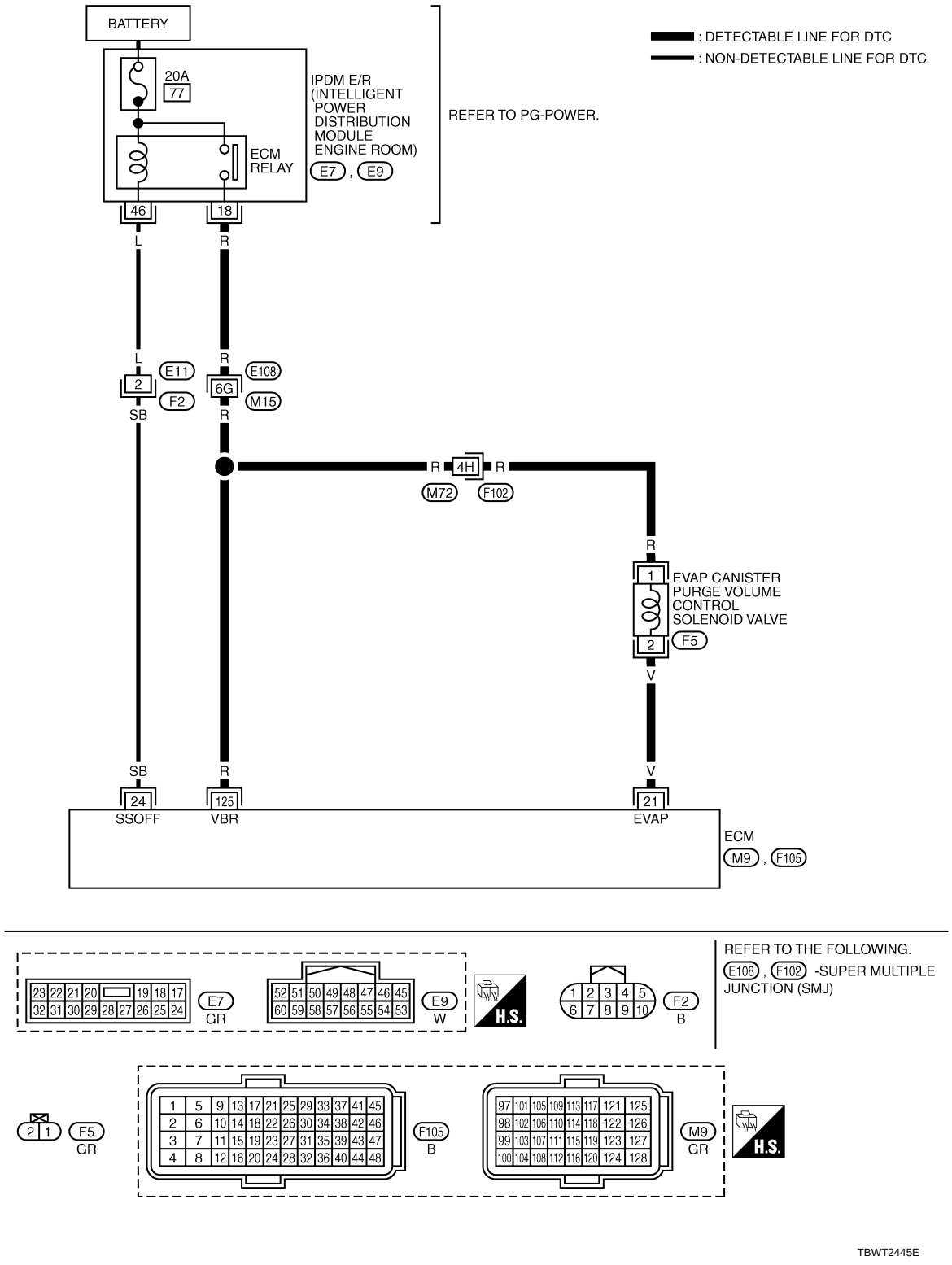
Is 1st trip DTC detected?

YES >> Go to EC-376, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353568

EC-PGC/V-01



TBWT2445E

Diagnosis Procedure

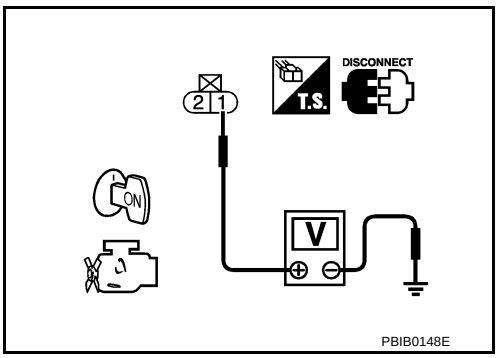
INFOID:0000000005353569

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		
F5	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 E108, M15
- Harness connectors F102, M72
- 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	
F5	2	F105	21	Existed

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

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 4.
YES-2 >> Without CONSULT-III: GO TO 5.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-378, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

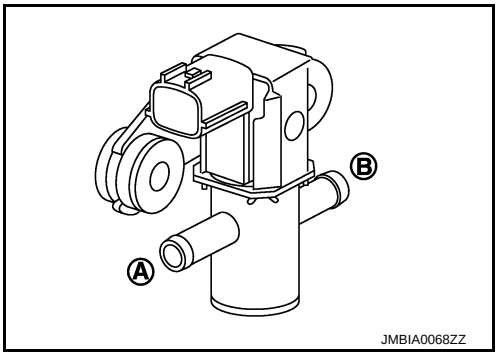
Component Inspection

INFOID:0000000005353570

1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Turn ignition switch ON.
5. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III.
6. Touch “Qd” and “Qu” on CONSULT-III screen to adjust “PURG VOL CONT/V” opening and check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

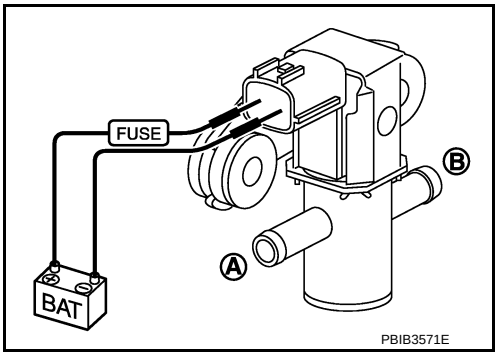


JMBIA0068ZZ

Condition (PURG VOL CONT/V value)	Air passage continuity between (A) and (B)
100%	Existed
0%	Not existed

Without CONSULT-III

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve harness connector.
3. Disconnect EVAP purge hoses connected to EVAP canister purge volume control solenoid valve.
4. Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.



PBIB3571E

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Existed
No supply	Not existed

Is the inspection result normal?

YES >> INSPECTION END

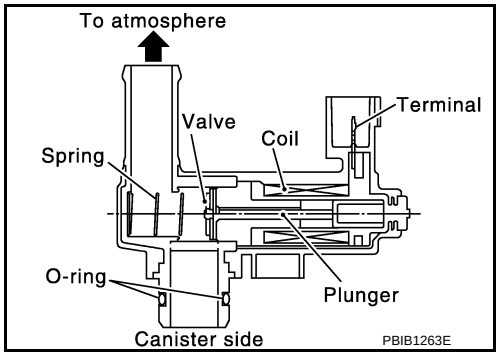
NO >> Replace EVAP canister purge volume control solenoid valve

P0447 EVAP CANISTER VENT CONTROL VALVE

Description

INFOID:0000000005353571

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:0000000005353572

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.

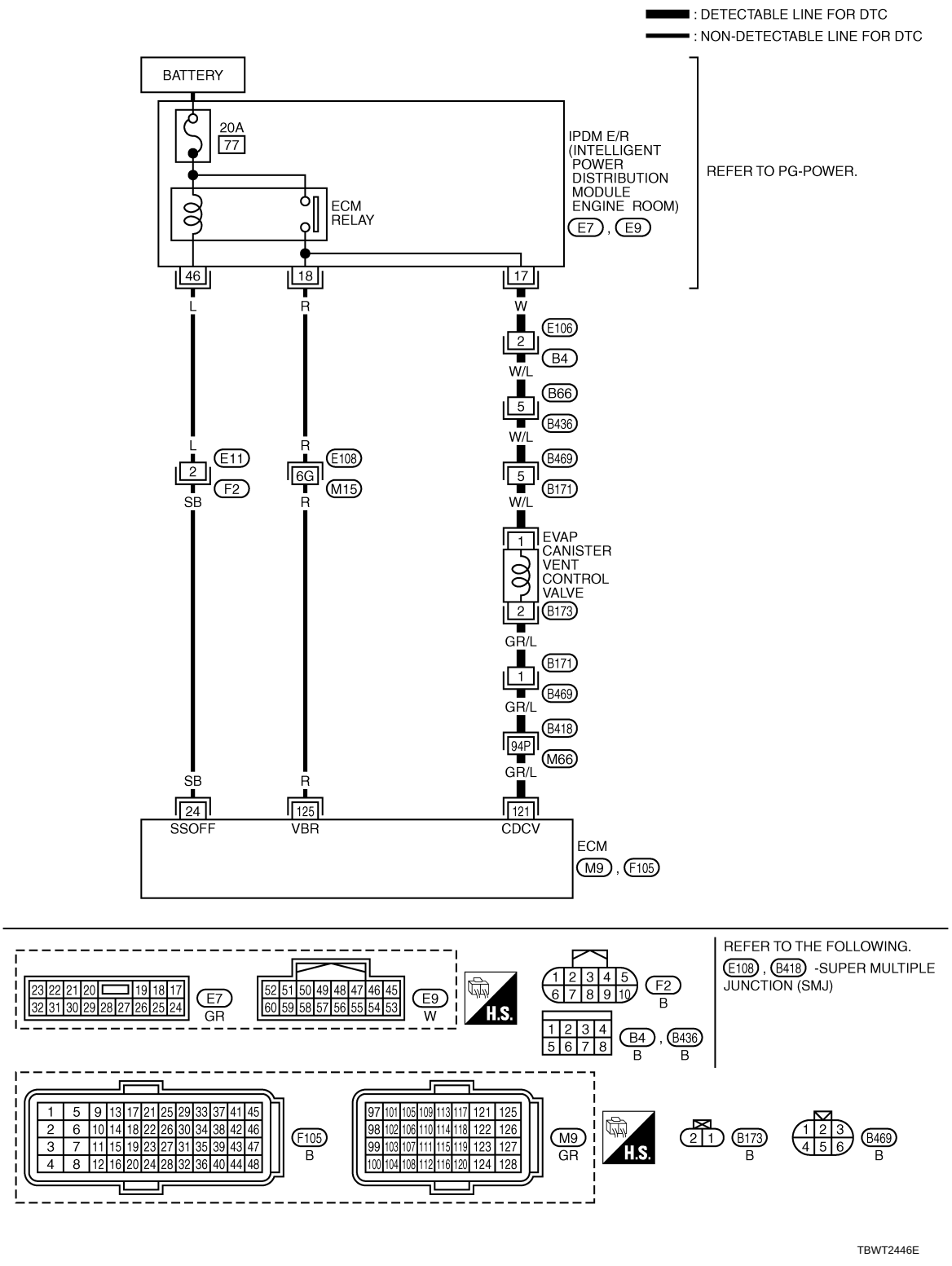
Is 1st trip DTC detected?

YES >> Go to EC-380, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353573

EC-VENT/V-01



TBWT2446E

Diagnosis Procedure

INFOID:0000000005353574

1. INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

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

2. CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-III

1. Turn ignition switch OFF and then ON.
2. Select “VENT CONTROL/V” in “ACTIVE TEST” mode with CONSULT-III.
3. Touch “ON/OFF” on CONSULT-III screen.
4. Check for operating sound of the valve.

Clicking sound should be heard.

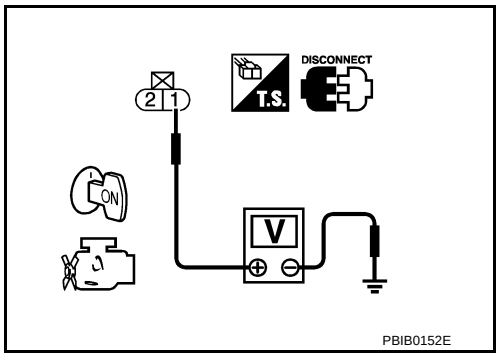
Is the inspection result normal?

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		
B173	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 B4, E106
- Harness connectors B66, B436
- Harness connectors B171, B469
- 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	
B173	2	M9	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 B171, B469
- Harness connectors B418, M66
- Harness for open or short between EVAP canister vent control valve and ECM

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

7. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-382, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace EVAP canister vent control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

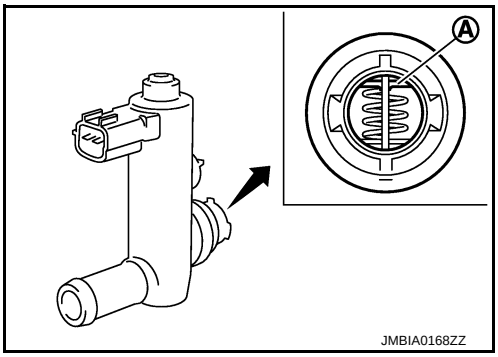
INFOID:0000000005353575

1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion (A) of EVAP canister vent control valve for rust.

Is it rusted?

YES >> Replace EVAP canister vent control valve
NO >> GO TO 2.



2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

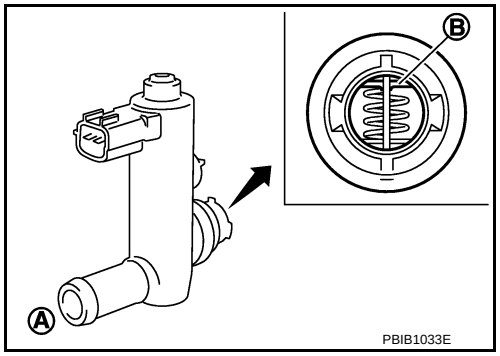
With CONSULT-III

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

4. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

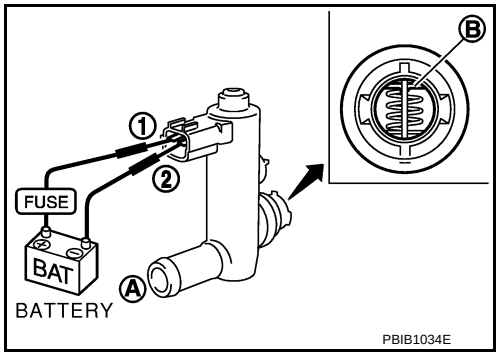
Operation takes less than 1 second.



Without CONSULT-III
1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.



Is the inspection result normal?

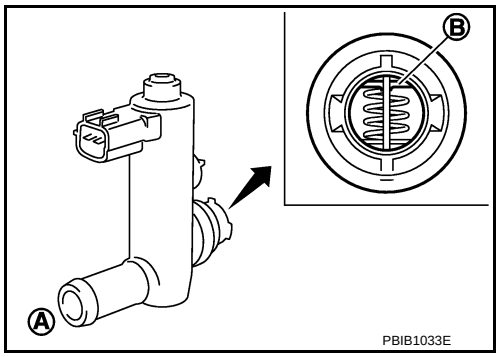
YES >> INSPECTION END
NO >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT-III
1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
3. Check air passage continuity and operation delay time.
Check that new O-ring is installed properly.

VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

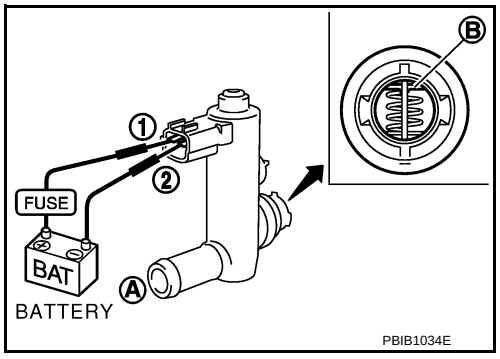
Operation takes less than 1 second.



Without CONSULT-III
1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
Check that new O-ring is installed properly.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Not existed
OFF	Existed

Operation takes less than 1 second.



Is the inspection result normal?

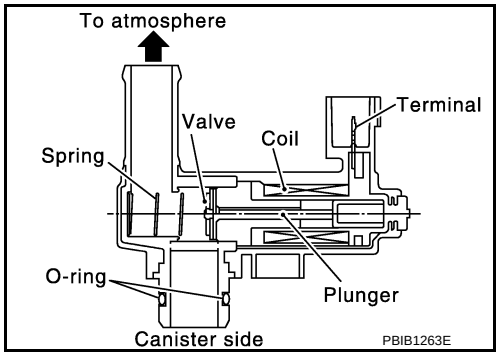
YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve

P0448 EVAP CANISTER VENT CONTROL VALVE

Description

INFOID:0000000005353576

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:0000000005353577

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 3 times.

- Increase the engine speed up to between 3,000 and 3,500 rpm and maintain that speed for 2 minutes and 50 seconds to 3 minutes.

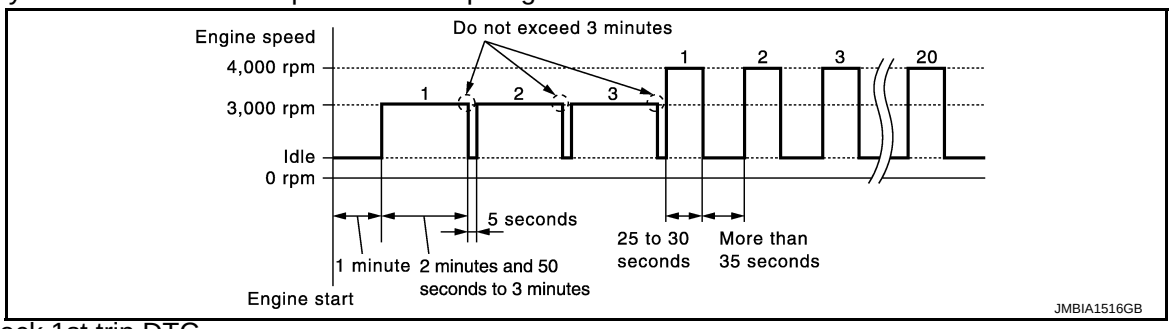
Do not exceed 3 minutes.

- Fully released accelerator pedal and keep engine idle for approximately 5 seconds.

5. Repeat next procedure 20 times.

- Quickly increase the engine speed up to between 4,000 and 4,500 rpm and maintain that speed for 25 to 30 seconds.

- Fully released accelerator pedal and keep engine idle for at least 35 seconds.



6. Check 1st trip DTC.

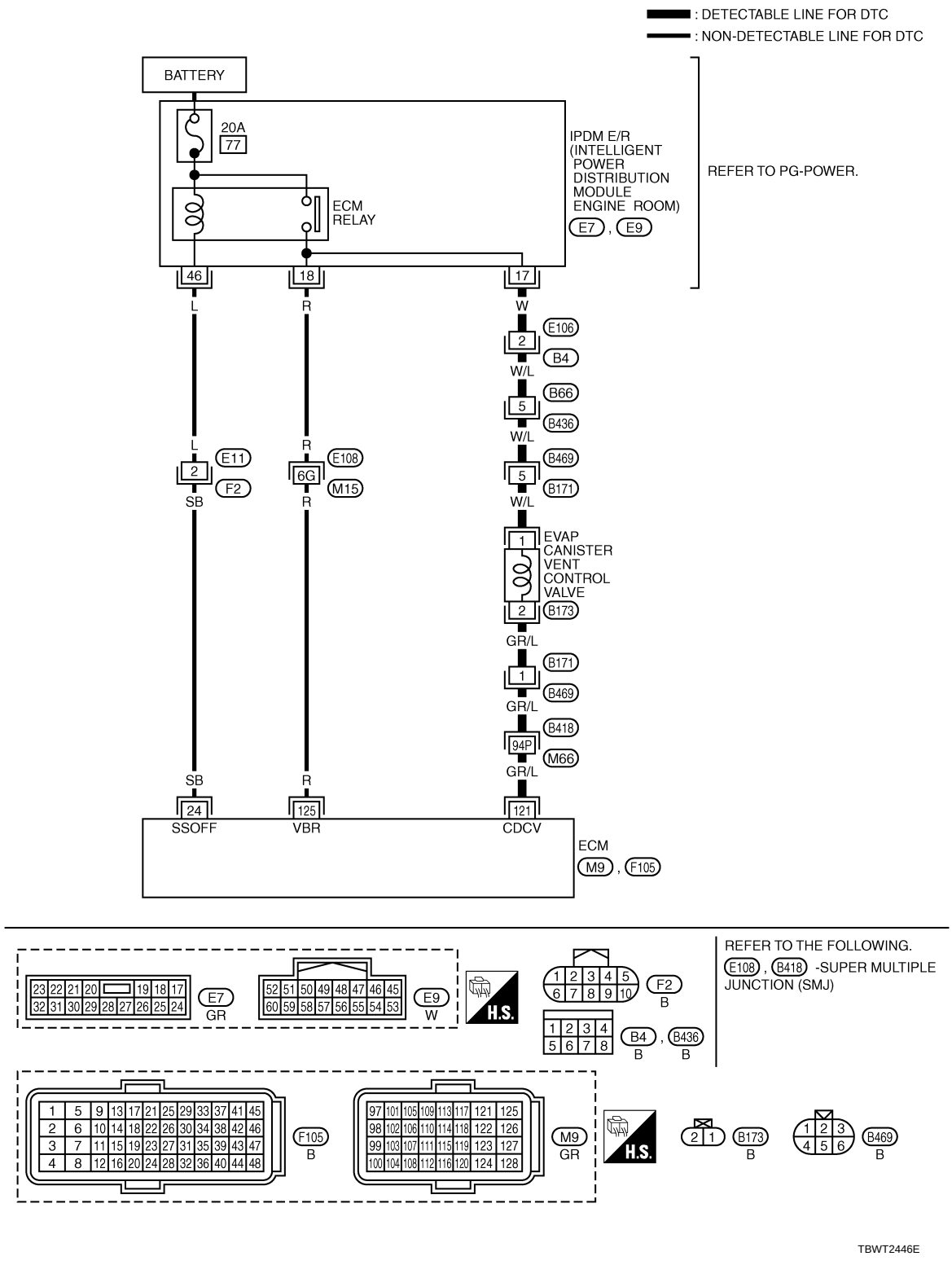
Is 1st trip DTC detected?

YES >> Go to EC-387, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353578

EC-VENT/V-01



TBWT2446E

Diagnosis Procedure

INFOID:0000000005353579

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-389, "Component Inspection".

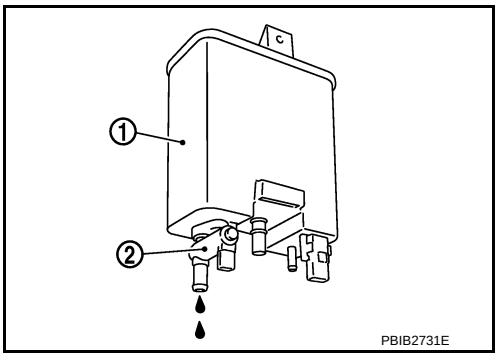
Is the inspection result normal?

YES >> GO TO 3.
NO >> Replace EVAP canister vent control valve.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from EVAP canister?

YES >> GO TO 4.
NO >> GO TO 6.

4.CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.0 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.

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.

7.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace EVAP control system pressure sensor.

8.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

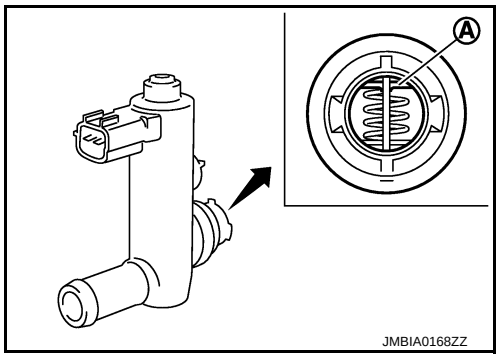
>> INSPECTION END

Component Inspection

INFOID:0000000005353580

1. CHECK EVAP CANISTER VENT CONTROL VALVE-I

1. Turn ignition switch OFF.
2. Remove EVAP canister vent control valve from EVAP canister.
3. Check portion (A) of EVAP canister vent control valve for being rusted.



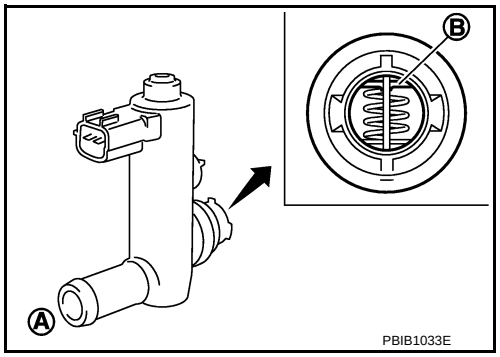
Is it rusted?

YES >> Replace EVAP canister vent control valve
NO >> GO TO 2.

2. CHECK EVAP CANISTER VENT CONTROL VALVE-II

With CONSULT-III

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time.
   Check new O-ring is installed properly.

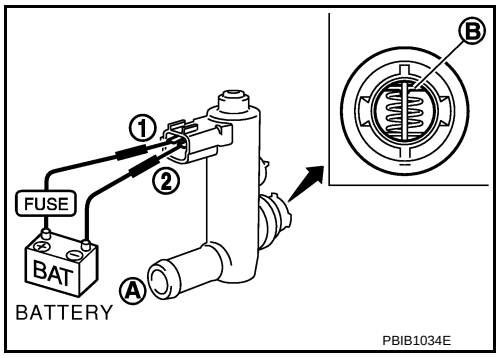


VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT-III

1. Disconnect EVAP canister vent control valve harness connector.
2. Check air passage continuity and operation delay time under the following conditions.
   Check 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?

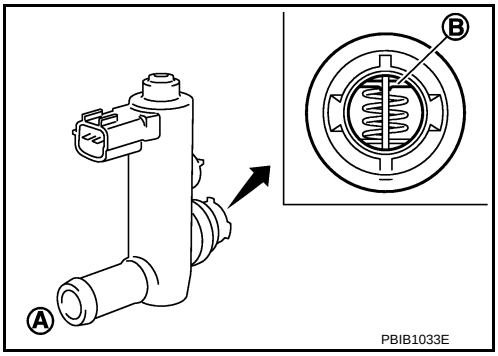
YES >> INSPECTION END
NO >> GO TO 3.

3. CHECK EVAP CANISTER VENT CONTROL VALVE-III

With CONSULT-III

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.

3. Check air passage continuity and operation delay time.
Check new O-ring is installed properly.

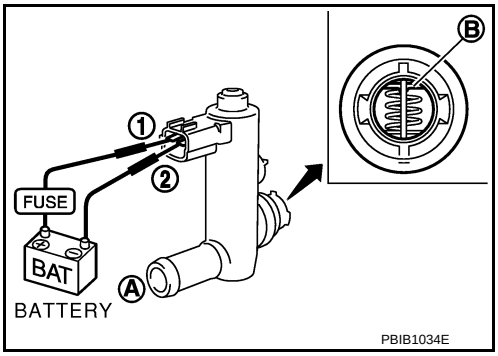


VENT CONTROL/V Condition	Air passage continuity between (A) and (B)
ON	Not existed
OFF	Existed

Operation takes less than 1 second.

Without CONSULT-III

1. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
2. Check air passage continuity and operation delay time under the following conditions.
Check 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?

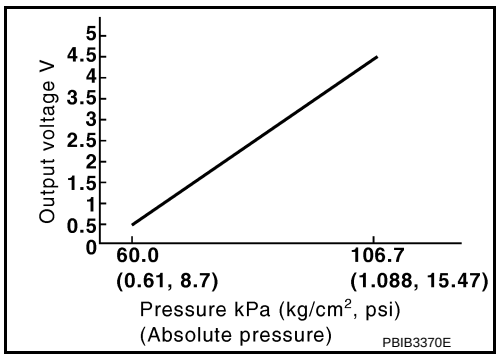
YES >> INSPECTION END
NO >> Replace EVAP canister vent control valve

P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

INFOID:0000000005353581

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:0000000005353582

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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • Battery current sensor • APP 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.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Start engine and wait at least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-392, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353583

1.CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

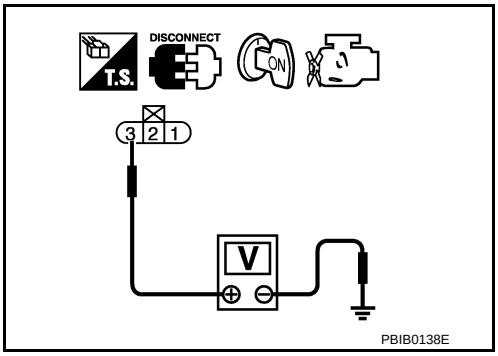
Is the inspection result normal?

YES >> GO TO 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		
B172	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 harness continuity between EVAP control system pressure sensor harness connector and ECM harness connector.

EVAP control system pressure sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B172	3	M9	107	Existed

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
1. Harness connectors B171, B469
2. Harness connectors B418, M66
3. Harness for open between EVAP control system pressure sensor and ECM

>> 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator pedal position (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

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

9.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

10.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace EVAP control system pressure sensor.

11.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

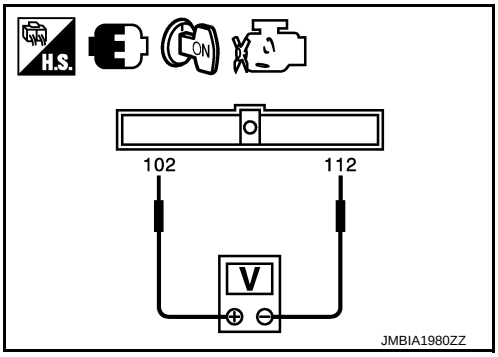
>> INSPECTION END

Component Inspection

INFOID:0000000005353584

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.



ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M9	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?

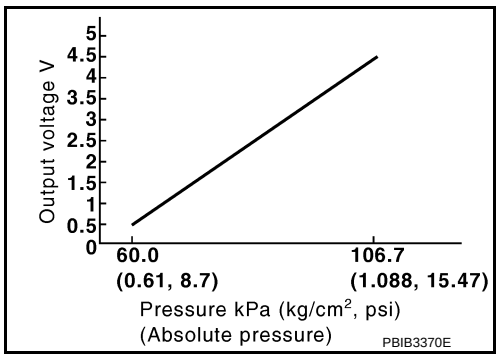
YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor

P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

INFOID:0000000005353585

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:0000000005353586

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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • Battery current sensor • APP 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:
Always perform test at a temperature of 5°C (41°F) or more.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

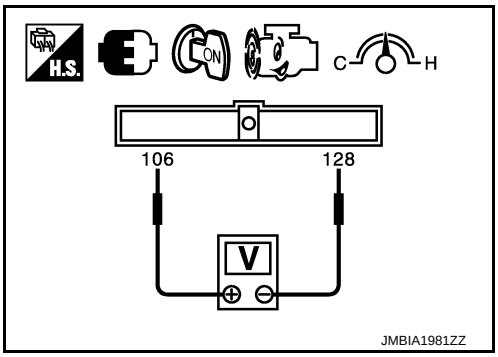
With CONSULT-III

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-III.
7. Check that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.



ECM		
Connector	+	–
	Terminal	Terminal
M9	106 (Fuel tank temperature sensor signal)	128

3. Check that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

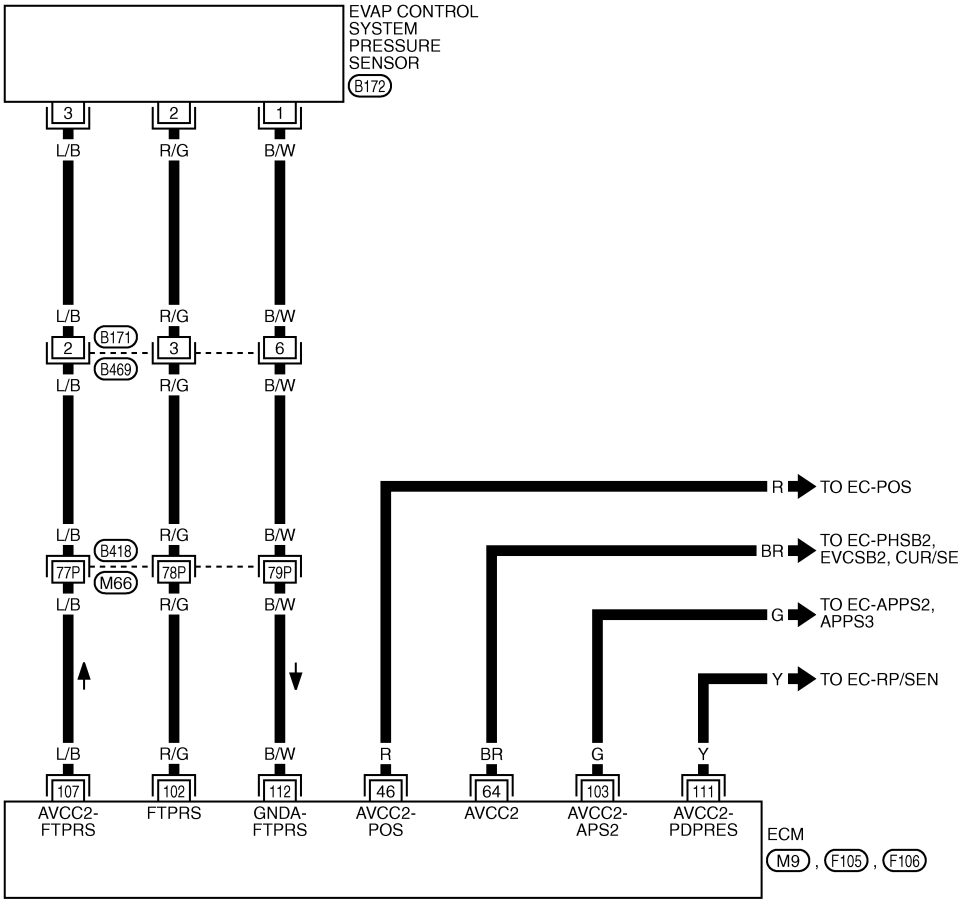
YES >> Go to EC-397, "Diagnosis Procedure".
NO >> INSPECTION END

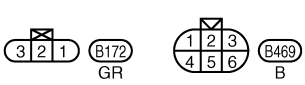
Wiring Diagram

INFOID:0000000005353587

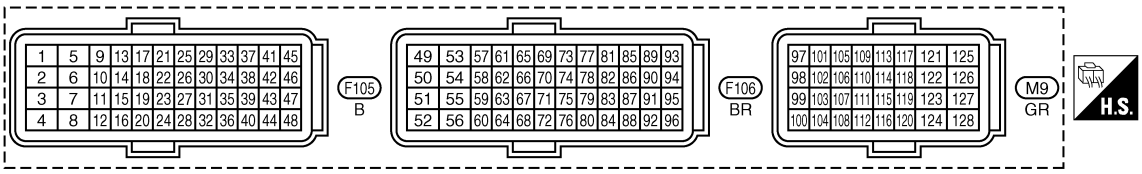
EC-PRE/SE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





REFER TO THE FOLLOWING.
B418 -SUPER MULTIPLE JUNCTION (SMJ)



TBWT2447E

Diagnosis Procedure

INFOID:0000000005353588

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

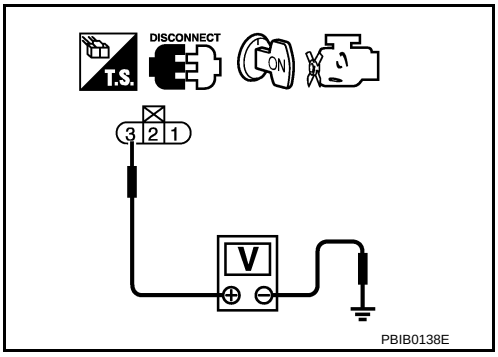
Is the inspection result normal?

YES >> GO TO 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		
B172	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	
B172	3	M9	107	Existed

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator pedal position (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-561, "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
2. Go to EC-562, "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	
B172	1	M9	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 B171, B469
- Harness connectors B418, M66
- 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	
B172	2	M9	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 B171, B469
- Harness connectors B418, M66
- 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-400, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace EVAP control system pressure sensor.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

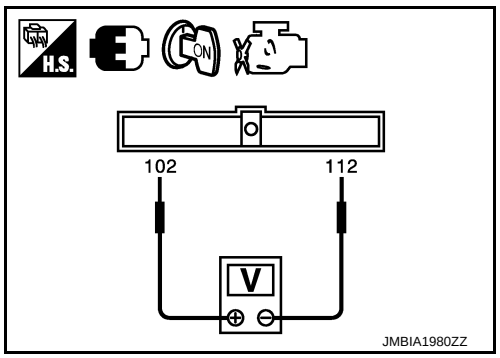
Component Inspection

INFOID:0000000005353589

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. **Always replace O-ring with a new one.**
3. Install a vacuum pump to EVAP control system pressure sensor.

4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.



ECM			Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M9	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?

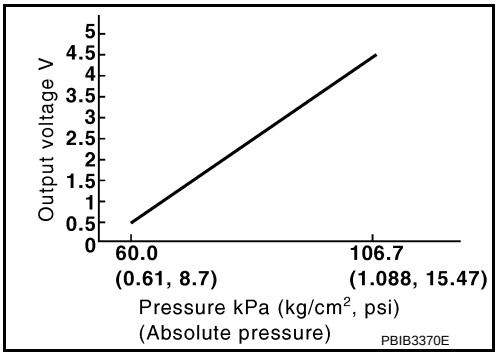
YES >> INSPECTION END
NO >> Replace EVAP control system pressure sensor

P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Description

INFOID:0000000005353590

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:0000000005353591

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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (Refrigerant pressure sensor circuit is shorted.) • EVAP control system pressure sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • Battery current sensor • APP sensor • Refrigerant pressure sensor • EVAP canister vent control valve • EVAP canister • Rubber hose from EVAP canister vent control valve to vehicle frame

DTC CONFIRMATION PROCEDURE

1.PRECONDITIONING

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.

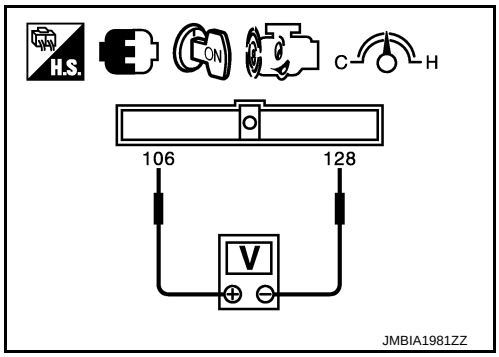
2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

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-III.
7. Check that “FUEL T/TMP SE” is more than 0°C (32°F).
8. Start engine and wait at least 20 seconds.
9. Check 1st trip DTC.

With GST

1. Start engine and warm it up to normal operating temperature.
2. Set voltmeter probes to ECM harness connector terminals under the following conditions.



ECM		
Connector	+	–
	Terminal	Terminal
M9	106 (Fuel tank temperature sensor signal)	128

3. Check that the voltage is less than 4.2 V.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON.
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Start engine and wait at least 20 seconds.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

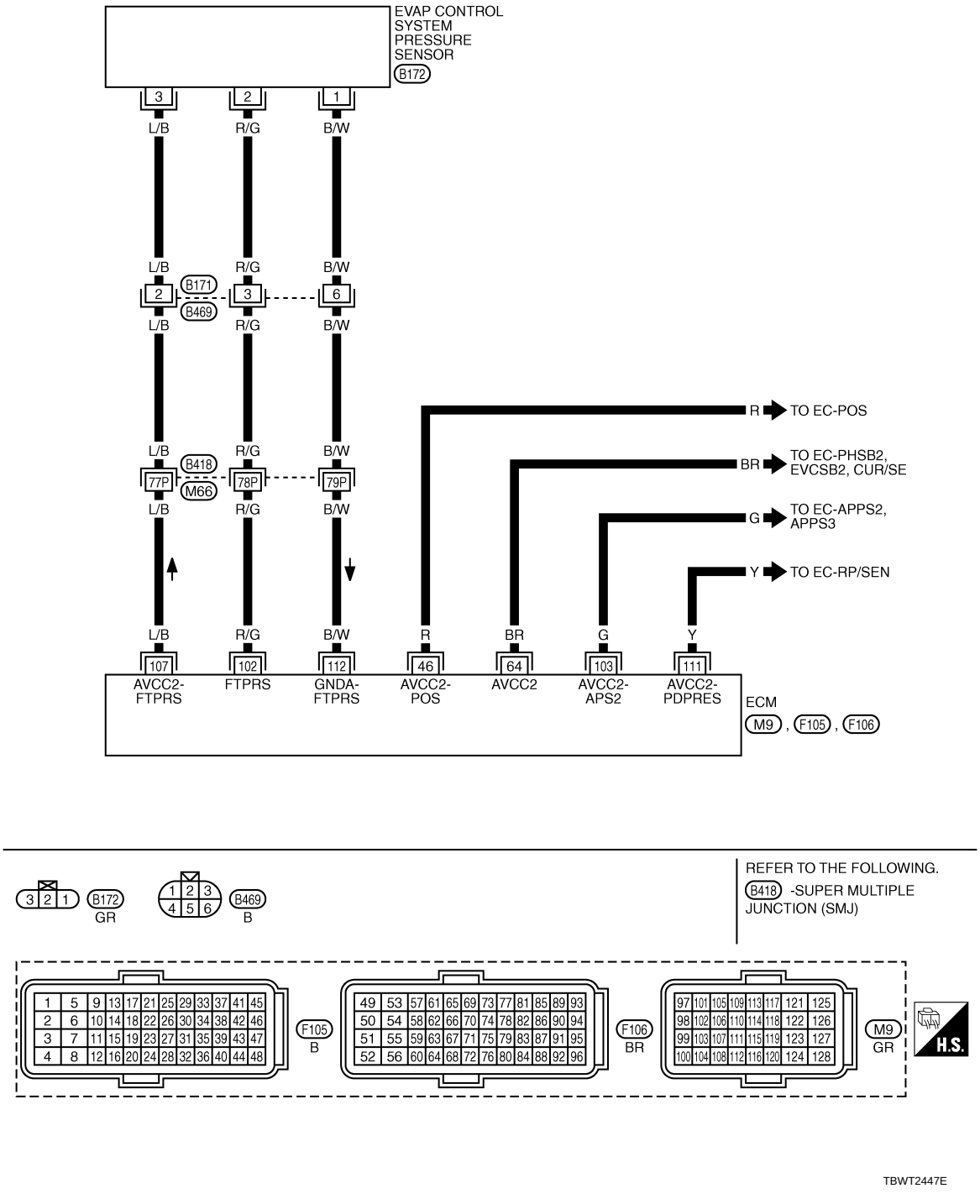
YES >> Go to EC-404, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353592

EC-PRE/SE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC



TBWT2447E

Diagnosis Procedure

INFOID:0000000005353593

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check that water is not inside connectors.

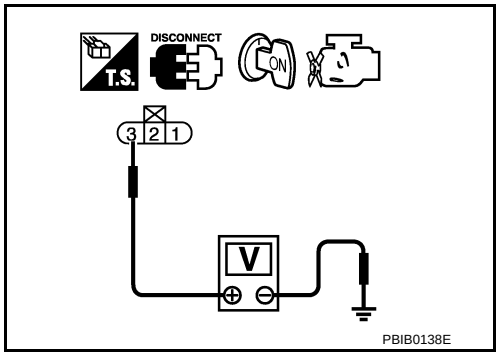
Is the inspection result normal?

YES >> GO TO 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		
B172	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	
B172	3	M9	107	Existed

Is the inspection result normal?

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

5.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator pedal position (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace malfunctioning component.

8.CHECK APP SENSOR

Refer to EC-561, "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
2. Go to EC-562, "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	
B172	1	M9	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 B171, B469
- Harness connectors B418, M66
- 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	
B172	2	M9	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 B171, B469
- Harness connectors B418, M66
- 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-382, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP canister vent control valve.

16. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-408, "Component Inspection".

Is the inspection result normal?

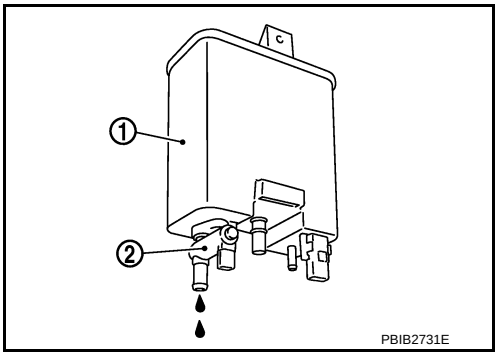
YES >> GO TO 17.
NO >> Replace EVAP control system pressure sensor.

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.

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 2.0 kg (4.0 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.

20. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

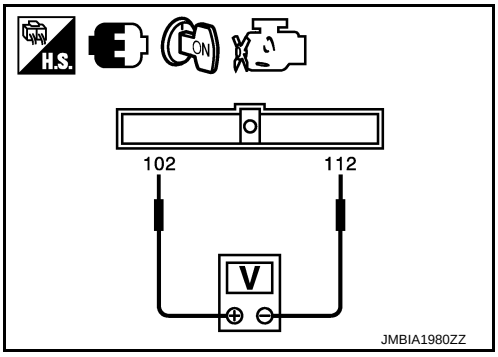
>> INSPECTION END

Component Inspection

INFOID:0000000005353594

1. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Turn ignition switch OFF.
2. Remove EVAP control system pressure sensor with its harness connector connected from EVAP canister. **Always replace O-ring with a new one.**
3. Install a vacuum pump to EVAP control system pressure sensor.
4. Turn ignition switch ON and check output voltage between ECM harness connector terminals under the following conditions.



ECM		Ground	Condition [Applied vacuum kPa (kg/cm^2, psi)]	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M9	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

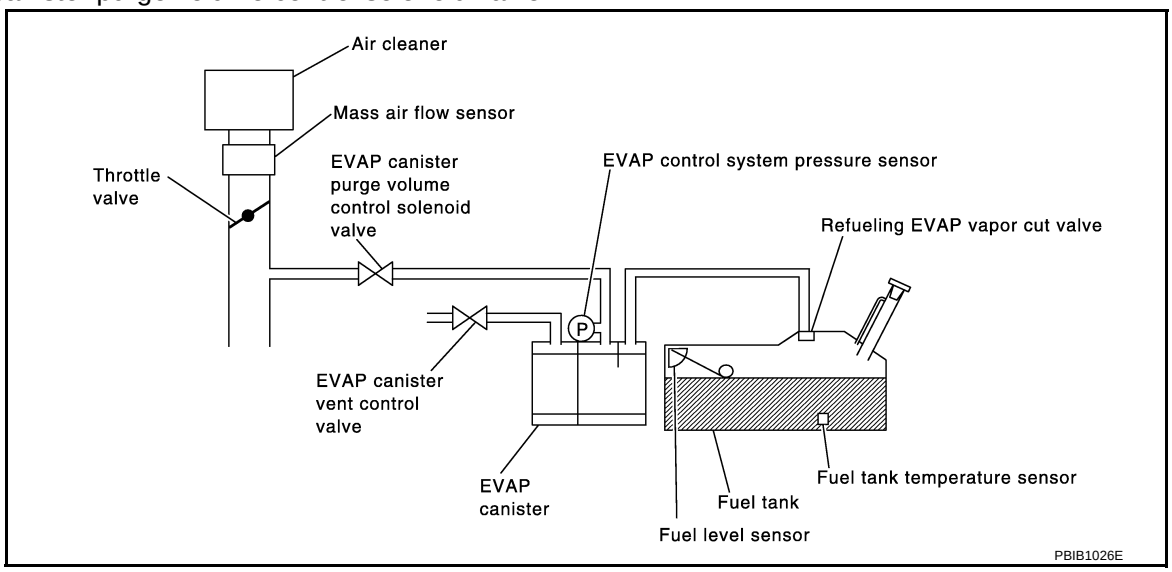
P0455 EVAP CONTROL SYSTEM

DTC Logic

INFOID:0000000005353595

DTC DETECTION LOGIC

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	• Fuel filler cap remains open or does not close. • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • 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 control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks

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

CAUTION:

Never remove fuel filler cap during the DTC Confirmation Procedure.
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:
Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

Will CONSULT-III be used?

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

2. PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III
TESTING CONDITION:
- **Perform "DTC WORK SUPPORT" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedures.**

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
5. Check that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select "EVP SML LEAK P0442/P1442" of "EVAPORATIVE SYSTEM" in "DTC WORK SUPPORT" mode with CONSULT-III.
   Follow the instructions displayed.
   NOTE:
   If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-22, "BASIC INSPECTION : Special Repair Requirement".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> GO TO 3.

3. CHECK DTC

Check DTC.

Which DTC is detected?

P0455 >> Go to EC-412, "Diagnosis Procedure".
P0442 >> Go to EC-364, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE

With GST
NOTE:
Be sure to read the explanation of Driving Pattern in EC-671, "How to Set SRT Code" before driving vehicle.
1. Start engine.
2. Drive vehicle according to Driving Pattern.
3. Stop vehicle.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Turn ignition switch ON
6. Turn ignition switch OFF and wait at least 10 seconds.
7. Turn ignition switch ON.
8. Check 1st trip DTC.

Is 1st trip DTC detected?

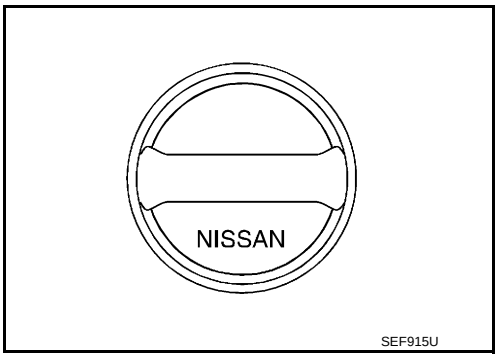
YES-1 >> P0455: Go to EC-412, "Diagnosis Procedure".
YES-2 >> P0442: Go to EC-364, "Diagnosis Procedure".
YES-3 >> P0441: Go to EC-360, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353596

1.CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace with genuine NISSAN fuel filler cap.

2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. 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-414, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filler cap with a genuine one.

5.CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.
Refer to EC-86, "System Diagram".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Repair or reconnect the hose.

6.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.
- EVAP canister vent control valve is installed properly.
  Refer to EC-695, "Removal and Installation".
- EVAP canister vent control valve.
  Refer to EC-382, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace EVAP canister vent control valve and O-ring.

8. CHECK FOR EVAP LEAK

Refer to EC-693, "Inspection".

Is there any leak in EVAP line?

YES >> Repair or replace malfunctioning part.
NO-1 >> With CONSULT-III: GO TO 9.
NO-2 >> Without CONSULT-III: GO TO 10.

9. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

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.
4. Touch “Qu” on CONSULT-III screen to increase “PURG VOL CONT/V” opening to 100%.
5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

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

10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-III

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.
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 11.

11. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-86, "System Diagram".

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 12.
YES-2 >> Without CONSULT-III: GO TO 13.
NO >> Repair or reconnect the hose.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

Does engine speed vary according to the valve opening?

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

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-374, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP canister purge volume control solenoid valve.

14. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor.

16. 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-630, "Description".

Is the inspection result normal?

YES >> GO TO 17.
NO >> Repair or replace hoses and tubes.

17. 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 18.
NO >> Repair or replace hose, tube or filler neck tube.

18. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-633, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 19.
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

19. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

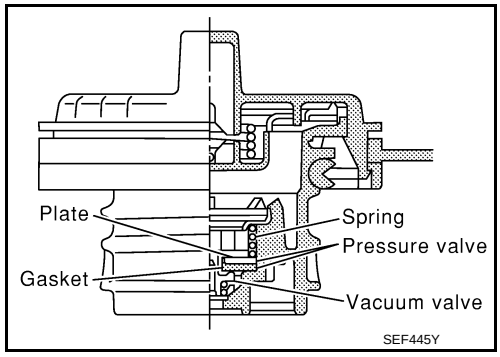
>> INSPECTION END

Component Inspection

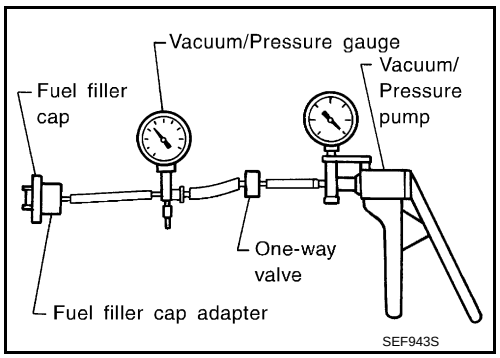
INFOID:0000000005353597

1. CHECK FUEL FILLER CAP

1. Turn ignition switch OFF.
2. Remove fuel filler cap.
3. Wipe clean valve housing.



4. Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
5. Check valve opening pressure and vacuum.



Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)**

Vacuum: **–6.0 to –3.3 kPa (–0.061 to –0.034 kg/cm^2, –0.87 to –0.48 psi)**

Is the inspection result normal?

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

2.REPLACE FUEL FILLER CAP

Replace fuel filler cap.

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END

P0456 EVAP CONTROL SYSTEM

DTC Logic

INFOID:0000000005353598

DTC DETECTION LOGIC

NOTE:

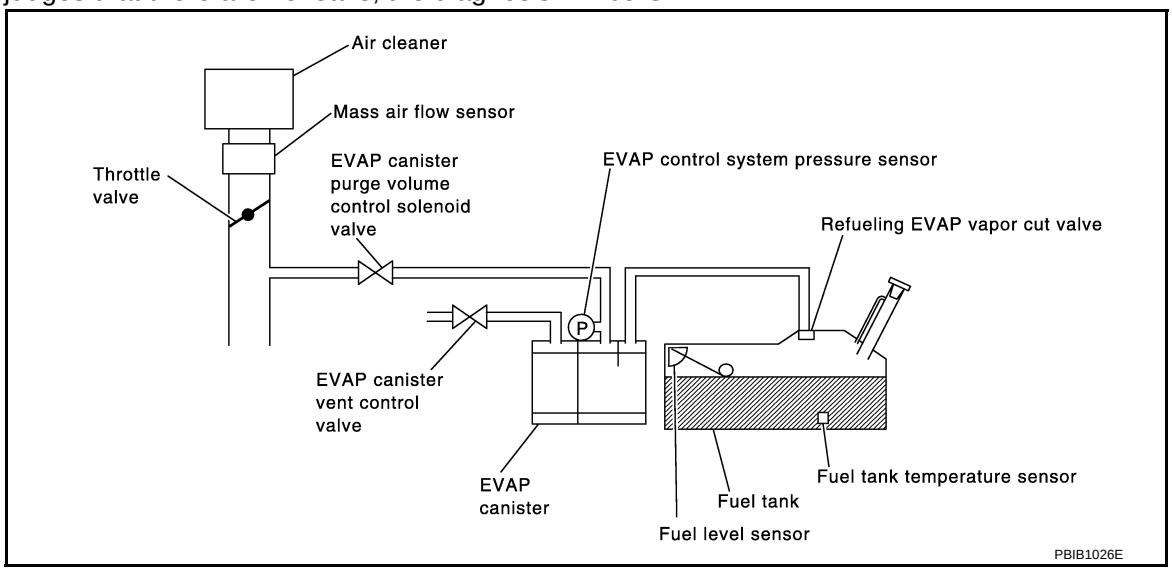
If DTC P0456 is displayed with DTC P0442, first perform the trouble diagnosis for DTC P0456.

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the negative pressure.

If ECM judges a leak which corresponds to a very small leak, the very small leak P0456 will be detected.

If ECM judges a leak equivalent to a small leak, EVAP small leak P0442 will be detected.

If ECM judges that there are no leaks, the diagnosis will be OK.



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 does not close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leaks • EVAP purge line (pipe and rubber tube) leaks • EVAP purge line rubber tube bent • Loose or disconnected rubber tube • EVAP canister vent control valve and the circuit • EVAP canister purge volume control solenoid valve and the circuit • Fuel tank temperature sensor • O-ring of EVAP canister vent control valve is missing or damaged • EVAP canister is saturated with water • EVAP control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leaks • Fuel level sensor and the circuit • Foreign matter caught in EVAP canister purge volume control solenoid valve

CAUTION:

- **Use only a genuine NISSAN fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.**
- **If the fuel filler cap is not tightened properly, the MIL may illuminate.**

- **Use only a genuine NISSAN rubber tube as a replacement.**

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

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

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.

NOTE:
After repair, check that the hoses and clips are installed properly.
TESTING CONDITION:

- **Open engine hood before conducting the following procedure.**
- **If any of following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Fuel is refilled or drained.**
  - **EVAP component part/parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.**
- **Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

>> GO TO 3.

3.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Check that the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.4 V
   COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
   FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
   INT A/TEMP SE: More than 0°C (32°F)
   If NG, turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle), or refill/drain fuel until the output voltage of the “FUEL LEVEL SE” meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select “EVP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
   Follow the instructions displayed.
   NOTE:
   If the engine speed cannot be maintained within the range displayed on CONSULT-III screen, go to EC-22, "BASIC INSPECTION : Special Repair Requirement".

Which is displayed on CONSULT-III screen?

OK >> INSPECTION END
NG >> Go to EC-418, "Diagnosis Procedure".

4.PERFORM COMPONENT FUNCTION CHECK

With GST

Perform component function check. Refer to EC-418, "Component Function Check".

NOTE:
Use component function check to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-418, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353599

1. PERFORM COMPONENT FUNCTION CHECK

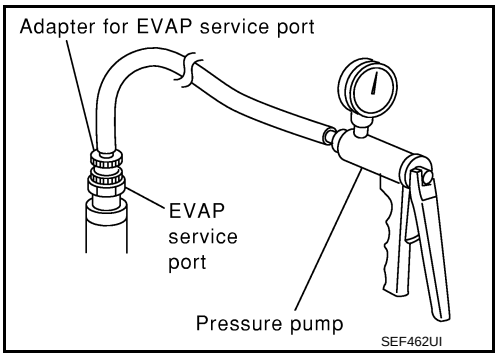
With GST

CAUTION:

- **Never use compressed air, doing so may damage the EVAP system.**
- **Never start engine.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi).**

1. Attach the EVAP service port adapter securely to the EVAP service port (commercial service tool).
2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch ON.
5. Connect GST and select Service $08.
6. Using Service $08 control the EVAP canister vent control valve (close).
7. Apply pressure and check the following conditions are satisfied.

   Pressure to be applied: 2.7 kPa (0.028 kg/cm^2, 0.39 psi)
   Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (0.004 kg/cm^2, 0.06 psi).



Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-418, "Diagnosis Procedure".

2. RELEASE PRESSURE

1. Disconnect GST.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Restart engine and let it idle for 90 seconds.
7. Keep engine speed at 2,000 rpm for 30 seconds.
8. Turn ignition switch OFF.

   NOTE:
   For more information, refer to GST Instruction Manual.

>> INSPECTION END

Diagnosis Procedure

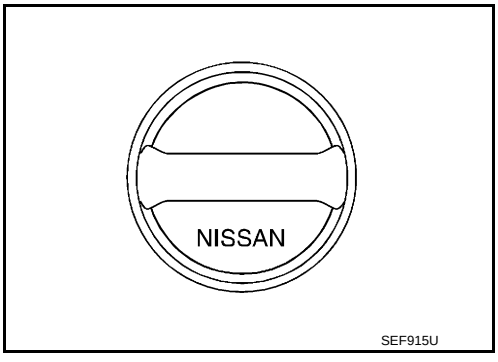
INFOID:0000000005353600

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Open fuel filler cap, then clean cap and fuel filler neck threads using air blower. 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-421, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace fuel filler cap with a genuine one.

5. CHECK FOR EVAP LEAK

Refer to EC-693, "Inspection".

Is there any leak in EVAP line?

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

6. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
  Refer to EC-695, "Removal and Installation".
- EVAP canister vent control valve.
  Refer to EC-382, "Component Inspection".

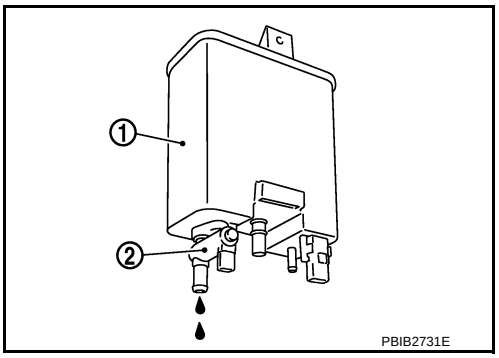
Is the inspection result normal?

YES >> GO TO 7.
NO >> Repair or replace EVAP canister vent control valve and O-ring.

7. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from EVAP canister (1).

2 : EVAP canister vent control valve



Does water drain from the EVAP canister?

YES >> GO TO 8.
NO-1 >> With CONSULT-III: GO TO 10.
NO-2 >> Without CONSULT-III: GO TO 11.

8. 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 2.0 kg (4.0 lb).

Is the inspection result normal?

YES-1 >> With CONSULT-III: GO TO 10.
YES-2 >> Without CONSULT-III: 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.

10. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

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-III screen to increase “PURG VOL CONT/V” opening to 100%.
5. Check vacuum hose for vacuum.

Vacuum should exist.

Is the inspection result normal?

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

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-III

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 14.
NO >> GO TO 12.

12. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-86, "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-374, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace EVAP canister purge volume control solenoid valve.

14. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-311, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

15. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-394, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 16.
NO >> Replace EVAP control system pressure sensor.

16. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection. Refer to EC-86, "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-630, "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 neck tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-633, "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 DI-24, "Electrical Component Inspection".

Is the inspection result normal?

YES >> GO TO 22.
NO >> Replace “fuel level sensor unit and fuel pump (main)”.

22. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

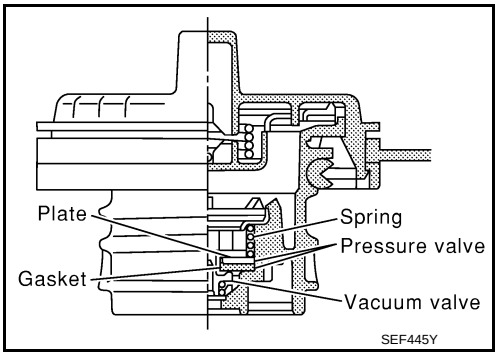
Component Inspection

INFOID:0000000005353601

1. CHECK FUEL FILLER CAP

1. Turn ignition switch OFF.
2. Remove fuel filler cap.

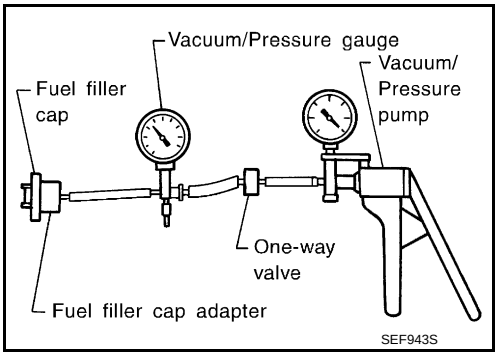
3. Wipe clean valve housing.



4. Install fuel filler cap adapter (commercial service tool) to fuel filler cap.
5. Check valve opening pressure and vacuum.

Pressure: **15.3 - 20.0 kPa (0.156 - 0.204 kg/cm^2, 2.22 - 2.90 psi)**

Vacuum: **−6.0 to −3.3 kPa (−0.061 to −0.034 kg/cm^2, −0.87 to −0.48 psi)**



Is the inspection result normal?

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

2. REPLACE FUEL FILLER CAP

Replace fuel filler cap.

CAUTION:

Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

>> INSPECTION END

P0460 FUEL LEVEL SENSOR

Description

INFOID:0000000005353602

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 through 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:0000000005353603

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-444, "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-423, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353604

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-18, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

2.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0461 FUEL LEVEL SENSOR

Description

INFOID:0000000005353605

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 through 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:0000000005353606

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-444, "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-425, "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-426, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353607

1.PRECONDITIONING

WARNING:
When performing the following procedure, always observe the handling of the fuel. Refer to FL-10, "Component".
TESTING CONDITION:
Before starting component function check, preparation of draining fuel and refilling fuel is required.

Will CONSULT-III be used?

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

2.PERFORM COMPONENT FUNCTION CHECK

With CONSULT-III
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-692, "Inspection".
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT-III.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-III.
9. Touch “ON” and drain fuel approximately 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) and stop it.
10. Check “FUEL LEVEL SE” output voltage and note it.
11. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
12. Check “FUEL LEVEL SE” output voltage and note it.
13. Confirm whether the voltage changes more than 0.03 V during step 7 to 10 and 10 to 12.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-426, "Diagnosis Procedure".

3.PERFORM COMPONENT FUNCTION CHECK

Without CONSULT-III
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-692, "Inspection".
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-426, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353608

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-18, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

2.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0462, P0463 FUEL LEVEL SENSOR

Description

INFOID:0000000005353609

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 through 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:0000000005353610

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-444, "DTC Logic".**

This diagnosis indicates the former, to detect open or short circuit malfunction.

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-427, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353611

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-18, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

2.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0500 VSS

Description

INFOID:0000000005353612

The vehicle speed signal is sent to the “unified meter and A/C amp.” from the “ABS actuator and electric unit (control unit)” by CAN communication line. The “unified meter and A/C amp.” then sends a signal to the ECM by CAN communication line.

DTC Logic

INFOID:0000000005353613

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-444, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500	Vehicle speed sensor	The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The vehicle speed signal circuit is open or shorted) • Wheel sensor • Unified meter and A/C amp. • ABS actuator and electric unit (control unit)

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

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

2.PRECONDITIONING

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

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

>> GO TO 3.

3.CHECK VEHICLE SPEED SIGNAL

NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

With CONSULT-III

1. Start engine (VDC switch OFF).
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-III. The vehicle speed on CONSULT-III should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-430, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT-III.
2. Warm engine up to normal operating temperature.

3. Maintain the following conditions for at least 50 consecutive seconds.
CAUTION:
Always drive vehicle at a safe speed.

ENG SPEED	1,650 - 6,000 rpm (with 2WD) 1,800 - 6,000 rpm (with 4WD)
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	6.5 - 31.8 msec (with 2WD) 5 - 31.8 msec (with 4WD)
Selector lever	Except P or N position
PW/ST SIGNAL	OFF

4. Check 1st trip DTC.

Is 1st trip DTC detected?

YES >> Go to EC-430, "Diagnosis Procedure".
NO >> INSPECTION END

5.PERFORM COMPONENT FUNCTION CHECK

With GST
Perform component function check. Refer to EC-430, "Component Function Check".
Use component function check to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-430, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353614

1.PERFORM COMPONENT FUNCTION CHECK

With GST
1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in Service $01 with GST.
The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-430, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353615

1.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-12, "Fail-safe".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-18, "CONSULT-III Function (METER/M&A)".

>> INSPECTION END

P0506 ISC SYSTEM

Description

INFOID:0000000005353616

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000005353617

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 target idle speed is out of the specified value, perform EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement", 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-431, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353618

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.
3. Go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P0507 ISC SYSTEM

Description

INFOID:0000000005353619

The ECM controls the engine idle speed to a specified level through the fine adjustment of the air, which is let into the intake manifold, by operating the electric throttle control actuator. The operating of the throttle valve is varied to allow for optimum control of the engine idling speed. The crankshaft position sensor detects the actual engine speed and sends a signal to the ECM.
The ECM controls the electric throttle control actuator so that the engine speed coincides with the target value memorized in the ECM. The target engine speed is the lowest speed at which the engine can operate steadily. The optimum value stored in the ECM is determined by taking into consideration various engine conditions, such as during warming up, deceleration and engine load (air conditioner, power steering and cooling fan operation, etc.).

DTC Logic

INFOID:0000000005353620

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 target idle speed is out of the specified value, perform EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement", 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-433, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353621

1.CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace malfunctioning part.

2.CHECK INTAKE AIR 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.
3. Go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P0550 PSP SENSOR

Description

INFOID:0000000005353622

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:0000000005353623

DTC DETECTION LOGIC

NOTE:
If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-445, "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.

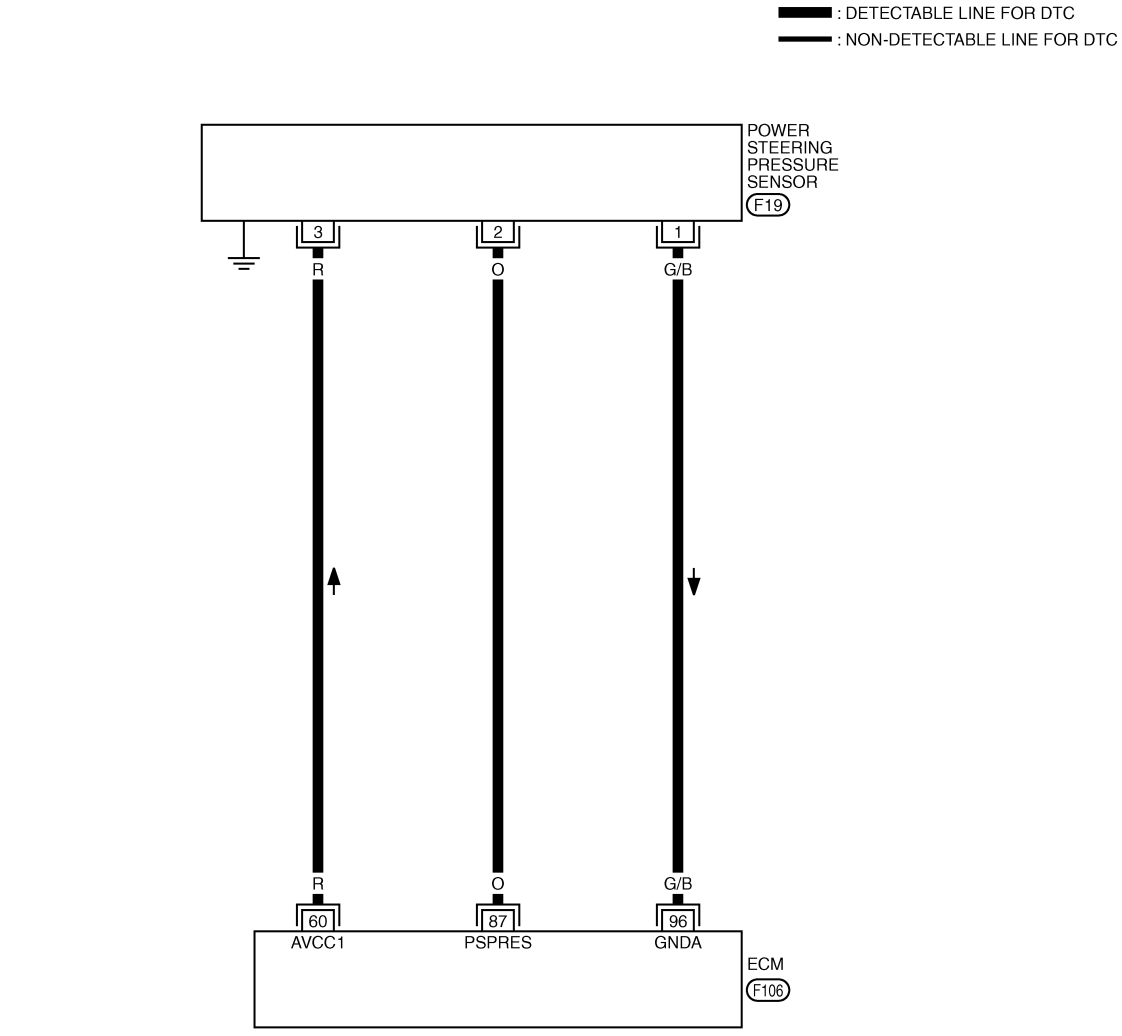
Is 1st trip DTC detected?

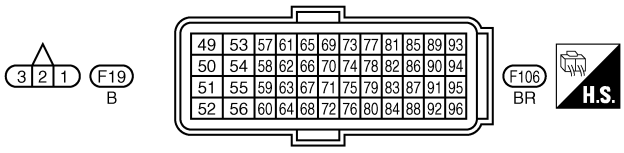
YES >> Go to EC-436, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353624

EC-PS/SEN-01





TBWT2448E

Diagnosis Procedure

INFOID:0000000005353625

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

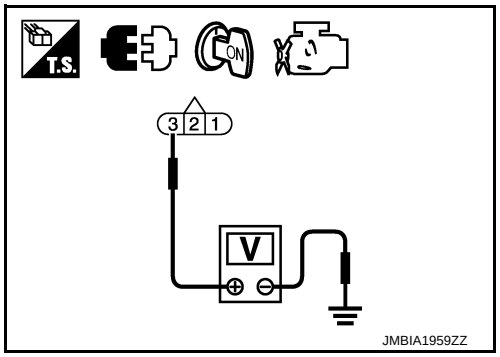
Is the inspection result normal?

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

2. CHECK POWER STEERING PRESSURE (PSP) SENSOR POWER SUPPLY CIRCUIT

1. Disconnect 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		
F19	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	
F19	1	F106	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	
F19	2	F106	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-438, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace PSP sensor.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

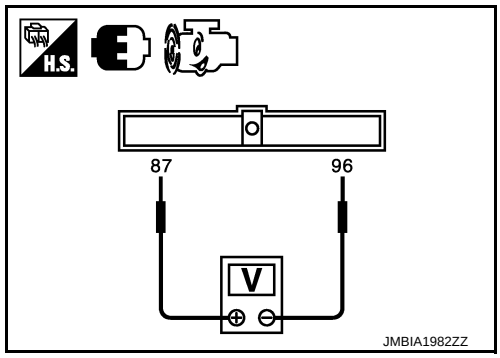
>> INSPECTION END

Component Inspection

INFOID:0000000005353626

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			
F106	87	96	Steering wheel	Being turned	0.5 - 4.5
				Not being turned	0.4 - 0.8

Is the inspection result normal?

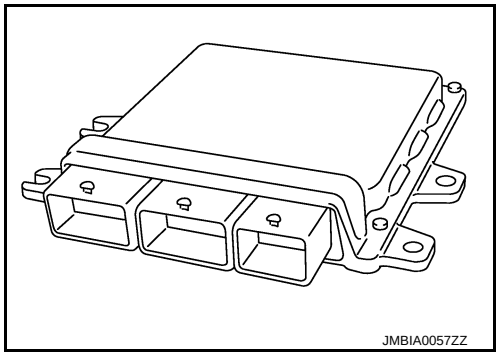
YES >> INSPECTION END
NO >> Replace power steering pressure sensor.

P0603 ECM POWER SUPPLY

Description

INFOID:0000000005353627

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:0000000005353628

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 second.
2. Turn ignition switch OFF and wait at least 5 minutes.
3. Turn ignition switch ON, wait at least 10 seconds.
4. Repeat steps 2 and 3 for five times.
5. Check 1st trip DTC.

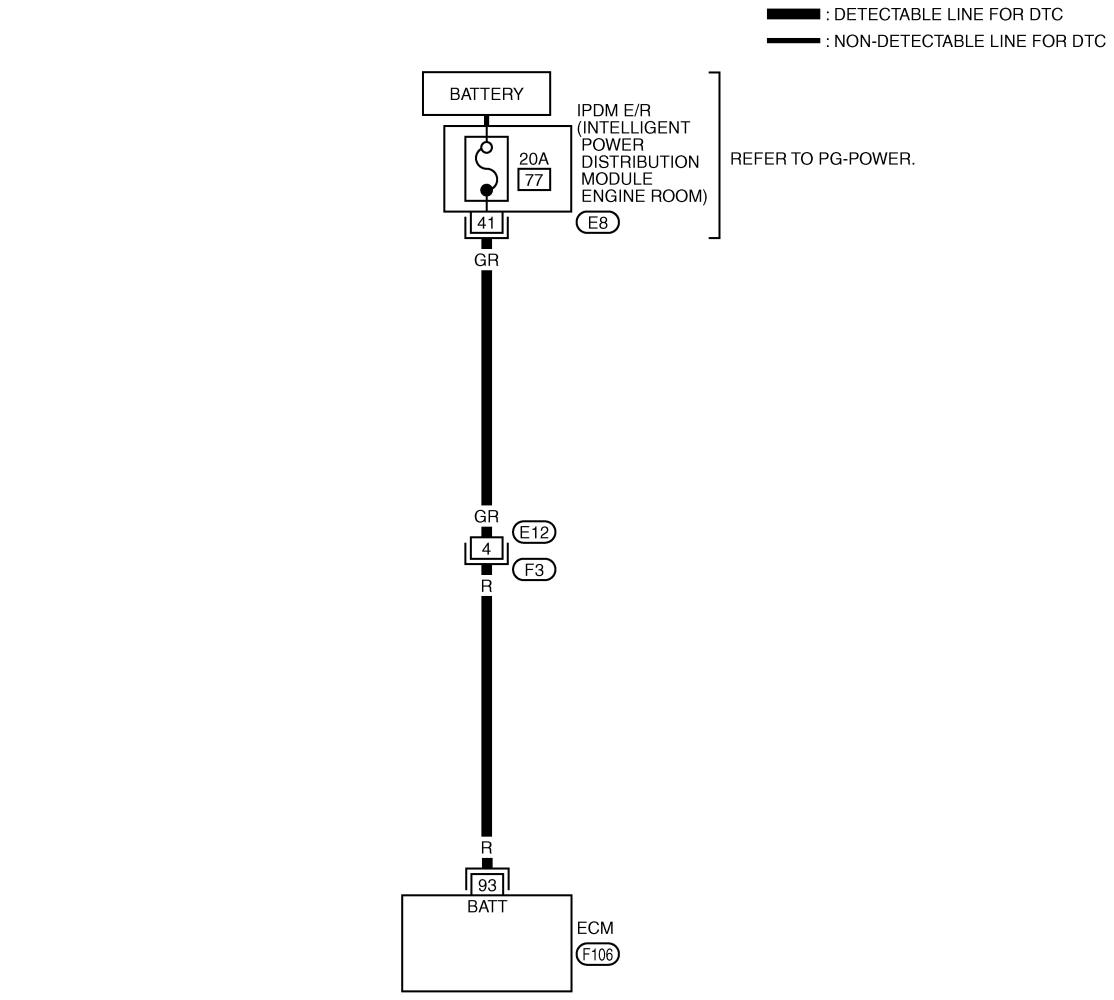
Is 1st trip DTC detected?

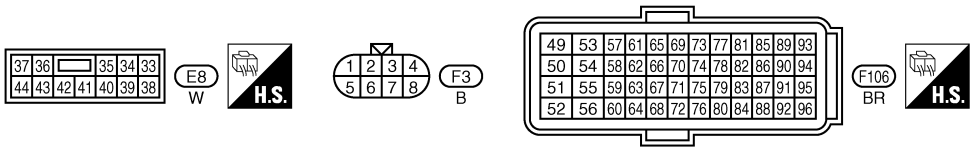
YES >> Go to EC-440, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353629

EC-ECM/PW-01





TBWT2449E

Diagnosis Procedure

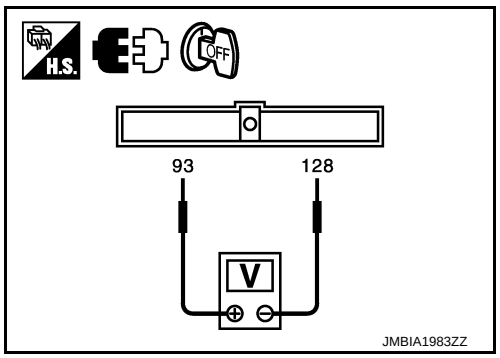
INFOID:0000000005353630

1. CHECK ECM POWER SUPPLY

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

3. Check the voltage between ECM harness connector terminals under the following conditions.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F106	93	M6	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 F12, F3
- 20 A fuse (No. 77)
- IPDM E/R harness connector E8
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

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-439, "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-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

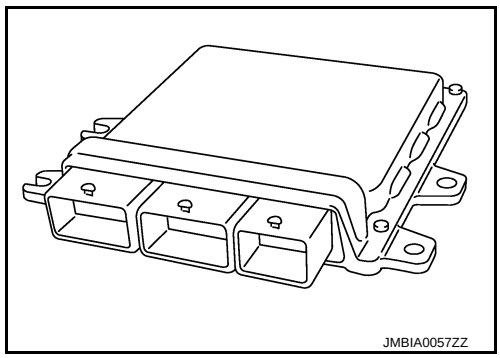
>> INSPECTION END

P0605 ECM

Description

INFOID:0000000005353631

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:0000000005353632

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-443, "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-443, "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-443, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353633

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-442, "DTC Logic".

Is the 1st trip DTC P0605 displayed again?

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

2.REPLACE ECM

1. Replace ECM.
2. Go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P0607 ECM

Description

INFOID:0000000005353634

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:0000000005353635

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-444, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353636

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-444, "DTC Logic".
4. Check DTC.

Is the DTC P0607 displayed again?

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

2.REPLACE ECM

1. Replace ECM.
2. Go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P0643 SENSOR POWER SUPPLY

DTC Logic

INFOID:0000000005353637

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 [Accelerator pedal position (APP) sensor 1 circuit is shorted.] [Throttle position (TP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 1) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 1) circuit is shorted.] [Power steering pressure (PSP) sensor circuit is shorted.] • APP sensor • TP sensor • CMP sensor (bank 1) • EVT control position sensor (bank 1) • PSP 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.

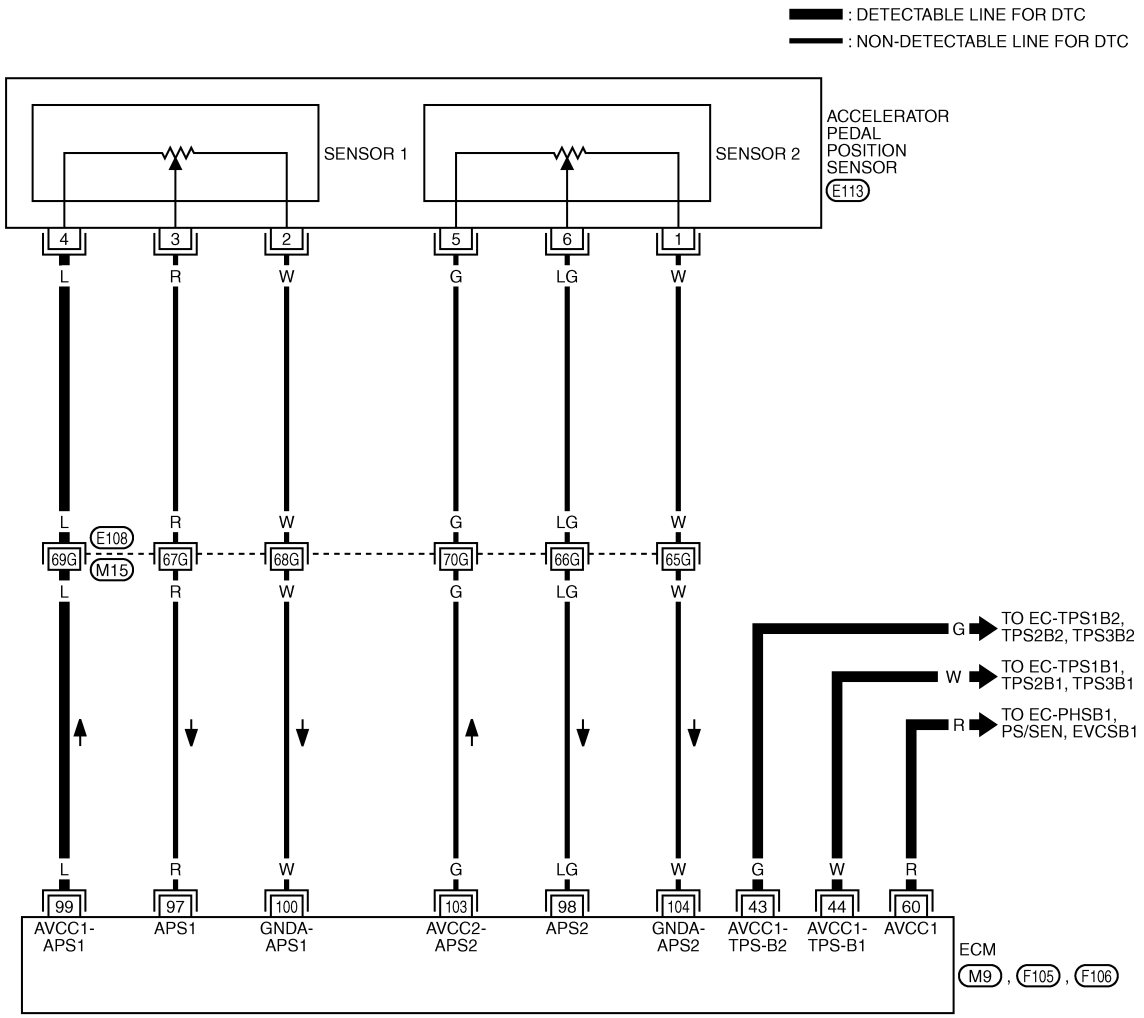
Is DTC detected?

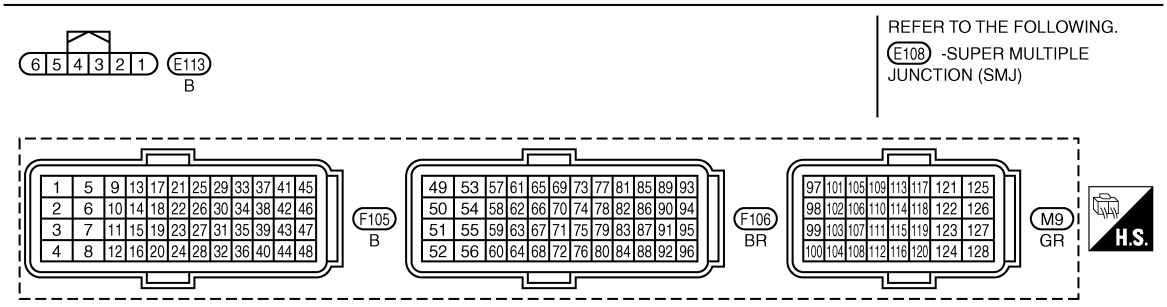
YES >> Go to EC-446, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353638

EC-SEN/PW-01





TBWT2450E

Diagnosis Procedure

INFOID:0000000005353639

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

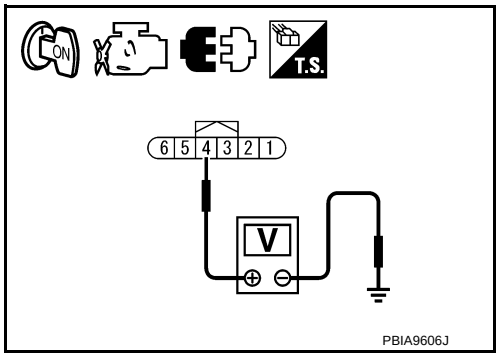
Is the inspection result normal?

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

2. CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect 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		
E113	4	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
F105	43	Electric throttle control actuator (bank 2)	F51	1
	44	Electric throttle control actuator (bank 1)	F31	6
F106	60	Camshaft position (CMP) sensor (bank 1)	F4	1
		Exhaust valve timing (EVT) control position sensor (bank 1)	F82	1
		Power steering pressure (PSP) sensor	F19	3
M9	99	APP sensor	E113	4

Is the inspection result normal?

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

4. CHECK COMPONENTS

Check the following.
- CMP sensor (bank 1) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 1) (Refer to EC-459, "Component Inspection".)
- PSP sensor (Refer to EC-438, "Component Inspection".)

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning component.

5. CHECK THROTTLE POSITION (TP) SENSOR

Refer to EC-228, "Component Inspection".

Is the inspection result normal?

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

6. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace electric throttle control actuator.

2. Go to EC-229, "Special Repair Requirement".

>> INSPECTION END

7. CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

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

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

9. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

P0850 PNP SWITCH

Description

INFOID:0000000005353640

When the selector lever position is P or N, park/neutral position (PNP) signal from the TCM is sent to ECM.

DTC Logic

INFOID:0000000005353641

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 PNP signal circuit is open or shorted.) • TCM

DTC CONFIRMATION PROCEDURE

1.INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

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-III

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-III. Then check the “P/N POSI SW” signal under the following conditions.

Position (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-451, "Diagnosis Procedure".

4.PERFORM DTC CONFIRMATION PROCEDURE

1. Select “DATA MONITOR” mode with CONSULT-III.
2. Start engine and warm it up to normal operating temperature.
3. Maintain the following conditions for at least 50 consecutive seconds.

CAUTION:
Always drive vehicle at a safe speed.

ENG SPEED	1,400 - 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-451, "Diagnosis Procedure".
NO >> INSPECTION END

5. PERFORM COMPONENT FUNCTION CHECK

With GST

Perform component function check. Refer to EC-450, "Component Function Check".

NOTE:

Use component function check to check the overall function of the 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-451, "Diagnosis Procedure".

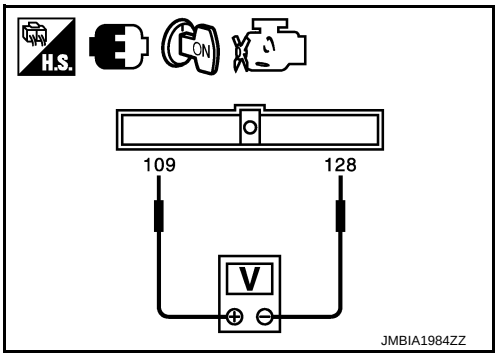
Component Function Check

INFOID:0000000005353642

1. PERFORM COMPONENT FUNCTION CHECK

With GST

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	109	128	Selector lever	P or N	Battery voltage
				Except above	Approx. 0

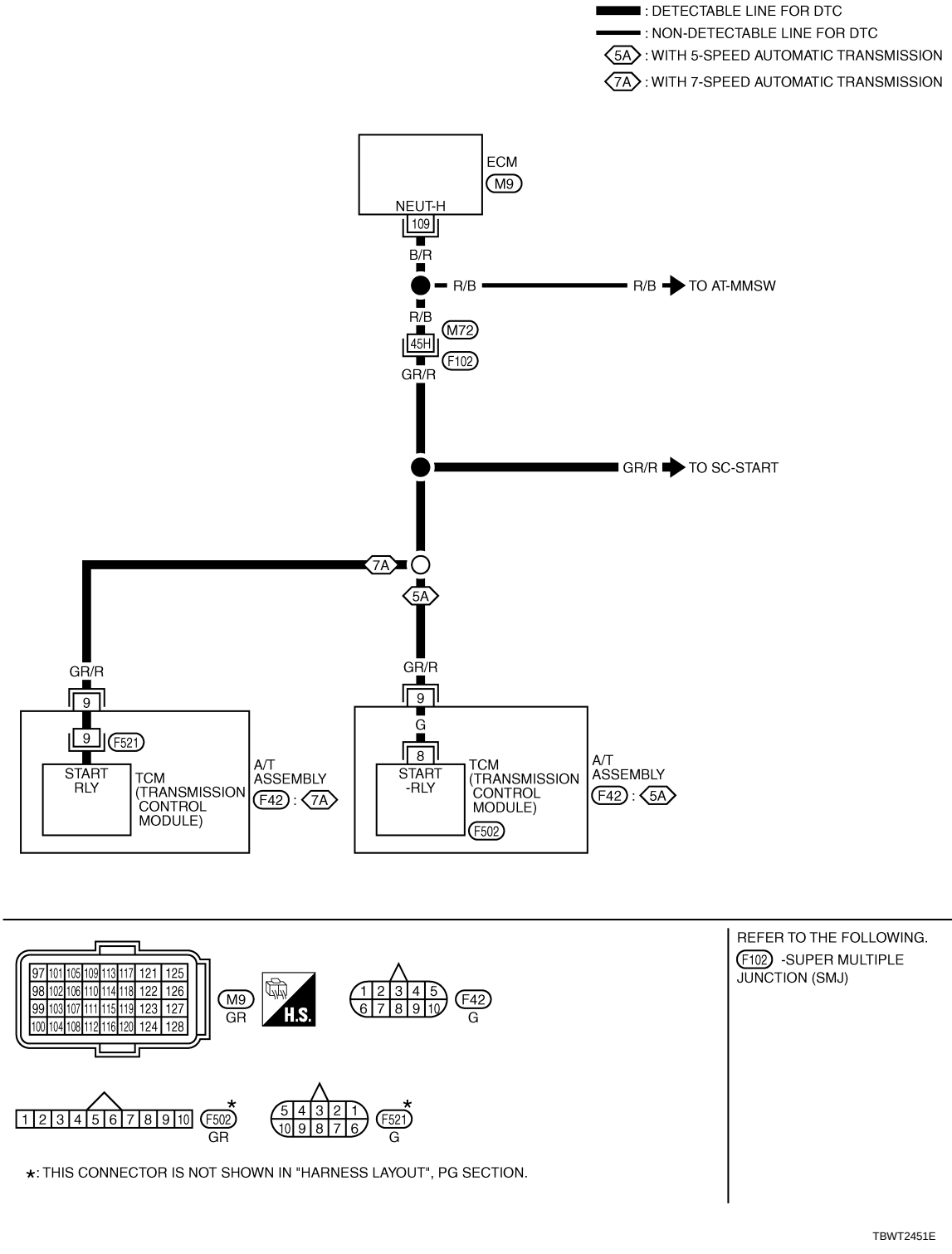
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-451, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353643

EC-TR/SW-01



TBWT2451E

Diagnosis Procedure

INFOID:0000000005353644

1. CHECK DTC WITH TCM

Refer to AT-47, "OBD-II Diagnostic Trouble Code (DTC)".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Repair or replace malfunctioning part.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.

Does starter motor operate?

YES >> GO TO 3.
NO >> Check DTC with BCM. Refer to SC-8, "System Description".

3.CHECK PARK/NEUTRAL POSITION (PNP) SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between A/T assembly harness connector and ECM harness connector.

A/T assembly		ECM		Continuity
Connector	Terminal	Connector	Terminal	
F42	9	M9	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 F102, M72
- 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 EC-154, "Description".

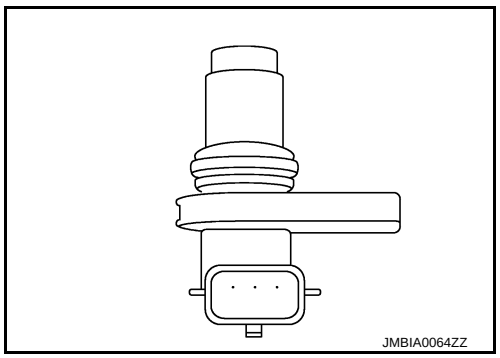
>> INSPECTION END

P1078, P1084 EVT CONTROL POSITION SENSOR

Description

INFOID:0000000005353645

Exhaust valve timing (EVT) control position sensor detects the concave groove of the exhaust camshaft rear end.
This sensor signal is used for sensing a position of the exhaust camshaft.
This sensor uses a Hall IC.
Based on the position of the exhaust camshaft, ECM controls exhaust valve timing control magnet retarder to optimize the shut/open timing of exhaust valve for the driving condition.



DTC Logic

INFOID:0000000005353646

DTC DETECTION LOGIC

NOTE:
If DTC P1078 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1078	Exhaust valve timing (EVT) control position sensor (bank 1) circuit	An excessively high or low voltage from the sensor is sent to ECM.	• Harness or connectors [EVT control position sensor (bank 1) circuit is open or shorted) • EVT control position sensor • Crankshaft position (CKP) sensor • Camshaft position (CMP) sensor (bank 1) • Accumulation of debris to the signal pick-up portion of the camshaft
P1084	Exhaust valve timing (EVT) control position sensor (bank 2) circuit		• Harness or connectors [EVT control position sensor (bank 2) circuit is open or shorted) (CKP sensor circuit is shorted.) [CMP sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) (APP sensor 2 circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • EVT control position sensor (bank 2) • CKP sensor • CMP sensor (bank 2) • Battery current sensor • Accelerator pedal position (APP) sensor • EVAP control system pressure sensor • Refrigerant pressure sensor • Accumulation of debris to the signal pick-up portion of the camshaft

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 10 seconds.
2. Check 1st trip DTC.

Is 1st trip DTC detected?

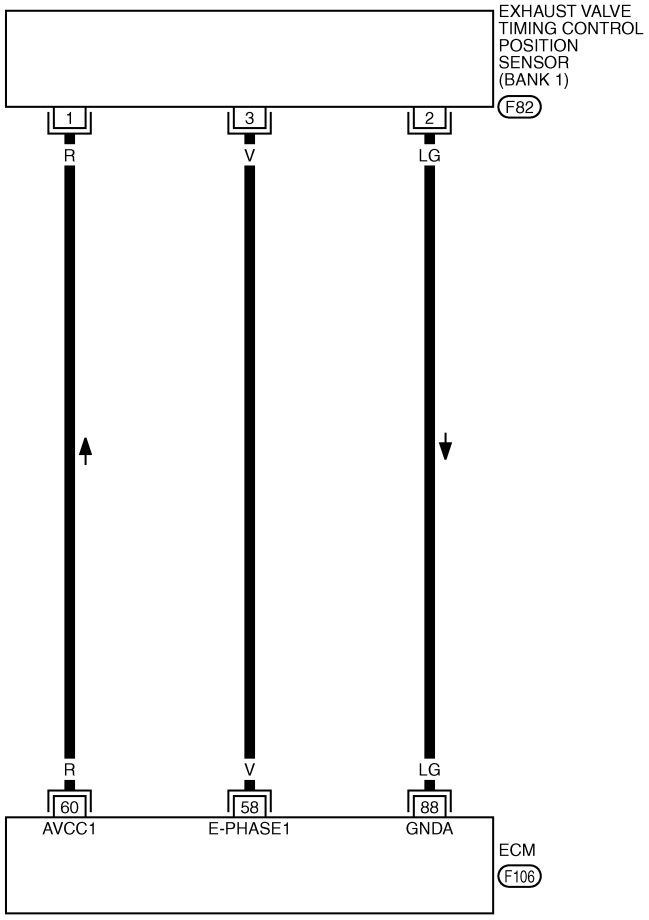
YES >> Go to EC-456, "Diagnosis Procedure".
NO >> INSPECTION END

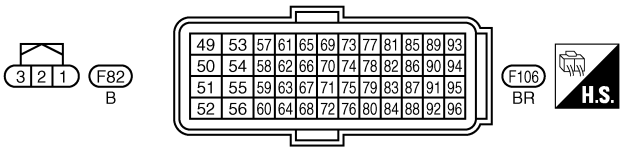
Wiring Diagram

INFOID:0000000005353647

EC-EVCSB1-01

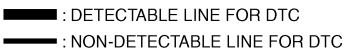
: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC

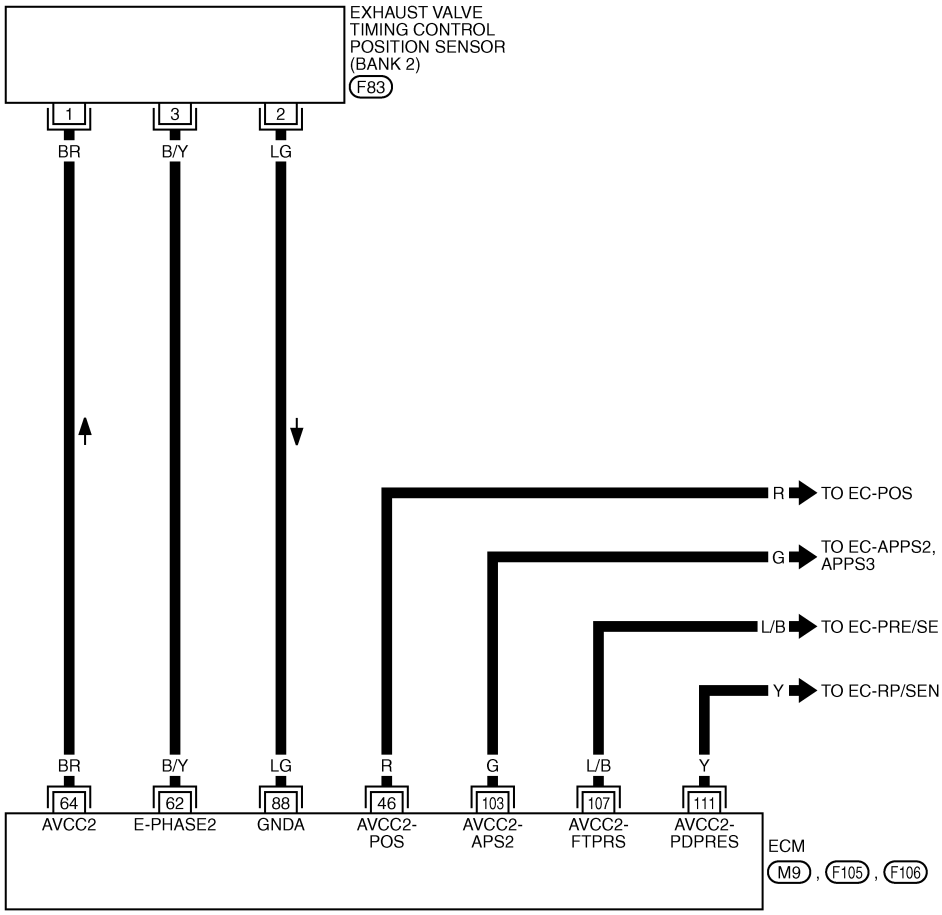


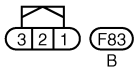


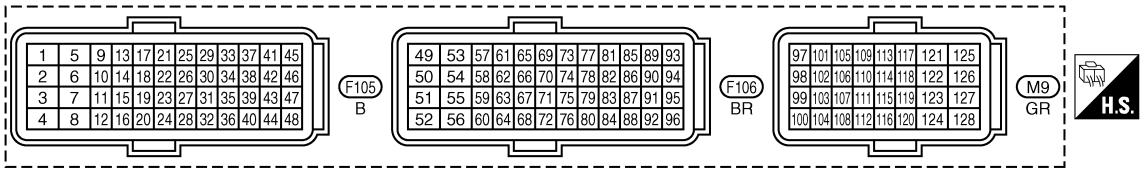
TBWT2452E

EC-EVCSB2-01









TBWT2453E

Diagnosis Procedure

INFOID:0000000005353648

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

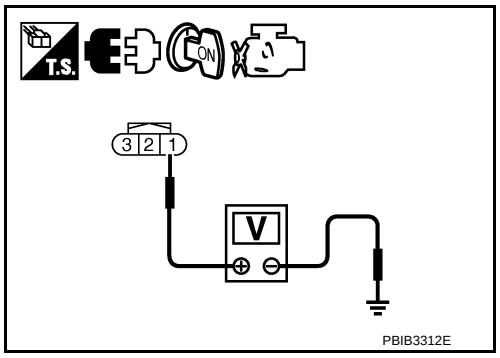
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

2. CHECK EXHAUST VALVE TIMING (EVT) CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect EVT control position sensor harness connector.
2. Turn ignition switch ON.
3. Check the voltage between EVT control position sensor harness connector and ground.



DTC	EVT control position sensor			Ground	Voltage (V)
	Bank	Connector	Terminal		
P1078	1	F82	1	Ground	Approx. 5
P1084	2	F83	1		

Is the inspection result normal?

YES >> GO TO 8.
NO-1 >> P1078: Repair open circuit, short to ground or short to power in harness or connectors.
NO-2 >> P1084: GO TO 3.

3. CHECK EVT CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT-II

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

EVT control position sensor			ECM		Continuity
Bank	Connector	Terminal	Connector	Terminal	
2	F83	1	F106	64	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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		EVT control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator pedal position (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)

- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

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

6. CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 7.

7. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

8. CHECK EVT CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

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

DTC	EVT control position sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1078	1	F82	2	F106	88	Existed
P1084	2	F83	2			

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 EVT CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between exhaust valve timing control position sensor harness connector and ECM harness connector.

DTC	EVT control position sensor			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1078	1	F82	3	F106	58	Existed
P1084	2	F83	3		62	

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 EVT CONTROL POSITION SENSOR

Refer to EC-459, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning EVT control position sensor.

11. CHECK CKP SENSOR

Refer to EC-345, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace CKP sensor.

12. CHECK CMP SENSOR

Refer to EC-352, "Component Inspection".

Is the inspection result normal?

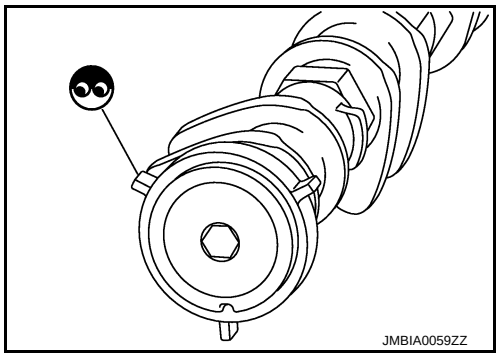
YES >> GO TO 13.
NO >> Replace malfunctioning CMP sensor.

13. CHECK CAMSHAFT (EXH)

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

Is the inspection result normal?

YES >> GO TO 14.
NO >> Remove debris and clean the signal plate of camshaft rear end or replace camshaft.



14. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

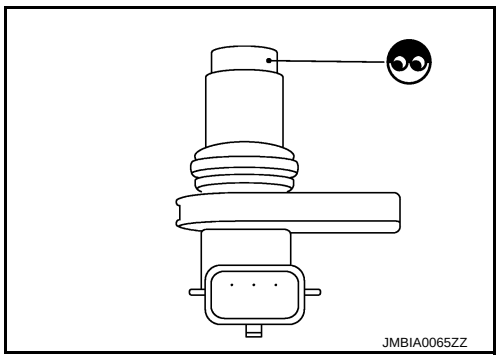
INFOID:0000000005353649

1. EXHAUST VALVE TIMING CONTROL POSITION SENSOR-I

1. Turn ignition switch OFF.
2. Disconnect exhaust valve timing control position sensor harness connector.
3. Loosen the fixing bolt of the sensor.
4. Remove the sensor.
5. Visually check the sensor for chipping.

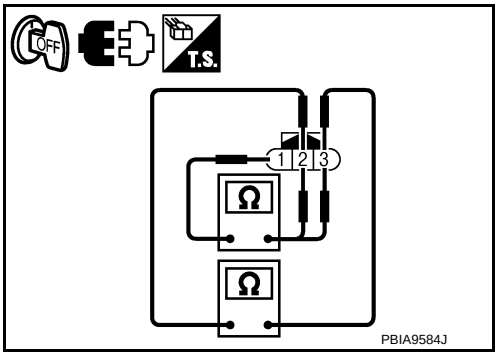
Is the inspection result normal?

YES >> GO TO 2.
NO >> Replace malfunctioning exhaust valve timing control position sensor.



2. EXHAUST VALVE TIMING CONTROL POSITION SENSOR-II

Check resistance exhaust valve timing control position sensor terminals as shown below.



Terminals	Resistance
1 (+) - 2 (-)	Except 0 or ∞ Ω [at 25°C (77°F)]
1 (+) - 3 (-)	
2 (+) - 3 (-)	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning exhaust valve timing control position sensor.

P1148, P1168 CLOSED LOOP CONTROL

DTC Logic

INFOID:0000000005353650

DTC DETECTION LOGIC

NOTE:
DTC P1148 or P1168 is displayed with another DTC for air fuel ratio (A/F) sensor 1.
Perform the trouble diagnosis for the corresponding DTC.

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:0000000005353651

The malfunction information related to TCS is transferred through 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:0000000005353652

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-462, "Diagnosis Procedure"
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353653

Go to BRC-12.

P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000005353654

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:0000000005353655

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-444, "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-463, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353656

Go to BRC-12.

P1217 ENGINE OVER TEMPERATURE

DTC Logic

INFOID:0000000005353657

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-444, "DTC Logic".**

If the cooling fan or another component in the cooling system malfunctions, engine coolant temperature will rise.
When the engine coolant temperature reaches an abnormally high temperature condition, a malfunction is indicated.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217	Engine over temperature (Overheat)	• Cooling fan does not operate properly (Overheat). • Cooling fan system does not operate properly (Overheat). • Engine coolant was not added to the system using the proper filling method. • Engine coolant is not within the specified range.	• Harness or connectors (The cooling fan circuit is open or shorted.) • IPDM E/R • Cooling fan relay • 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-10, "Changing Engine Coolant". Also, replace the engine oil. Refer to LU-7, "Changing Engine Oil".

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-10, "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-464, "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-465, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353658

1.PERFORM COMPONENT FUNCTION CHECK-I

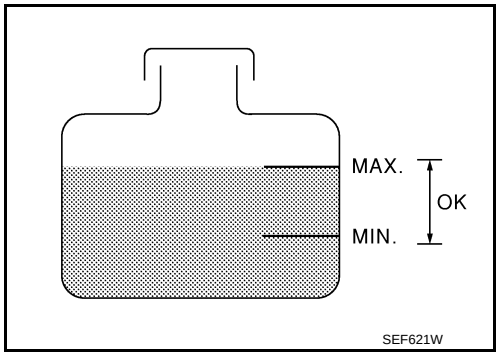
WARNING:

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-465, "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-465, "Diagnosis Procedure".
NO >> GO TO 3.

3.PERFORM COMPONENT FUNCTION CHECK-III

With CONSULT-III
1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT-III.
3. Check that cooling fan speed varies according to the percentage.

Without CONSULT-III
Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PG-22, "Auto Active Test".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-465, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353659

1.CHECK COOLING FAN OPERATION

With CONSULT-III
1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT-III.
3. Check that cooling fan speed varies according to the percentage.

Without CONSULT-III
1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PG-22, "Auto Active Test".
2. Check that cooling fan operates.

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-591, "Diagnosis Procedure".

2.CHECK COOLING SYSTEM FOR LEAK-I

Check cooling system for leak. Refer to CO-10, "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 CAP

Check radiator cap. Refer to CO-15, "Checking Radiator Cap".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace radiator cap.

5. CHECK THERMOSTAT

Check thermostat. Refer to CO-26, "Component".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace thermostat

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-222, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace engine coolant temperature sensor.

7. CHECK MAIN 12 CAUSES

If the cause cannot be isolated, check the following.

Engine	Step	Inspection item	Equipment	Standard	Reference page
OFF	1	• Blocked radiator • Blocked condenser • Blocked radiator grille • Blocked bumper	• Visual	No blocking	—
	2	• Coolant mixture	• Coolant tester	—	MA-10, "Anti-Freeze Coolant Mixture Ratio"
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	MA-11, "Changing Engine Coolant"
	4	• Radiator cap	• Pressure tester	—	CO-15, "Checking Radiator Cap"
ON*2	5	• Coolant leaks	• Visual	No leaks	CO-10, "Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-26, "Component"
ON*1	7	• Cooling fan	• CONSULT-III	Operating	EC-589, "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	MA-11, "Changing Engine Coolant"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	MA-11, "Changing Engine Coolant"
OFF	11	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-96, "On-Vehicle Service"
	12	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-119, "Component"

*1: Turn the ignition switch ON.

*2: Engine running at 3,000 rpm for 10 minutes.

*3: Drive at 90 km/h (56 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-7, "Troubleshooting Chart".

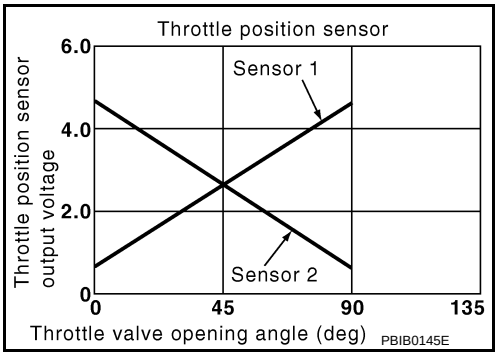
>> INSPECTION END

P1225, P1234 TP SENSOR

Description

INFOID:0000000005353660

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



DTC Logic

INFOID:0000000005353661

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 [Throttle position (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-468, "Diagnosis Procedure".
NO >> INSPECTION END

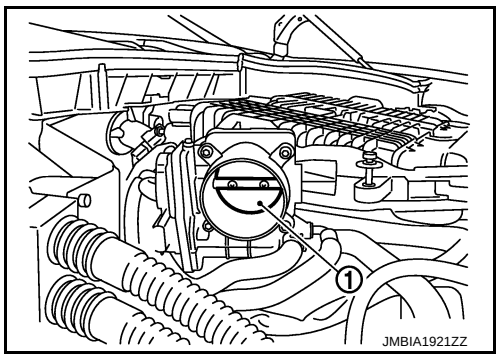
Diagnosis Procedure

INFOID:0000000005353662

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator.
2. Go to EC-469, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353663

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

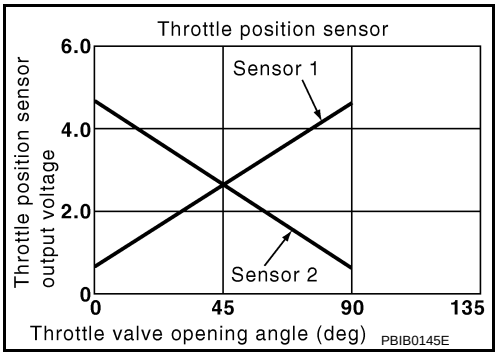
>> END

P1226, P1235 TP SENSOR

Description

INFOID:0000000005353664

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



DTC Logic

INFOID:0000000005353665

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 [Throttle position (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-470, "Diagnosis Procedure".
NO >> INSPECTION END

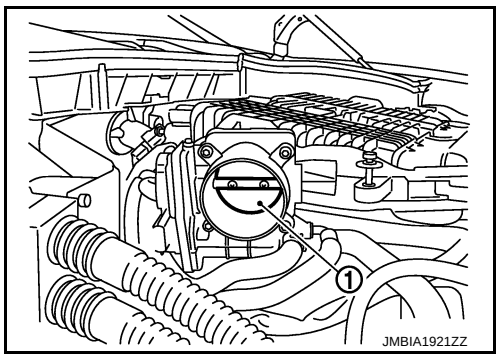
Diagnosis Procedure

INFOID:0000000005353666

1.CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.

3. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator.
2. Go to EC-471, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353667

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1233, P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000005353668

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. The throttle position sensor provides feedback to the ECM, when open/closes the throttle valve in response to driving conditions via the throttle control motor.

DTC Logic

INFOID:0000000005353669

DTC DETECTION LOGIC

NOTE:
If DTC P1233 or P2101 is displayed with DTC P1238, P2119, first perform the trouble diagnosis for DTC P1238, P2119. Refer to EC-484, "DTC Logic".
If DTC P2101 or P2101 is displayed with DTC P1290, P2100, first perform the trouble diagnosis for DTC P1290, P2100. Refer to EC-492, "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

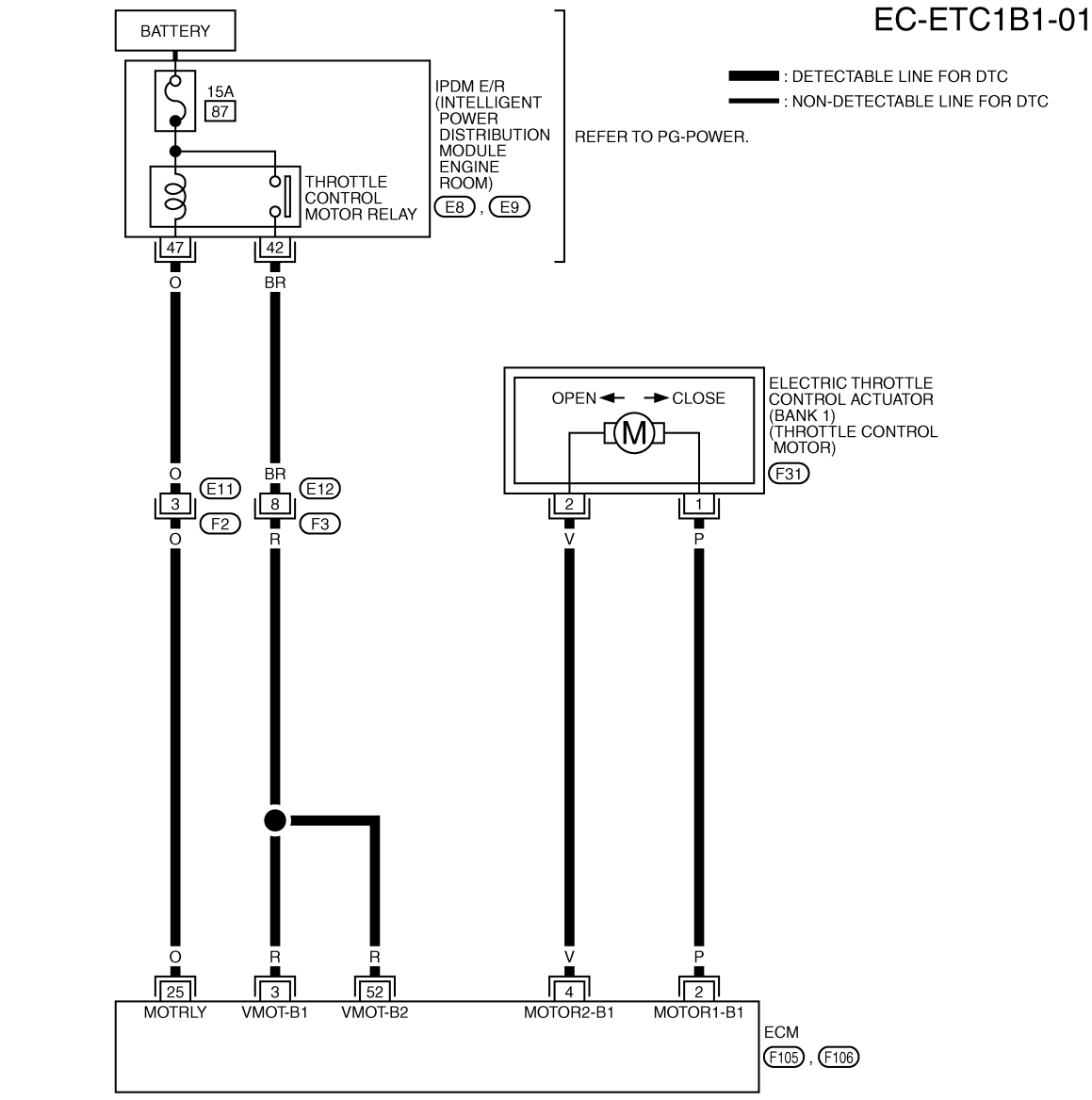
1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

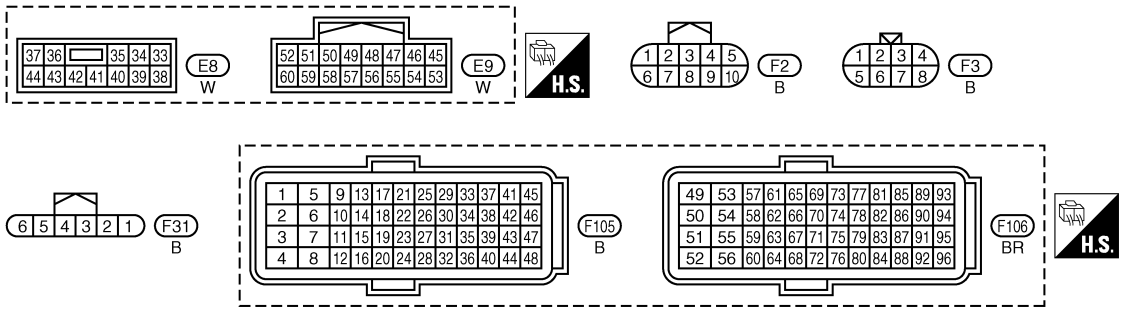
Is DTC detected?

YES >> Go to EC-474, "Diagnosis Procedure".
NO >> INSPECTION END

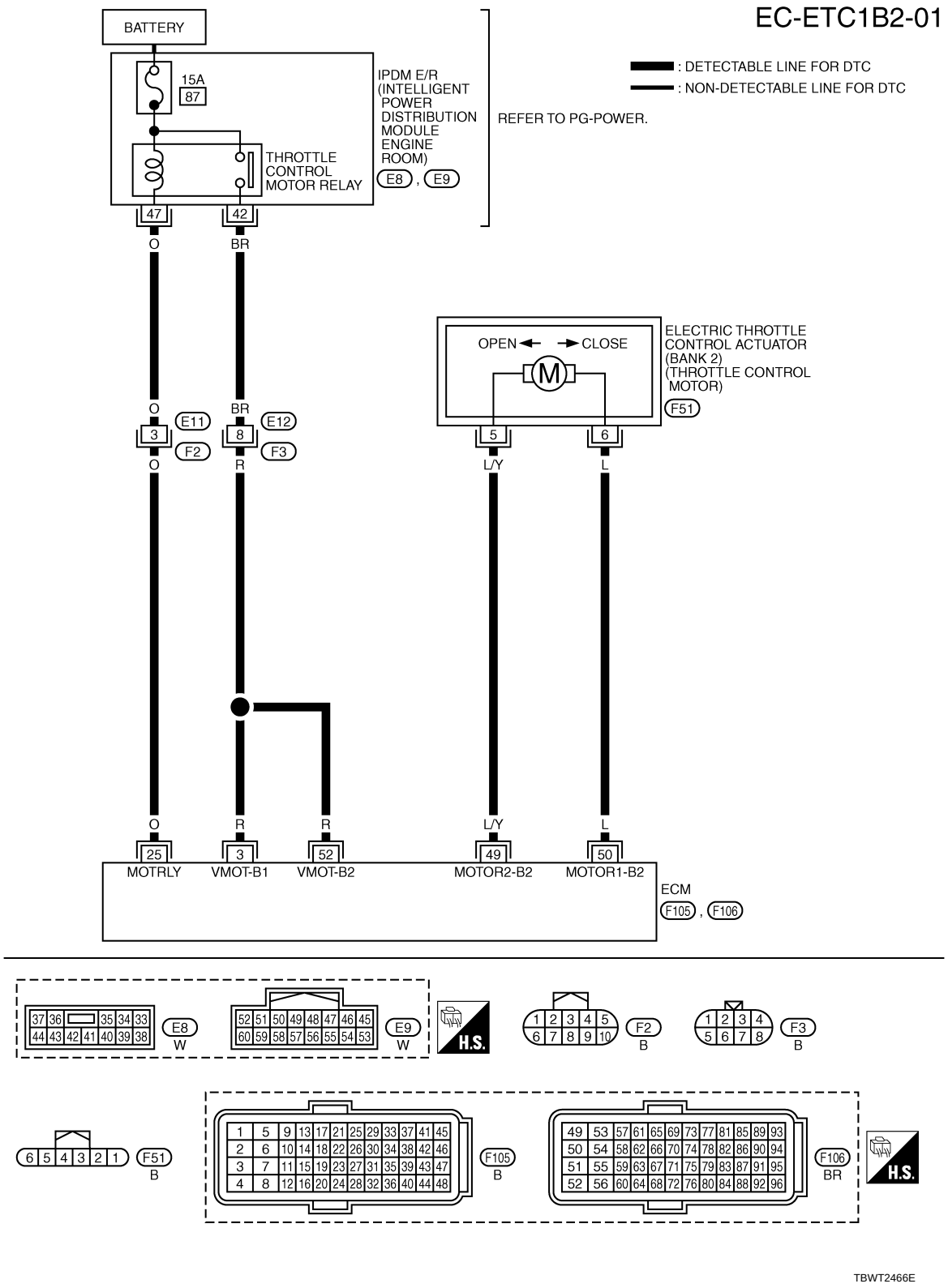
Wiring Diagram

INFOID:0000000005353670





TBWT2465E



TBWT2466E

Diagnosis Procedure

INFOID:0000000005353671

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

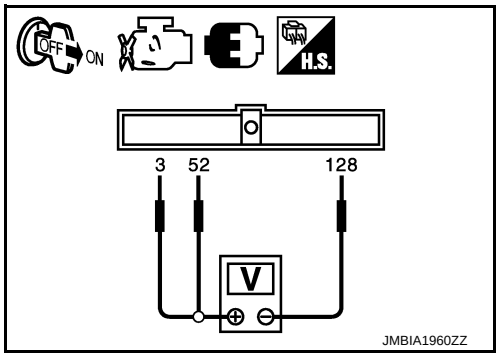
Is the inspection result normal?

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	F106	52	M9	128	Ignition switch OFF	Approx. 0
					Ignition switch ON	Battery voltage
P2101	F105	3			Ignition switch OFF	Approx. 0
					Ignition switch ON	Battery voltage

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E9.
4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E9	47	F105	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 E11, F2
- 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. Disconnect IPDM E/R harness connector E8.
2. Check the continuity between IPDM E/R harness connector and ECM harness connector.

DTC	IPDM E/R		ECM		Continuity
	Connector	Terminal	Connector	Terminal	
P1233	E8	42	F106	52	Existed
P2101			F105	3	

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

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- 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. 87) from IPDM E/R.
2. Check if 15 A fuse is blown.

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace 15 A fuse.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

9. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator harness connector.
3. Disconnect ECM harness connector.
4. Check the continuity between electric throttle control actuator harness connector and ECM harness connector.

DTC	Electric throttle control actuator			ECM		Continuity
	Bank	Connector	Terminal	Connector	Terminal	
P1233	2	F51	5	F106	49	Existed
					50	Not existed
			6		49	Not existed
					50	Existed
P2101	1	F31	1	F105	2	Existed
					4	Not existed
			2		2	Not existed
					4	Existed

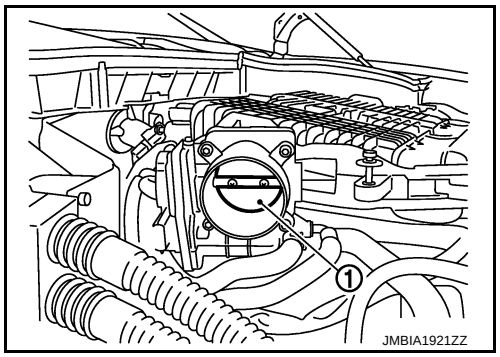
5. Also check harness for short to ground and short to power.

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair or replace malfunctioning part.

10. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 11.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

11. CHECK THROTTLE CONTROL MOTOR

Refer to EC-477, "Component Inspection".

Is the inspection result normal?

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

12. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

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

13. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunction electric throttle control actuator.
2. Go to EC-478, "Special Repair Requirement".

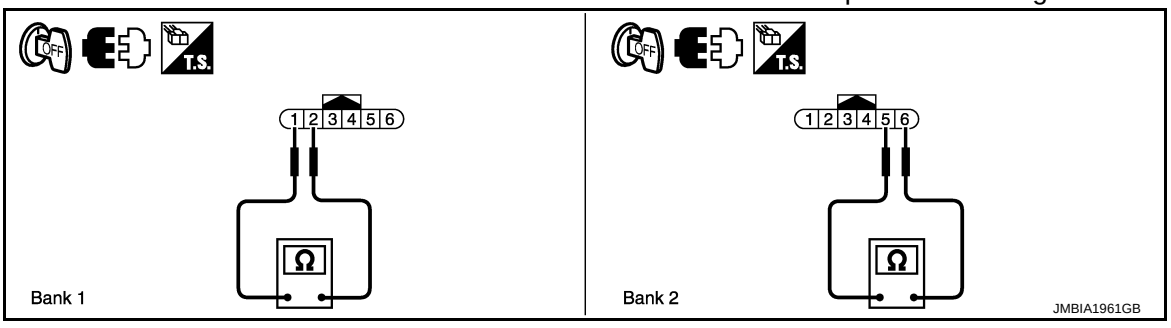
>> INSPECTION END

Component Inspection

INFOID:0000000005353672

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
Bank	Terminals	
1	1 and 2	Approx. 1 - 15 Ω [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.
2. Go to EC-478, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353673

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1236, P2118 THROTTLE CONTROL MOTOR

Description

INFOID:0000000005353674

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

DTC Logic

INFOID:0000000005353675

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

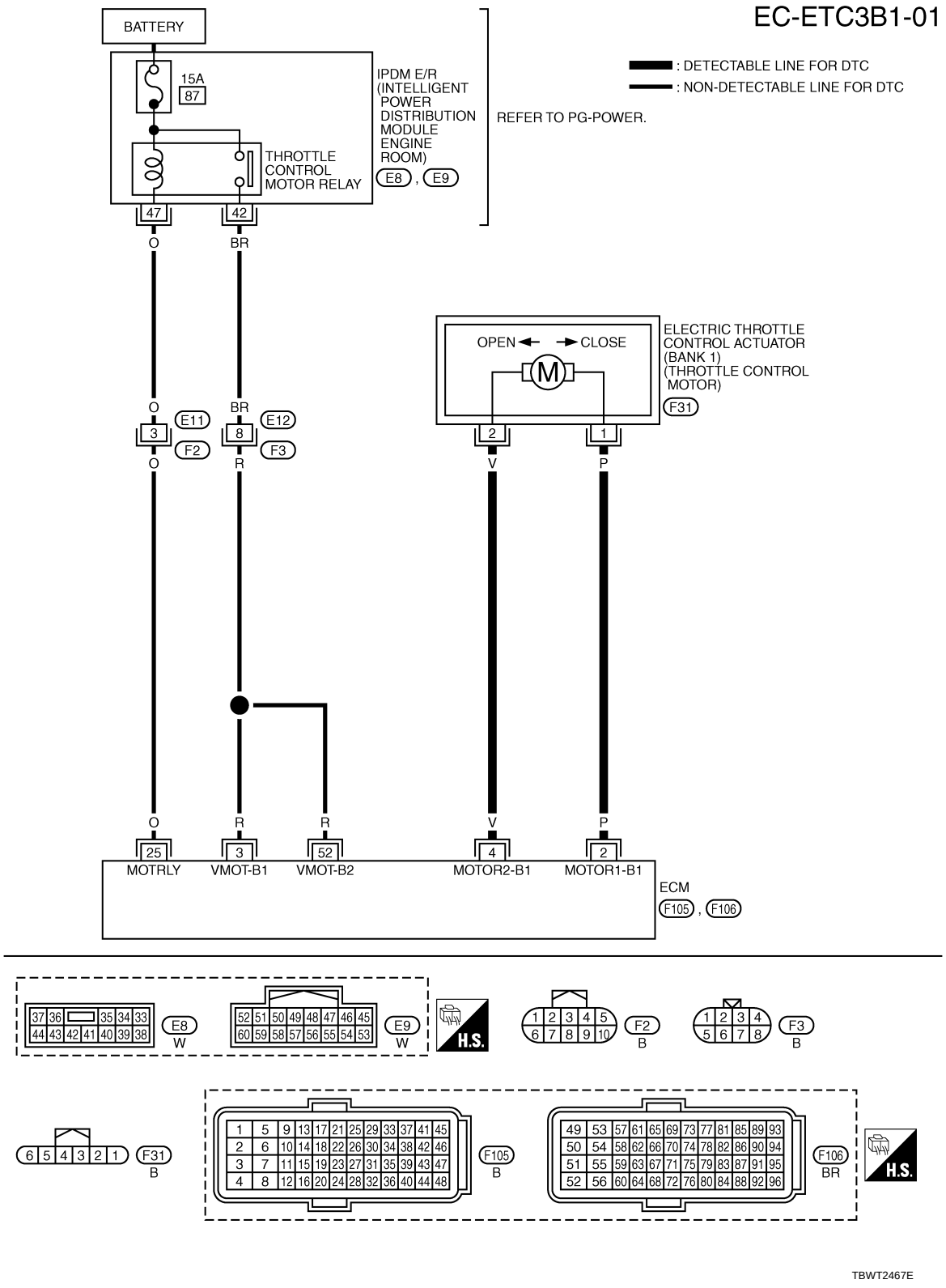
1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.

Is DTC detected?

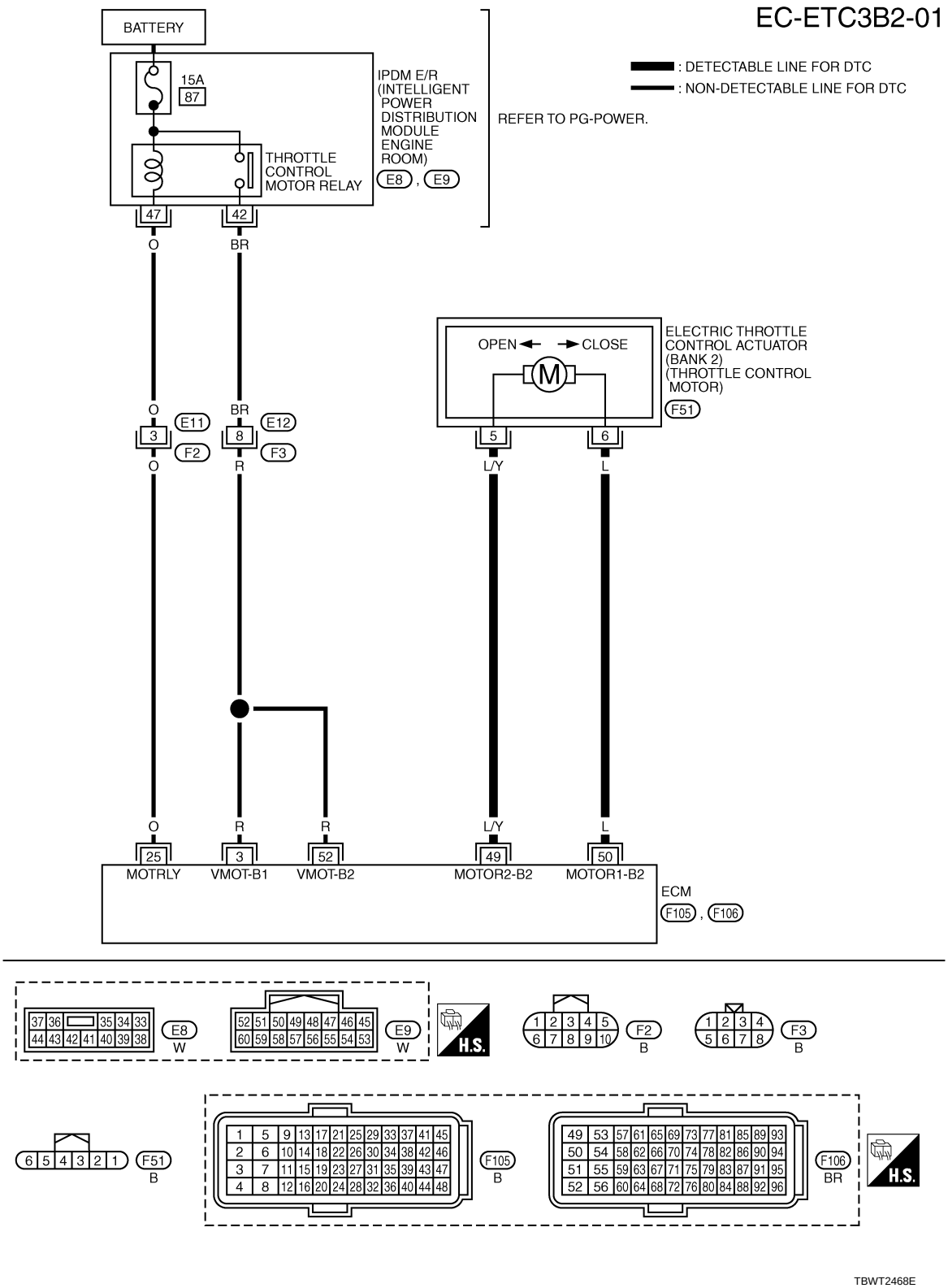
YES >> Go to EC-481, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353676



TBWT2467E



TBWT2468E

Diagnosis Procedure

INFOID:0000000005353677

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

2.CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR 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	F51	5	F106	49	Existed
					50	Not existed
			6		49	Not existed
					50	Existed
P2118	1	F31	1	F105	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 malfunctioning part.

3.CHECK THROTTLE CONTROL MOTOR

Refer to EC-482, "Component Inspection".

Is the inspection result normal?

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

4.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

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.
2. Go to EC-483, "Special Repair Requirement".

>> INSPECTION END

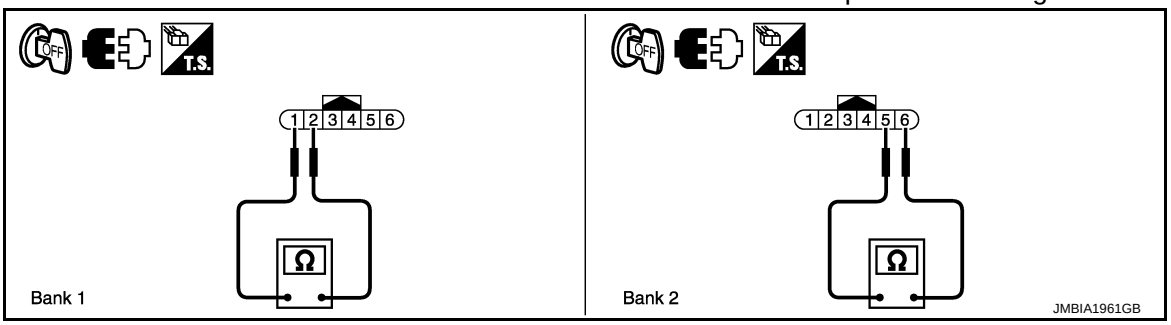
Component Inspection

INFOID:0000000005353678

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
Bank	Terminals	
1	1 and 2	Approx. 1 - 15 Ω [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.
2. Go to EC-483, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353679

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1238, P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Description

INFOID:0000000005353680

Electric throttle control actuator consists of throttle control motor, throttle position sensor, etc.
The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The throttle position sensor detects the throttle valve position, and the opening and closing speed of the throttle valve and sends the voltage signals to the ECM. The ECM judges the current opening angle of the throttle valve from these signals and opens/closes the throttle valve in response to driving conditions via the throttle control motor.

DTC Logic

INFOID:0000000005353681

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 detects that 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 position to D and wait at least 3 seconds.
3. Shift selector lever position to P.
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 position to D and wait at least 3 seconds.
7. Shift selector lever position to P.
8. Turn ignition switch OFF, wait at least 10 seconds, and then turn ON.
9. Check DTC.

Is DTC detected?

YES >> Go to EC-485, "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 position to D and wait at least 3 seconds.

3. Shift selector lever position to P.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.

Is DTC detected?

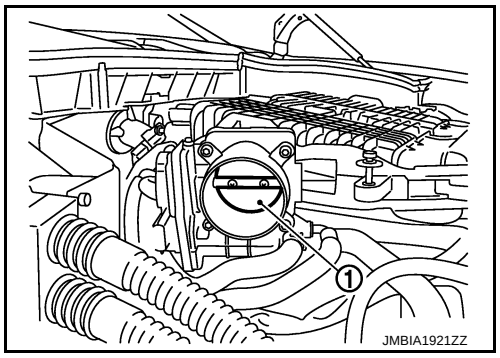
YES >> Go to EC-485, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353682

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve (1) and the housing.



Is the inspection result normal?

YES >> GO TO 2.
NO >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace malfunctioning electric throttle control actuator.
2. Go to EC-485, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353683

1. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

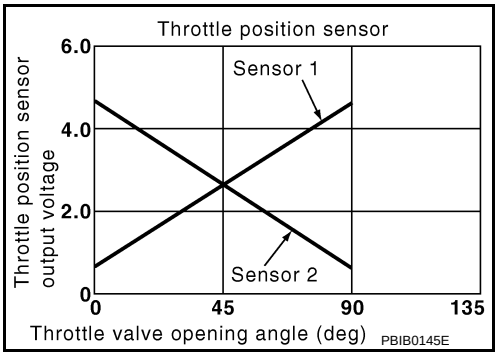
>> END

P1239, P2135 TP SENSOR

Description

INFOID:0000000005353684

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



DTC Logic

INFOID:0000000005353685

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-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1239	Throttle position (TP) 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 and 2 circuit is open or shorted.) • Electric throttle control actuator (TP sensor 1 and 2)
P2135	Throttle position (TP) 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.

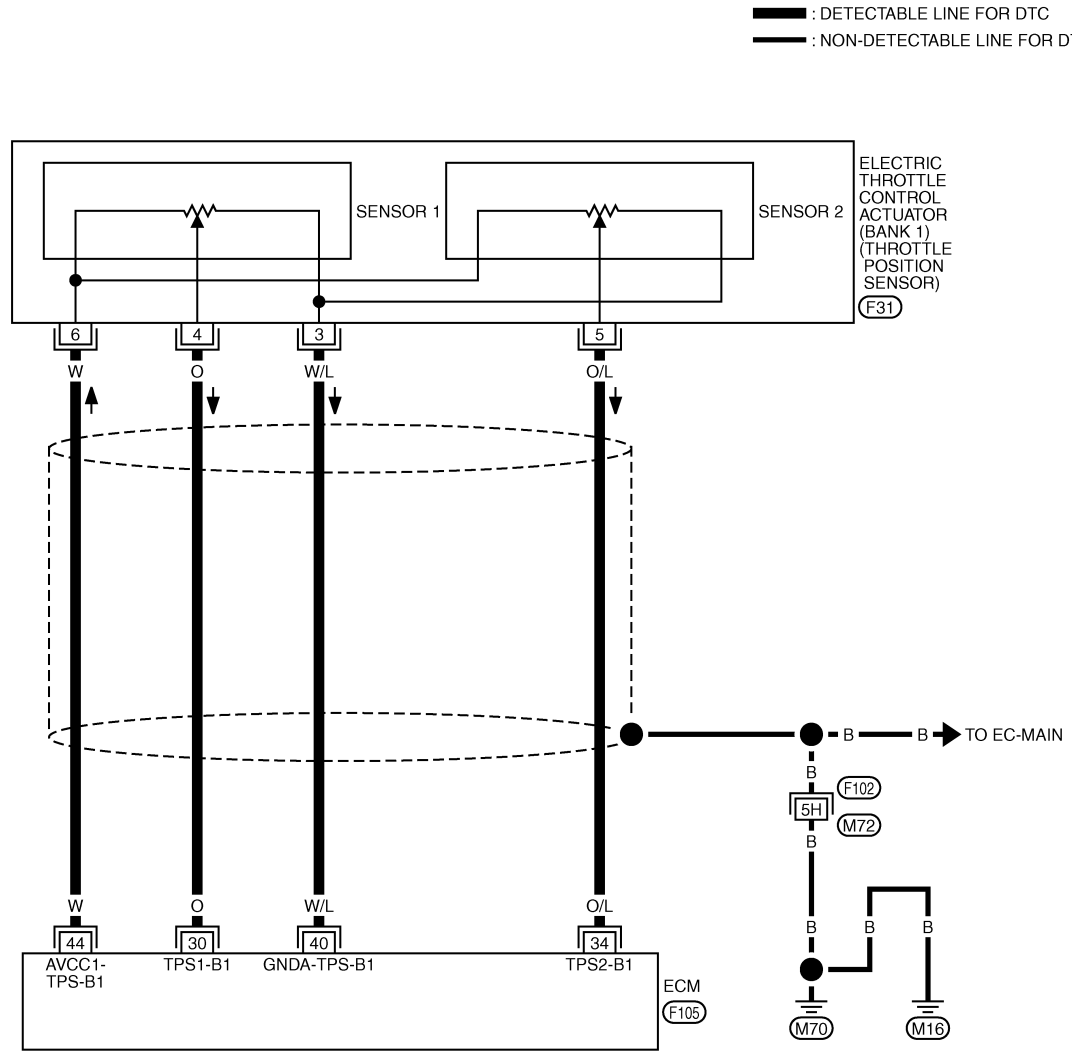
Is DTC detected?

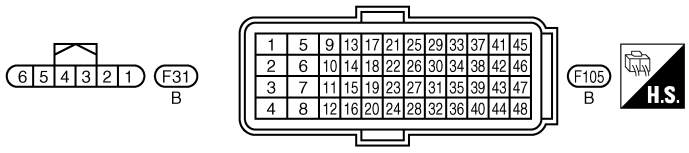
YES >> Go to EC-488, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353686

EC-TPS3B1-01

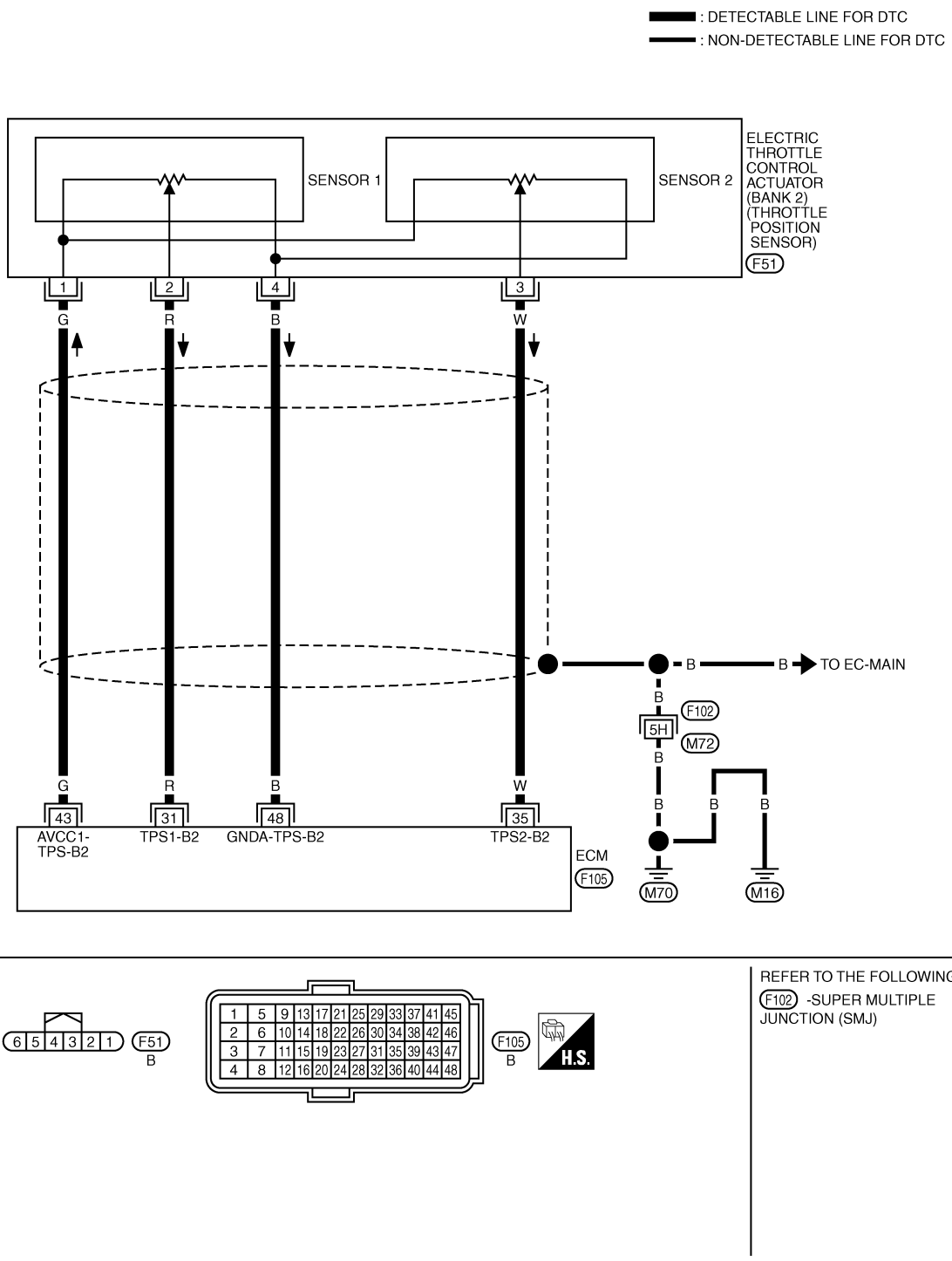




REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT2471E

EC-TPS3B2-01



TBWT2472E

Diagnosis Procedure

INFOID:0000000005353687

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

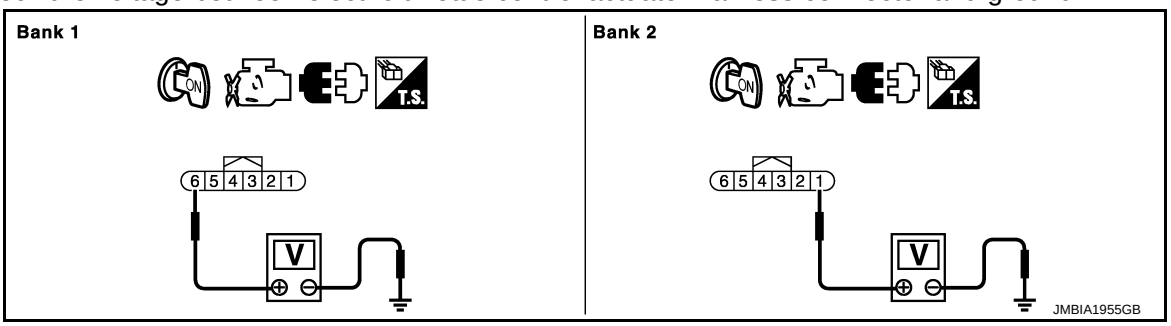
Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT

1. Disconnect electric throttle control actuator harness connector.
2. Turn ignition switch ON.
3. Check the voltage between electric throttle control actuator harness connector and ground.



DTC	Electric throttle control actuator			Ground	Voltage (V)
	Bank	Connector	Terminal		
P1239	2	F51	1	Ground	Approx. 5
P2135	1	F31	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	F51	4	F105	48	Existed
P2135	1	F31	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	F51	2	F105	31	Existed
			3		35	
P2135	1	F31	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-490, "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.
2. EC-491, "Special Repair Requirement"

>> INSPECTION END

7.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

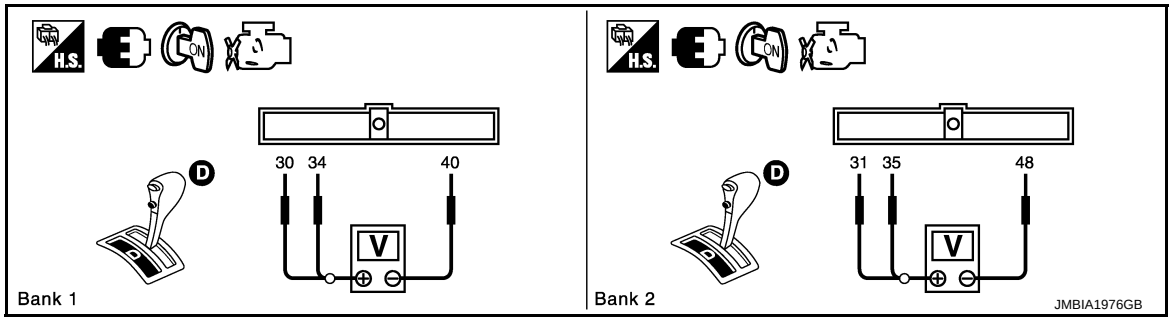
>> INSPECTION END

Component Inspection

INFOID:0000000005353688

1.CHECK THROTTLE POSITION (TP) SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Perform EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".
4. Turn ignition switch ON.
5. Set selector lever position to D.
6. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
F105	30 [TP sensor 1 (bank 1)]	40	Accelerator pedal: Fully released	More than 0.36
			Accelerator pedal: Fully depressed	Less than 4.75
	31 [TP sensor 1 (bank 2)]	48	Accelerator pedal: Fully released	More than 0.36
			Accelerator pedal: Fully depressed	Less than 4.75
	34 [TP sensor 2 (bank 1)]	40	Accelerator pedal: Fully released	Less than 4.75
			Accelerator pedal: Fully depressed	More than 0.36
	35 [TP sensor 2 (bank 2)]	48	Accelerator pedal: Fully released	Less than 4.75
			Accelerator pedal: 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.
2. Go to EC-491, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353689

1.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement"

>> GO TO 2.

2.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement"

>> END

P1290, P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Description

INFOID:0000000005353690

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:0000000005353691

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-494, "Diagnosis Procedure".
NO >> INSPECTION END

3.PERFORM DTC CONFIRMATION PROCEDURE FOR DTC P2103

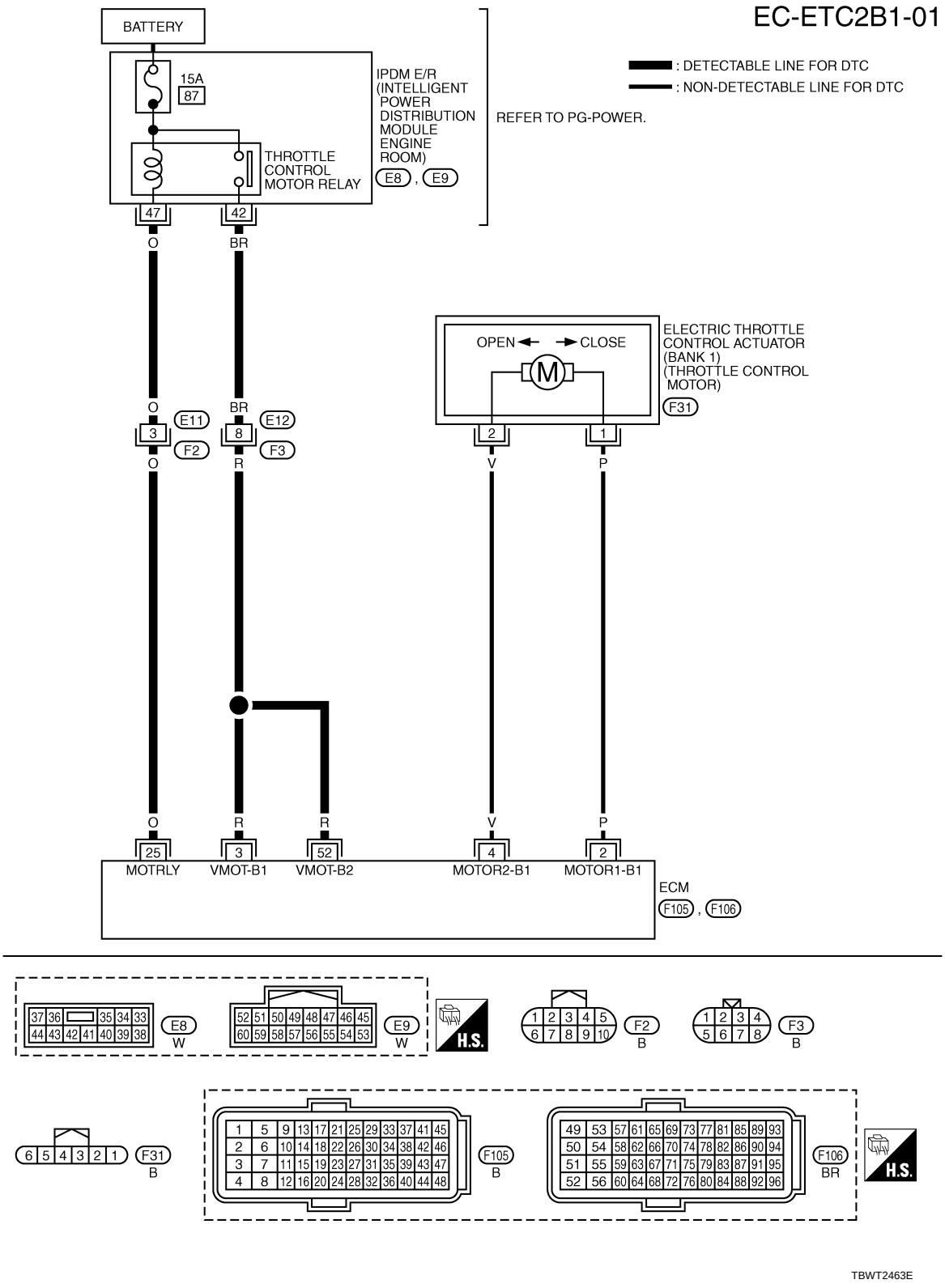
1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.

Is DTC detected?

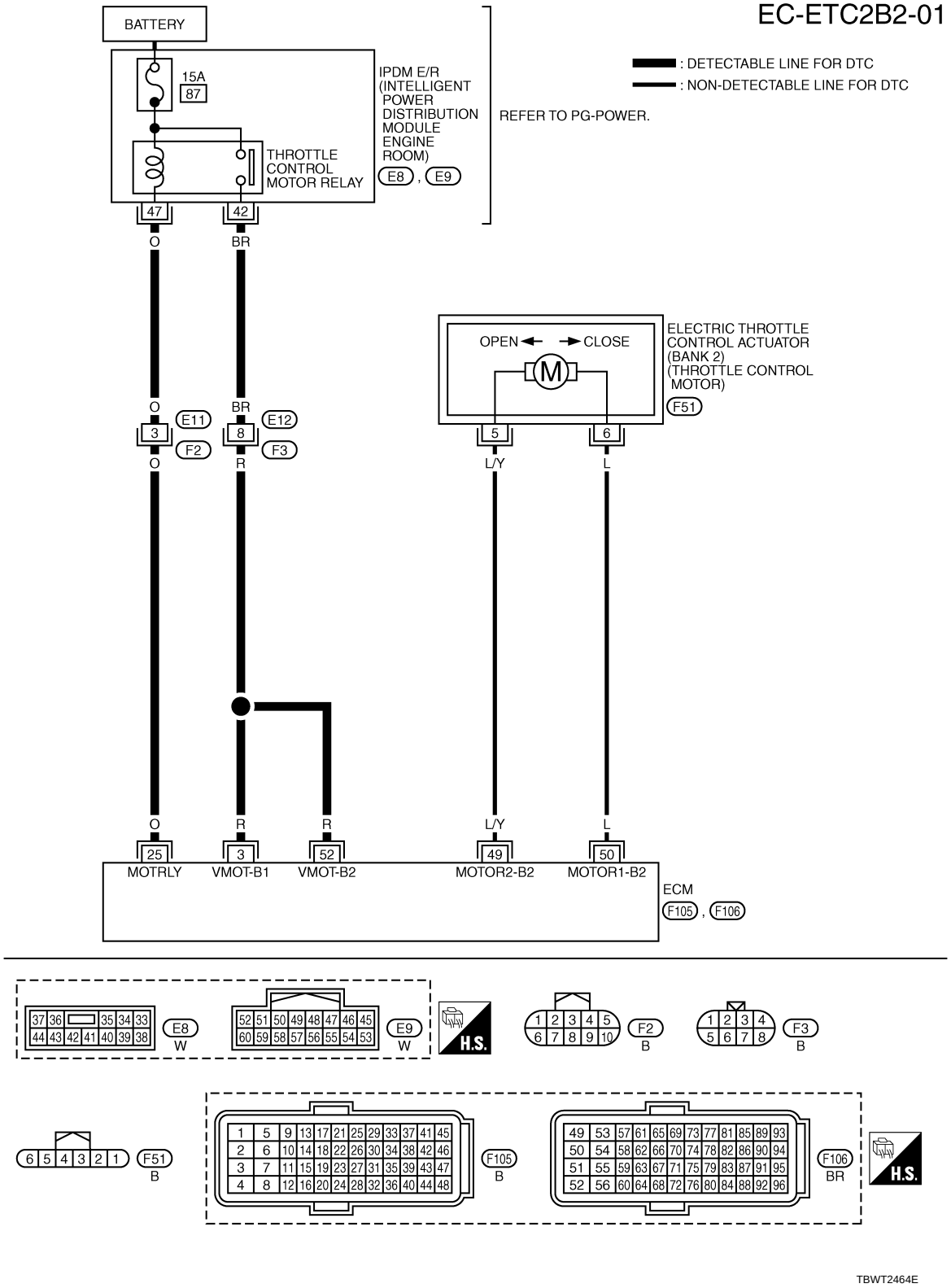
YES >> Go to EC-494, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353692



TBWT2463E



TBWT2464E

Diagnosis Procedure

INFOID:0000000005353693

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 E9.
4. Check the continuity between IPDM E/R harness connector and ECM harness connector.

IPDM E/R		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E9	47	F105	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 E11, F2
- 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. Disconnect IPDM E/R harness connector E9.
2. 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	E9	42	F106	52	Existed
P2100			F105	3	
P2103			F105	3	
			F106	52	

3. 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 E12, F3
- 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. 87) from IPDM E/R.
2. Check 15 A fuse for blown.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 15 A fuse.

6.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

P1421 COLD START CONTROL

Description

INFOID:0000000005353694

ECM controls ignition timing and engine idle speed when engine is started with pre-warming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

DTC Logic

INFOID:0000000005353695

DTC DETECTION LOGIC

NOTE:

- **If DTC P1421 is displayed with other DTC, first perform the trouble diagnosis for other DTC.**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1421	Cold start emission reduction strategy monitoring	ECM does not control ignition timing and engine idle speed properly when engine is started with pre-warming up condition.	• Lack of intake air volume • Fuel injection system • 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 idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

With CONSULT-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT-III.
4. Check the indication of “COOLAN TEMP/S”.
   If it is between 7°C (45°F) and 36°C (97°F), go to the following steps.
   If it is below 7°C (45°F), warm engine up to more than 7°C (45°F) and retry from step 1.
   If it is above 36°C (97°F), cool engine down to less than 36°C (97°F) and retry from step 1.
5. Start engine and let it idle for 5 minutes.
6. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-496, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353696

1.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

Is Idle Air Volume Learning carried out successfully?

YES >> GO TO 2.
NO >> Follow the instruction of Idle Air Volume Learning.

2.CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.
- Crushed intake air passage
- Intake air passage clogging

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part

3. CHECK FUEL INJECTION SYSTEM FUNCTION

Perform DTC Confirmation Procedure for DTC P0171, P0174. Refer to EC-294, "DTC Logic".

Is the inspection result normal?

YES >> GO TO 4.
NO >> Go to EC-297, "Diagnosis Procedure" for DTC P0171, P0174.

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-496, "DTC Logic".

Is the 1st trip DTC P1421 displayed again?

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

5. REPLACE ECM

1. Replace ECM.
2. Go to EC-25, "ADDITIONAL SERVICE WHEN REPLACING CONTROL UNIT : Special Repair Requirement".

>> INSPECTION END

P1550 BATTERY CURRENT SENSOR

Description

INFOID:0000000005353697

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 SC-21, "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:0000000005353698

DTC DETECTION 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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Battery current sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • APP sensor • EVAP control system 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 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.

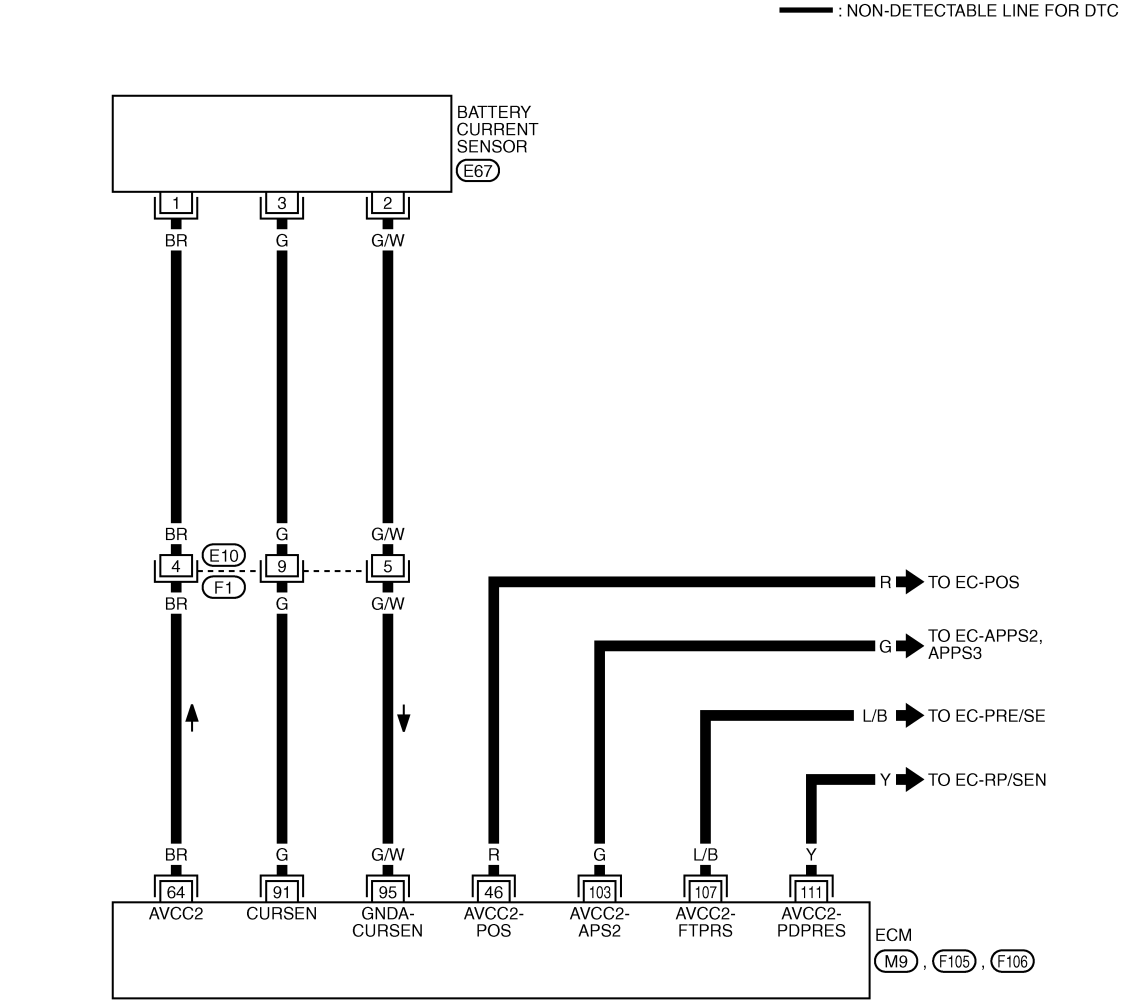
Is 1st trip DTC detected?

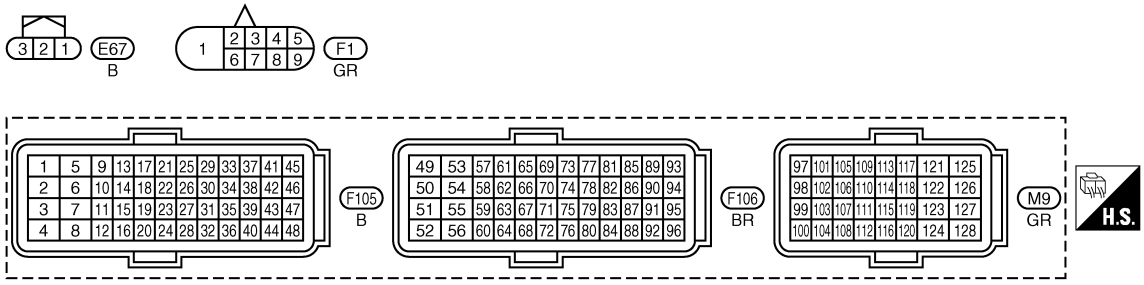
YES >> Go to EC-499, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353699

EC-CUR/SE-01





TBWT2457E

Diagnosis Procedure

INFOID:0000000005353700

1. CHECK GROUND CONNECTION

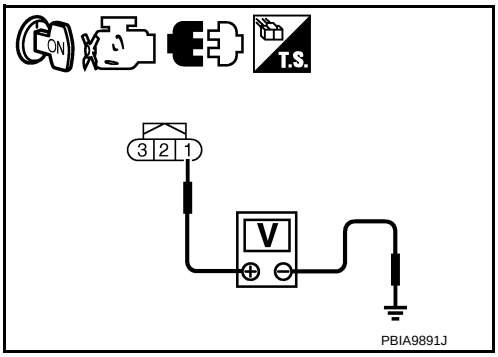
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

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		
E67	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

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

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E67	1	F106	64	Existed

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- Harness for open between battery current sensor and ECM

>> 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
M9	103	Accelerator position sensor (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

9.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	
E67	2	F106	95	Existed

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

Is the inspection result normal?

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

10.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

11.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	
E67	3	F106	91	Existed

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

Is the inspection result normal?

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

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-502, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

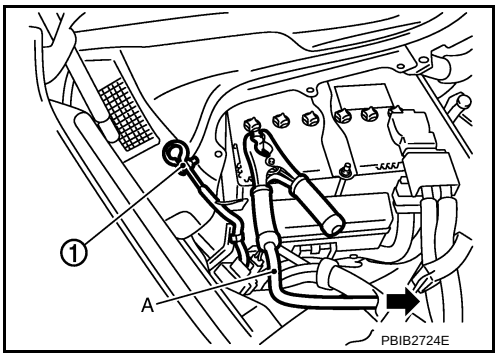
Component Inspection

INFOID:0000000005353701

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).

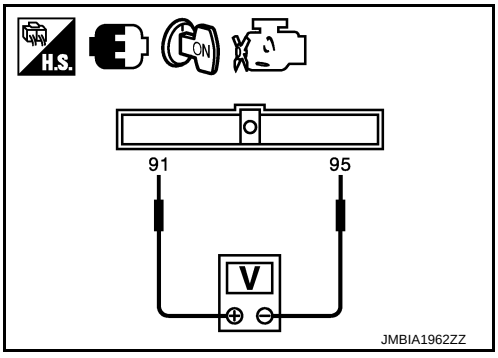
: To body ground



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 under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F106	91 (Battery current sensor signal)	95	Approx. 2.5



Before measuring the terminal voltage, confirm that the battery is fully charged.
Refer to SC-4, "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:0000000005353702

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 SC-21, "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:0000000005353703

DTC DETECTION 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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Battery current sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • APP sensor • EVAP control system pressure sensor • Refrigerant pressure 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.

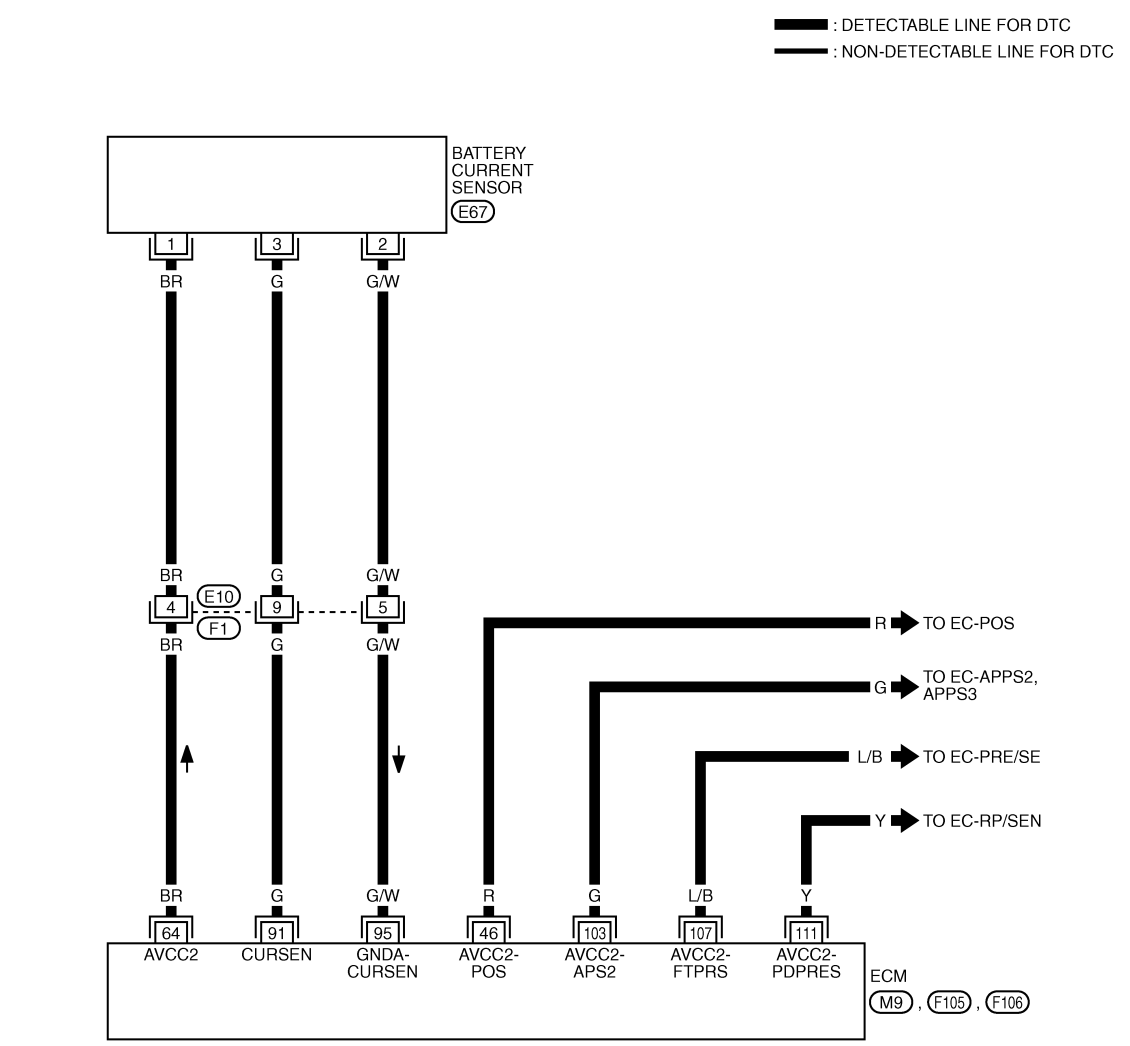
Is 1st trip DTC detected?

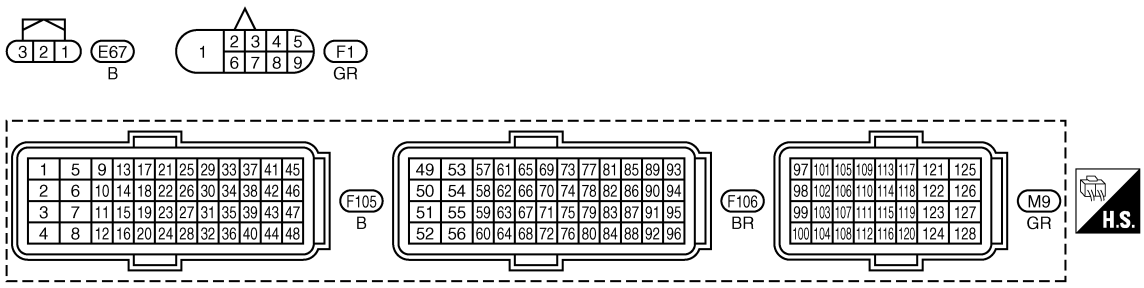
YES >> Go to EC-506, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353704

EC-CUR/SE-01





TBWT2457E

Diagnosis Procedure

INFOID:0000000005353705

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

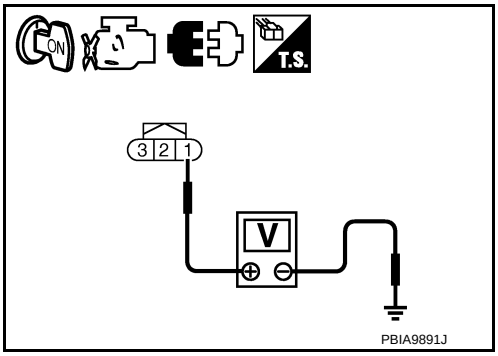
Is the inspection result normal?

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

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		
E67	1	Ground	Approx. 5



Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3. CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

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

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E67	1	F106	64	Existed

Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- Harness for open between battery current sensor and ECM

>> 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
F105	46	Crankshaft position (CKP) sensor	F52	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator position sensor (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

9.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	
E67	2	F106	95	Existed

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

Is the inspection result normal?

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

10.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

11. 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	
E67	3	F106	91	Existed

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

Is the inspection result normal?

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

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-521, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

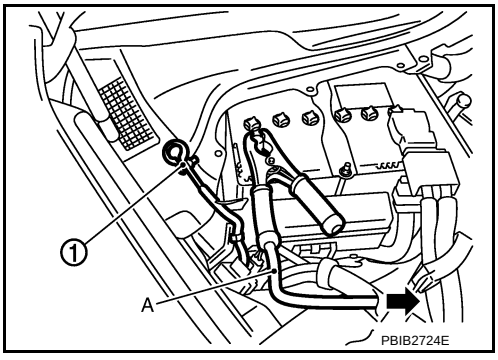
INFOID:0000000005353706

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).

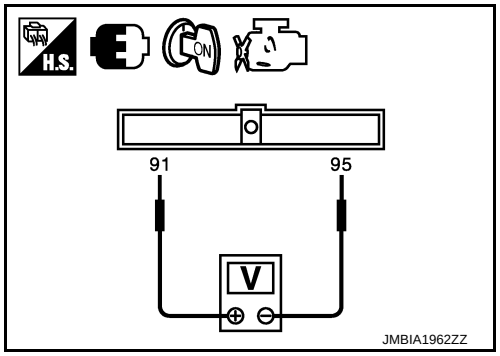
⬅: To body ground

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 under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F106	91 (Battery current sensor signal)	95	Approx. 2.5



Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1553 BATTERY CURRENT SENSOR

Description

INFOID:0000000005353707

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 SC-21, "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:0000000005353708

DTC DETECTION 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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Battery current sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • APP sensor • EVAP control system 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 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.

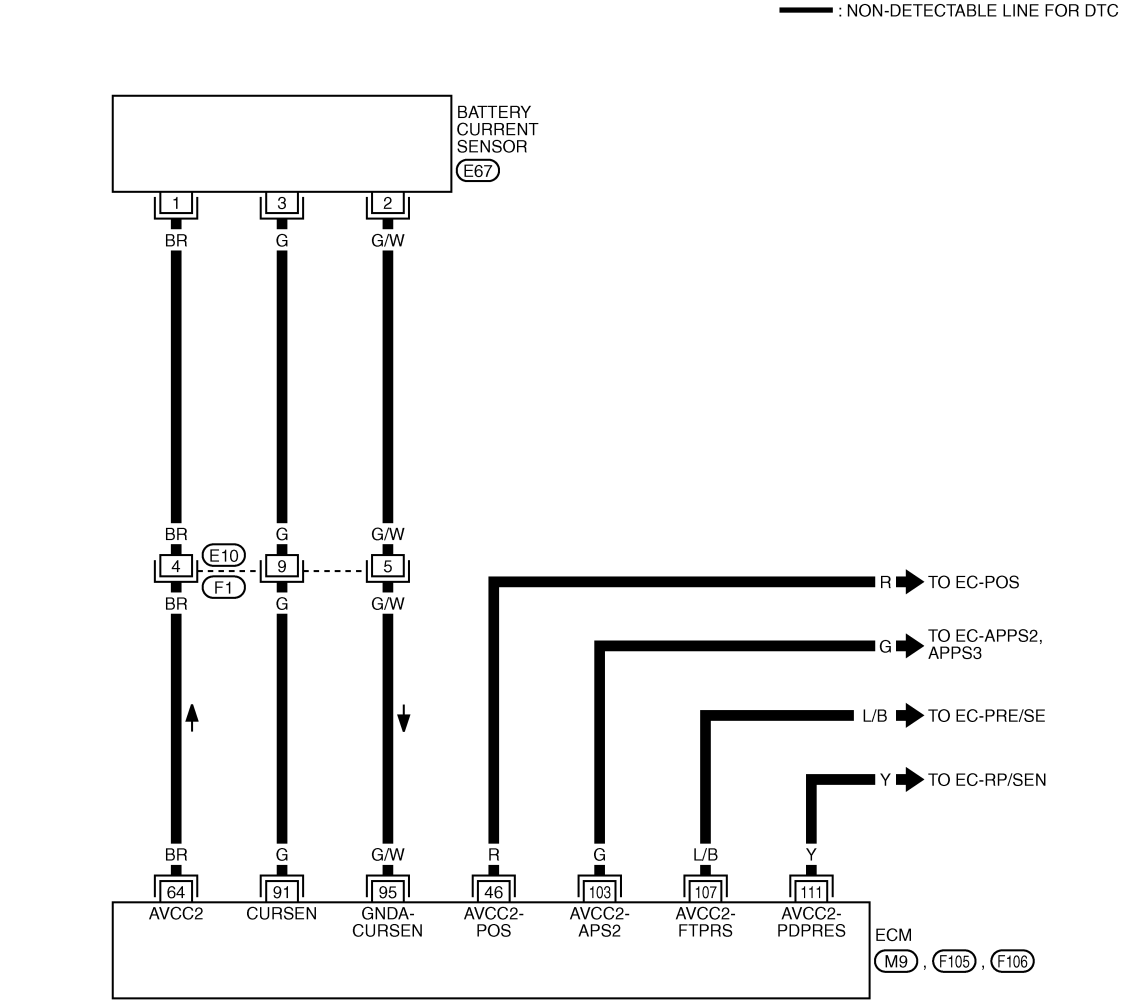
Is 1st trip DTC detected?

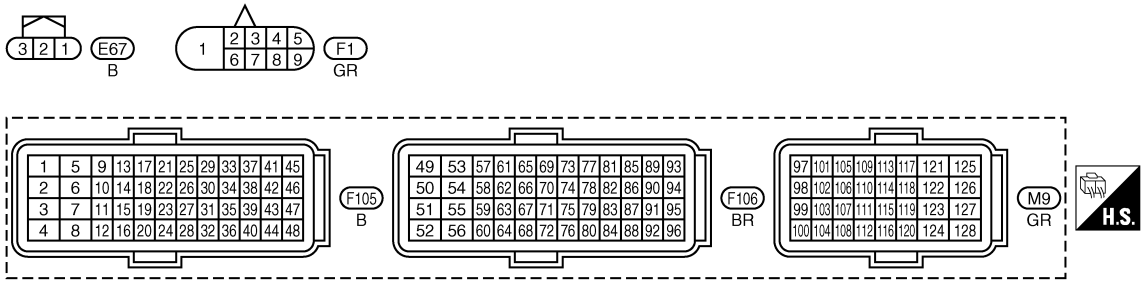
YES >> Go to EC-511, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353709

EC-CUR/SE-01





TBWT2457E

Diagnosis Procedure

INFOID:0000000005353710

1. CHECK GROUND CONNECTION

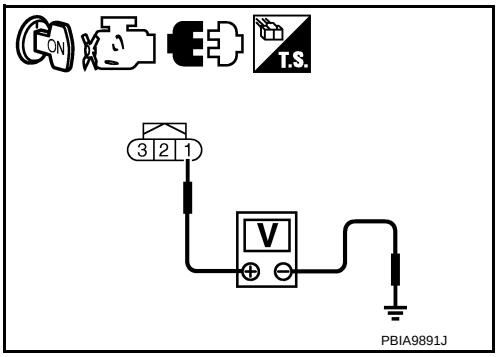
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

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		
E67	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

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

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E67	1	F106	64	Existed

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- Harness for open between battery current sensor and ECM

>> 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
M9	103	Accelerator position sensor (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7.CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

8.REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

9.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	
E67	2	F106	95	Existed

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

Is the inspection result normal?

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

10.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

11.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	
E67	3	F106	91	Existed

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

Is the inspection result normal?

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

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-521, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

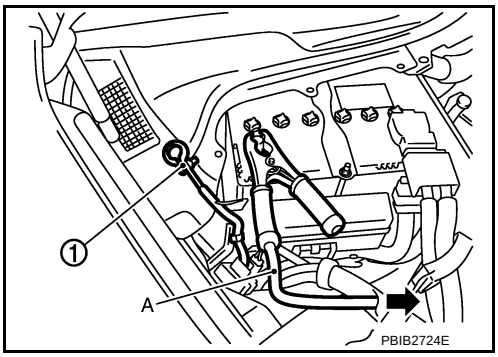
Component Inspection

INFOID:0000000005353711

1. CHECK BATTERY CURRENT SENSOR

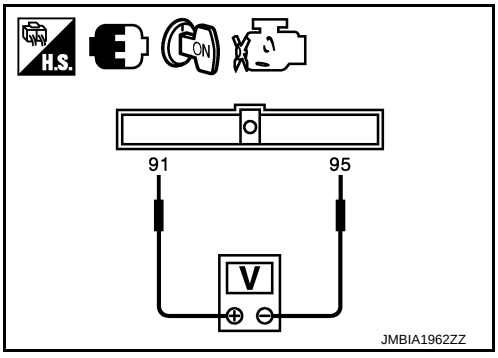
1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).

: 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 under the following conditions.



ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F106	91 (Battery current sensor signal)	95	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1554 BATTERY CURRENT SENSOR

Description

INFOID:0000000005353712

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 SC-21, "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:0000000005353713

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1554	Battery current sensor performance	The output voltage of the battery current sensor is lower than the specified value while the battery voltage is high enough.	• Harness or connectors (Battery current sensor circuit is open or shorted.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] [Accelerator pedal position (APP) sensor 2 circuit is shorted.] (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • Battery current sensor • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • APP sensor • EVAP control system pressure sensor • Refrigerant pressure sensor

DTC CONFIRMATION PROCEDURE

1.PERFORM COMPONENT FUNCTION CHECK

Perform component function check. Refer to EC-516, "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-518, "Diagnosis Procedure".

Component Function Check

INFOID:0000000005353714

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

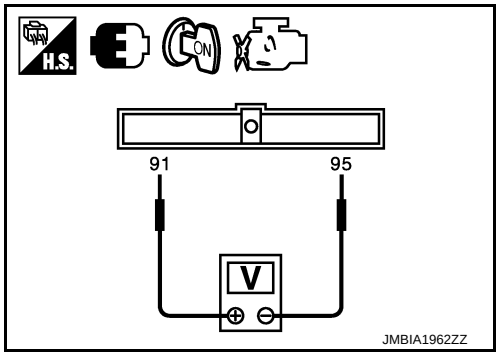
With CONSULT-III

1. Start engine and let it idle.
2. Select “BAT CUR SEN” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BAT CUR SEN” indication for 10 seconds.
   “BAT CUR SEN” should be above 2,300 mV at least once.

Without CONSULT-III

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	
F106	91 (Battery current sensor signal)	95	Above 2.3 at least once



Is the inspection result normal?

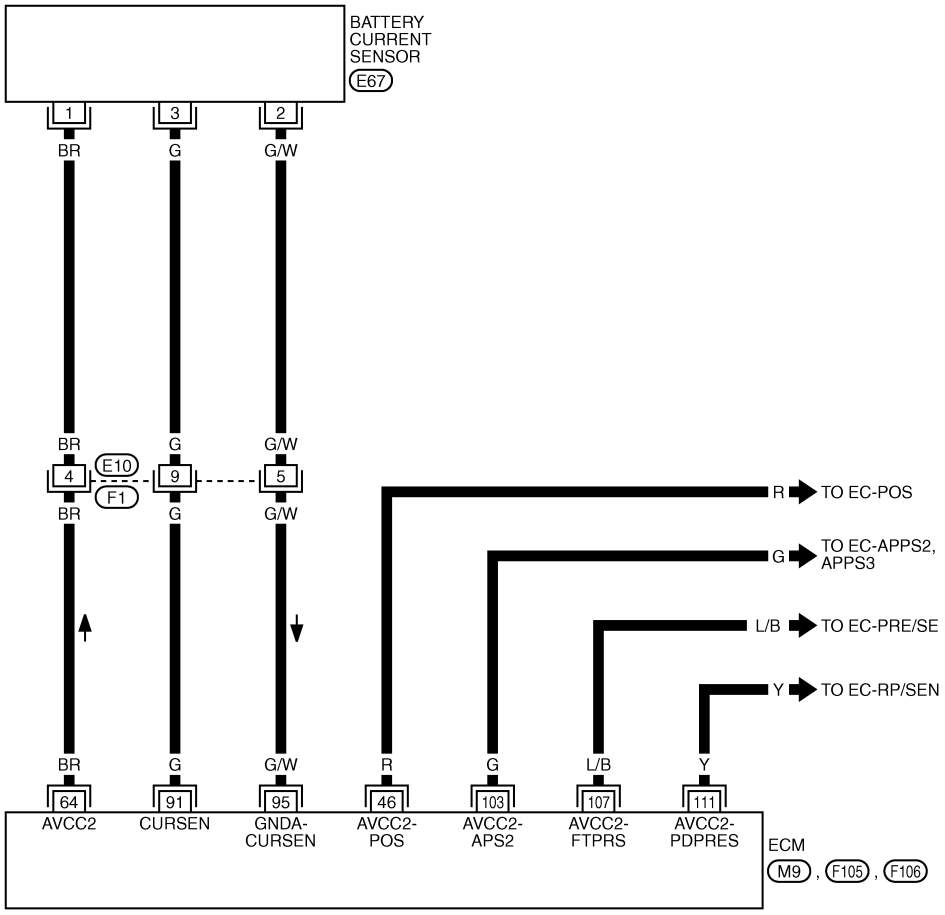
YES >> INSPECTION END
NO >> Go to EC-518, "Diagnosis Procedure".

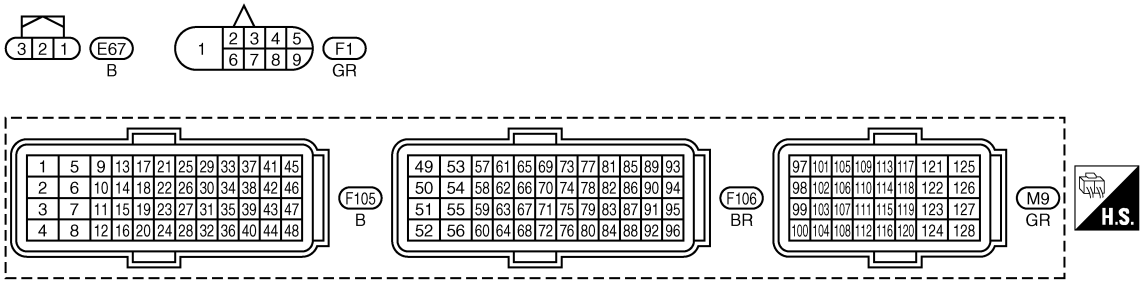
Wiring Diagram

INFOID:0000000005353715

EC-CUR/SE-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





TBWT2457E

Diagnosis Procedure

INFOID:0000000005353716

1. CHECK GROUND CONNECTION

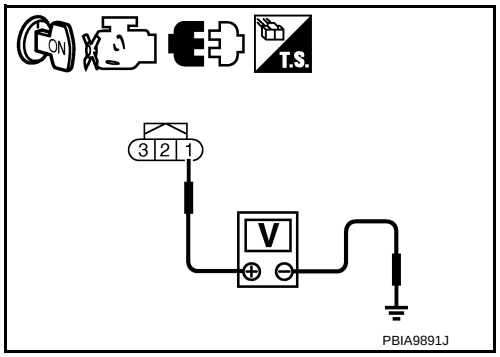
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

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		
E67	1	Ground	Approx. 5

Is the inspection result normal?

YES >> GO TO 9.
NO >> GO TO 3.

3.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT-II

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

Battery current sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E67	1	F106	64	Existed

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- Harness for open between battery current sensor and ECM

>> 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	Accelerator position sensor (APP) sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace malfunctioning component.

7. CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> GO TO 8.

8. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

9. 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	
E67	2	F106	95	Existed

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

Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

11. 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	
E67	3	F106	91	Existed

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

Is the inspection result normal?

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

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E10, F1
- 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.

13. CHECK BATTERY CURRENT SENSOR

Refer to EC-521, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace battery negative cable assembly.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

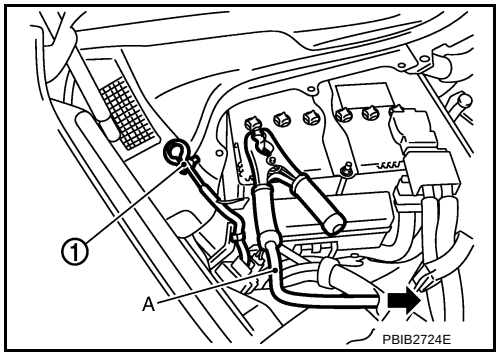
INFOID:0000000005353717

1. CHECK BATTERY CURRENT SENSOR

1. Turn ignition switch OFF.
2. Reconnect harness connectors disconnected.
3. Disconnect battery negative cable (1).

: To body ground

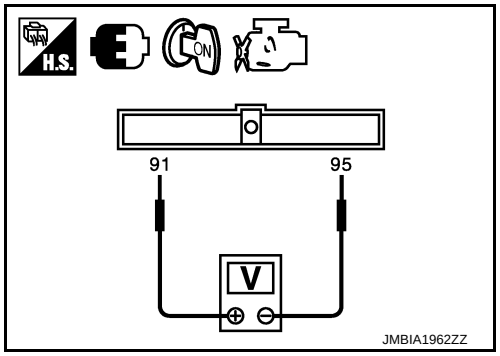
4. Install jumper cable (A) between battery negative terminal and body ground.
5. Turn ignition switch ON.



6. Check the voltage between ECM harness connector terminals under the following conditions.

ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
F106	91 (Battery current sensor signal)	95	Approx. 2.5

Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".



Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace battery negative cable assembly.

P1564 ASCD STEERING SWITCH

Description

INFOID:0000000005353718

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-68, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000005353719

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "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.

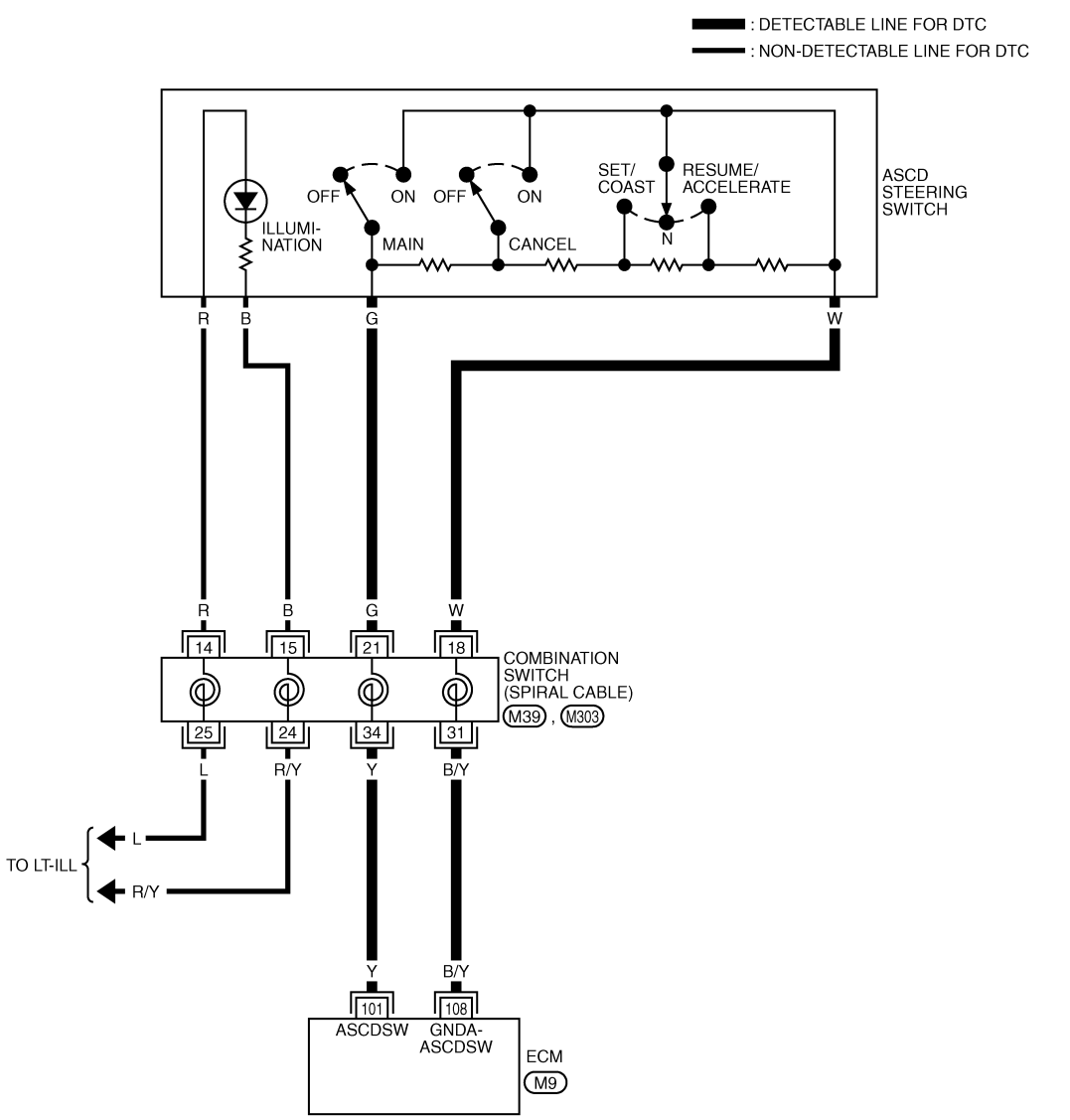
Is DTC detected?

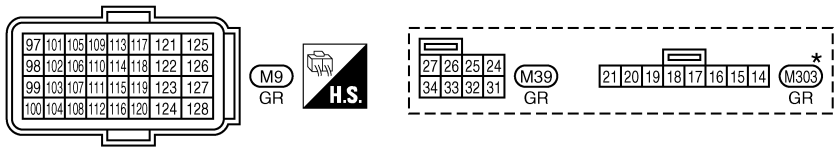
YES >> Go to EC-523, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353720

EC-ASC/SW-01





*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", PG SECTION.

TBWT2459E

Diagnosis Procedure

INFOID:0000000005353721

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK ASCD STEERING SWITCH CIRCUIT

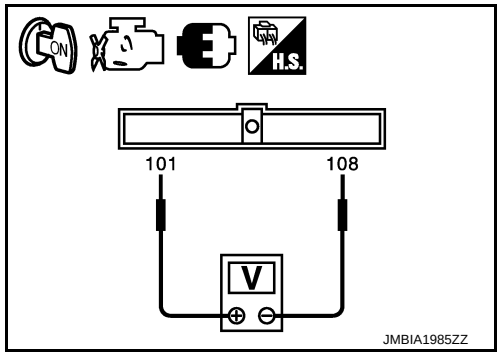
With CONSULT-III

1. Turn ignition switch ON.
2. Select “MAIN SW”, “CANCEL SW”, “RESUME/ACC SW” and “SET SW” in “DATA MONITOR” mode with CONSULT-III.
3. Check each item indication under the following conditions.

Monitor item	Condition		Indication
MAIN SW	MAIN switch	Pressed	ON
		Released	OFF
CANCEL SW	CANCEL switch	Pressed	ON
		Released	OFF
RESUME/ACC SW	RESUME/ACCEL-ERATE switch	Pressed	ON
		Released	OFF
SET SW	SET/COAST switch	Pressed	ON
		Released	OFF

Without CONSULT-III

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M9	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 (spiral cable) harness connector.
4. Check the continuity between combination switch (spiral cable) harness connector and ECM harness connector.

Combination switch (spiral cable)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
M303	18	M9	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 (spiral cable)

>> 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 (spiral cable) harness connector and ECM harness connector.

Combination switch (spiral cable)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
M303	21	M9	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 (spiral cable)

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

7. CHECK ASCD STEERING SWITCH

Refer to EC-525, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ASCD steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

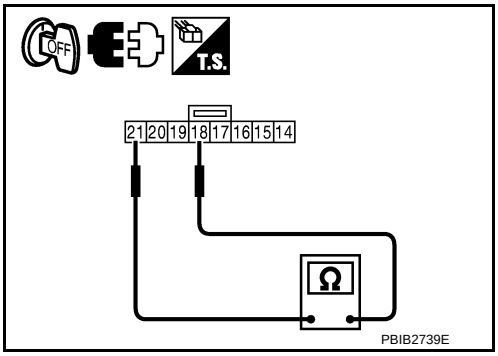
Component Inspection

INFOID:0000000005353722

1. CHECK ASCD STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector.

3. Check resistance between combination switch (spiral cable) harness connector terminals under the following conditions.



Combination switch (spiral cable)		Condition	Resistance (Ω)
Connector	Terminals		
M303	18 and 21	MAIN switch: Pressed	Approx. 0
		CANCEL switch: Pressed	Approx. 250
		SET/COAST switch: Pressed	Approx. 660
		RESUME/ACCELERATE switch: Pressed	Approx. 1,490
		All ASCD steering switches: Released	Approx. 3,980

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD steering switch

P1564 ICC STEERING SWITCH

Description

INFOID:0000000005353723

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 ACS-9 for the ICC function.

DTC Logic

INFOID:0000000005353724

DTC DETECTION LOGIC

NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "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 switch for at least 10 seconds, then release it at wait at least 10 seconds.
8. Check DTC.

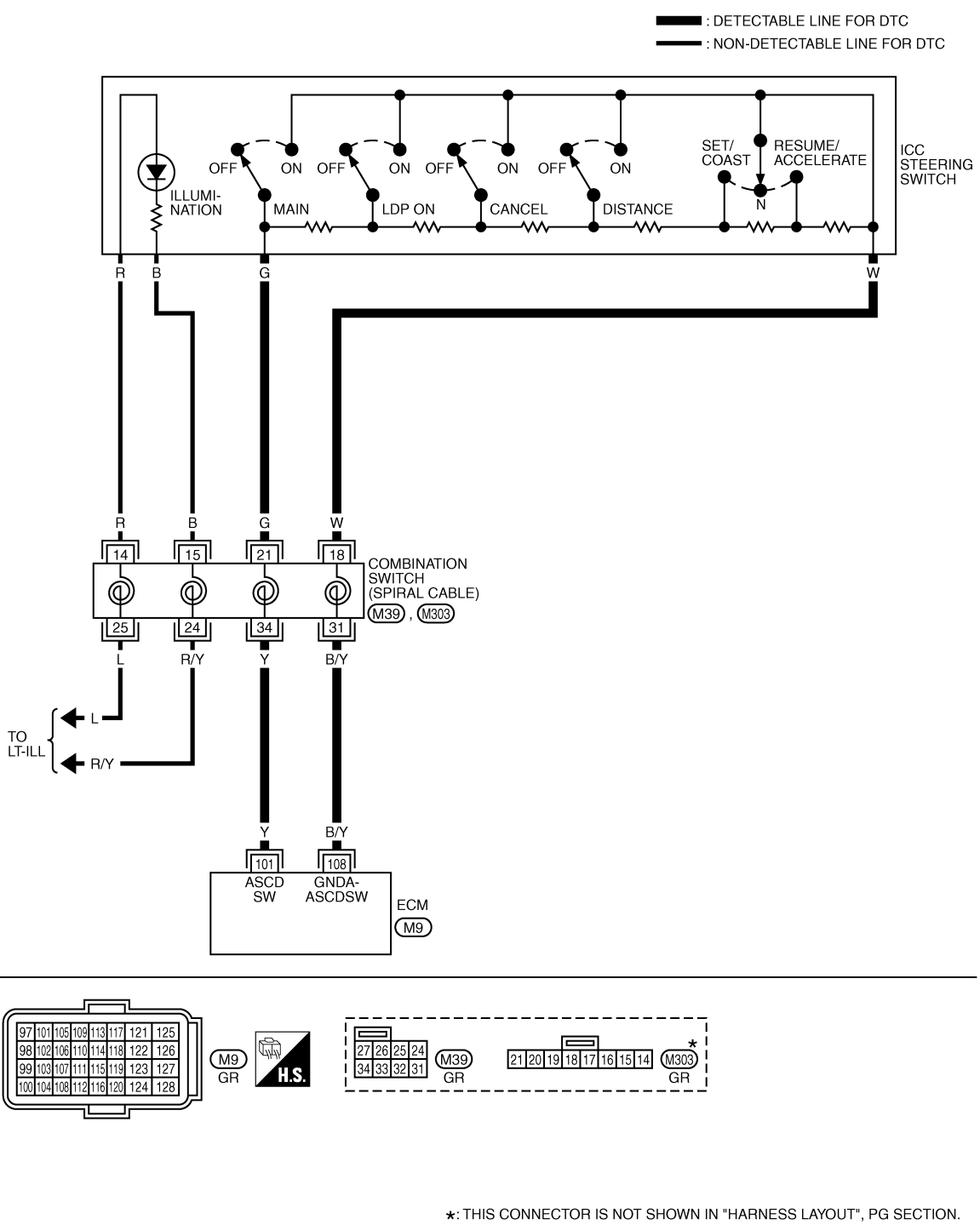
Is DTC detected?

YES >> Go to EC-528, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353725

EC-ICC/SW-01



*: THIS CONNECTOR IS NOT SHOWN IN "HARNESS LAYOUT", PG SECTION.

TBWT2458E

Diagnosis Procedure

INFOID:0000000005353726

1. CHECK GROUND CONNECTION

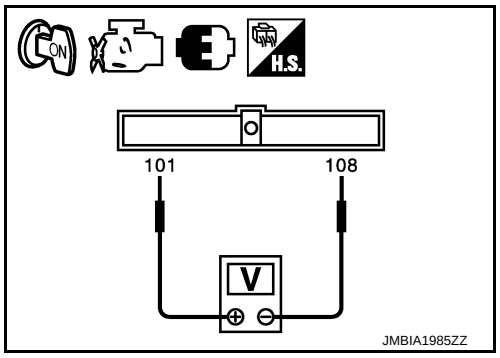
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK ICC STEERING SWITCH CIRCUIT

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals under the following conditions.



ECM			Condition	Voltage (V)
Connector	+	–		
	Terminal	Terminal		
M9	101 (ICC steering switch signal)	108	MAIN switch: Pressed	Approx. 0
			LDP 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 (spiral cable) harness connector.
4. Check the continuity between combination switch (spiral cable) harness connector and ECM harness connector.

Combination switch (spiral cable)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
M303	18	M9	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 (spiral cable)

>> 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 (spiral cable) harness connector switch and ECM harness connector.

Combination switch (spiral cable)		ECM		Continuity
Connector	Terminal	Connector	Terminal	
M303	21	M9	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 (spiral cable)

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

7.CHECK ICC STEERING SWITCH

Refer to EC-530, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 8.
NO >> Replace ICC steering switch.

8.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

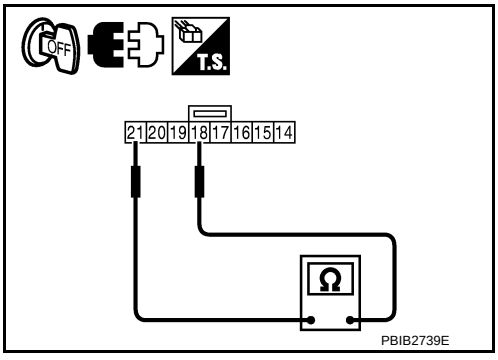
>> INSPECTION END

Component Inspection

INFOID:0000000005353727

1.CHECK ICC STEERING SWITCH

1. Turn ignition switch OFF.
2. Disconnect combination switch (spiral cable) harness connector.
3. Check resistance between combination switch (spiral cable) harness connector terminals under the following conditions.



Combination switch (spiral cable)		Condition	Resistance (Ω)
Connector	Terminals		
M303	18 and 21	MAIN switch: Pressed	Approx. 0
		LDP 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

P1568 ICC FUNCTION

DTC Logic

INFOID:0000000005353728

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-442, "DTC Logic".**
- **If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-444, "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 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Press MAIN switch on ICC steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH).
   CAUTION:
   Always drive vehicle at a safe speed.
4. Press SET/COAST switch.
5. Check DTC.

Is DTC detected?

YES >> Go to EC-532, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353729

1.REPLACE ICC SENSOR INTEGRATED UNIT

1. Replace ICC sensor integrated unit.
2. Perform ACS-14, "ICC System Running Test".
3. Check DTC of ICC sensor integrated unit. Refer to ACS-40, "Diagnostic Trouble Code (DTC) Chart".

>> INSPECTION END

P1572 ASCD BRAKE SWITCH

Description

INFOID:0000000005353730

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-68, "System Description" for the ASCD function.

DTC Logic

INFOID:0000000005353731

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "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-I

With CONSULT-III

1. Start engine (VDC switch OFF).
2. Select “DATA MONITOR” mode with CONSULT-III.
3. Press MAIN switch and make sure that CRUISE lamp illuminates.
4. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position

5. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

Is 1st trip DTC detected?

YES >> Go to EC-535, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

With CONSULT-III

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

With GST

Follow the procedure “With CONSULT-III” above.

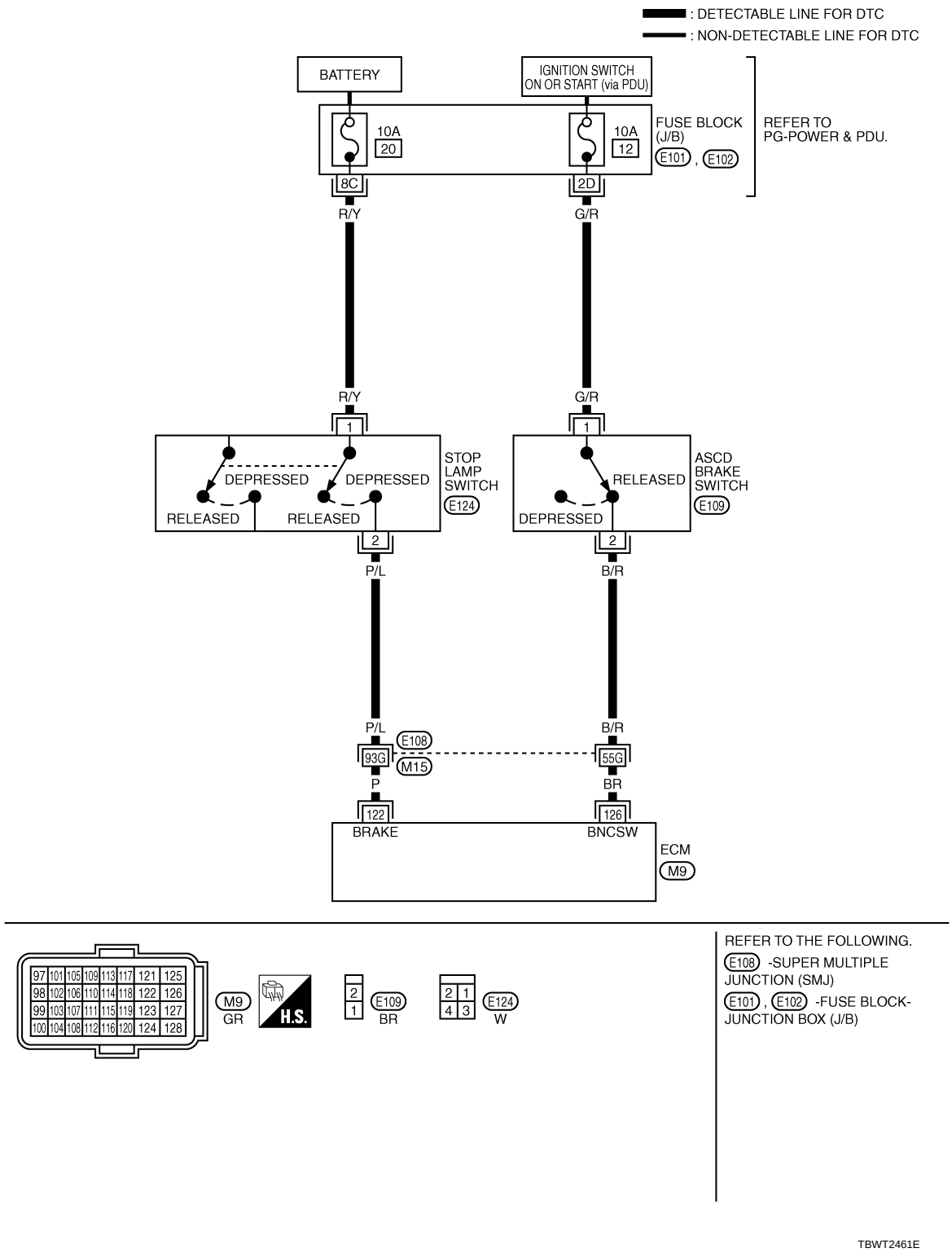
Is 1st trip DTC detected?

YES >> Go to EC-535, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353732

EC-ASC/BS-01



TBWT2461E

Diagnosis Procedure

INFOID:0000000005353733

1. CHECK OVERALL FUNCTION-I

With CONSULT-III

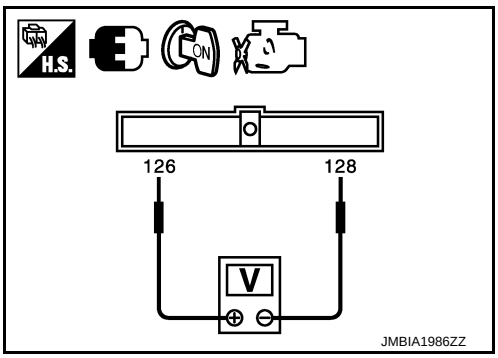
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.

3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

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			
M9	126 (ASCD brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

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

2. CHECK OVERALL FUNCTION-II

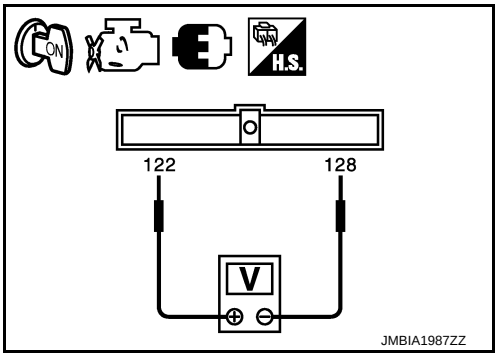
With CONSULT-III

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-III

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



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	122 (Stop lamp switch signal)	128	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

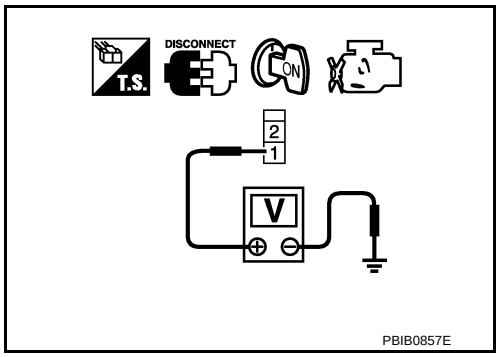
Is the inspection result normal?

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 E102
- 10 A fuse (No. 12)
- Harness for open or short between ASCD brake switch and fuse

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

5. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. 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	M9	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 E108, M15
- 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-539, "Component Inspection (ASCD Brake Switch)"

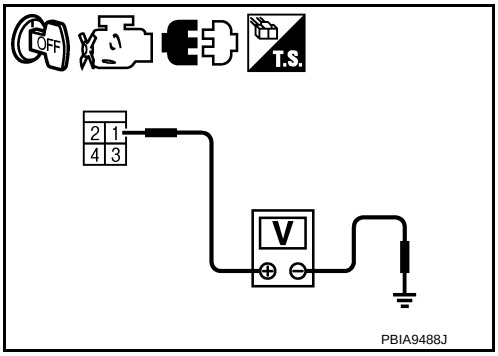
Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace ASCD brake switch.

8.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E124	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 E101
- 10 A fuse (No. 20)
- 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	
E124	2	M9	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.
- Harness connectors E108, M15
- 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-539, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace stop lamp switch.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000005353734

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-6, "Inspection and Adjustment".
2. Check the continuity between ASCD brake switch terminals under the following conditions.

Terminals	Condition		Continuity
1 and 2	Brake pedal	Fully released	Existed
		Slightly depressed	Not existed

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ASCD brake switch.

Component Inspection (Stop Lamp Switch)

INFOID:0000000005353735

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-6, "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.

P1572 ICC BRAKE SWITCH

Description

INFOID:0000000005353736

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 ACS-9 for the ICC function.

DTC Logic

INFOID:0000000005353737

DTC DETECTION LOGIC

NOTE:

- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "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-I

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.

VHCL SPEED SE	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-543, "Diagnosis Procedure".
NO >> GO TO 3.

3. PERFORM DTC CONFIRMATION PROCEDURE-II

1. Drive the vehicle for at least 5 consecutive seconds under the following conditions.
   CAUTION:
   Always drive vehicle at a safe speed.
   NOTE:
   This procedure may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

VHCL SPEED SE	More than 30 km/h (19 mph)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

2. Check 1st trip DTC.

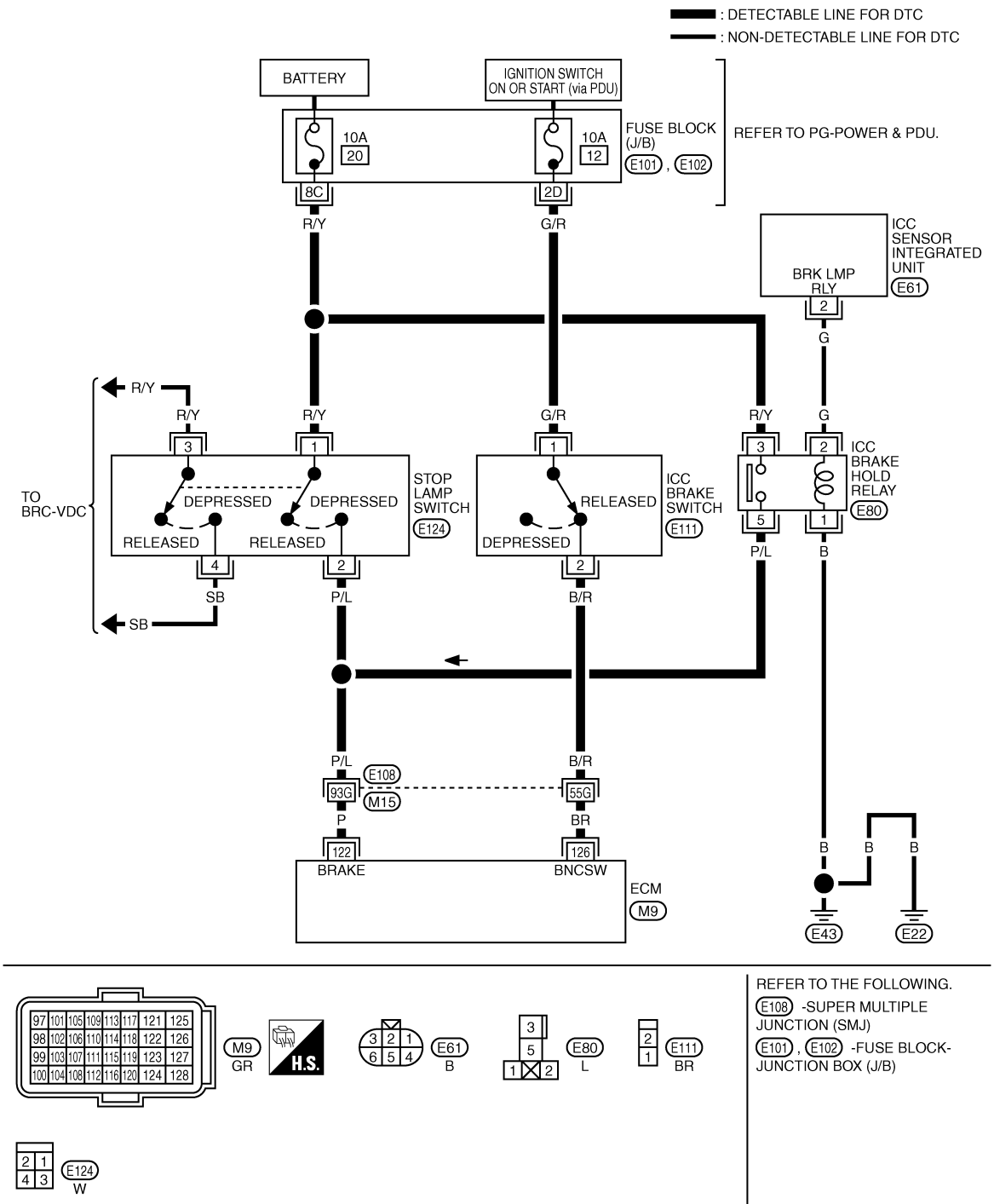
Is 1st trip DTC detected?

YES >> Go to EC-543, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353738

EC-ICC/BS-01



TBWT2460E

Diagnosis Procedure

INFOID:0000000005353739

1. CHECK OVERALL FUNCTION-I

With CONSULT-III

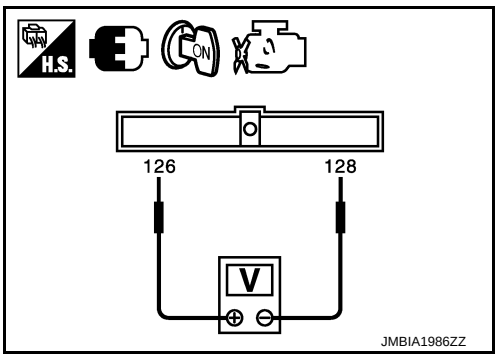
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.

3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

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			
M9	126 (ICC brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

Is the inspection result normal?

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

2. CHECK OVERALL FUNCTION-II

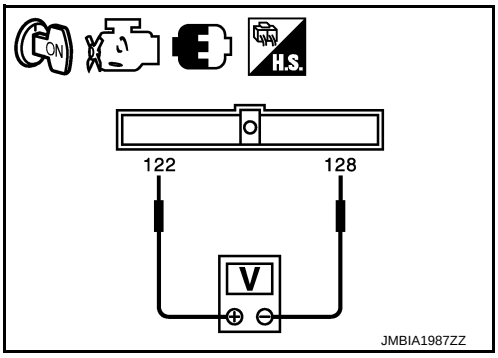
With CONSULT-III

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-III

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



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	122 (Stop lamp switch signal)	128	Brake pedal	Slightly depressed	Battery voltage
				Fully released	Approx. 0

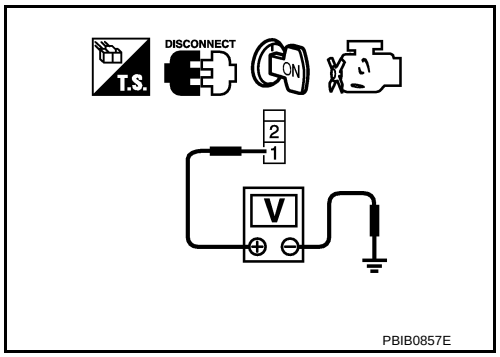
Is the inspection result normal?

YES >> GO TO 15.
NO >> GO TO 8.

3. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Turn ignition switch ON.
4. Check the voltage between ICC brake switch harness connector and ground.

ICC brake switch		Ground	Voltage
Connector	Terminal		
E111	1	Ground	Battery voltage



Is the inspection result normal?

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

4. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E102
- 10 A fuse (No. 12)
- Harness for open or short between ICC brake hold relay switch and fuse

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

5. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

ICC brake switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E111	2	M9	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 E108, M15

• Harness for open or short between ICC brake switch and ECM

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

7. CHECK ICC BRAKE SWITCH

Refer to EC-547, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace ICC brake switch.

8. CHECK DTC WITH ICC SENSOR INTEGRATED UNIT

Refer to ACS-40, "Diagnostic Trouble Code (DTC) Chart".

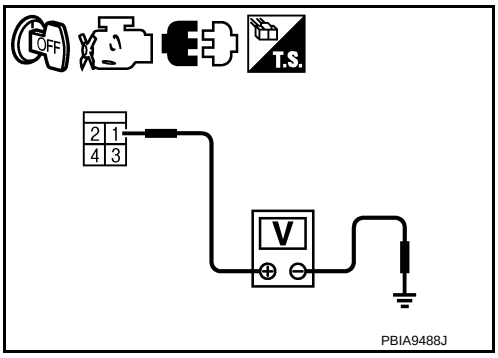
Is the inspection result normal?

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

9. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

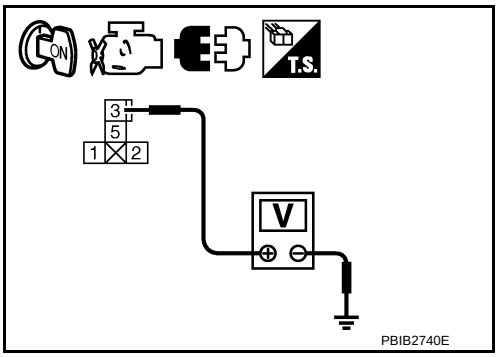
1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Disconnect ICC brake hold relay.
4. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E124	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		
E80	3	Ground	Battery voltage



Is the inspection result normal?

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

10. DETECT MALFUNCTIONING PART

Check the following.
• Fuse block (J/B) connector E101
• 10 A fuse (No. 20)
• 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, short to ground or short to power in harness or connectors.

11. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check the continuity between stop lamp switch harness connector and ECM harness connector.

Stop lamp switch		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E124	2	M9	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	
E80	5	M9	122	Existed

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

Is the inspection result normal?

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

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- 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.

13. CHECK STOP LAMP SWITCH

Refer to EC-548, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace stop lamp switch.

14. CHECK ICC BRAKE HOLD RELAY

Refer to EC-548, "Component Inspection (ICC Brake Hold Relay)".

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace ICC brake hold relay.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000005353740

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-6, "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.

Component Inspection (Stop Lamp Switch)

INFOID:0000000005353741

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-6, "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.

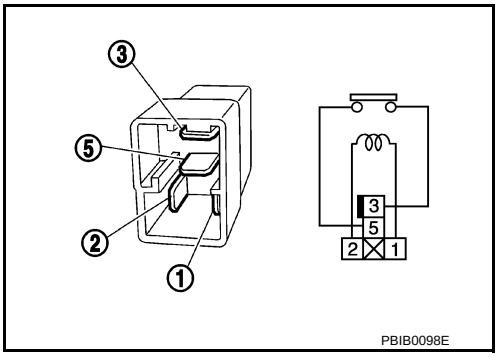
Component Inspection (ICC Brake Hold Relay)

INFOID:0000000005353742

1.CHECK ICC BRAKE HOLD RELAY

1. Turn ignition switch OFF.
2. Remove ICC brake hold relay.
3. Check the continuity between ICC brake hold relay terminals under the following conditions.

Terminals	Condition	Continuity
3 and 5	12 V direct current supply between terminals 1 and 2	Not existed
	No current supply	Existed



PBIB0098E

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace ICC brake hold relay

P1574 ASCD VEHICLE SPEED SENSOR

Description

INFOID:0000000005353743

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 ASCD control. Refer to EC-68, "System Description" for ASCD functions.

DTC Logic

INFOID:0000000005353744

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-429, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-444, "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-549, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353745

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-47, "Introduction".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform troubleshooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-12.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

>> INSPECTION END

P1574 ICC VEHICLE SPEED SENSOR

Description

INFOID:0000000005353746

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 ACS-9 for ICC functions.

DTC Logic

INFOID:0000000005353747

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-429, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "DTC Logic".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-444, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574	ICC vehicle speed sensor	ECM detects a difference between two vehicle speed signals is out of the specified range.	• Harness or connectors (The CAN communication line is open or shorted.) • 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-551, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353748

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-47, "Introduction".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform troubleshooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-12.

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Check combination meter function.
Refer to DI-28, "CONSULT-III Function (METER/M&A)".

>> INSPECTION END

P1715 INPUT SPEED SENSOR

Description

INFOID:0000000005353749

ECM receives Input speed sensor signal from TCM through CAN communication line. ECM uses this signal for engine control.

DTC Logic

INFOID:0000000005353750

DTC DETECTION LOGIC

NOTE:

- **If DTC P1715 is displayed with DTC UXXXX first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-340, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to EC-346, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-442, "DTC Logic".**
- **If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-444, "DTC Logic".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715	Input speed sensor (TCM output)	Input speed sensor signal is different from the theoretical value calculated by ECM from output speed sensor signal and engine rpm signal.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (Input speed sensor circuit is open or shorted) • TCM

Diagnosis Procedure

INFOID:0000000005353751

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-47, "Introduction".

Is the inspection result normal?

YES >> GO TO 2.
NO >> Perform trouble shooting relevant to DTC indicated.

2.REPLACE TCM

Replace TCM.

>> INSPECTION END

P1805 BRAKE SWITCH

Description

INFOID:0000000005353752

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

INFOID:0000000005353753

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.

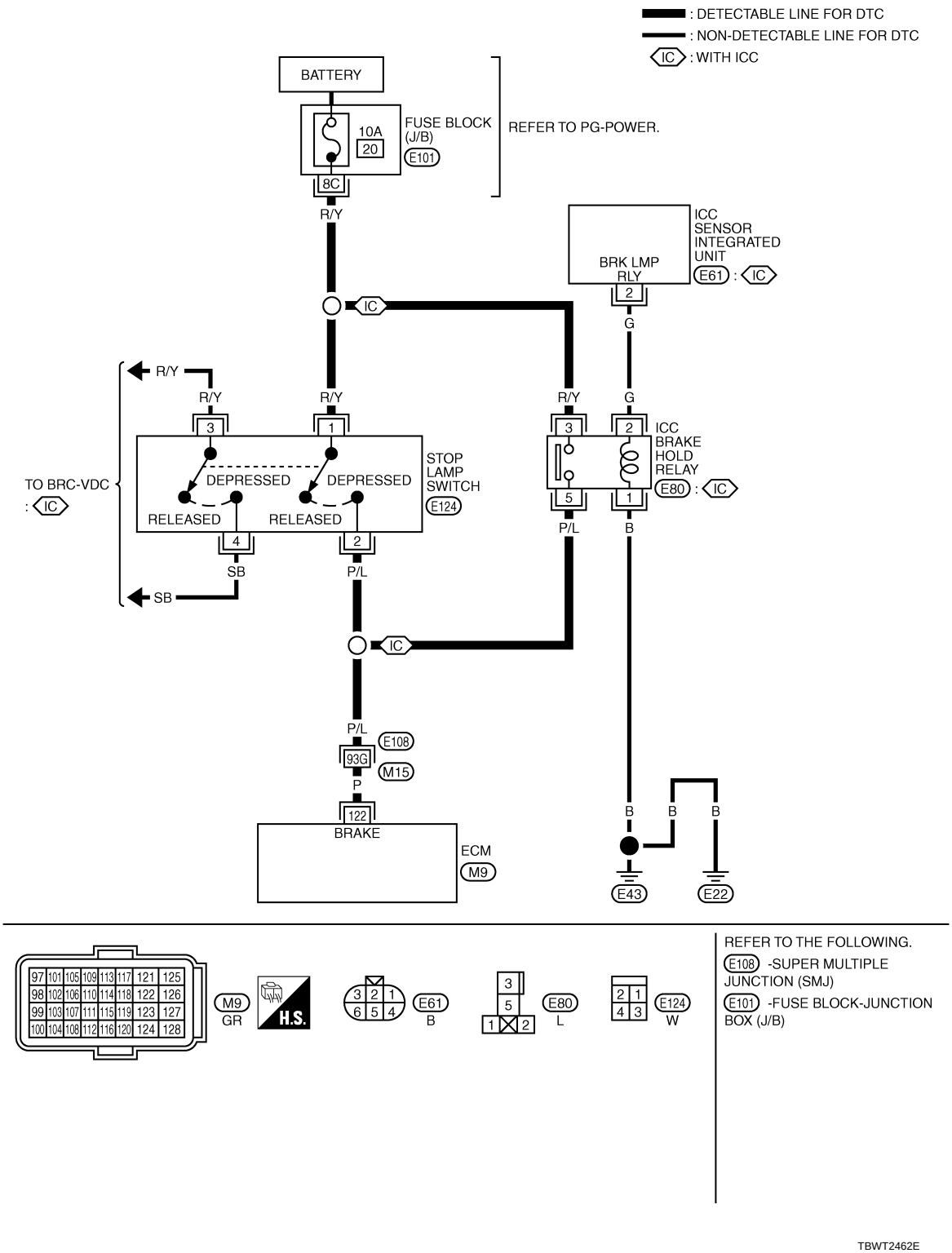
Is 1st trip DTC detected?

YES >> Go to EC-555, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353754

EC-BRK/SW-01



TBWT2462E

Diagnosis Procedure

INFOID:0000000005353755

1. CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp illumination under the following conditions.

Condition		Stop lamp
Brake pedal	Fully released	Not illuminated
	Slightly depressed	Illuminated

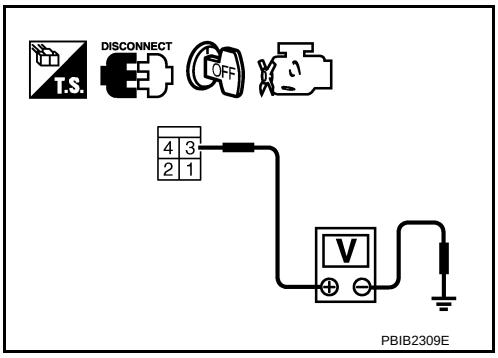
Is the inspection result normal?

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

2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch harness connector.
2. Check the voltage between stop lamp switch harness connector and ground.

Stop lamp switch		Ground	Voltage
Connector	Terminal		
E124	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 E101
- 10 A fuse (No. 20)
- 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	
E124	2	M9	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.
- Harness connectors E108, M15
- 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-557, "Component Inspection (Stop Lamp Switch)".

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection (Stop Lamp Switch)

INFOID:0000000005353756

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-6, "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?

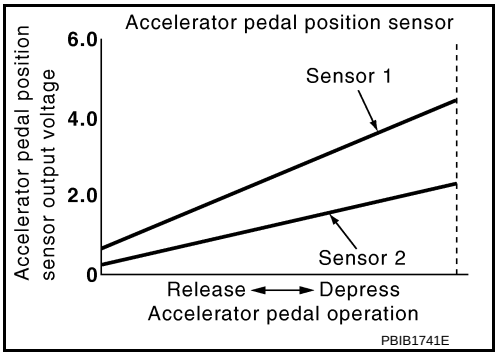
YES >> INSPECTION END
NO >> Replace stop lamp switch.

P2122, P2123 APP SENSOR

Description

INFOID:0000000005353757

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. In addition, these sensors detect the opening and closing speed of the accelerator pedal and sends voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



DTC Logic

INFOID:0000000005353758

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-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122	Accelerator pedal position (APP) 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 (APP) 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.

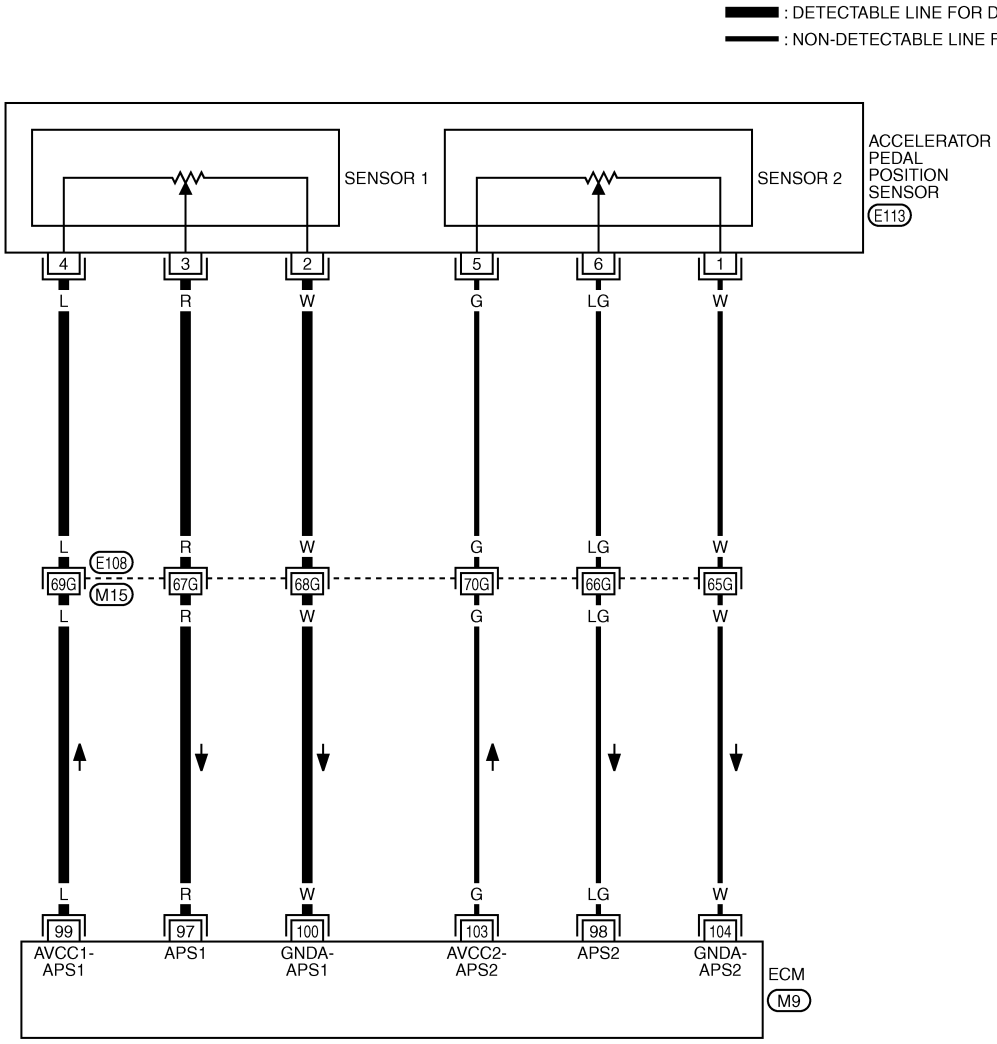
Is DTC detected?

YES >> Go to EC-559, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353759

EC-APPS1-01



REFER TO THE FOLLOWING.
E108 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT2469E

Diagnosis Procedure

INFOID:0000000005353760

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

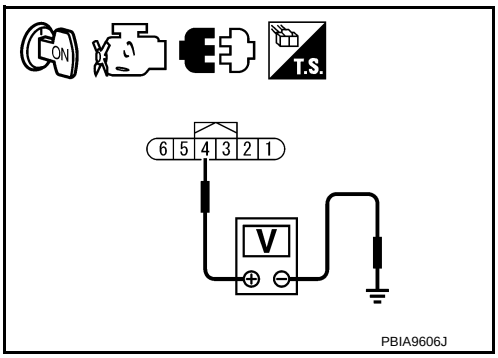
Is the inspection result normal?

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

2.CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect 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		
E113	4	Ground	Approx. 5



Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and APP 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	
E113	2	M9	100	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 E108, M15
- Harness for open or short between ECM and APP 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	
E113	3	M9	97	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 E108, M15
- Harness for open or short between ECM and APP sensor

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

8. CHECK APP SENSOR

Refer to EC-561, "Component Inspection".

Is the inspection result normal?

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

9. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

10. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

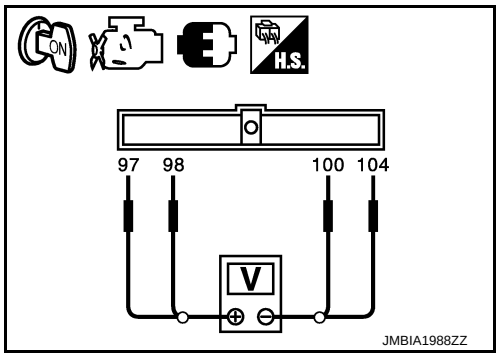
>> INSPECTION END

Component Inspection

INFOID:0000000005353761

1. CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	97 (APP sensor 1)	100	Accelerator pedal	Fully released	0.45 - 1.0
				Fully depressed	4.4 - 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.
2. Go to EC-562, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353762

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

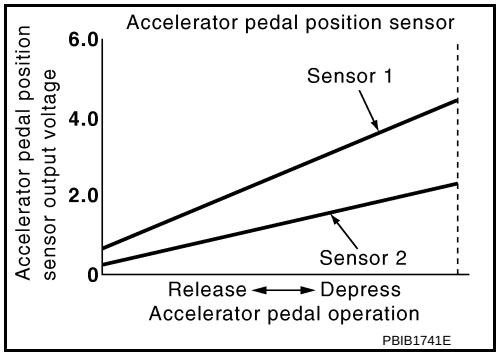
>> END

P2127, P2128 APP SENSOR

Description

INFOID:0000000005353763

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. In addition, these sensors detect the opening and closing speed of the accelerator pedal and sends voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



DTC Logic

INFOID:0000000005353764

DTC DETECTION LOGIC

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127	Accelerator pedal position (APP) sensor 2 circuit low input	An excessively low voltage from the APP sensor 2 is sent to ECM.	• Harness or connectors (APP sensor 2 circuit is open or shorted.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • APP sensor (APP sensor 2) • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • Battery current sensor • EVAP control system pressure sensor • Refrigerant pressure sensor
P2128	Accelerator pedal position (APP) 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.

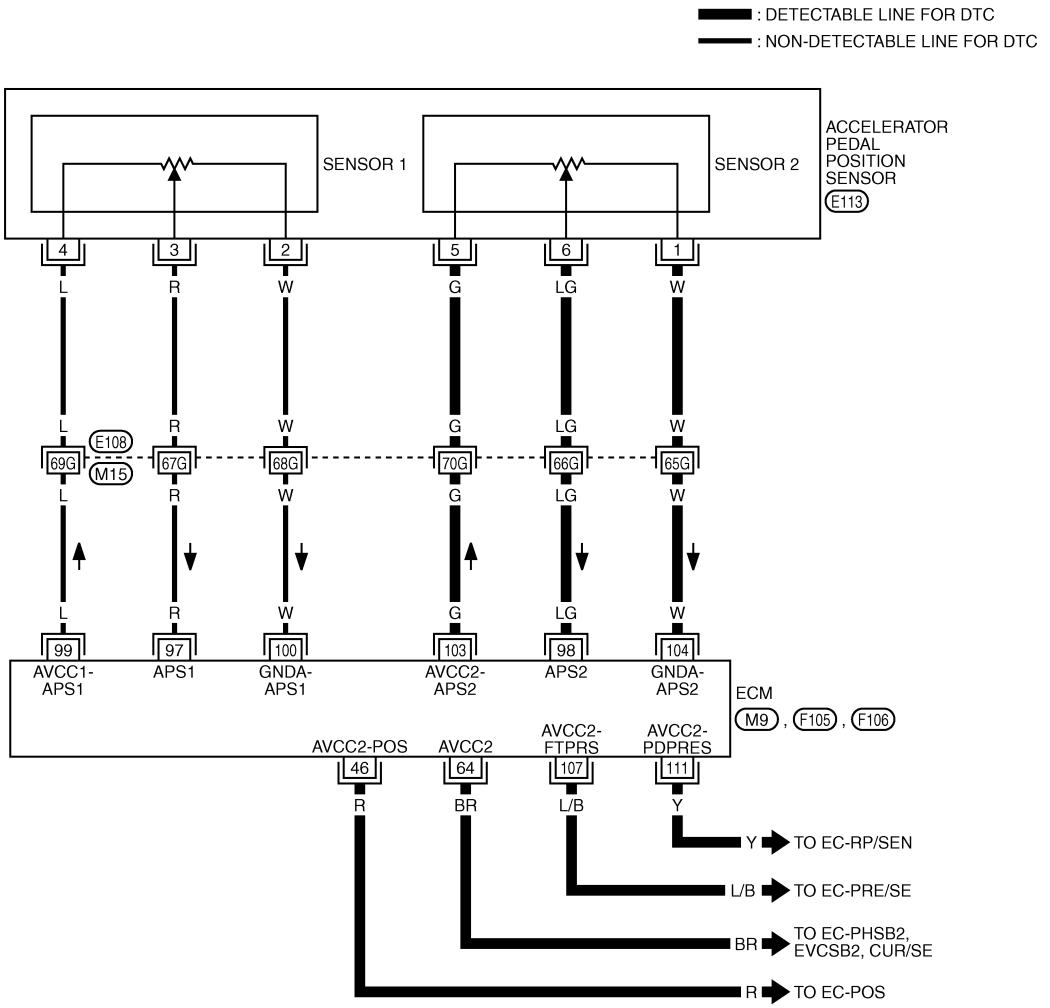
Is DTC detected?

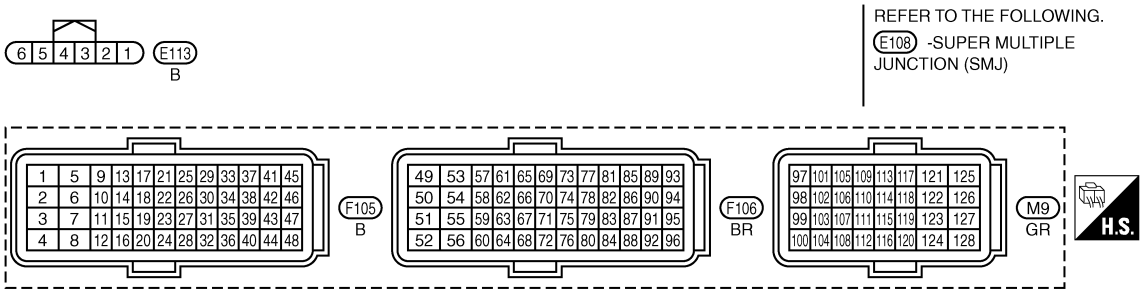
YES >> Go to EC-564, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353765

EC-APPS2-01





TBWT2470E

Diagnosis Procedure

INFOID:0000000005353766

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

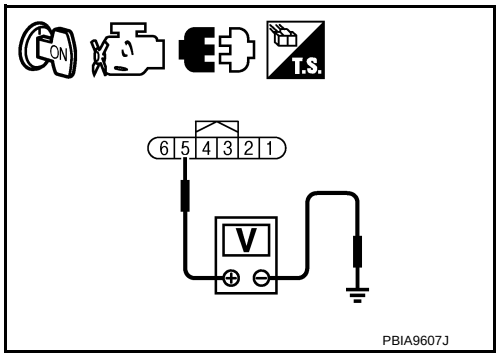
Is the inspection result normal?

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

2.CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect 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		
E113	5	Ground	Approx. 5



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	
E113	5	M9	103	Existed

Is the inspection result normal?

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

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open between ECM and APP sensor

>> Repair open circuit.

5.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-III

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

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1

ECM		Sensor		
Connector	Terminal	Name	Connector	Terminal
M9	103	APP sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

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	
E113	1	M9	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 E108, M15
- Harness for open or short between ECM and APP 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	
E113	6	M9	98	Existed

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 E108, M15
- 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-567, "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.
2. Go to EC-568, "Special Repair Requirement".

>> INSPECTION END

13. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

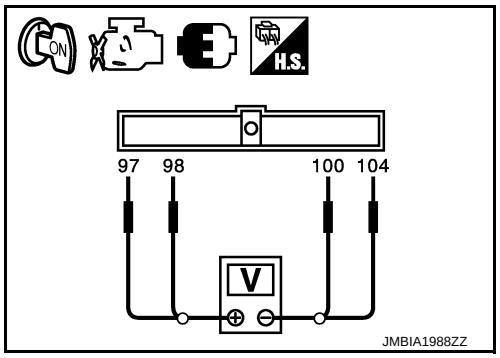
>> INSPECTION END

Component Inspection

INFOID:0000000005353767

1. CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.
4. Check the voltage ECM harness connector terminals under the following conditions.



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	97 (APP sensor 1)	100	Accelerator pedal	Fully released	0.45 - 1.0
				Fully depressed	4.4 - 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.
2. Go to EC-574, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353768

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

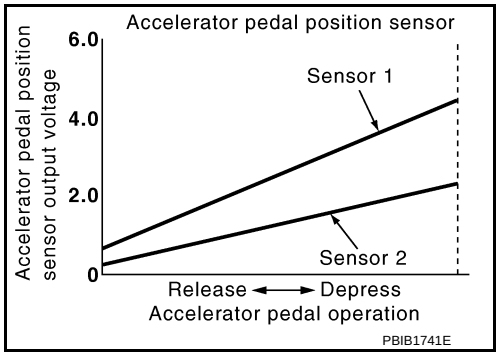
>> END

P2138 APP SENSOR

Description

INFOID:0000000005353769

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. In addition, these sensors detect the opening and closing speed of the accelerator pedal and sends voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle control motor based on these signals.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for engine operations such as fuel cut.



DTC Logic

INFOID:0000000005353770

DTC DETECTION LOGIC

NOTE:
If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-445, "DTC Logic".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138	Accelerator pedal position (APP) 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.) [Crankshaft position (CKP) sensor circuit is shorted.] [Camshaft position (CMP) sensor (bank 2) circuit is shorted.] [Exhaust valve timing (EVT) control position sensor (bank 2) circuit is shorted.] (Battery current sensor circuit is shorted.) (EVAP control system pressure sensor circuit is shorted.) (Refrigerant pressure sensor circuit is shorted.) • APP sensor (APP sensor 2) • CKP sensor • CMP sensor (bank 2) • EVT control position sensor (bank 2) • Battery current sensor • EVAP control system 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.

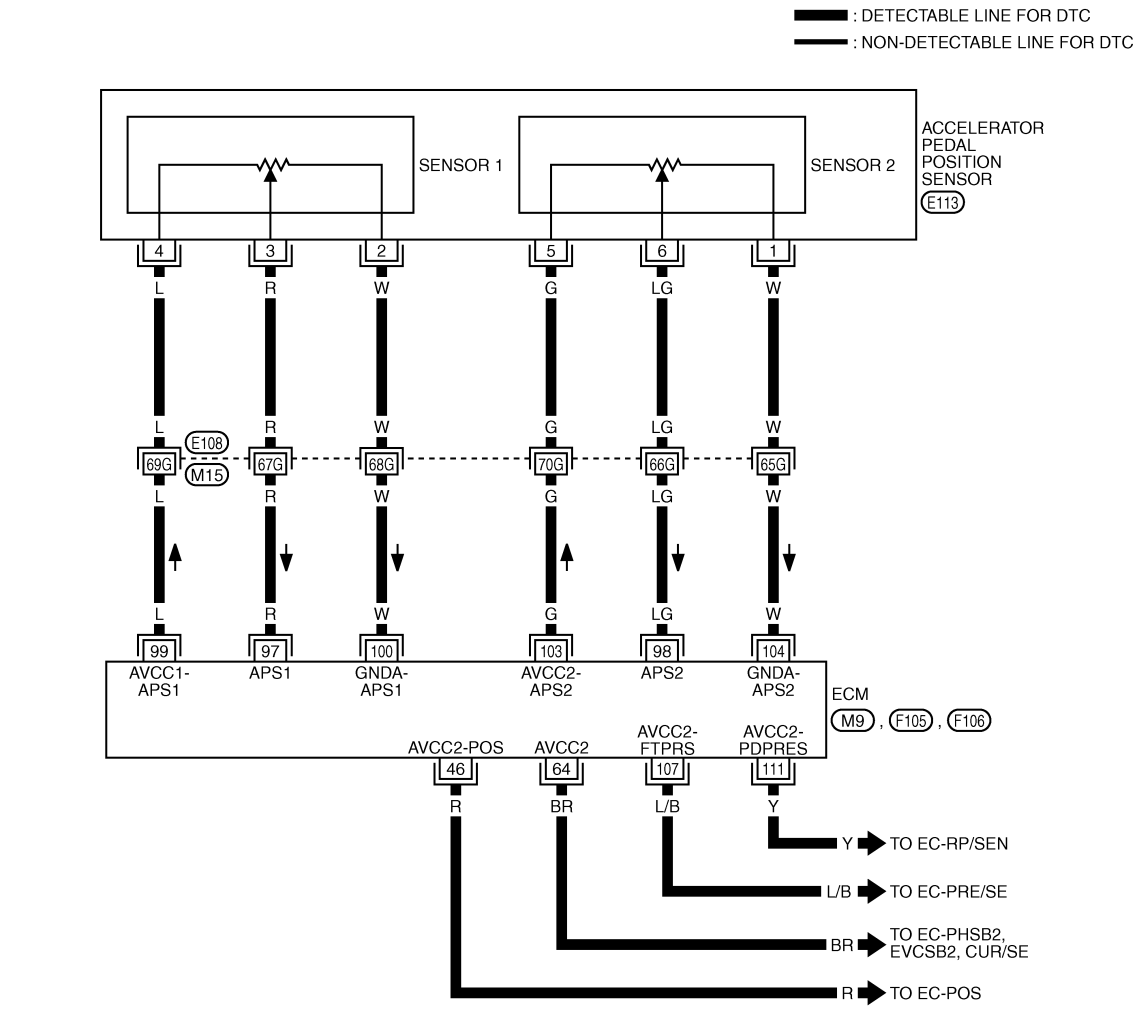
Is DTC detected?

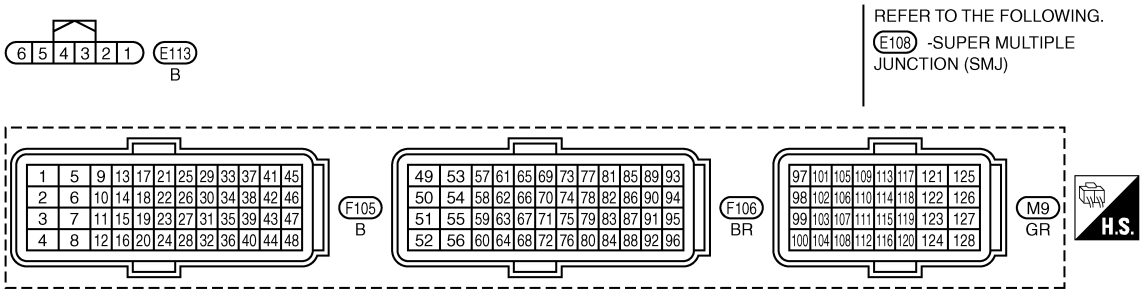
YES >> Go to EC-571, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353771

EC-APPS3-01





TBWT2473E

Diagnosis Procedure

INFOID:0000000005353772

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

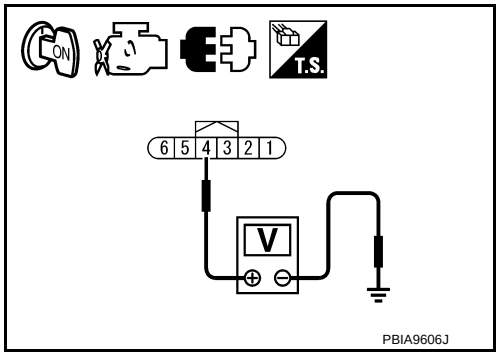
Is the inspection result normal?

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

2. CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect 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		
E113	4	Ground	Approx. 5



Is the inspection result normal?

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

3. DETECT MALFUNCTIONING PART

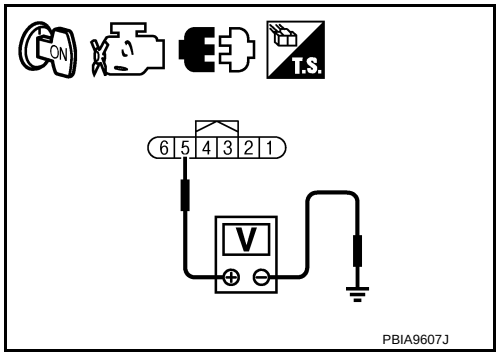
Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> 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		
E113	5	Ground	Approx. 5



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	
E113	5	M9	103	Existed

Is the inspection result normal?

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

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open between ECM and APP 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
F105	46	Crankshaft position (CKP) sensor	F52	1
F106	64	Camshaft position (CMP) sensor (bank 2)	F32	1
		Exhaust valve timing (EVT) control position sensor (bank 2)	F83	1
		Battery current sensor	E67	1
M9	103	APP sensor	E113	5
	107	EVAP control system pressure sensor	B172	3
	111	Refrigerant pressure sensor	E66	1

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.
- CKP sensor (Refer to EC-345, "Component Inspection".)
- CMP sensor (bank 2) (Refer to EC-352, "Component Inspection".)
- EVT control position sensor (bank 2) (Refer to EC-459, "Component Inspection".)
- Battery current sensor (Refer to EC-502, "Component Inspection".)
- EVAP control system pressure sensor (Refer to EC-394, "Component Inspection".)
- Refrigerant pressure sensor (Refer to ATC-80, "Magnet Clutch Circuit".)

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.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E113	2	M9	100	Existed
	1		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 E108, M15
- Harness for open or short between ECM and APP 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.

APP sensor		ECM		Continuity
Connector	Terminal	Connector	Terminal	
E112	3	M9	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 E108, M15
- Harness for open or short between ECM and APP sensor

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

13. CHECK APP SENSOR

Refer to EC-573, "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.
2. Go to EC-574, "Special Repair Requirement".

>> INSPECTION END

15. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

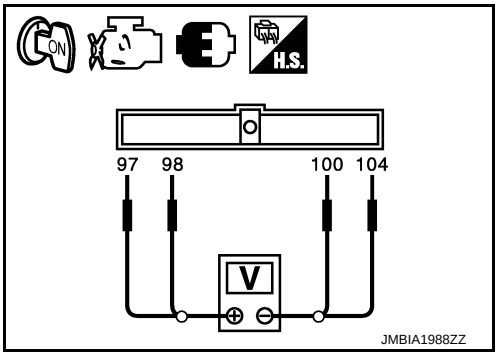
Component Inspection

INFOID:0000000005353773

1. CHECK ACCELERATOR PEDAL POSITION (APP) SENSOR

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Turn ignition switch ON.

4. Check the voltage ECM harness connector terminals under the following conditions.



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	97 (APP sensor 1)	100	Accelerator pedal	Fully released	0.45 - 1.0
				Fully depressed	4.4 - 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.
2. Go to EC-574, "Special Repair Requirement".

>> INSPECTION END

Special Repair Requirement

INFOID:0000000005353774

1.PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

Refer to EC-27, "ACCELERATOR PEDAL RELEASED POSITION LEARNING : Special Repair Requirement".

>> GO TO 2.

2.PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Refer to EC-27, "THROTTLE VALVE CLOSED POSITION LEARNING : Special Repair Requirement".

>> GO TO 3.

3.PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-27, "IDLE AIR VOLUME LEARNING : Special Repair Requirement".

>> END

P2A00, P2A03 A/F SENSOR 1

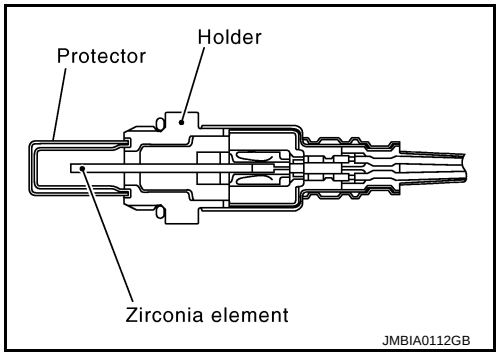
Description

INFOID:0000000005353775

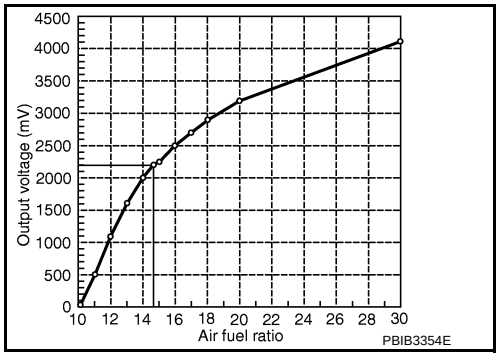
The air fuel ratio (A/F) sensor 1 is a planar one-cell limit current sensor. The sensor element of the A/F sensor 1 is composed an electrode layer, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range.

The exhaust gas components diffuse through the diffusion layer at the sensor cell. An electrode layer is applied voltage, and this current relative oxygen density in lean. Also this current relative hydrocarbon density in rich.



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



DTC Logic

INFOID:0000000005353776

DTC DETECTION LOGIC

To judge the malfunction, the air fuel ratio (A/F) signal computed by ECM from the A/F sensor 1 signal is monitored so it will not shift to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2A00	A/F sensor 1 (bank 1) circuit range/performance	• The output voltage computed by ECM from the A/F sensor 1 signal shifts to the lean side for a specified period. • The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the rich side for a specified period.	• A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leaks
P2A03	A/F sensor 1 (bank 2) 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 11 V at idle.

>> GO TO 2.

2.PERFORM DTC CONFIRMATION PROCEDURE

1. Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
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.

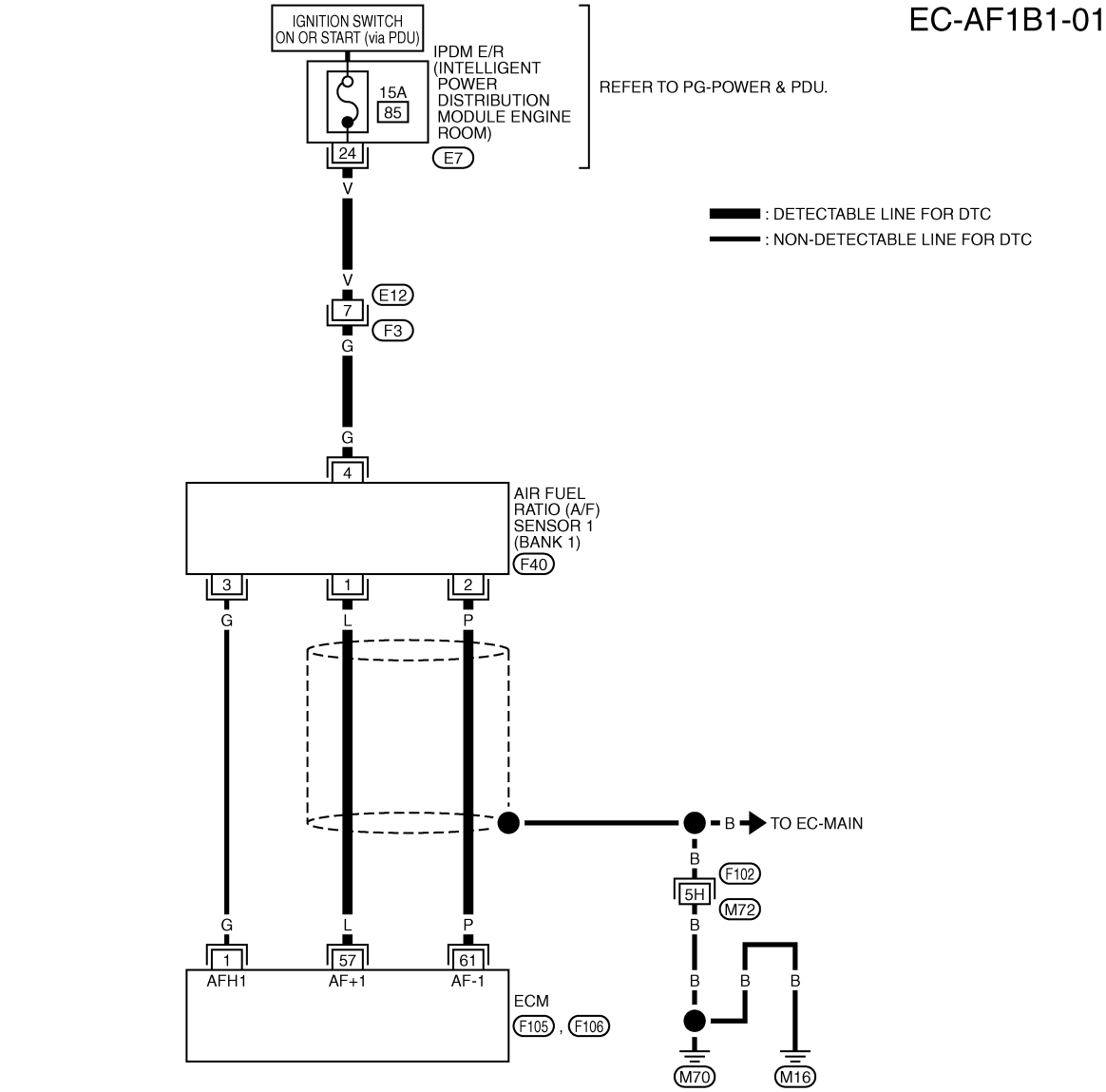
Is 1st trip DTC detected?

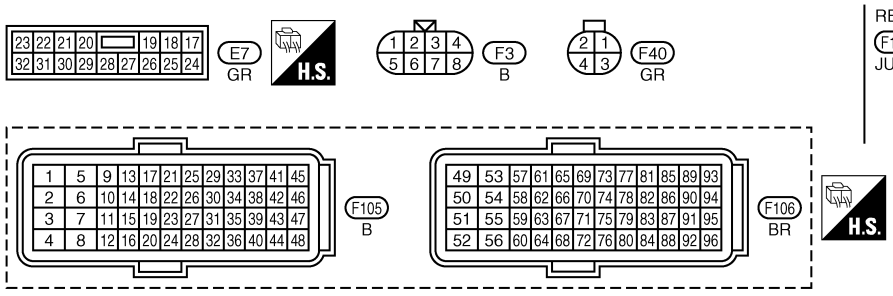
YES >> Go to EC-578, "Diagnosis Procedure".
NO >> INSPECTION END

Wiring Diagram

INFOID:0000000005353777

EC-AF1B1-01

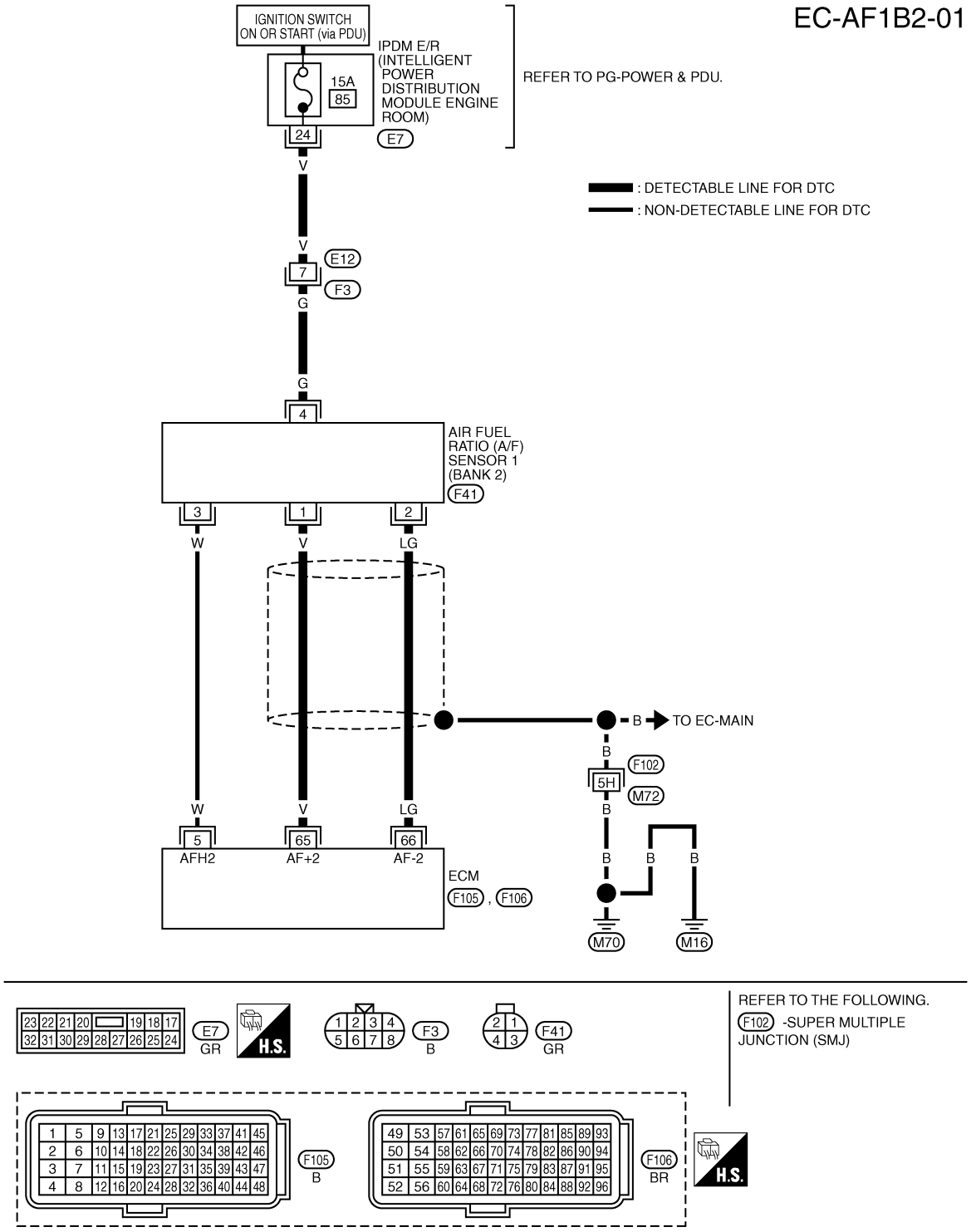




REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT2430E

EC-AF1B2-01



TBWT2431E

Diagnosis Procedure

INFOID:0000000005353778

1. CHECK GROUND CONNECTION

1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 2.

NO >> Repair or replace ground connections.

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

1. Loosen and retighten the A/F sensor 1. Refer to EM-24, "Removal and Installation".

>> GO TO 3.

3. CHECK FOR INTAKE AIR LEAK

1. Start engine and run it at idle.
2. Listen for an intake air leak after the mass air flow sensor.

Is intake air leak detected?

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

4. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

1. Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".
2. Run engine for at least 10 minutes at idle speed.

Is the 1st trip DTC P0171, 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-297, "Diagnosis Procedure" or EC-304, "Diagnosis Procedure".
NO >> GO TO 5.

5. CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.
3. Check that water is not inside connectors.

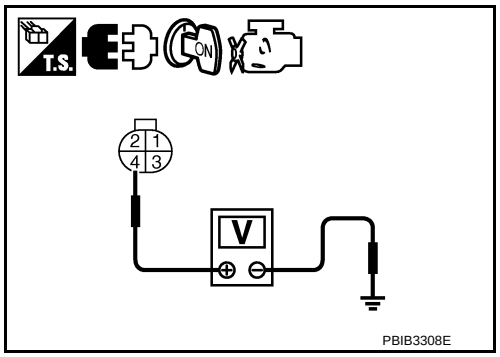
Is the inspection result normal?

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

6. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

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

DTC	A/F sensor 1			Ground	Voltage
	Bank	Connector	Terminal		
P2A00	1	F40	4	Ground	Battery voltage
P2A03	2	F41	4		



Is the inspection result normal?

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

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse (No. 85)
- 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	
P2A00	1	F40	1	F106	57	Existed
			2		61	
P2A03	2	F41	1		65	
			2		66	

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

DTC	A/F sensor 1			Ground	Continuity
	Bank	Connector	Terminal		
P2A00	1	F40	1	Ground	Not existed
			2		
P2A03	2	F41	1		
			2		

DTC	ECM		Ground	Continuity
	Connector	Terminal		
P2A00	F106	57	Ground	Not existed
		61		
P2A03		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 A/F SENSOR 1 HEATER

Refer to EC-178, "Component Inspection".

Is the inspection result normal?

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

10. CHECK INTERMITTENT INCIDENT

Perform EC-154, "Description".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Repair or replace malfunctioning part.

11. REPLACE A/F SENSOR 1

Replace A/F sensor 1.

CAUTION:

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

Will CONSULT-III be used?

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

12. CONFIRM A/F ADJUSTMENT DATA

With CONSULT-III

1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT-III.
3. Make sure that “0.000” is displayed on CONSULT-III screen.

Is “0.000” displayed?

YES >> INSPECTION END
NO >> GO TO 13.

13. CLEAR THE MIXTURE RATIO SELF-LEARNING VALUE

Clear the mixture ratio self-learning value. Refer to EC-30, "MIXTURE RATIO SELF-LEARNING VALUE CLEAR : Special Repair Requirement".

Will CONSULT-III be used?

YES >> GO TO 14.
NO >> INSPECTION END

14. CONFIRM A/F ADJUSTMENT DATA

With CONSULT-III

1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT-III.
3. Make sure that “0.000” is displayed on CONSULT-III screen.

>> INSPECTION END

ASCD BRAKE SWITCH

Description

INFOID:0000000005353779

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-68, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000005353780

1. CHECK ASCD BRAKE SWITCH FUNCTION

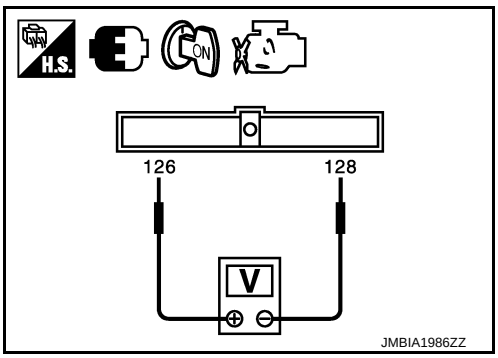
With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1	Brake pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

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			
M9	126 (ASCD brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

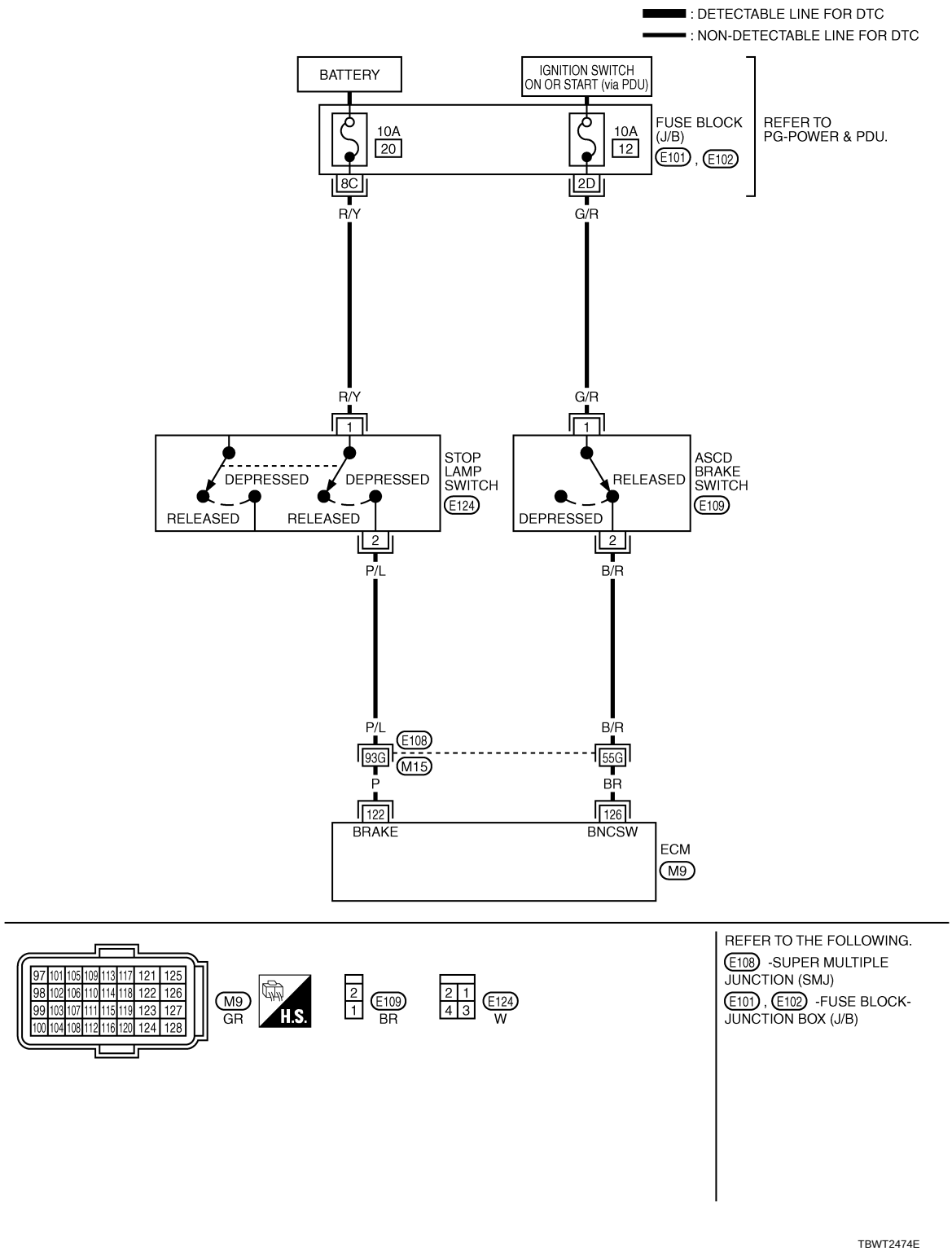
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-583, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353781

EC-ASCBOF-01



TBWT2474E

Diagnosis Procedure

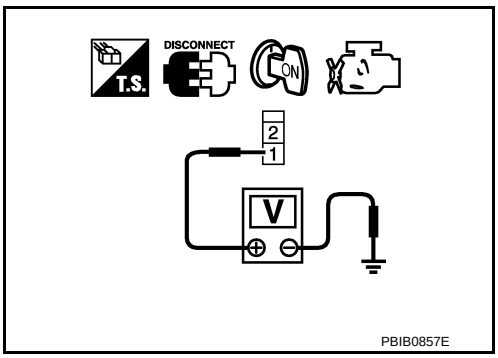
INFOID:0000000005353782

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 E102
- 10 A fuse (No. 12)
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit, short to ground or short to power 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	M9	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 E108, M15
- 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-585, "Component Inspection (ASCD Brake Switch)"

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace ASCD brake switch.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection (ASCD Brake Switch)

INFOID:0000000005353783

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-6, "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.

ASCD INDICATOR

Description

INFOID:0000000005353784

ASCD operation status is indicated by two indicators (CRUISE and SET) 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-68, "System Description" for the ASCD function.

Component Function Check

INFOID:0000000005353785

1.CHECK ASCD INDICATOR FUNCTION

Check ASCD indicator under the following conditions.

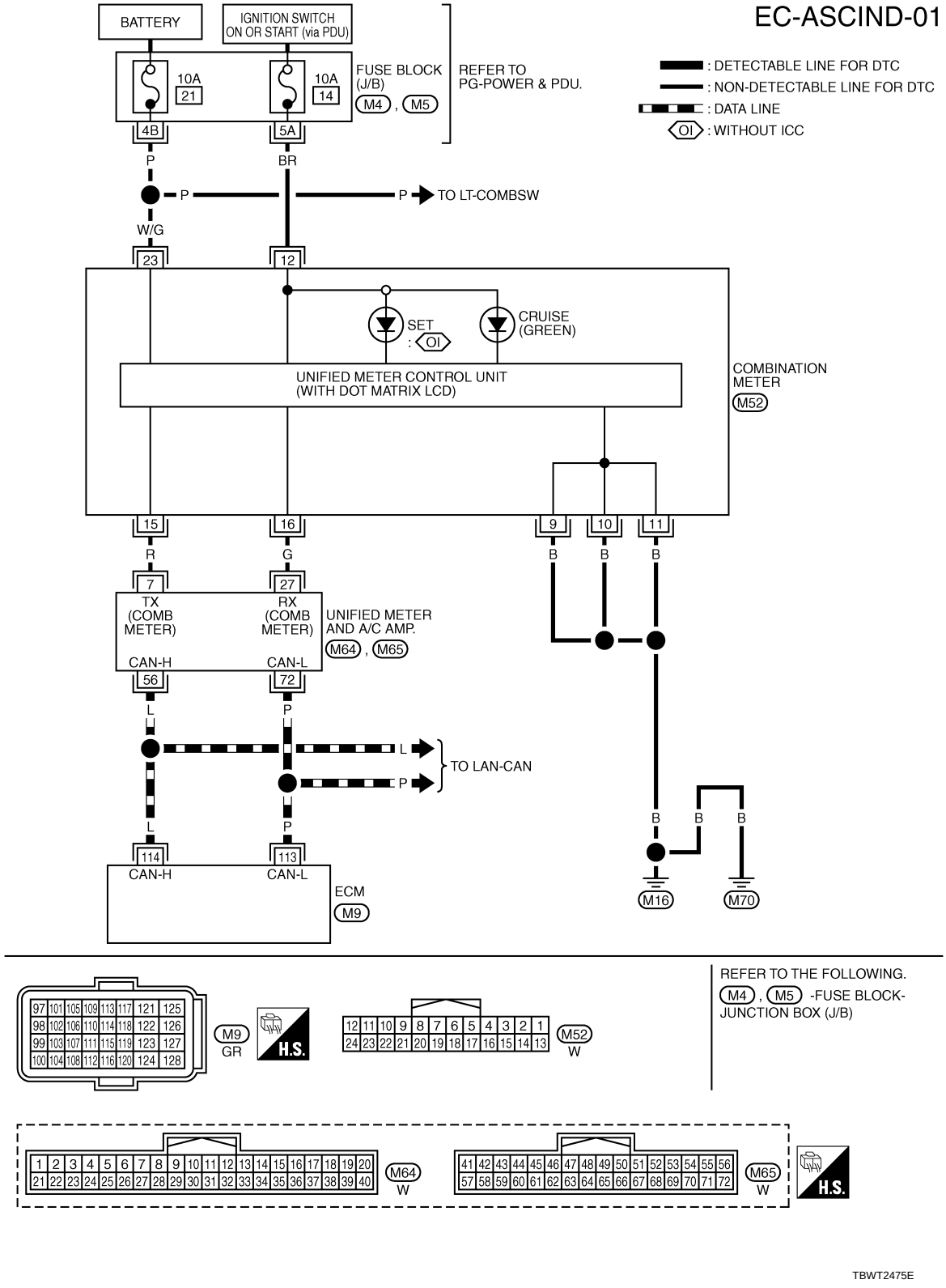
ASCD INDICATOR	CONDITION		SPECIFICATION
CRUISE	• Ignition switch: ON	• MAIN switch: Pressed at the 1st time →at the 2nd time	ON → OFF
SET	• MAIN switch: ON • When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	• ASCD: Operating	ON
		• ASCD: Not operating	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-587, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353786



TBWT2475E

Diagnosis Procedure

INFOID:0000000005353787

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 DI-28, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace malfunctioning part.

COOLING FAN

Description

INFOID:0000000005353788

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:0000000005353789

1. CHECK COOLING FAN FUNCTION

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT-III.
3. Check that cooling fan speed varies according to the percentage.

Without CONSULT-III

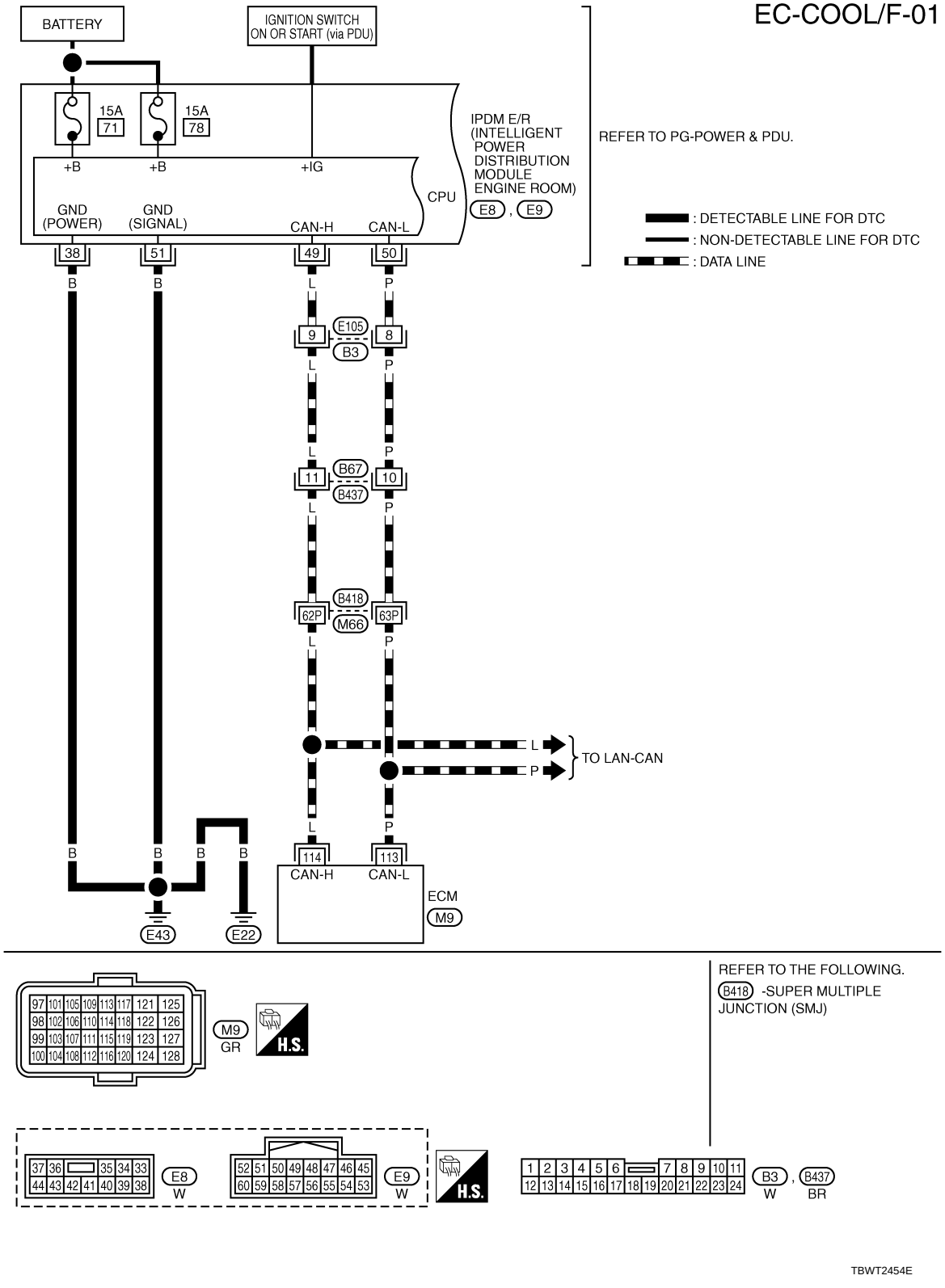
1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PG-22, "Auto Active Test".
2. Check that cooling fan operates.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-591, "Diagnosis Procedure".

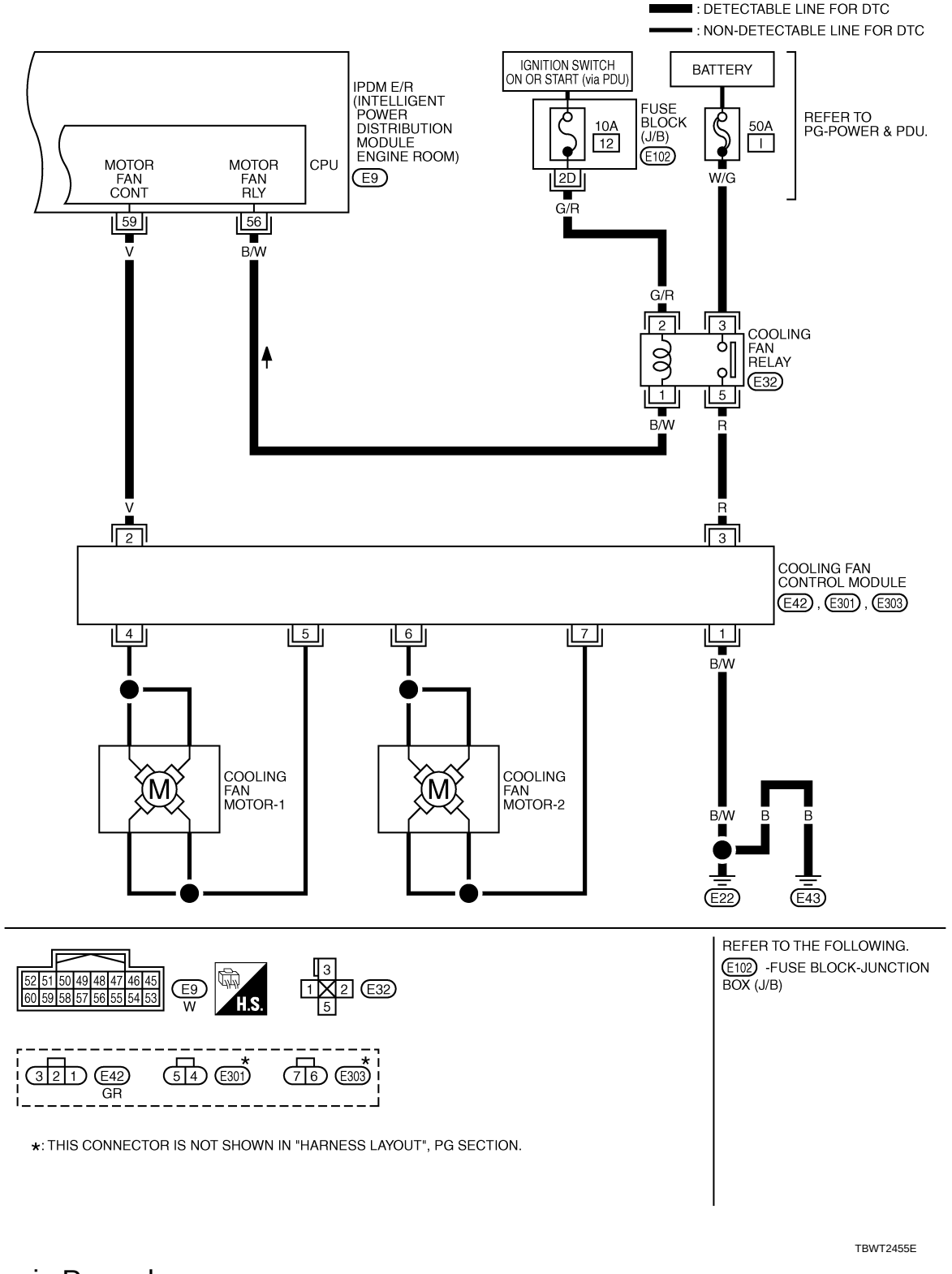
Wiring Diagram

INFOID:0000000005353790



TBWT2454E

EC-COOL/F-02



TBWT2455E

Diagnosis Procedure

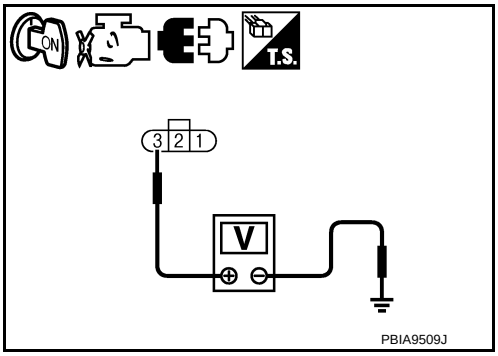
INFOID:0000000005353791

1. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect cooling fan control module harness connector.
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		
E42	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		
E42	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.
2. Check the continuity between IPDM E/R harness connector and ground.

IPDM E/R		Ground	Continuity
Connector	Terminal		
E8	38	Ground	Existed
E9	51		

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.
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	59	E42	2	Existed

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

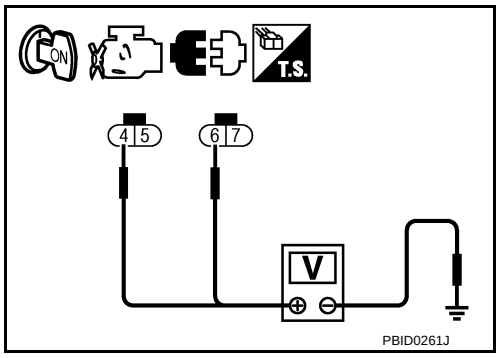
Is the inspection result normal?

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.
3. Turn ignition switch ON.
4. Check the voltage between cooling fan control module terminals and ground.

Cooling fan control module		Ground	Voltage
Connector	Terminal		
E301	4	Ground	Battery voltage
E303	6		



Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace cooling fan control module 1.

6. CHECK COOLING FAN MOTORS -1 AND -2

Refer to EC-594, "Component Inspection (Cooling Fan Motor)".

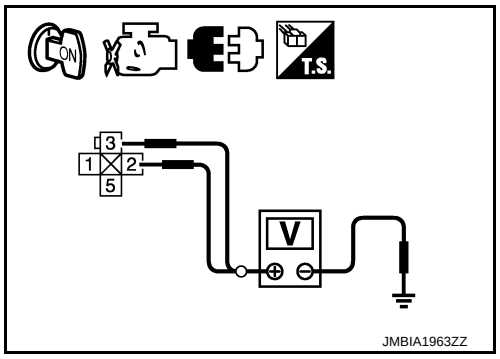
Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning cooling fan motor.

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		
E32	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.
- 10 A fuse (No. 12)
- Fuse block (J/B) connector E102
- 50 A fusible link (letter I)
- 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. Disconnect IPDM E/R harness connector.
3. Check the continuity between cooling fan relay harness connector and IPDM E/R harness connector.

Cooling fan relay		IPDM E/R		Continuity
Connector	Terminal	Connector	Terminal	
E32	1	E9	56	Existed

4. 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	
E32	5	E42	3	Existed

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

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK COOLING FAN RELAY

Refer to EC-594, "Component Inspection (Cooling Fan Relay)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace cooling fan relay.

11. CHECK INTERMITTENT INCIDENT

Perform EC-154, "Description".

Is the inspection result normal?

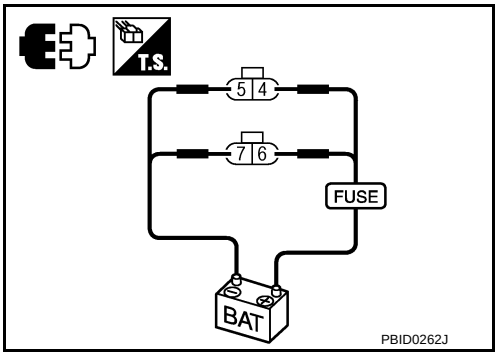
YES >> Replace IPDM E/R.
NO >> Repair or replace harness connectors.

Component Inspection (Cooling Fan Motor)

INFOID:0000000005353792

1. CHECK COOLING FAN MOTOR

1. Turn ignition switch OFF.
2. Disconnect cooling fan control module harness connectors.
3. Supply cooling fan control module harness connector terminals with battery voltage and check operation.



Cooling fan control module				Operation
Motor	Connector	Terminal		
		(+)	(–)	
1	E301	4	5	Cooling fan operates.
2	E303	6	7	

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace cooling fan motor.

Component Inspection (Cooling Fan Relay)

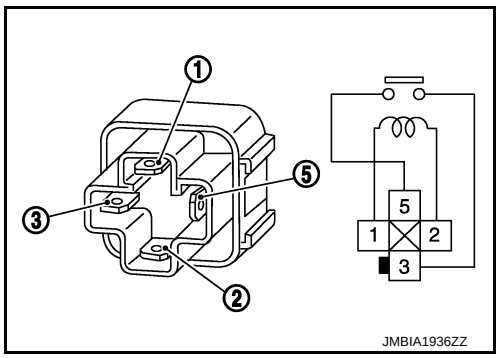
INFOID:0000000005353793

1. CHECK COOLING FAN RELAY

1. Turn ignition switch OFF.
2. Remove cooling fan relay.

3. Check the continuity between cooling fan relay terminals under the following conditions.

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.

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000005353794

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, etc.) is transferred through the CAN communication line.

Component Function Check

INFOID:0000000005353795

1.CHECK REAR WINDOW DEFOGGER SWITCH FUNCTION

1. Turn ignition switch ON.
2. Connect CONSULT-III and select “DATA MONITOR” mode.
3. Select “LOAD SIGNAL” and check indication under the following conditions.

Monitor item	Condition		Indication
LOAD SIGNAL	Rear window defogger switch	ON	ON
		OFF	OFF

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-596, "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-596, "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-596, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353796

1.INSPECTION START

Confirm the malfunctioning circuit (rear window defogger, headlamp or heater fan). Refer to EC-596, "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 GW-64, "Component Parts and Harness Connector Location".

>> INSPECTION END

3.CHECK HEADLAMP SYSTEM

Refer to LT-6 or LT-35.

>> INSPECTION END

4.CHECK HEATER FAN CONTROL SYSTEM

Refer to ATC-34, "CONSULT-III Function (ECM)".

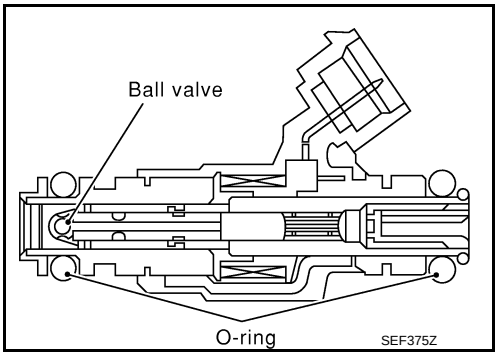
>> INSPECTION END

FUEL INJECTOR

Description

INFOID:0000000005353797

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



Component Function Check

INFOID:0000000005353798

1. INSPECTION START

Turn ignition switch to START.

Are any cylinders ignited?

YES >> GO TO 2.
NO >> Go to EC-599, "Diagnosis Procedure".

2. CHECK FUEL INJECTOR FUNCTION

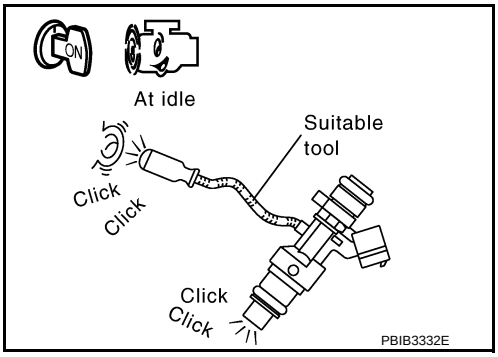
With CONSULT-III

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

Without CONSULT-III

1. Start engine.
2. Listen to each fuel injector operating sound.

Clicking sound should be heard.



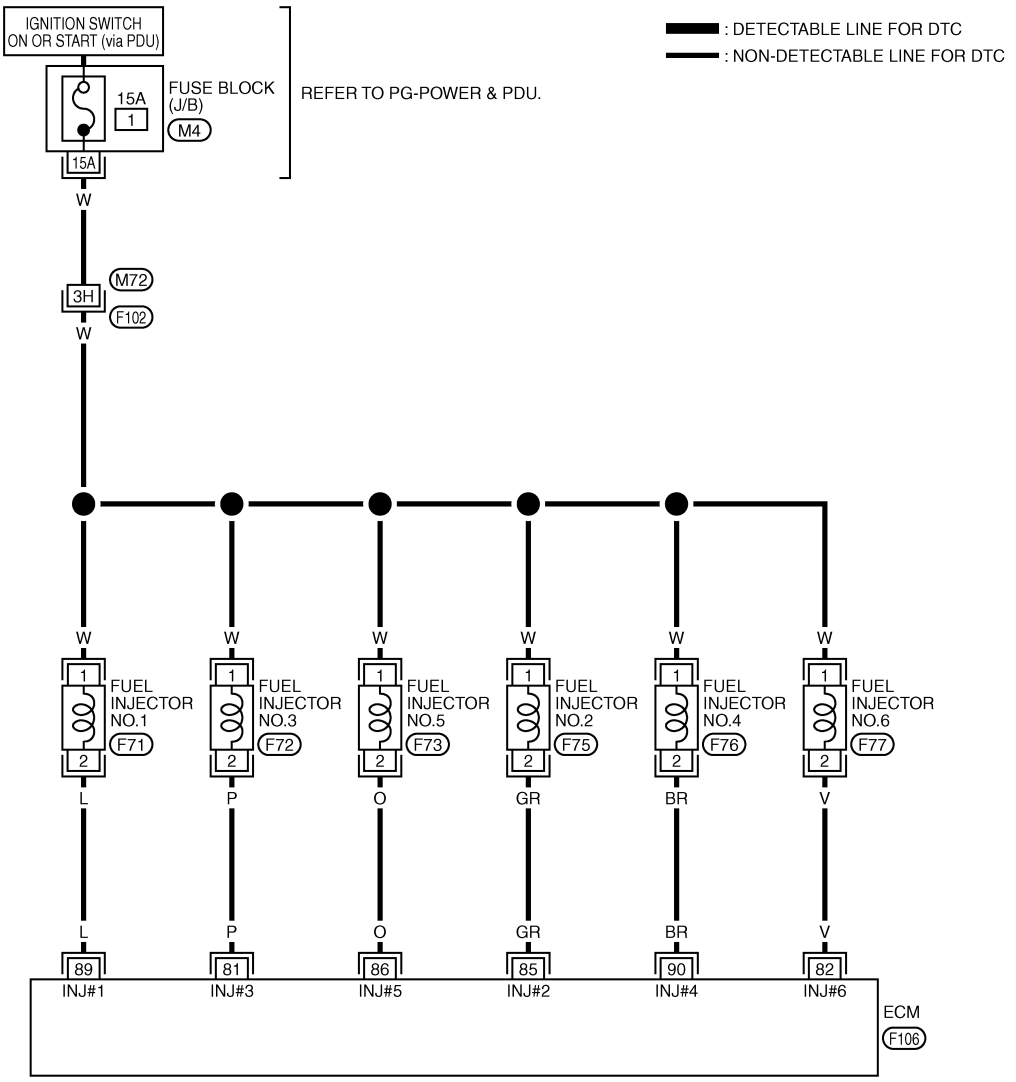
Is the inspection result normal?

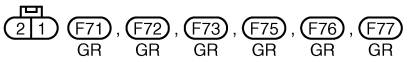
YES >> INSPECTION END
NO >> Go to EC-599, "Diagnosis Procedure".

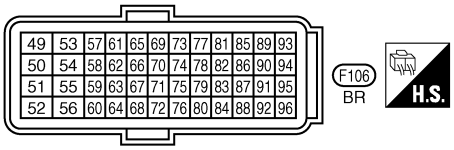
Wiring Diagram

INFOID:0000000005353799

EC-INJECT-01







REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)
M4 -FUSE BLOCK-JUNCTION BOX (J/B)

TBWT2476E

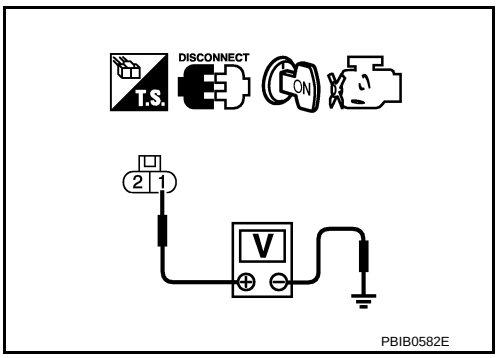
Diagnosis Procedure

INFOID:0000000005353800

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	F71	1	Ground	Battery voltage
2	F75	1		
3	F72	1		
4	F76	1		
5	F73	1		
6	F77	1		

Is the inspection result normal?

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

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F102, M72
- Fuse block (J/B) connector M4
- 15 A fuse (No. 1)
- 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	F71	2	F106	89	Existed
2	F75	2		85	
3	F72	2		81	
4	F76	2		90	
5	F73	2		86	
6	F77	2		82	

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 FUEL INJECTOR

Refer to EC-601, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 5.
NO >> Replace malfunctioning fuel injector.

5.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

YES >> Replace IPDM E/R.

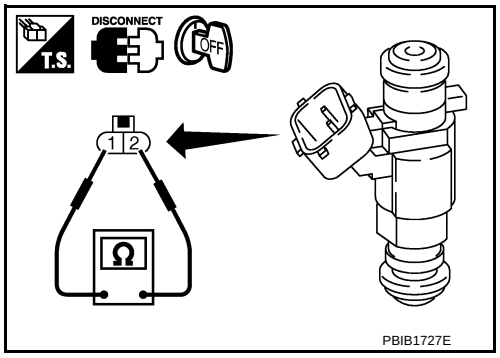
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

Component Inspection

INFOID:0000000005353801

1. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connector.
3. Check resistance between fuel injector terminals as per the following.



Terminals	Resistance
1 and 2	11.1 - 14.3 Ω [at 10 - 60°C (50 - 140°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace malfunctioning fuel injector.

FUEL PUMP

Description

INFOID:0000000005353802

Sensor	Input signal to ECM	ECM Function	Actuator
Crankshaft position sensor Camshaft position sensor	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 start ability. If the ECM receives a engine speed signal from the camshaft position sensor, 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.

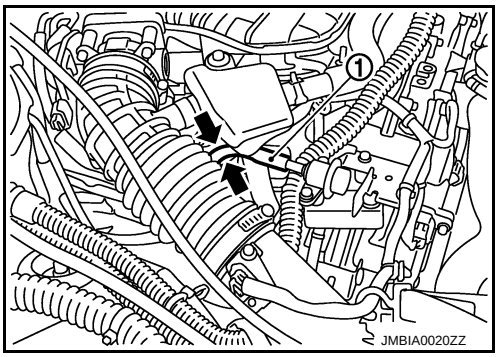
Component Function Check

INFOID:0000000005353803

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.

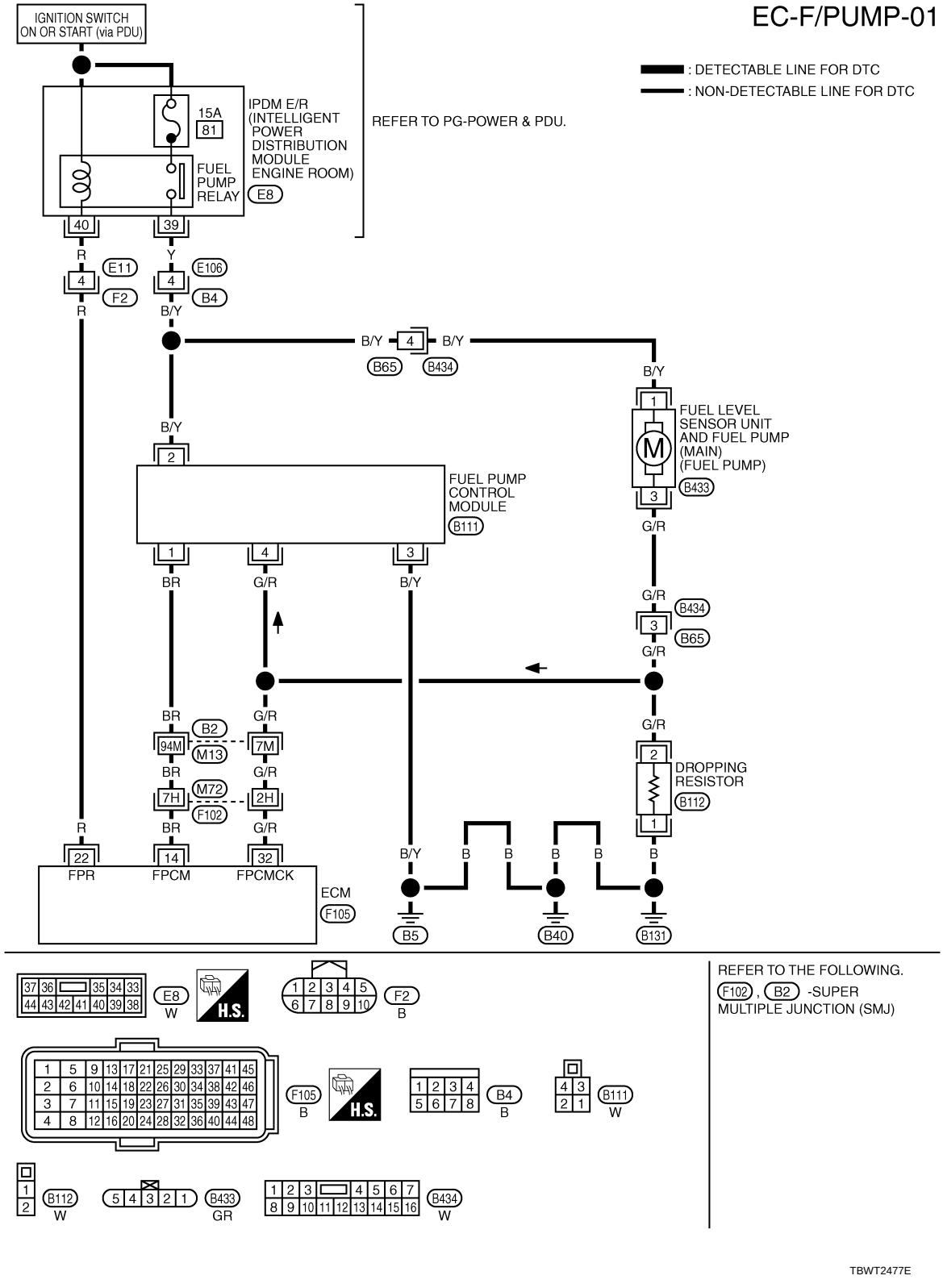


Is the inspection result normal?

YES >> INSPECTION END
NO >> EC-603, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353804



TBWT2477E

Diagnosis Procedure

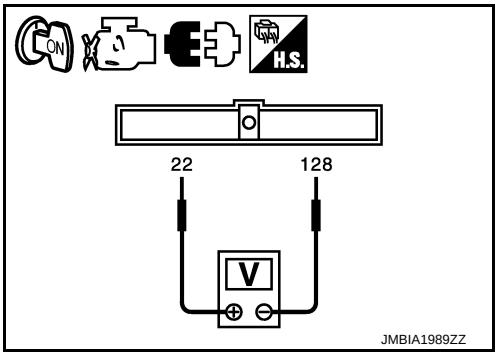
INFOID:0000000005353805

1. CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

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

4. Check the voltage between ECM harness connector and ground.

ECM				Voltage
+		–		
Connector	Terminal	Connector	Terminal	
F105	22	M9	128	Battery voltage



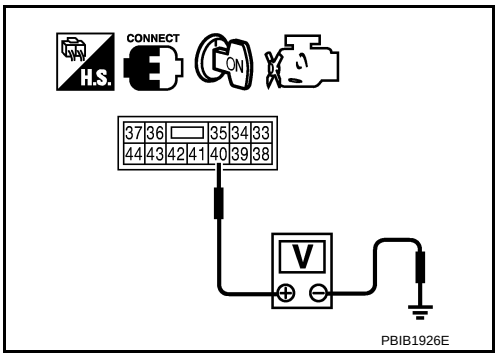
Is the inspection result normal?

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		
E8	40	Ground	Battery voltage



Is the inspection result normal?

YES >> GO TO 3.
NO >> GO TO 13.

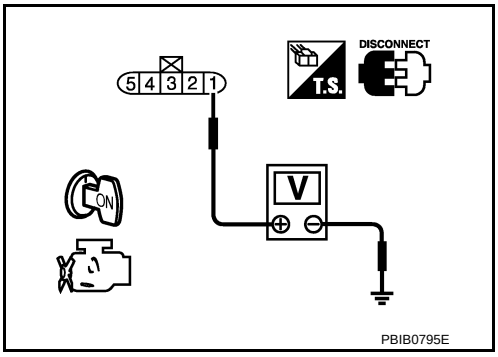
3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- 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-II

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect “fuel level sensor unit and fuel pump (main)” harness connector.
4. Turn ignition switch ON.
5. Check the voltage between “fuel level sensor unit and fuel pump (main)” harness connector and ground.



Fuel level sensor unit and fuel pump (main)		Ground	Voltage
Connector	Terminal		
B433	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 15 A FUSE

1. Turn ignition switch OFF.
2. Disconnect 15 A fuse (No. 81) from IPDM E/R.
3. Check 15 A fuse.

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace 15 A fuse.

6.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-III

1. Disconnect IPDM E/R harness connector E8.
2. Check the continuity between IPDM E/R harness connector and “fuel level sensor unit and fuel pump (main)” harness connector.

IPDM E/R		Fuel level sensor unit and fuel pump (main)		Continuity
Connector	Terminal	Connector	Terminal	
E8	39	B433	1	Existed

3. 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 B4, E106
- Harness connectors B65, B434
- IPDM E/R harness connector E8
- Harness for open or short between IPDM E/R and “fuel level sensor unit and fuel pump (main)”

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

8.CHECK FUEL PUMP GROUND CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect dropping resistor harness connector.
3. Check the continuity between “fuel level sensor unit and fuel pump (main)” harness connector and dropping resistor.

Fuel level sensor unit and fuel pump (main)		Dropping resistor		Continuity
Connector	Terminal	Connector	Terminal	
B433	3	B112	2	Existed

4. Also check harness for 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 B65, B434
- Harness for open or short between “fuel level sensor unit and fuel pump (main)” and dropping resistor

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

10.CHECK FUEL PUMP GROUND CIRCUIT-II

1. Check the continuity between dropping resistor and ground.

Dropping resistor		Ground	Continuity
Connector	Terminal		
B112	1	Ground	Existed

2. Also check harness for short to power.

Is the inspection result normal?

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

11.CHECK DROPPING RESISTOR

Refer to EC-606, "Component Inspection (Dropping Resistor)".

Is the inspecting result normal?

YES >> GO TO 12.
NO >> Replace dropping resistor.

12.CHECK FUEL PUMP

Refer to EC-606, "Component Inspection (Fuel Pump)".

Is the inspection result normal?

YES >> GO TO 13.
NO >> Replace fuel pump.

13.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

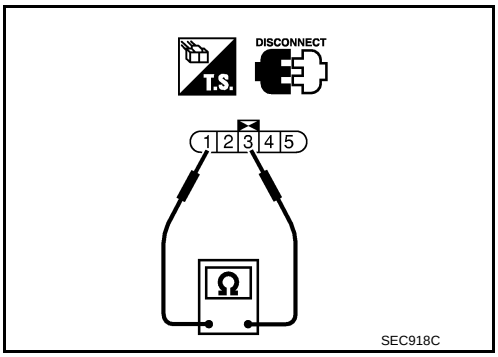
YES >> Replace IPDM E/R.
NO >> Repair or replace harness or connectors.

Component Inspection (Fuel Pump)

INFOID:0000000005353806

1.CHECK FUEL PUMP

1. Turn ignition switch OFF.
2. Disconnect “fuel level sensor unit and fuel pump (main)” harness connector.
3. Check resistance between “fuel level sensor unit and fuel pump (main)” terminals as follows.



Terminals	Resistance
1 and 3	0.2 - 5.0 Ω [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace “fuel level sensor unit and fuel pump (main)”

Component Inspection (Dropping Resistor)

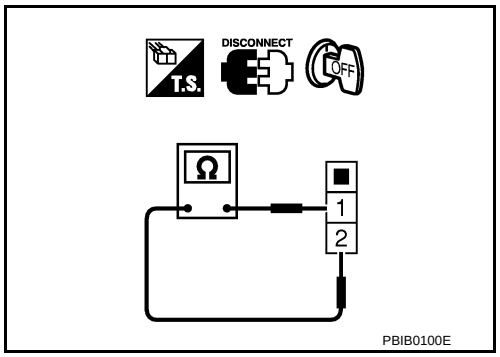
INFOID:0000000005353807

1.CHECK DROPPING RESISTOR

1. Turn ignition switch OFF.

2. Disconnect dropping resistor harness connector.
3. Check resistance between dropping resistor as follows.

Terminals	Resistance
1 and 2	0.9 Ω [at 20°C (68°F)]



Is the inspection result normal?

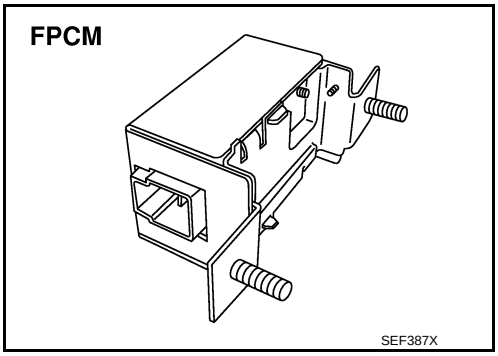
YES >> INSPECTION END
NO >> Replace dropping resistor.

FUEL PUMP CONTROL MODULE

Description

INFOID:0000000005353808

The Fuel pump control module (FPCM) adjusts the voltage supplied to the fuel pump to control the amount of fuel flow. When the FPCM increases the voltage supplied to the fuel pump, the fuel flow is increased. When the FPCM decreases the voltage, the fuel flow is decreased.



Component Function Check

INFOID:0000000005353809

1. CHECK FUEL PUMP CONTROL MODULE (FPCM) FUNCTION

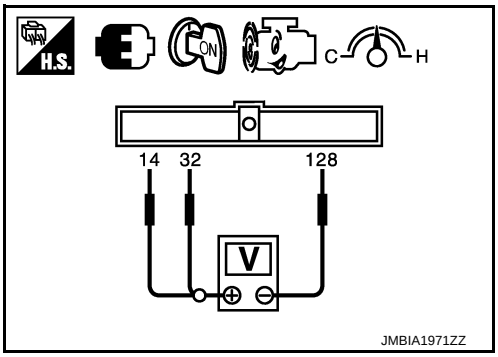
With CONSULT-III

1. Turn ignition switch ON.
2. Select “FPCM” in “DATA MONITOR” mode with CONSULT-III.
3. Check “FPCM” indication under the following conditions.

Monitor item	Condition	Indication
FPCM	• Engine: Cranking	HI
	• Engine: Idle • Engine coolant temperature: More than 10 °C (50 °F)	LOW

Without CONSULT-III

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminal as per the following.



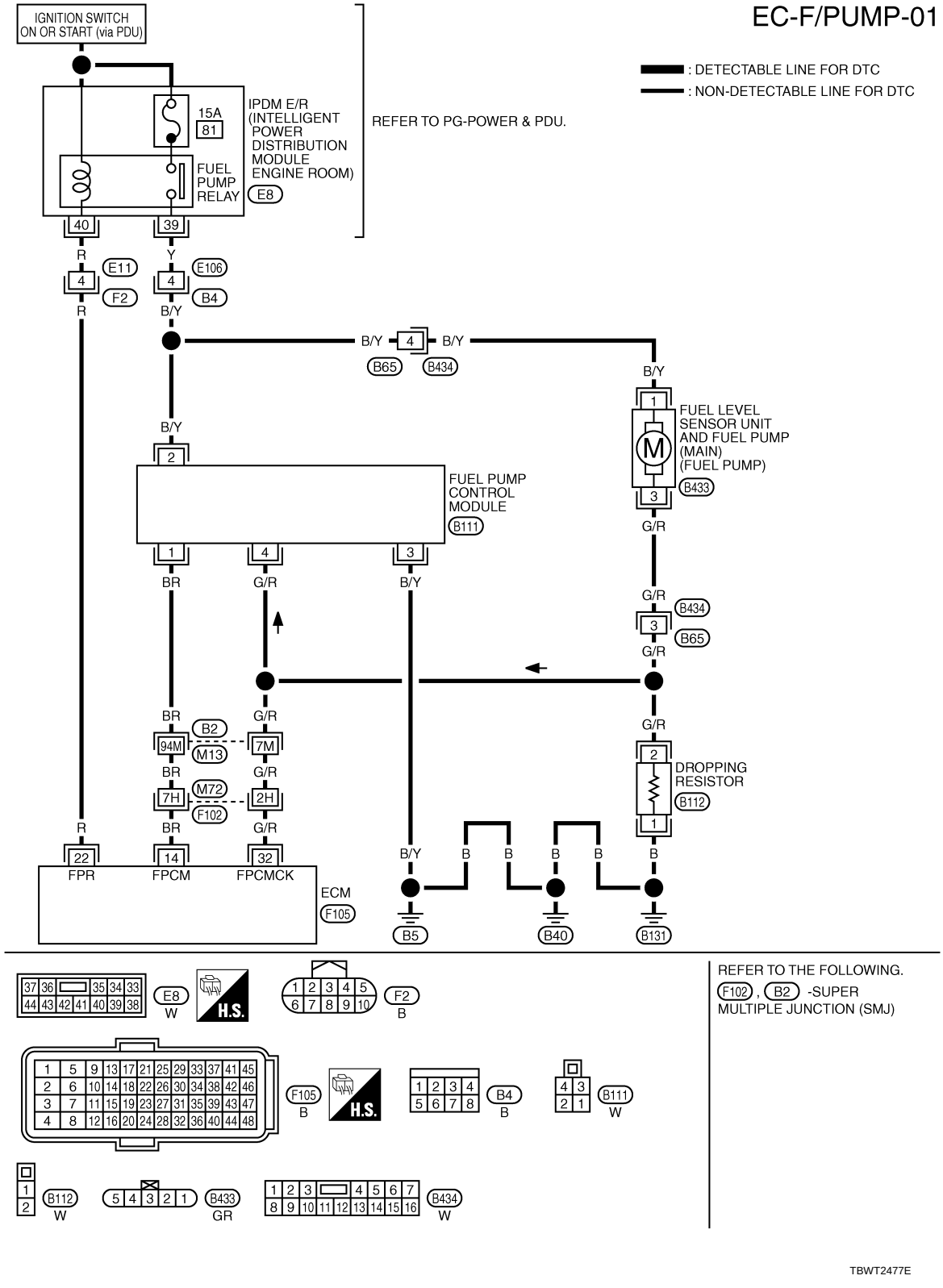
ECM				Condition	Voltage (V)
+		–			
Connector	Terminal	Connector	Terminal		
F105	14	M9	128	• Engine: Cranking	0 - 0.5
	32				
	14			• Engine: Idle • Engine coolant temperature: More than 10 °C (50 °F)	Approx. 0
	32				

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-609, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353810



TBWT2477E

Diagnosis Procedure

INFOID:0000000005353811

1. CHECK GROUND CONNECTION

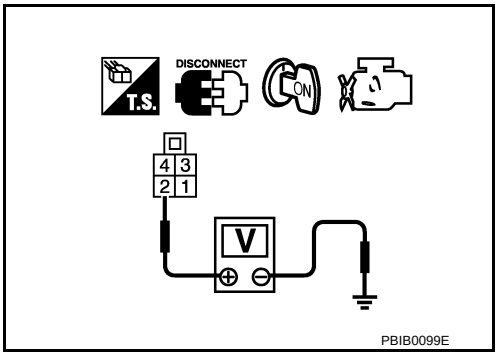
1. Turn ignition switch OFF.
2. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

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

2.CHECK FPCM POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect fuel pump control module (FPCM) harness connector.
3. Turn ignition switch ON.
4. Check the voltage between FPCM harness connector and ground.



FPCM		Ground	Voltage
Connector	Terminal		
B111	2	Ground	Battery voltage

Is the inspection result normal?

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

3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B4, E106
- IPDM E/R harness connector E8
- 15 A fuse (No. 81)
- Harness for open or short between FPCM and IPDM E/R

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

4.CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Check the continuity between FPCM harness connector and ground.

FPCM		Ground	Continuity
Connector	Terminal		
B111	3	Ground	Existed

3. Also check harness for short to power.

Is the inspection result normal?

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

5.CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect “fuel level sensor unit and fuel pump” (main) harness connector.
2. Disconnect dropping resistor harness connector.
3. Check the continuity between “fuel level sensor unit and fuel pump” (main) harness connector or FPCM harness connector and dropping resistor harness connector.

Fuel level sensor unit and fuel pump (main)		Dropping resistor		Continuity
Connector	Terminal	Connector	Terminal	
B433	3	B112	2	Existed

FPCM		Dropping resistor		Continuity
Connector	Terminal	Connector	Terminal	
B111	4	B112	2	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 B65, B434
- Harness for open or short between “fuel level sensor unit and fuel pump” (main) and dropping resistor
- Harness for open or short between FPCM and dropping resistor

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

7. CHECK FPCM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

FPCM		ECM		Continuity
Connector	Terminal	Connector	Terminal	
B111	4	F105	32	Existed

3. 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 B2, M13
- Harness connectors F102, M72
- Harness for open or short between FPCM and ECM

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

9. CHECK FPCM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check the continuity between ECM and FPCM

ECM		FPCM		Continuity
Connector	Terminal	Connector	Terminal	
F105	14	B111	1	Existed

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 B2, M13
- Harness connectors F102, M72
- Harness for open or short between ECM and FPCM

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

11. CHECK FPCM

Refer to EC-612, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 12.
NO >> Replace FPCM.

12. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

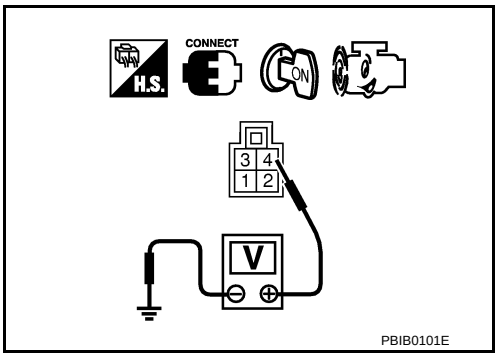
>> INSPECTION END

Component Inspection

INFOID:0000000005353812

1. CHECK FUEL PUMP CONTROL MODULE (FPCM)

1. Start engine and warm it up normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Check the voltage between FPCM terminals under the following conditions.



FPCM		Ground	Condition	Voltage (V)
Connector	Terminal			
B111	4	Ground	When engine cranking	Approx. 0
			After starting engine	Approx. 5

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace FPCM.

ICC BRAKE SWITCH

Description

INFOID:0000000005353813

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 ACS-9 for the ICC function.

Component Function Check

INFOID:0000000005353814

1. CHECK ICC BRAKE SWITCH FUNCTION

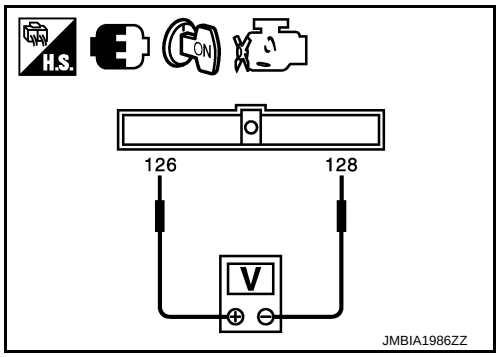
With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

Monitor item	Condition		Indication
BRAKE SW1 (ICC brake switch)	Brake pedal	Slightly depressed	OFF
		Fully released	ON

Without CONSULT-III

1. Turn ignition switch ON.
2. Check the voltage between ECM harness connector terminals as follows.



ECM			Condition		Voltage (V)
Connector	+	–			
	Terminal	Terminal			
M9	126 (ICC brake switch signal)	128	Brake pedal	Slightly depressed	Approx. 0
				Fully released	Battery voltage

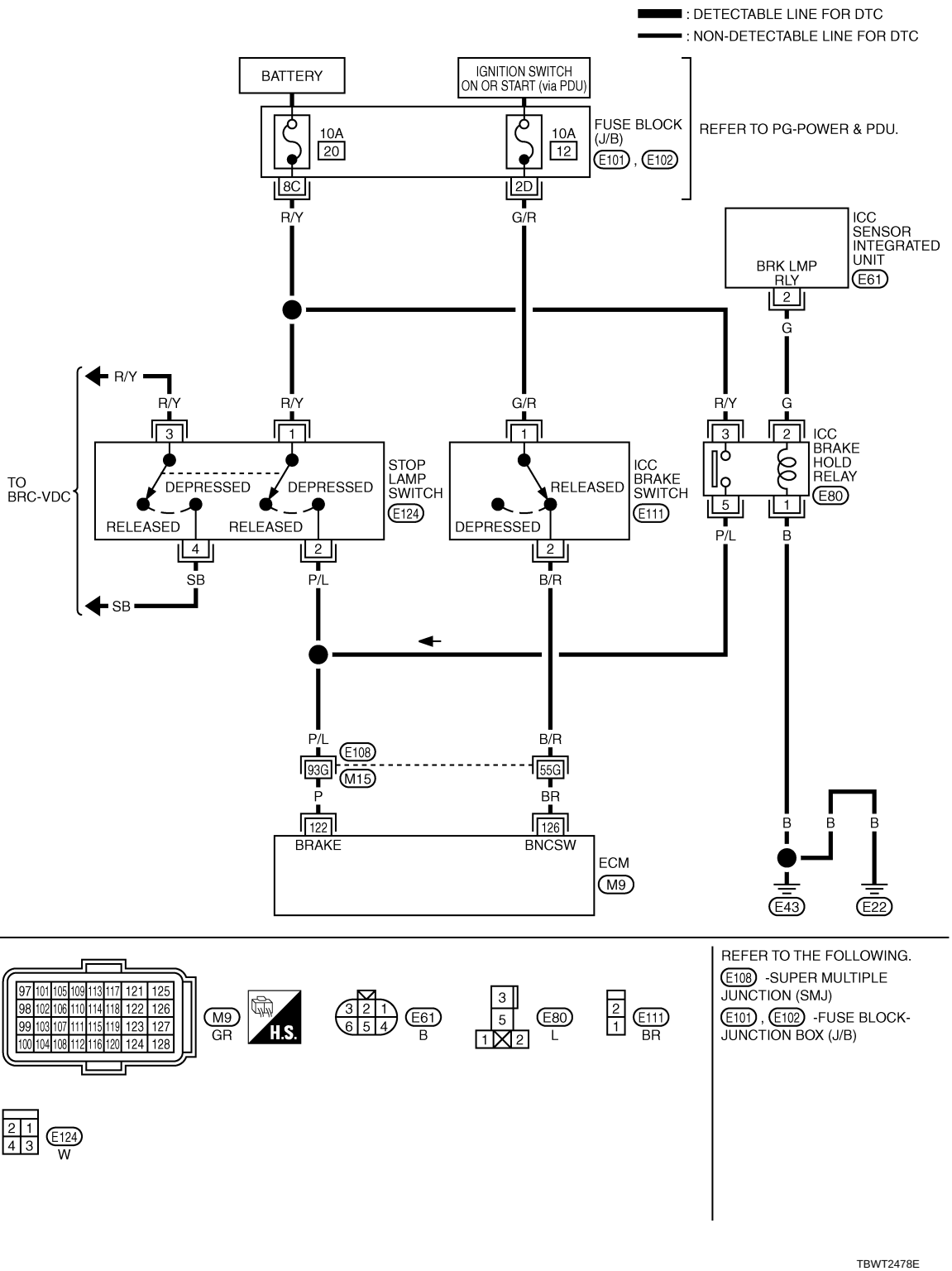
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-614, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353815

EC-ICCBOF-01



TBWT2478E

Diagnosis Procedure

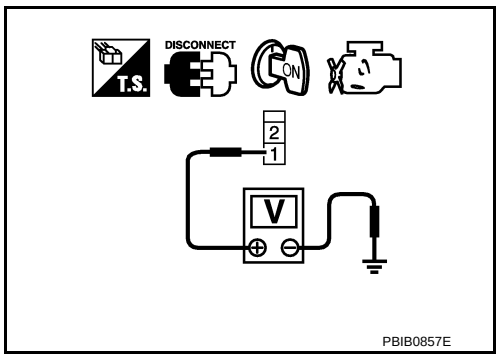
INFOID:0000000005353816

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 3.
NO >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E102
- 10 A fuse (No. 12)
- Harness for open or short between ICC brake switch and fuse

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

3. 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	M9	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 E108, M15
- 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.

5. CHECK ICC BRAKE SWITCH

Refer to EC-616, "Component Inspection (ICC Brake Switch)".

Is the inspection result normal?

YES >> GO TO 6.
NO >> Replace ICC brake switch.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection (ICC Brake Switch)

INFOID:0000000005353817

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-6, "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.

IGNITION SIGNAL

Description

INFOID:0000000005353818

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:0000000005353819

1. INSPECTION START

Turn ignition switch OFF, and restart engine.

Does the engine start?

YES-1 >> With CONSULT-III: GO TO 2.
YES-2 >> Without CONSULT-III: GO TO 3.
NO >> Go to EC-620, "Diagnosis Procedure".

2. CHECK IGNITION SIGNAL FUNCTION

With CONSULT-III

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

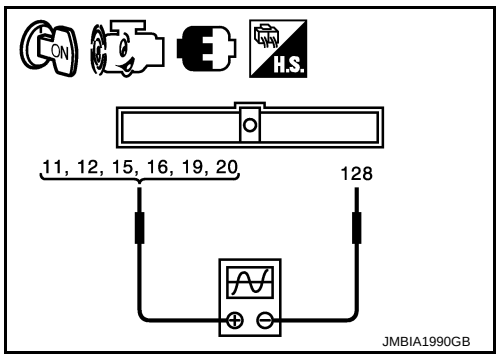
Is the inspection result normal?

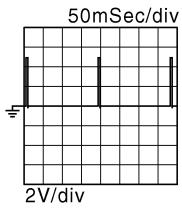
YES >> INSPECTION END
NO >> Go to EC-620, "Diagnosis Procedure".

3. CHECK IGNITION SIGNAL FUNCTION

Without CONSULT-III

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	
F105	11	M9	128	
	12			
	15			
	16			
	19			
	20			

NOTE:

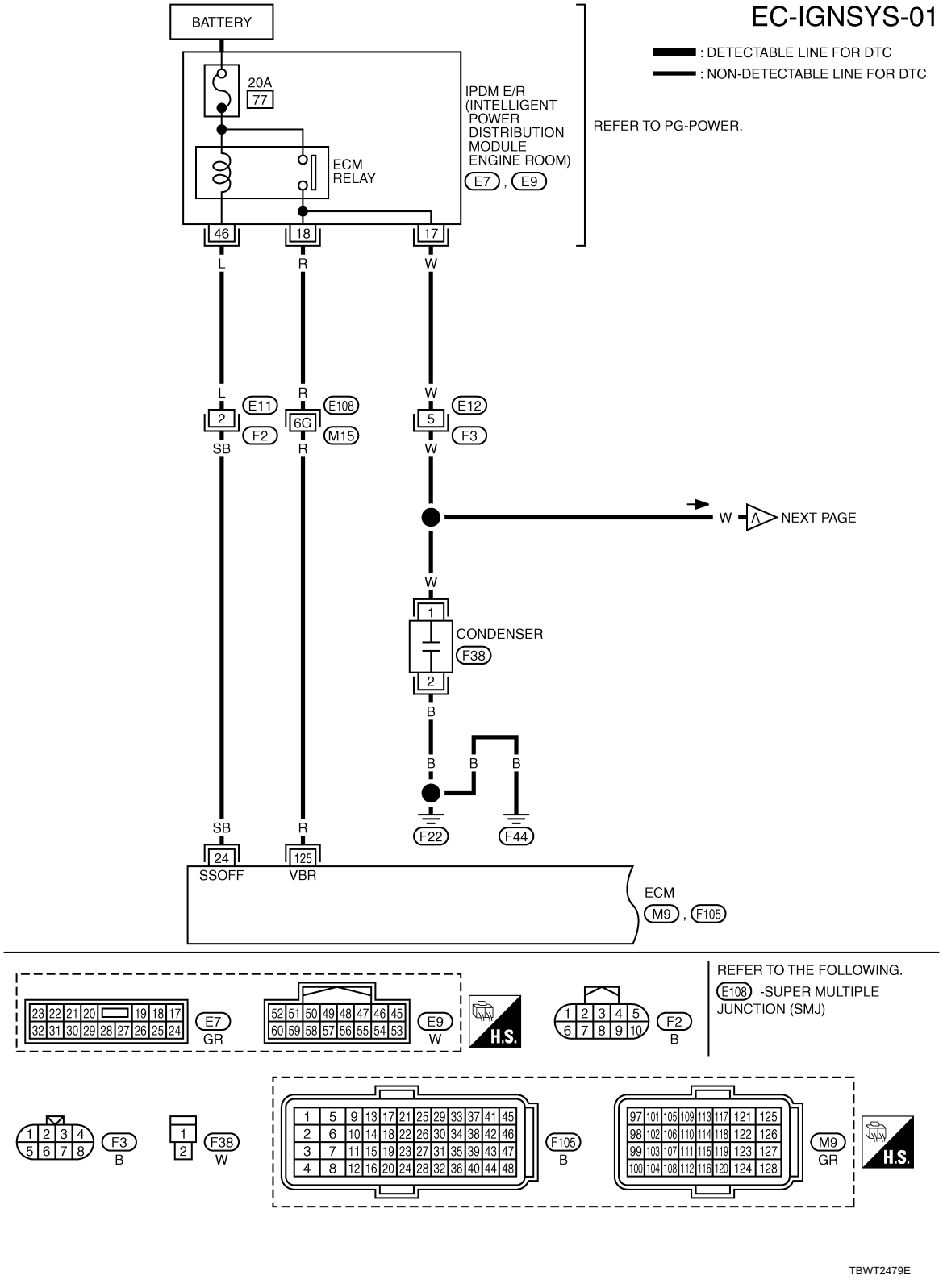
The pulse cycle changes depending on rpm at idle.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-620, "Diagnosis Procedure".

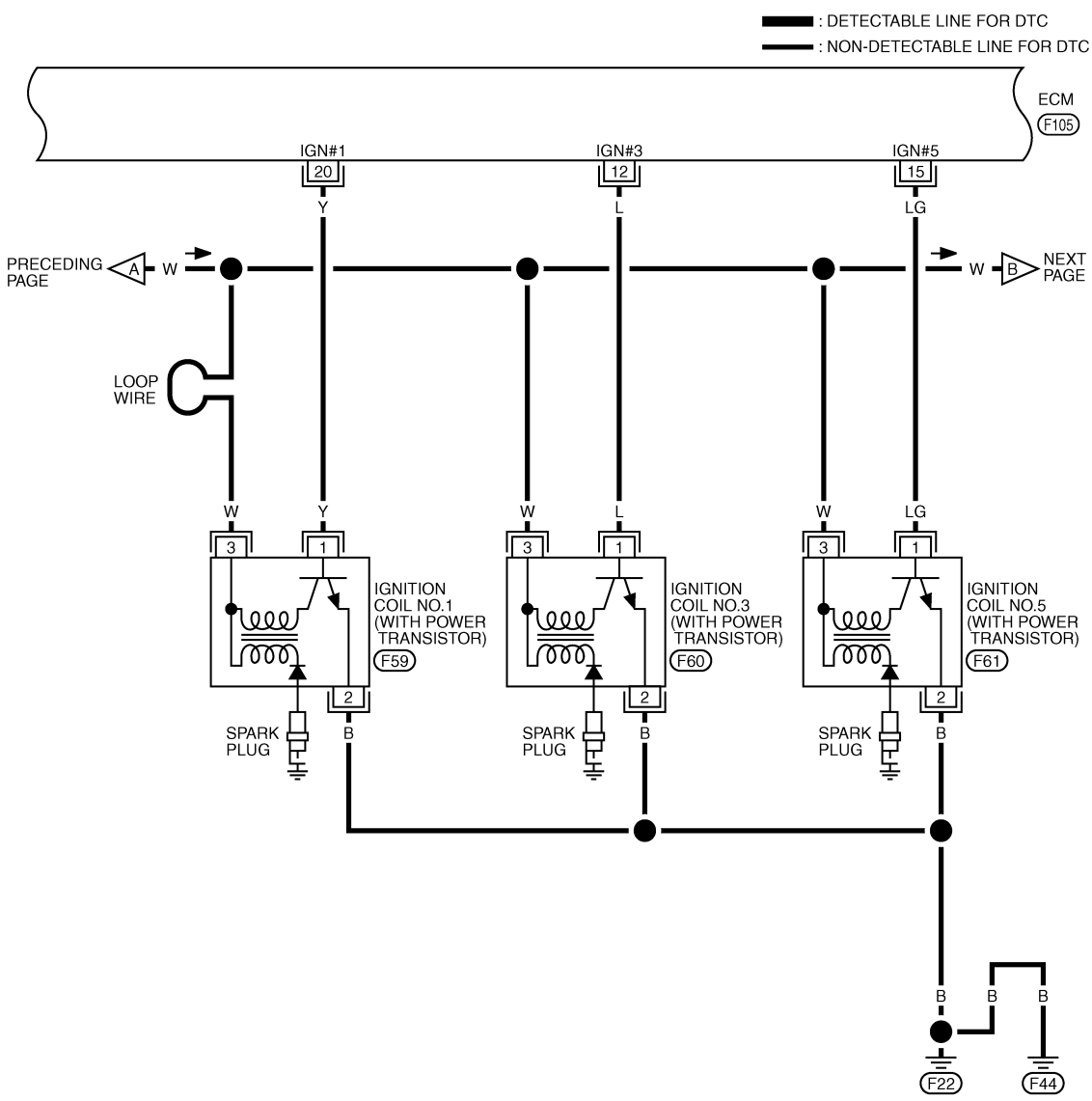
Wiring Diagram

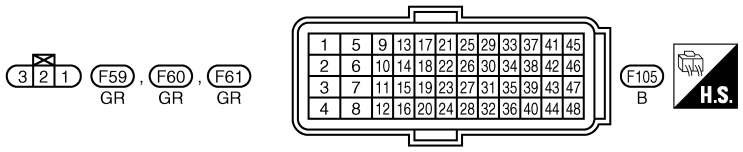
INFOID:0000000005353820



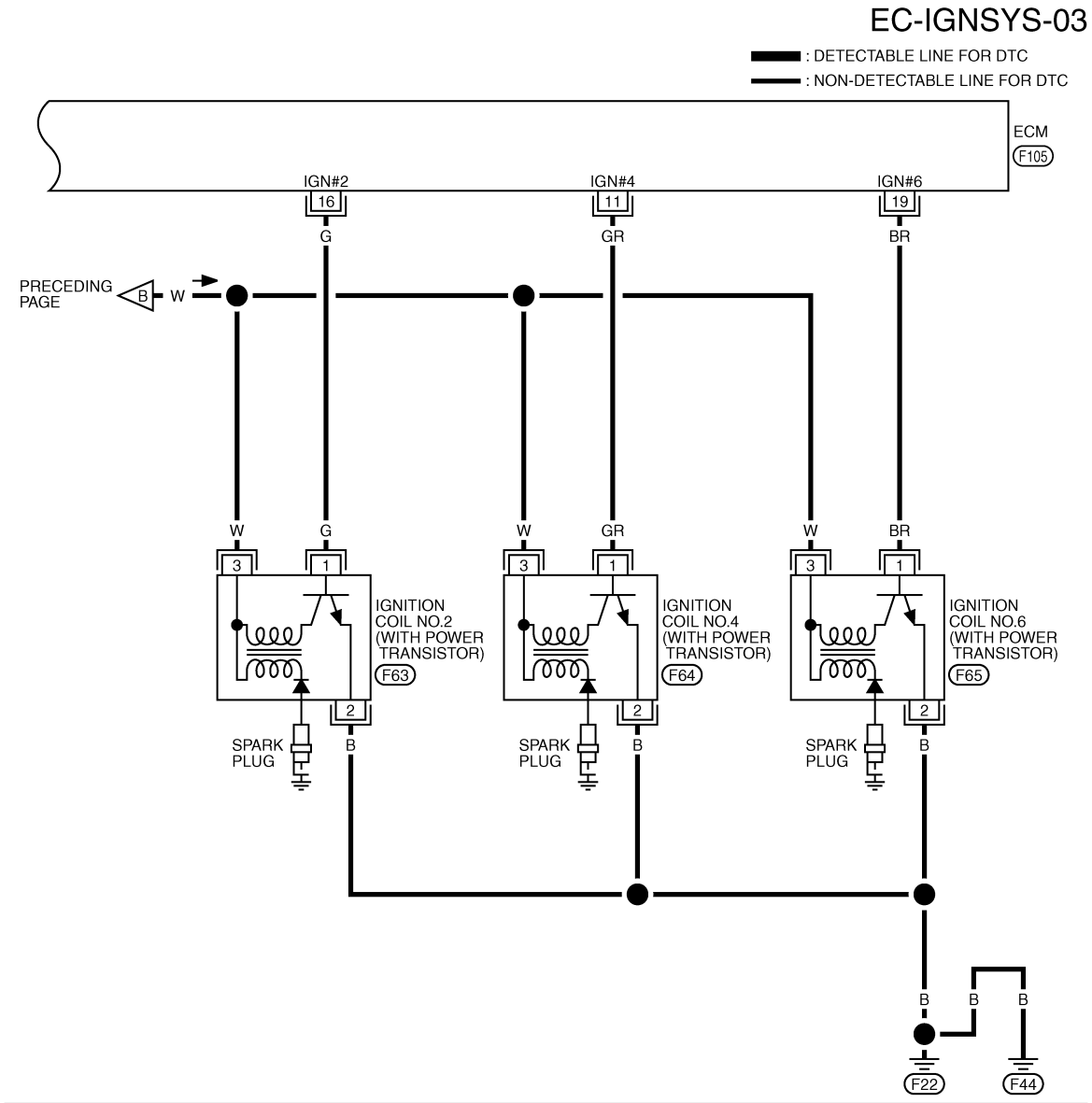
TBWT2479E

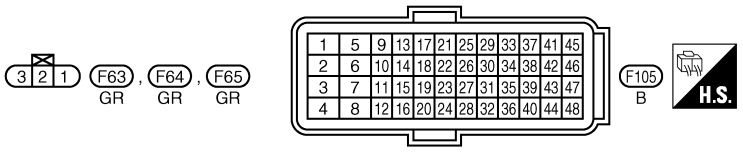
EC-IGNSYS-02





TBWT2480E





TBWT2481E

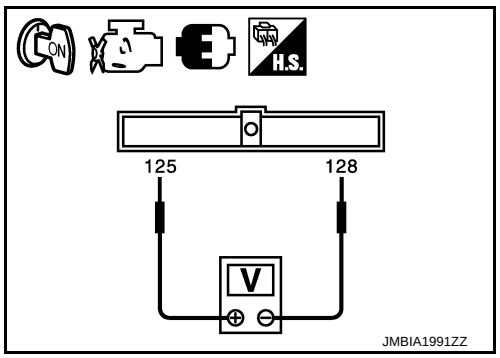
Diagnosis Procedure

INFOID:0000000005353821

1. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn it ON.

2. Check the voltage between ECM harness connector terminals under the following conditions.



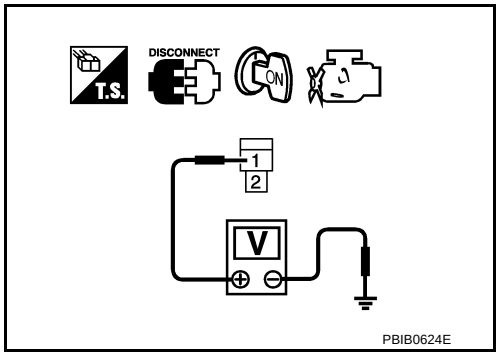
ECM			Voltage
Connector	+	–	
	Terminal	Terminal	
M9	125	128	Battery voltage

Is the inspection result normal?

YES >> GO TO 2.
NO >> Go to EC-155, "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		
F38	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.
3. Check the continuity between IPDM E/R harness connector and condenser harness connector.

IPDM E/R		Condenser		Continuity
Connector	Terminal	Connector	Terminal	
E7	17	F38	1	Existed

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

Is the inspection result normal?

YES >> Go to EC-155, "Diagnosis Procedure".
NO >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F3, E12
- 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		
F38	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

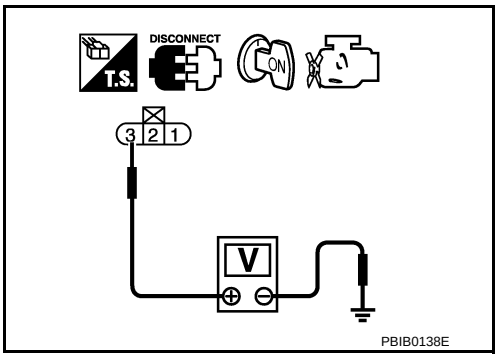
Refer to EC-624, "Component Inspection (Condenser)"

Is the inspection result normal?

YES >> GO TO 7.
NO >> Replace condenser.

7. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

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	F59	3	Ground	Battery voltage
2	F63	3		
3	F60	3		
4	F64	3		
5	F61	3		
6	F65	3		

Is the inspection result normal?

YES >> GO TO 8.
NO >> Repair or replace harness connectors.

8. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check the continuity between ignition coil harness connector and ground.

Ignition coil			Ground	Continuity
Cylinder	Connector	Terminal		
1	F59	2	Ground	Existed
2	F63	2		
3	F60	2		
4	F64	2		
5	F61	2		
6	F65	2		

3. Also check harness for short to power.

Is the inspection result normal?

YES >> GO TO 9.

NO >> Repair open circuit or short to power in harness or connectors.

9. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

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

Ignition coil			ECM		Continuity
Cylinder	Connector	Terminal	Connector	Terminal	
1	F59	1	F105	20	Existed
2	F63	1		16	
3	F60	1		12	
4	F64	1		11	
5	F61	1		15	
6	F65	1		19	

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

Is the inspection result normal?

YES >> GO TO 10.
NO >> Repair open circuit, short to ground or short to power in harness or connectors.

10. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-623, "Component Inspection (Ignition Coil with Power Transistor)".

Is the inspection result normal?

YES >> GO TO 11.
NO >> Replace malfunctioning ignition coil with power transistor.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

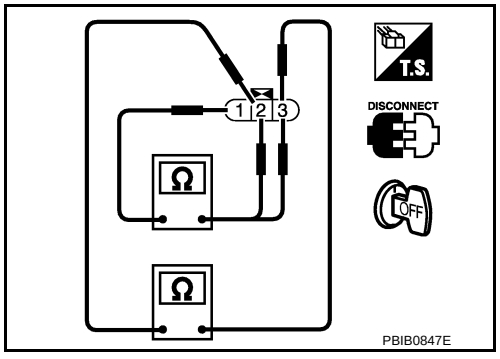
Component Inspection (Ignition Coil with Power Transistor)

INFOID:0000000005353822

1. CHECK IGNITION COIL WITH POWER TRANSISTOR-I

1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.

Terminals	Resistance [at 25°C (77°F)]
1 and 2	Except 0 or ∞Ω
1 and 3	Except 0 Ω
2 and 3	



Is the inspection result normal?

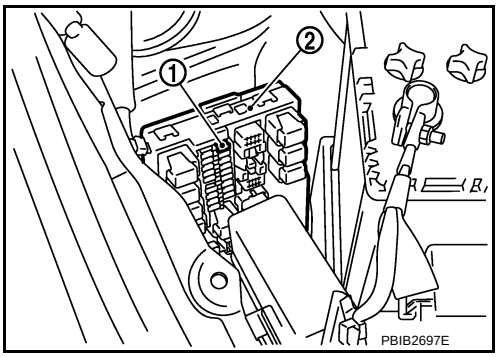
YES >> GO TO 2.
NO >> Replace malfunctioning ignition coil with power transistor.

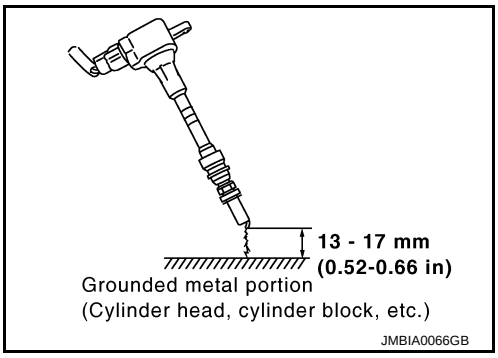
2. CHECK IGNITION COIL WITH POWER TRANSISTOR-II

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.

2. Reconnect all harness connectors disconnected.
3. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
4. Start engine.
5. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
6. Turn ignition switch OFF.
7. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
8. Remove ignition coil and spark plug of the cylinder to be checked.
9. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
10. Connect spark plug and harness connector to ignition coil.
11. Fix ignition coil using a rope etc. with gap of 13 - 17 mm (0.52 - 0.66 in) between the edge of the spark plug and grounded metal portion as shown in the figure.
12. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.





Spark should be generated.

CAUTION:
- **Never place to the spark plug and the ignition coil within 50 cm (19.7 in). Be careful not to get an electrical shock while checking, because the electrical discharge voltage becomes 20 kV or more.**
- **It might damage the ignition coil if the gap of more than 17 mm (0.66 in) is made.**

NOTE:
When the gap is less than 13 mm (0.52 in), a spark might be generated even if the coil is malfunctioning.

Is the inspection result normal?

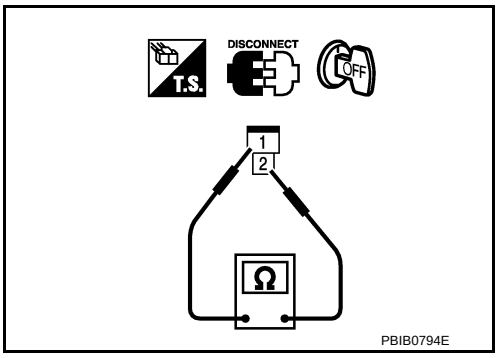
YES >> INSPECTION END
NO >> Replace malfunctioning ignition coil with power transistor.

Component Inspection (Condenser)

INFOID:0000000005353823

1. CHECK CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals as per the following.



Terminals	Resistance
1 and 2	Above 1 MΩ [at 25°C (77°F)]

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace condenser.

INFORMATION DISPLAY (ASCD)

Description

INFOID:0000000005353824

ASCD operation status is indicated by two indicators (CRUISE and SET) 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. The set speed is also displayed on the information display.

SET indicator is displayed during ASCD control.
When the canceling conditions come into effect, the CRUISE and SET indications on the information display disappear.

Component Function Check

INFOID:0000000005353825

1.CHECK INFORMATION DISPLAY

1. Start engine.
2. Press MAIN switch on ASCD steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH)
   CAUTION:
   Always drive vehicle at a safe speed.
4. Press SET/COAST switch.
5. Check that the readings of the speedometer show the same values as the set speed indicated in the information display while driving the vehicle on a flat road.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-625, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353826

1.CHECK DTC

Check that DTC UXXXX, P0500 or P1574 is not displayed.

Is the inspection result normal?

YES >> GO TO 2.
NO-1 >> UXXXX: Perform trouble diagnosis for DTC UXXXX.
NO-2 >> P0500: Perform trouble diagnosis for DTC P0500. Refer to EC-430, "Diagnosis Procedure".
NO-3 >> P1574: Perform trouble diagnosis for DTC P1574. Refer to EC-549, "Diagnosis Procedure".

2.CHECK DTC WITH “UNITIED MATER & A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Perform trouble diagnosis relevant to DTC indicated.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

Is the inspection result normal?

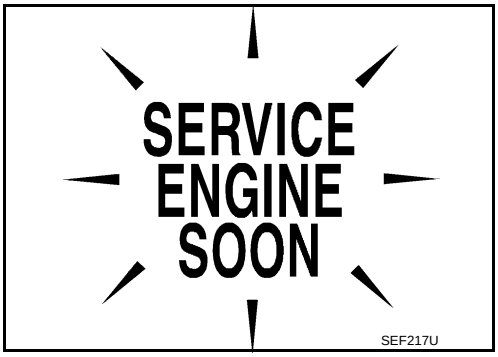
YES >> Replace combination meter.
NO >> Repair or replace.

MALFUNCTION INDICATOR LAMP

Description

INFOID:0000000005353827

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-121, "Diagnosis Description".



Component Function Check

INFOID:0000000005353828

1. CHECK MALFUNCTION INDICATOR LAMP (MIL) FUNCTION

1. Turn ignition switch ON.
2. Check that MIL illuminates.

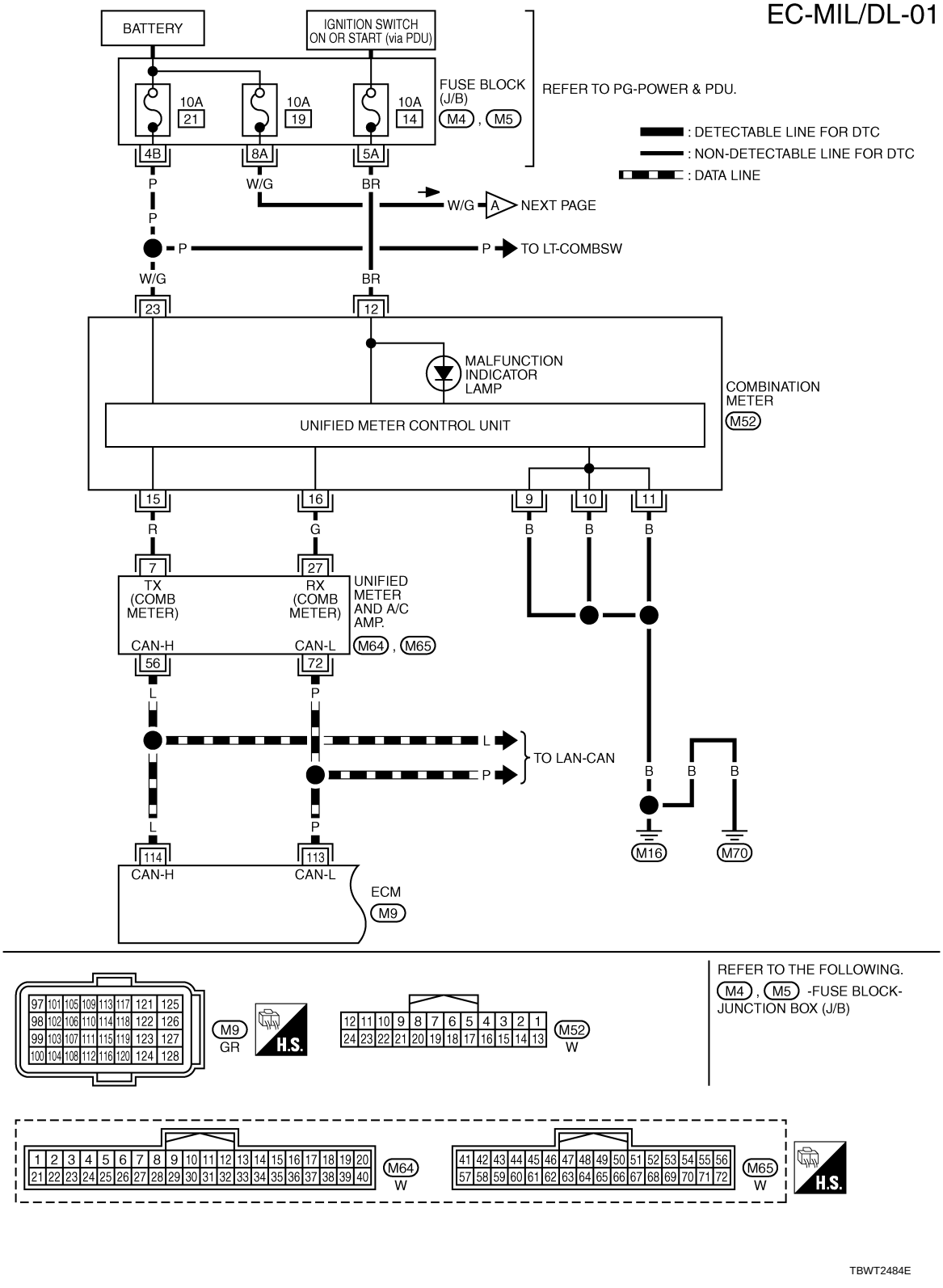
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-628, "Diagnosis Procedure".

Wiring Diagram

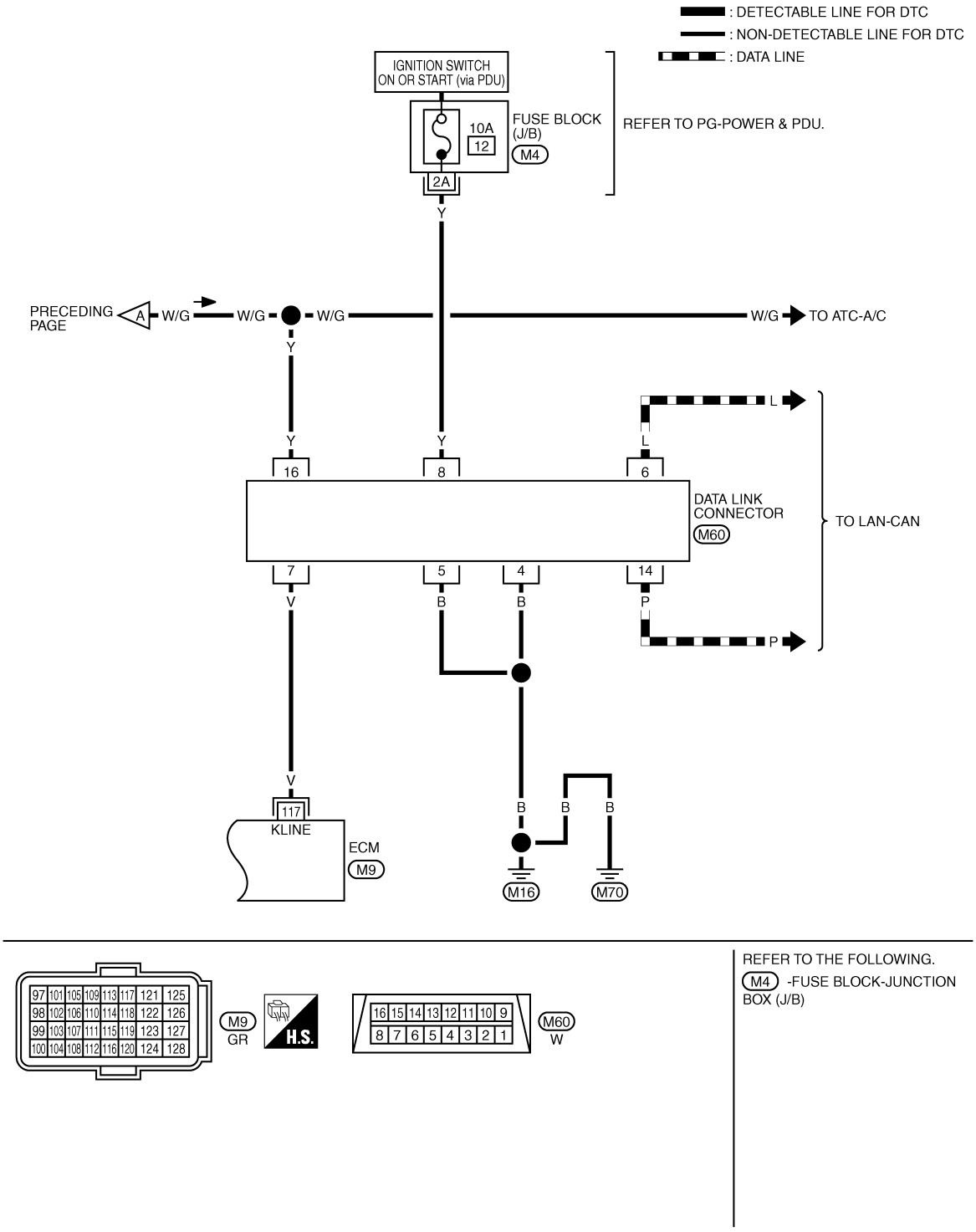
INFOID:0000000005353829

EC-MIL/DL-01



TBWT2484E

EC-MIL/DL-02



TBWT2485E

Diagnosis Procedure

INFOID:0000000005353830

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 DI-28, "CONSULT-III Function (METER/M&A)".

Is the inspection result normal?

YES >> GO TO 3.
NO >> Repair or replace malfunctioning part.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

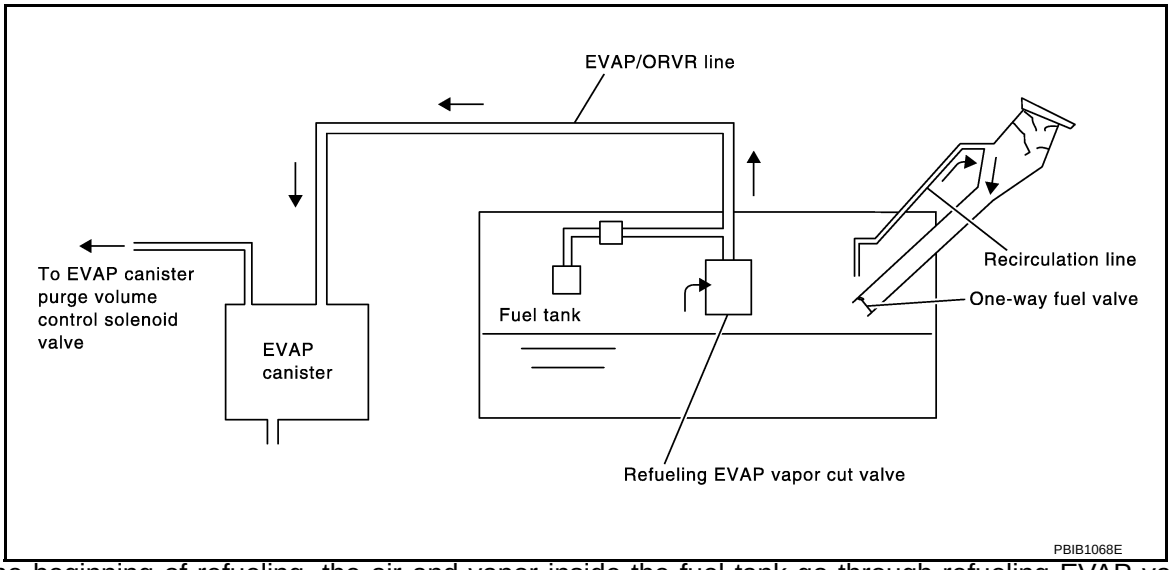
Is the inspection result normal?

YES >> Replace combination meter.
NO >> Repair or replace malfunctioning part.

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

Description

INFOID:0000000005353831



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-692, "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:0000000005353832

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-630, "Diagnosis Procedure".
NO >> INSPECTION END

Diagnosis Procedure

INFOID:0000000005353833

1. INSPECTION START

Check whether the following symptoms are present.
A: Fuel odor from EVAP canister is strong.

B: Cannot refuel/Fuel odor from the fuel filler opening is strong while refueling.

Which symptom is present?

A >> GO TO 2.
B >> GO TO 7.

2. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.0 kg (4.0 lb).

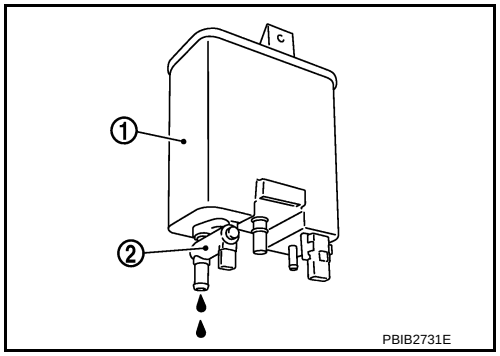
Is the inspection result normal?

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.

>> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

6. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-633, "Component Inspection".

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

7. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.0 kg (4.0 lb).

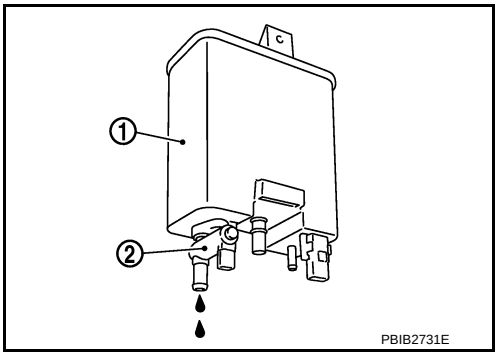
Is the inspection result normal?

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.

>> 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-633, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 14.
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

14. CHECK FUEL FILLER TUBE

Check filler neck tube and hose connected to the fuel tank for clogging, dents and cracks.

Is the inspection result normal?

YES >> GO TO 15.
NO >> Replace fuel filler tube.

15. CHECK ONE-WAY FUEL VALVE-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.

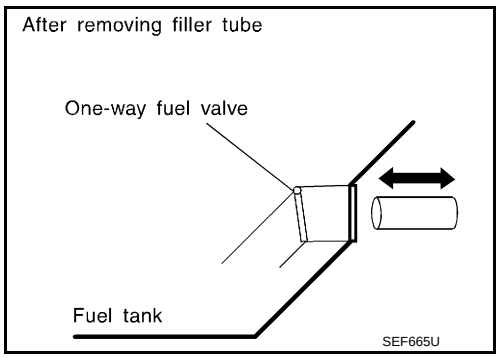
16. CHECK ONE-WAY FUEL VALVE-II

1. Check that fuel is drained from the tank.
2. Remove fuel filler tube and hose.

3. Check one-way fuel valve for operation as per the following.
When a stick is inserted, the valve should open, when removing stick it should close.
Do not drop any material into the tank.

Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.



Component Inspection

INFOID:0000000005353834

1. INSPECTION START

Will CONSULT-III be used?

Will CONSULT-III be used?

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

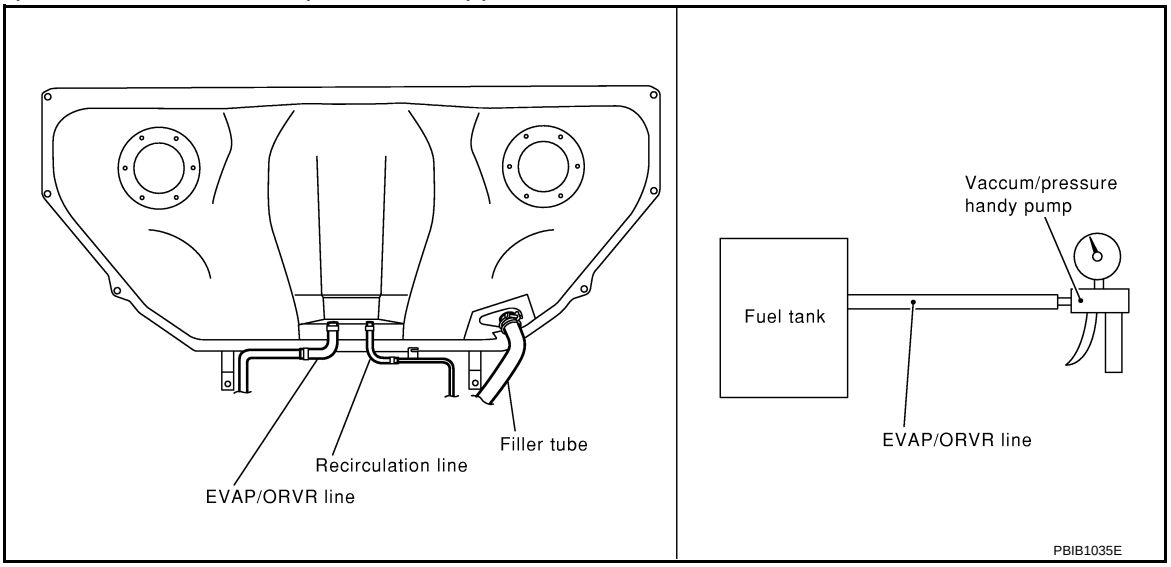
2. CHECK REFUELING EVAP VAPOR CUT VALVE

With CONSULT-III

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-10, "Removal and Installation".
3. Drain fuel from the tank as per the following:
- 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-III.
4. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as per the following.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^3, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Is the inspection result normal?

YES >> INSPECTION END

NO >> Replace refueling EVAP vapor cut valve with fuel tank.

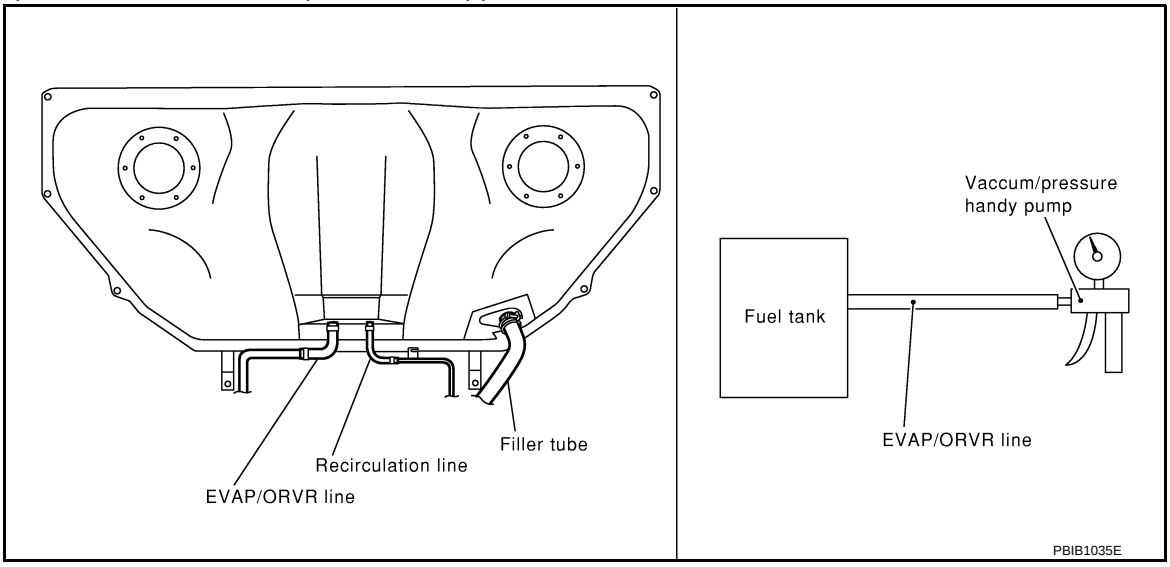
3. CHECK REFUELING EVAP VAPOR CUT VALVE

Without CONSULT-III

1. Turn ignition switch OFF.
2. Remove fuel tank. Refer to FL-10, "Removal and Installation".
3. Drain fuel from the tank as per the following:
- Remove fuel gauge retainer.
- Drain fuel from the tank using a handy pump into a fuel container.
4. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
   Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
5. Check refueling EVAP vapor cut valve for being stuck to open as per the following.
- Connect vacuum pump to hose end.
- Remove fuel gauge retainer with fuel gauge unit.

Always replace O-ring with new one.

- Turn fuel tank upside down.
- Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^3, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



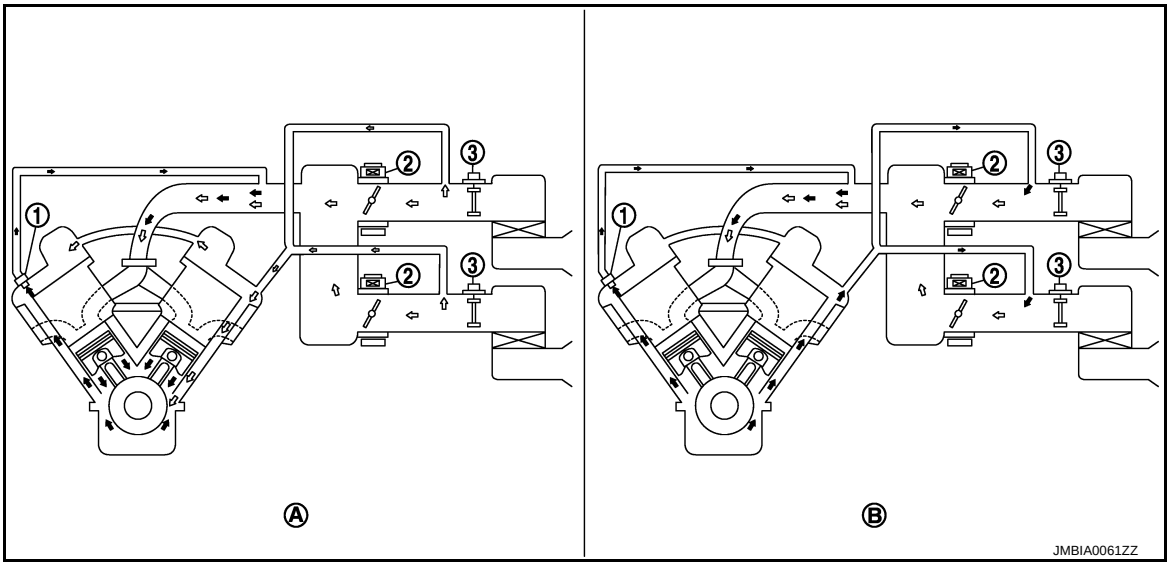
Is the inspection result normal?

YES >> INSPECTION END
NO >> Replace refueling EVAP vapor cut valve with fuel tank.

POSITIVE CRANKCASE VENTILATION

Description

INFOID:0000000005353835



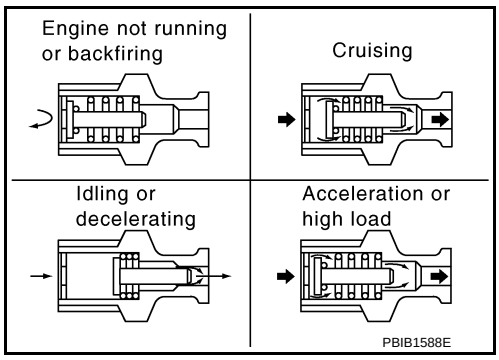
1. PCV valve
2. Electric throttle control actuator
3. Mass air flow sensor

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 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.

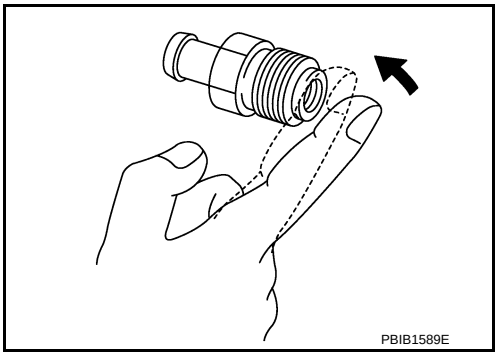


Component Inspection

INFOID:0000000005353836

1. CHECK POSITIVE CRANKCASE VENTILATION (PCV) VALVE

With engine running at idle, remove PCV valve from rocker cover. A properly working valve makes a hissing noise as air passes through it. A strong vacuum should be felt immediately when a finger is placed over valve inlet.



Is the inspection result normal?

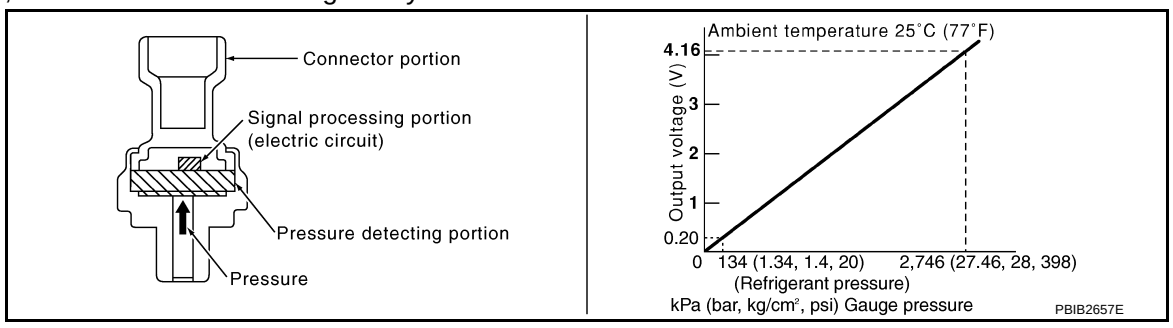
YES >> INSPECTION END
NO >> Replace PCV valve.

REFRIGERANT PRESSURE SENSOR

Description

INFOID:0000000005353837

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.

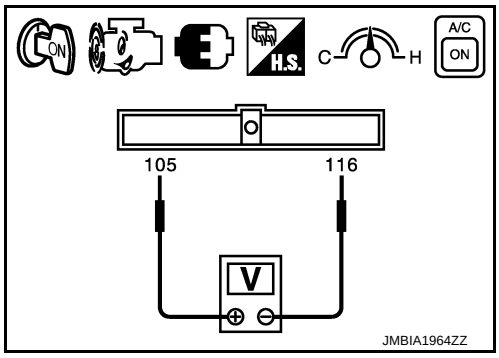


Component Function Check

INFOID:0000000005353838

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 under the following conditions.



ECM			Voltage (V)
Connector	+	–	
	Terminal	Terminal	
M9	105 (Refrigerant pressure sensor signal)	116	1.0 - 4.0

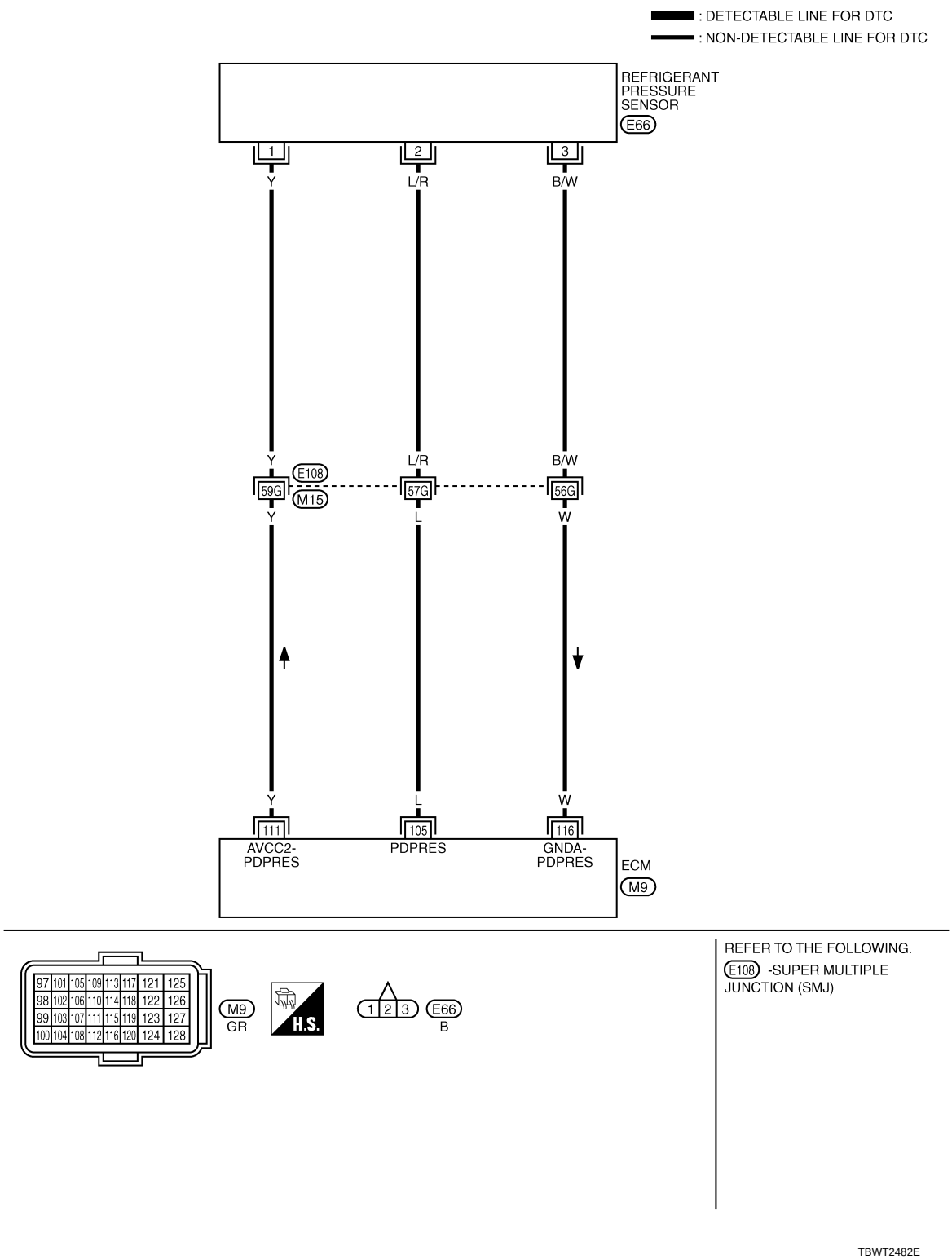
Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-638, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353839

EC-RP/SEN-01



TBWT2482E

Diagnosis Procedure

INFOID:0000000005353840

1. CHECK GROUND CONNECTION

1. Turn A/C switch and blower fan switch OFF.
2. Turn ignition switch OFF.
3. Check ground connections M16, M70. Refer to EC-158, "Ground Inspection".

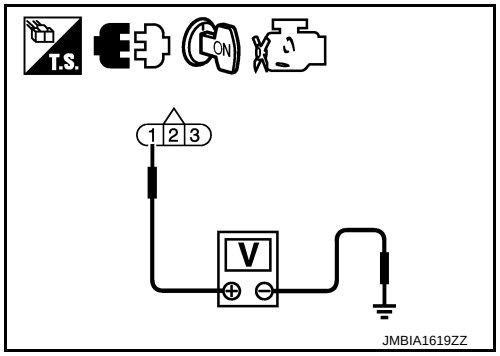
Is the inspection result normal?

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

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		
E66	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 E108, M15
- 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	
E66	3	M9	116	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 E108, M15
- 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	
E66	2	M9	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 E108, M15
- 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 EC-154, "Description".

Is the inspection result normal?

YES >> Replace refrigerant pressure sensor.
NO >> Repair or replace malfunctioning part.

SNOW MODE SWITCH

Description

INFOID:0000000005353841

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 by 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 accelerator 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:0000000005353842

1. CHECK SNOW MODE SWITCH FUNCTION

1. Turn ignition switch ON.
2. Select “SNOW MODE SW” in “DATA MONITOR” mode with CONSULT-III.
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-642, "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.

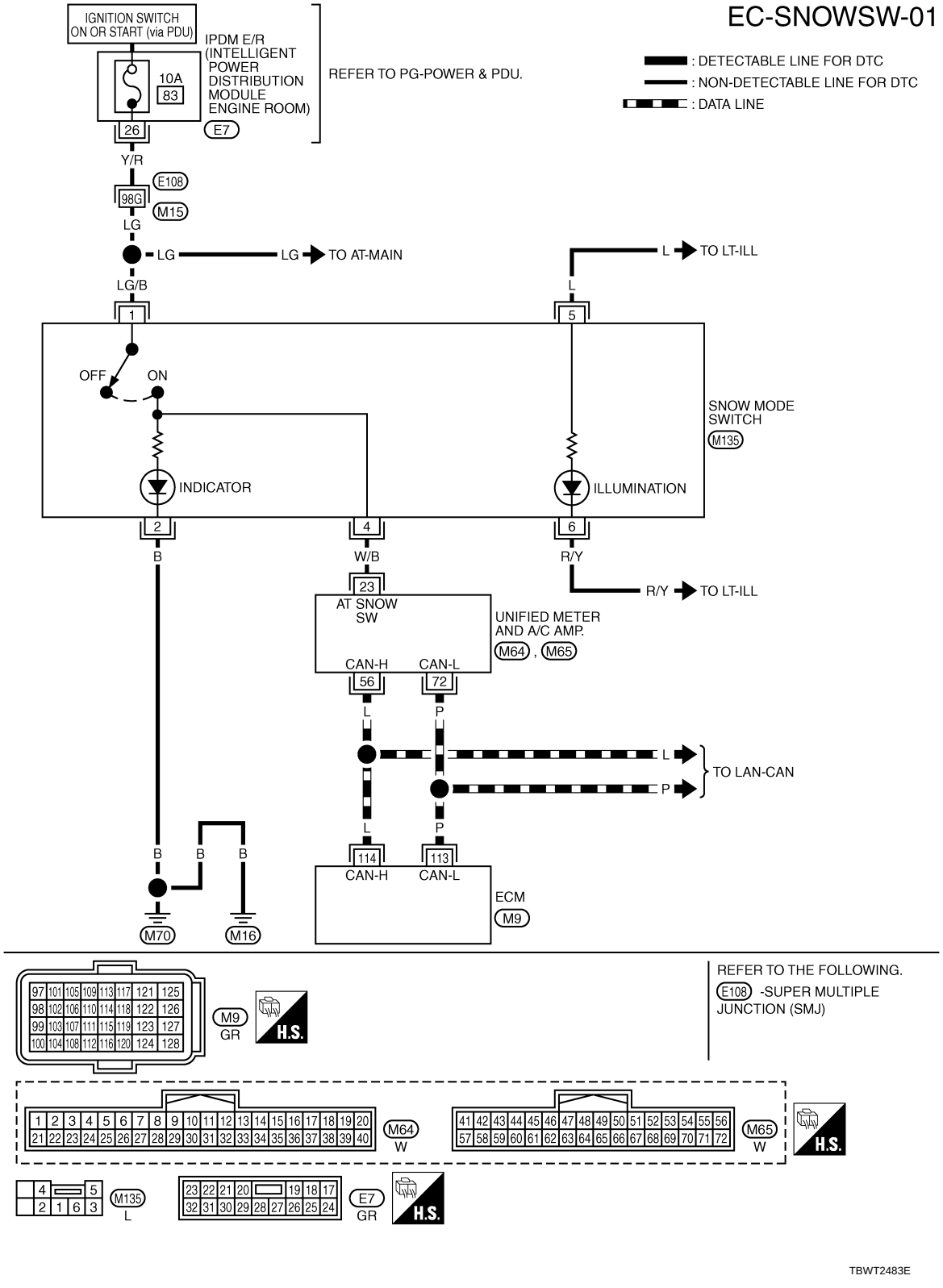
Condition		Snow mode indicator
Snow mode switch	ON	ON
	OFF	OFF

Is the inspection result normal?

YES >> INSPECTION END
NO >> Go to EC-642, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353843



TBWT2483E

Diagnosis Procedure

INFOID:0000000005353844

1. CHECK SNOW MODE SWITCH OVERALL FUNCTION

Confirm the malfunctioning circuit (snow mode switch or snow mode indicator). Refer to EC-641, "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 DI-28, "CONSULT-III Function (METER/M&A)".

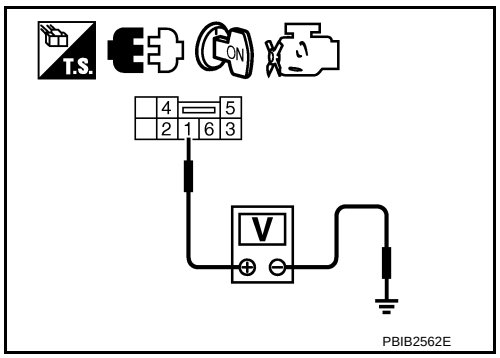
Is the inspection result normal?

YES >> GO TO 3.
NO >> Go to DI-26, "System Description".

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		
M135	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 E108, M15
- IPDM E/R harness connector E7
- 10 A fuse (No. 83)
- 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	
M135	4	M64	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 connections M16, M70. Refer to EC-158, "Ground Inspection".

Is the inspection result normal?

YES >> GO TO 7.

NO >> Repair or replace ground connections.

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		
M135	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-644, "Component Inspection".

Is the inspection result normal?

YES >> GO TO 9.
NO >> Replace snow mode switch.

9.CHECK INTERMITTENT INCIDENT

Refer to EC-154, "Description".

>> INSPECTION END

Component Inspection

INFOID:0000000005353845

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.

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.

ECU DIAGNOSIS

ECM

Reference Value

INFOID:0000000005353846

VALUES ON THE DIAGNOSIS TOOL

NOTE:

- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

CONSULT-III MONITOR ITEM

Monitor Item	Condition		Values/Status
ENG SPEED	• Run engine and compare CONSULT-III value with the tachometer indication.		Almost the same speed as the tachometer indication
MAS A/F SE-B1	See EC-146, "Description".		
MAS A/F SE-B2	See EC-146, "Description".		
B/FUEL SCHDL	See EC-146, "Description".		
A/F ALPHA-B1	See EC-146, "Description".		
A/F ALPHA-B2	See EC-146, "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 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 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 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 to 3,000 rpm quickly after the following conditions are met. - Engine: After warming up - After keeping engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		LEAN ←→ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.45 - 1.0 V
		Accelerator pedal: Fully depressed	4.4 - 4.8 V
ACCEL SEN 2*1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.45 - 1.0 V
		Accelerator pedal: Fully depressed	4.4 - 4.8 V

Monitor Item	Condition		Values/Status
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	10° - 20° 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%
MASS AIRFLOW	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s

Monitor Item	Condition		Values/Status
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
EXH/V TIM B1	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	–5° - 5°CA
		Around 2,500 rpm while the engine speed is rising	Approx. 0° - 30°CA
EXH/V TIM B2	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	–5° - 5°CA
		Around 2,500 rpm while the engine speed is rising	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%
VTC DTY EX B1	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	0% - 2%
		Around 2,500 rpm while the engine speed is rising	Approx. 0% - 70%
VTC DTY EX B2	• Engine: After warming up • Selector lever: P or N • Air conditioner switch: OFF • No load	Idle	0% - 2%
		Around 2,500 rpm while the engine speed is rising	Approx. 0% - 70%
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
FPCM	• Engine: Cranking		HI
	• Engine: Idle • Engine coolant temperature: More than 10°C (50°F)		LOW
VENT CONT/V	• Ignition switch: ON		OFF
THRTL RELAY	• Ignition switch: ON		ON

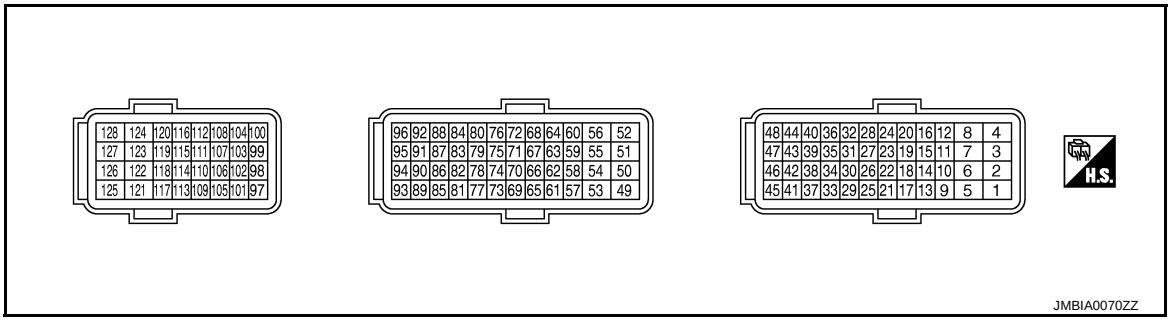
Monitor Item	Condition		Values/Status
HO2S2 HTR (B1)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
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-III value with the speedometer indication.		Almost the same speed as the speedometer indication
IDL A/V LEARN	• Engine: Running	Idle air volume learning has not been performed yet.	YET
		Idle air volume learning has already been performed successfully.	CMPLT
SNOW MODE SW	• Ignition switch: ON	Snow mode switch: ON	ON
		Snow mode switch: OFF	OFF
ENG OIL TEMP	• Engine: After warming up		More than 70°C (158°F)
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-III value with the speedometer indication.		Almost the same speed as the speedometer indication
SET VHCL SPD	• Engine: Running	ASCD: Operating	The preset vehicle speed is displayed
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	• Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	• Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1 (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
VHCL SPD CUT	• Ignition switch: ON		NON

Monitor Item	Condition		Values/Status
LO SPEED CUT	• Ignition switch: ON		NON
AT OD MONITOR	• Ignition switch: ON		OFF
AT OD CANCEL	• Ignition switch: ON		OFF
CRUISE LAMP	• Ignition switch: ON	MAIN switch: Pressed at the 1st time → at the 2nd time	ON → OFF
SET LAMP	• MAIN switch: ON • When vehicle speed is between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Operating	ON
		ASCD: Not operating	OFF
EXH V/T LEARN	• Engine: Running	Exhaust Valve Timing Control Learning has not been performed yet.	YET
		Exhaust Valve Timing Control Learning has not been performed yet.	CMPLT
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
AC EVA TEMP	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		Changes according to instructed value from Unified mater and A/C amp.
AC EVA TARGET	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		Changes according to instructed value from Unified mater and A/C amp.
ALT DUTY	• Engine: Idle		0 - 80%
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

*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.

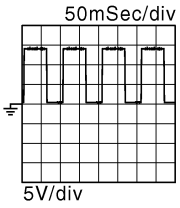
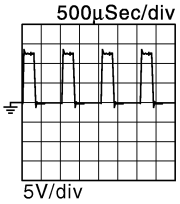
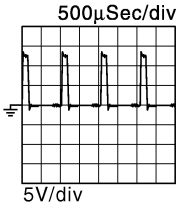
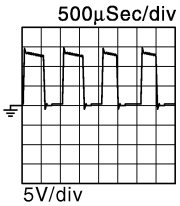
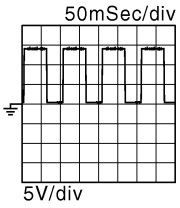
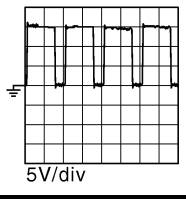
*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

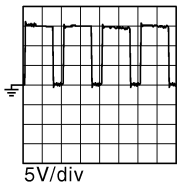
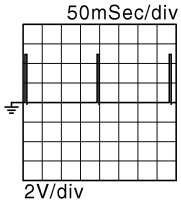
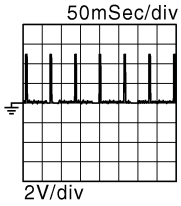
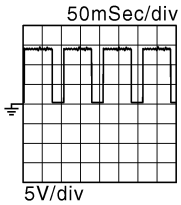
TERMINAL LAYOUT

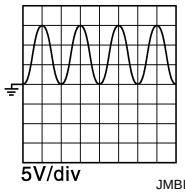
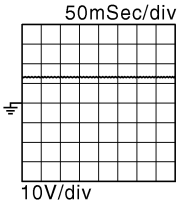
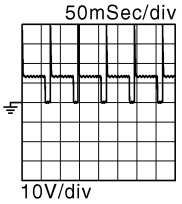


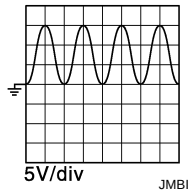
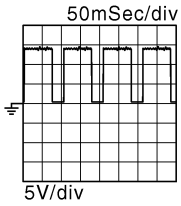
PHYSICAL VALUES

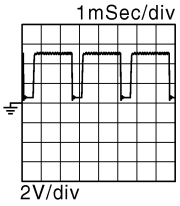
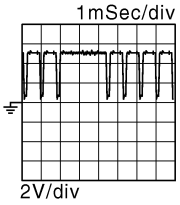
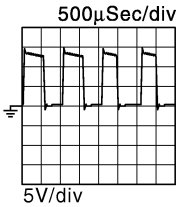
NOTE:
- ECM is located behind the instrument assist lower panel. For this inspection, remove passenger side instrument lower panel.
- Specification data are reference values and are measured between each terminal and ground.
- Pulse signal is measured by CONSULT-III.

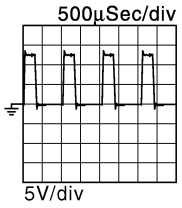
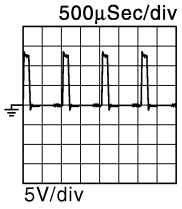
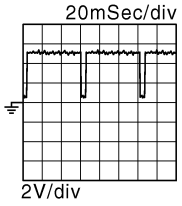
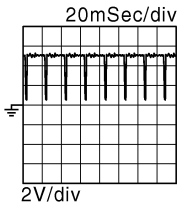
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
1 (G)	128 (B)	A/F sensor 1 heater (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed (More than 140 seconds after starting engine)	2.9 - 8.8 V★  JMBIA0030GB
2 (P)	128 (B)	Throttle control 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 relay power supply (bank 1)	Input	[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
4 (V)	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
6 (SB)	128 (B)	Exhaust valve timing control magnet retarder (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Around 2,500 rpm while the engine speed is rising	7 - 12 V★  JMBIA0034GB

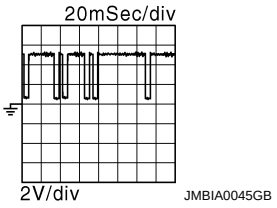
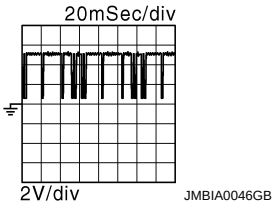
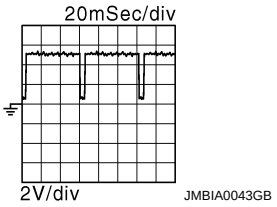
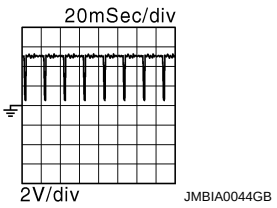
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
7 (Y)	128 (B)	Exhaust valve timing control magnet retarder (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Around 2,500 rpm while the engine speed is rising	7 - 12 V★  JMBIA0034GB
8 (B)	—	ECM ground	—	—	—
11 (GR) 12 (L) 15 (LG) 16 (G) 19 (BR) 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★  JMBIA0035GB
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	0.1 - 0.4 V★  JMBIA0036GB
14 (BR)	128 (B)	Fuel pump control module (FPCM)	Output	[When cranking engine]	0 - 0.5 V
				• Warm-up condition • Idle speed	8 - 12 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★  JMBIA0037GB
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)

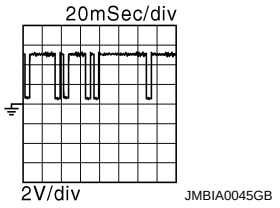
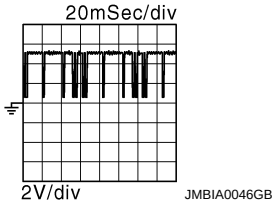
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
18 (W)	128 (B)	Intake valve timing control solenoid valve (bank 1)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	7 - 12 V★  JMBIA1638GB
21 (V)	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)★  JMBIA0039GB
				[Engine is running] • Engine speed: Approx. 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★  JMBIA0040GB
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 (SB)	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

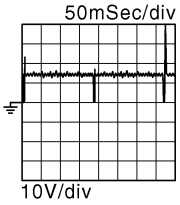
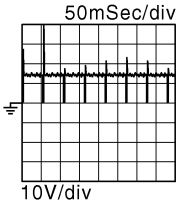
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
29 (GR)	128 (B)	Intake valve timing control solenoid valve (bank 2)	Output	[Engine is running] • Warm-up condition • Idle speed	BATTERY VOLTAGE (11 - 14 V)
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	7 - 12 V★  JMBIA1638GB
30 (O)	40 (W/L)	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
32 (G/R)	128 (B)	Fuel pump control module (FPCM) check	Input	[When cranking engine]	0 V
				[Engine is running] • Warm-up condition • Idle speed	4 - 6 V
33 (LG)	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★  JMBIA0037GB
				[Ignition switch: ON] • Engine stopped [Engine is running] • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
34 (O/L)	40 (W/L)	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

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
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
37 (W)	128 (B)	Crankshaft position sensor	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.0 - 5.0 V★  JMBIA0041GB
				[Engine is running] • Engine speed: 2,000 rpm	4.0 - 5.0 V★  JMBIA0042GB
40 (W/L)	—	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 (W)	40 (W/L)	Sensor power supply [Throttle position sensor (bank 1)]	—	[Ignition switch: ON]	5 V
46 (R)	47 (B/W)	Sensor power supply [Crankshaft position sensor]	—	[Ignition switch: ON]	5 V
47 (B/W)	—	Sensor ground [Crankshaft position sensor]	—	—	—
48 (B)	—	Sensor ground [Throttle position sensor (bank 2)]	—	—	—
49 (L/Y)	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★  JMBIA0033GB

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
50 (L)	128 (B)	Throttle control motor (Open) (bank 2)	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
52 (R)	128 (B)	Throttle control motor relay 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)
57 (L)	128 (B)	A/F sensor 1 (bank 1)	Input	[Ignition switch: ON]	2.2 V
58 (V)	88 (L/G)	Exhaust valve timing control position sensor (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	4.0 - 5.0 V★  JMBIA0043GB
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	4.0 - 5.0 V★  JMBIA0044GB

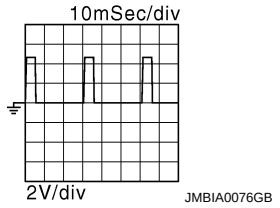
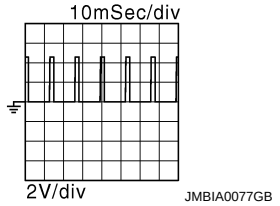
Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
59 (LG)	96 (G/B)	Camshaft position sensor (bank 1)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★ 
60 (R)	128 (B)	Sensor power supply [Camshaft position sensor (bank 1), Exhaust valve timing control position sensor (bank 1), Power steering pressure sensor]	—	[Ignition switch: ON]	5 V
61 (P)	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.
62 (B/Y)	88 (LG)	Exhaust valve timing control position sensor (bank 2)	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] • Warm-up condition • Engine speed: 2,000 rpm	4.0 - 5.0 V★ 

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
63 (L)	128 (B)	Camshaft position sensor (bank 2)	Input	[Engine is running] • Warm-up condition • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	3.0 - 5.0 V★ 
				[Engine is running] • Engine speed: 2,000 rpm	3.0 - 5.0 V★ 
64 (BR)	128 (B)	Sensor power supply [Camshaft position sensor (bank 2), Exhaust valve timing control position sensor (bank 2), Battery current sensor]	—	[Ignition switch: ON]	5 V
65 (V)	128 (B)	A/F sensor 1 (bank 2)	Input	[Ignition switch: ON]	2.2 V
66 (LG)	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 (Y)	68 (P)	Intake air temperature sensor (bank 1)	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.
68 (P)	—	Sensor ground [Mass air flow sensor (bank 1), Intake air temperature sensor (bank 1)]	—	—	—
69 (W)	72 (—)	Knock sensor (bank 2)	Input	[Engine is running] • Idle speed	2.5 V*1
71 (O)	84 (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)	72 (—)	Knock sensor (bank 1)	Input	[Engine is running] • Idle speed	2.5 V*1
76 (GR)	84 (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

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
77 (L)	68 (P)	Mass air flow sensor (bank 1)	Input	[Ignition switch: ON]	0.4 V
				[Engine is running] • Warm-up condition • Idle speed	0.9 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.6 - 1.9 V
				[Engine is running] • Warm-up condition • Idle speed to approx. 4,000 rpm	0.9 – 1.2 to 2.4 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 (W)	94 (B)	Mass air flow sensor (bank 2)	Input	[Ignition switch: ON]	0.4 V
				[Engine is running] • Warm-up condition • Idle speed	0.9 - 1.2 V
				[Engine is running] • Warm-up condition • Engine speed: 2,500 rpm	1.6 - 1.9 V
				[Engine is running] • Warm-up condition • Idle speed to approx. 4,000 rpm	0.9 – 1.2 to 2.4 V
80 (BR)	84 (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 (P) 82 (V) 85 (GR) 86 (O) 89 (L) 90 (BR)	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)★  JMBIA0047GB
				[Engine is running] • Warm-up condition • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  JMBIA0048GB
83 (Y)	94 (B)	Intake air temperature sensor (bank 2)	Input	[Engine is running]	0 - 4.8 V Output voltage varies with intake air temperature.

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
84 (B)	—	Sensor ground (Heated oxygen sensor 2, Engine coolant temperature sensor, Engine oil temperature sensor)	—	—	—
87 (O)	96 (G/B)	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
88 (LG)	—	Sensor ground [Exhaust valve timing control position sensor (bank 1), Exhaust valve timing control position sensor (bank 2)]	—	—	—
91 (G)	95 (G/W)	Battery current sensor	Input	[Engine is running] • Battery: Fully charged*2 • Idle speed	2.6 - 3.5 V
92 (R)	—	Sensor ground [Camshaft position sensor (bank 2)]	—	[Engine is running] • Warm-up condition • Idle speed	0 V
93 (R)	128 (B)	Power supply for ECM (Back-up)	Input	[Ignition switch: OFF]	BATTERY VOLTAGE (11 - 14 V)
94 (B)	—	Sensor ground [Mass air flow sensor (bank 2)]	—	—	—
95 (G/W)	—	Sensor ground (Battery current sensor)	—	—	—
96 (G/B)	—	Sensor ground [Camshaft position sensor (bank 1), 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 - 1.0 V
				[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	4.4 - 4.8 V
98 (LG)	104 (W)	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)	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 (Y)	108 (B/Y)	ICC steering switch (models with ICC system)	Input	[Ignition switch: ON] • ICC steering switch: OFF	4.0 V
				[Ignition switch: ON] • MAIN switch: Pressed	0 V
				[Ignition switch: ON] • CANCEL switch: Pressed	1.6 V
				[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	3.4 V
				[Ignition switch: ON] • SET/COAST switch: Pressed	2.9 V
				[Ignition switch: ON] • DISTANCE switch: Pressed	2.2 V
				[Ignition switch: ON] • LDP switch: Pressed	0.8 V
101 (Y)	108 (B/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 (R/G)	112 (B/W)	EVAP control system pressure sensor	Input	[Ignition switch: ON]	1.8 - 4.8 V
103 (G)	104 (W)	Sensor power supply (Accelerator pedal position sensor 2)	—	[Ignition switch: ON]	5 V
104 (W)	—	Sensor ground (Accelerator pedal position sensor 2)	—	—	—
105 (L)	116 (W)	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 (L/B)	112 (B/W)	Sensor power supply (EVAP control system pressure sensor)	—	[Ignition switch: ON]	5 V
108 (B/Y)	—	Sensor ground (ASCD/ICC steering switch)	—	—	—
109 (B/R)	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

Terminal No. (Wire color)		Description		Condition	Value (Approx.)
+	–	Signal name	Input/ Output		
110 (R)	128 (B)	Engine speed signal output	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★ 
111 (Y)	116 (W)	Sensor power supply (Refrigerant pressure sensor)	—	[Ignition switch: ON]	5 V
112 (B/W)	—	Sensor ground (EVAP control system pressure sensor)	—	—	—
113 (P)	—	CAN communication line	Input/ Output	—	—
114 (L)	—	CAN communication line	Input/ Output	—	—
116 (W)	—	Sensor ground (Refrigerant pressure sensor)	—	—	—
117 (V)	—	Data link connector	Input/ Output	—	—
121 (GR/L)	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	—	—	—

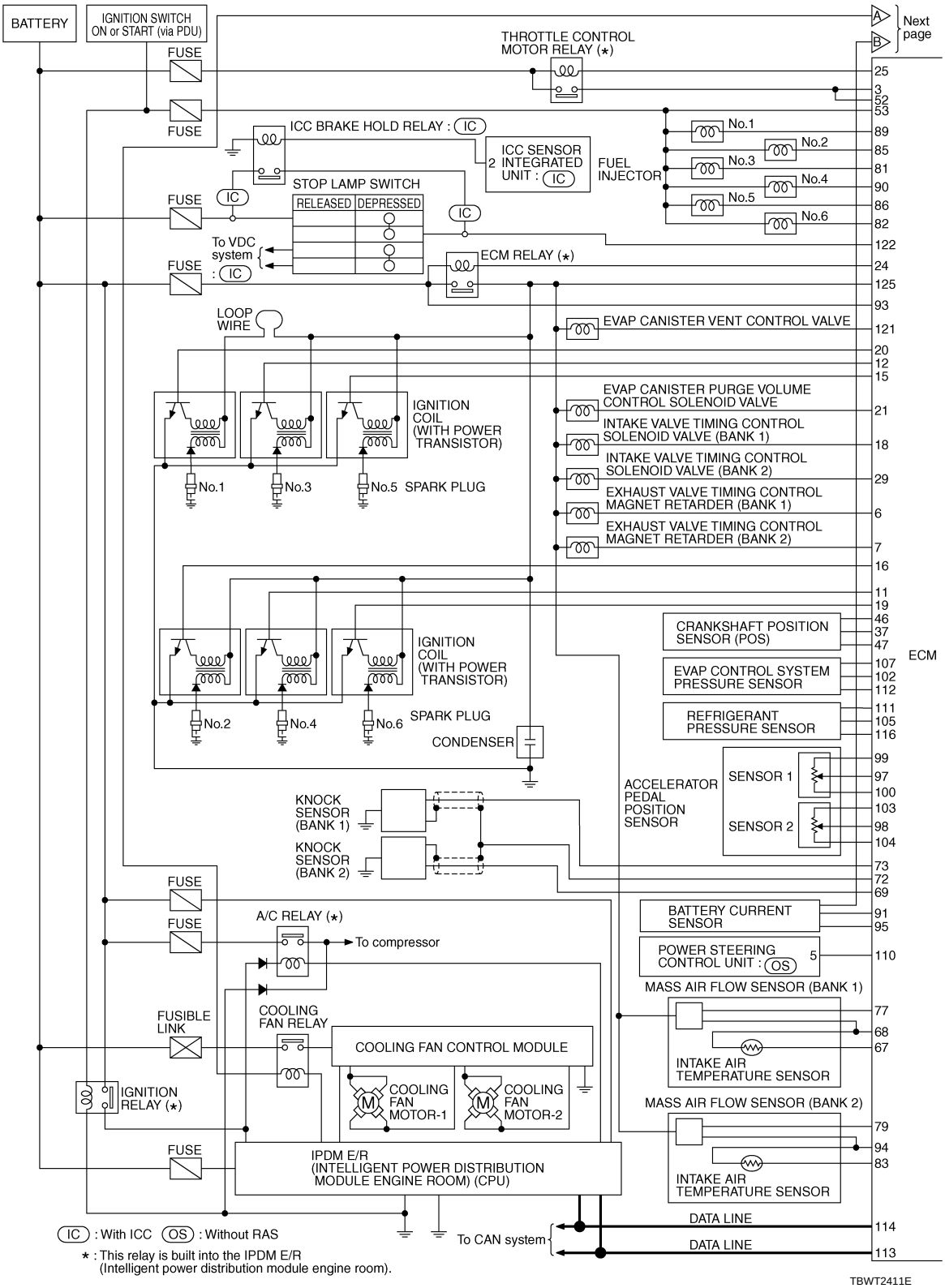
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

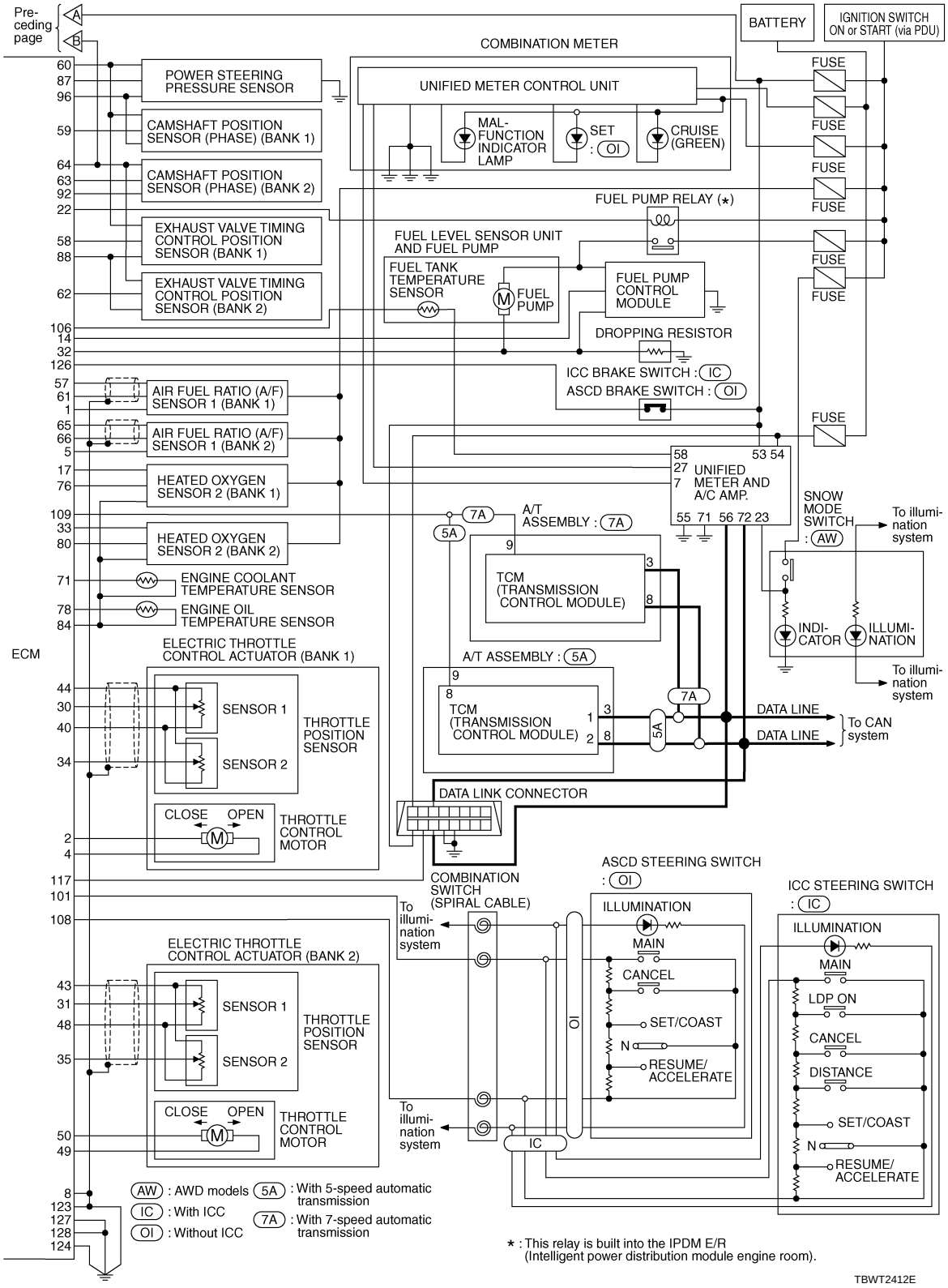
*1: This may vary depending on internal resistance of the tester.

*2: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Wiring Diagram - ENGINE CONTROL SYSTEM -

INFOID:0000000005353847





Fail-safe

INFOID:0000000005353848

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-626

DTC RELATED ITEM

DTC No.	Detected items	Engine operating condition in fail-safe mode	
P0011 P0021	Intake valve timing control	The signal is not energized to the intake valve timing control solenoid valve and the valve control does not function.	
P0014 P0024	Exhaust valve timing control	The signal is not energized to the exhaust valve timing control magnet retarder and the magnet retarder control does not function.	
P0102 P0103 P010C P010D	Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.	
P0117 P0118	Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following condition. CONSULT-III displays the engine coolant temperature decided by ECM.	
		Condition	Engine coolant temperature decided (CONSULT-III display)
		Just as ignition switch is turned ON or START	40°C (104°F)
		Approx. 4 minutes or more after engine starting	80°C (176°F)
		Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
		When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	
P0122 P0123 P0222 P0223 P0227 P0228 P1239 P2132 P2133 P2135	Throttle position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.	
P0196 P0197 P0198	Engine oil temperature sensor	Exhaust valve timing control does not function.	
P0500	Vehicle speed sensor	The cooling fan operates (Highest) while engine is running.	
P0605	ECM	(When ECM calculation function is malfunctioning:) ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring. ECM deactivates ASCD operation.	
P0643	Sensor power supply	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	
P1233 P2101	Electric throttle control function	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.	

DTC No.	Detected items	Engine operating condition in fail-safe mode
P1236 P2118	Throttle control motor	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1238 P2119	Electric throttle control actuator	(When electric throttle control actuator does not function properly due to the return spring malfunction:) ECM controls the electric throttle actuator by regulating the throttle opening around the idle position. The engine speed will not rise more than 2,000 rpm.
		(When throttle valve opening angle in fail-safe mode is not in specified range:) ECM controls the electric throttle control actuator because regulating the throttle opening to 20 degrees or less.
		(When ECM detects the throttle valve is stuck open:) While the vehicle is being driven, it slows down gradually 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.
P1290 P2100 P2103	Throttle control motor relay	ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.
P1805	Brake switch	ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.

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

P2122 P2123 P2127 P2128 P2138	Accelerator pedal position sensor	The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. Therefore, the acceleration will be poor.

DTC Inspection Priority Chart

INFOID:0000000005353849

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

Priority	Detected items (DTC)
1	• U0101 U0164 U1001 CAN communication line • P0101 P0102 P0103 P010B P010C P010D Mass air flow sensor • P0112 P0113 P0127 Intake air temperature sensor • P0116 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 • P0340 P0345 Camshaft position sensor • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0605 P0607 ECM • P0643 Sensor power supply • P0705 Transmission range switch • P0850 Park/neutral position (PNP) switch • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1614 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
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 • P0078 P0084 Exhaust valve timing control magnet retarder • P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 P2A00 P2A03 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 P0729 P0730 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P0750 P0775 P0780 P0795 P1730 P1734 P1752 P1757 P1762 P1767 P1772 P1774 P2713 P2722 P2731 P2307 A/T related sensors, solenoid valves and switches • P1078 P1084 Exhaust valve timing control position sensor • 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 • P0014 P0024 Exhaust valve timing control • P0171 P0172 P0174 P0175 Fuel injection system function • P0300 - P0306 Misfire • P0420 P0430 Three way catalyst function • P0442 P0456 EVAP control system (SMALL LEAK, VERY SMALL LEAK) • P0455 EVAP control system (GROSS LEAK) • P0506 P0507 Idle speed control system • P1148 P1168 Closed loop control • P1211 TCS control unit • P1212 TCS communication line • P1238 P2119 Electric throttle control actuator • P1421 Cold start control • 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 • P1715 Input speed sensor

DTC Index

INFOID:0000000005353850

×:Applicable —: Not applicable

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
U0101	0101*4	LOST COMM (ECM)	—	1	×	EC-160
U0164	0164*4	LOST COMM (HVAC)	—	1	×	EC-162
U1001	1001*4	CAN COMM CIRCUIT	—	2 (2WD) 1 (4WD)	—	EC-164
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	**Blinking***7	**—**
P0011	0011	INT/V TIM CONT-B1	—	2	×	EC-166
P0014	0014	EXH/V TIM CONT-B1	—	2	×	EC-170
P0021	0021	INT/V TIM CONT-B2	—	2	×	EC-166
P0024	0024	EXH/V TIM CONT-B2	—	2	×	EC-170
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	EC-174
P0032	0032	A/F SEN1 HTR (B1)	—	2	×	EC-174
P0037	0037	HO2S2 HTR (B1)	—	2	×	EC-179
P0038	0038	HO2S2 HTR (B1)	—	2	×	EC-179
P0051	0051	A/F SEN1 HTR (B2)	—	2	×	EC-174
P0052	0052	A/F SEN1 HTR (B2)	—	2	×	EC-174
P0057	0057	HO2S2 HTR (B2)	—	2	×	EC-179
P0058	0058	HO2S2 HTR (B2)	—	2	×	EC-179
P0075	0075	INT/V TIM V/CIR-B1	—	2	×	EC-185
P0078	0078	EX V/T ACT/CIRC-B1	—	2	×	EC-190
P0081	0081	INT/V TIM V/CIR-B2	—	2	×	EC-185
P0084	0084	EX V/T ACT/CIRC-B2	—	2	×	EC-190
P0101	0101	MAF SEN/CIRCUIT-B1	—	2	×	EC-195
P0102	0102	MAF SEN/CIRCUIT-B1	—	1	×	EC-205
P0103	0103	MAF SEN/CIRCUIT-B1	—	1	×	EC-205
P010B	010B	MAF SEN/CIRCUIT-B2	—	2	×	EC-195
P010C	010C	MAF SEN/CIRCUIT-B2	—	1	×	EC-205
P010D	010D	MAF SEN/CIRCUIT-B2	—	1	×	EC-205
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	EC-214
P0113	0113	IAT SEN/CIRCUIT-B1	—	2	×	EC-214
P0116	0116	ECT SEN/CIRC	—	2	×	EC-218
P0117	0117	ECT SEN/CIRC	—	1	×	EC-220
P0118	0118	ECT SEN/CIRC	—	1	×	EC-220
P0122	0122	TP SEN 2/CIRC-B1	—	1	×	EC-224
P0123	0123	TP SEN 2/CIRC-B1	—	1	×	EC-224
P0125	0125	ECT SENSOR	—	2	×	EC-230
P0127	0127	IAT SENSOR-B1	—	2	×	EC-233
P0128	0128	THERMSTAT FNCTN	—	2	×	EC-235

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P0130	0130	A/F SENSOR1 (B1)	—	2	×	EC-237
P0131	0131	A/F SENSOR1 (B1)	—	2	×	EC-244
P0132	0132	A/F SENSOR1 (B1)	—	2	×	EC-250
P0133	0133	A/F SENSOR1 (B1)	×	2	×	EC-256
P0137	0137	HO2S2 (B1)	×	2	×	EC-264
P0138	0138	HO2S2 (B1)	×	2	×	EC-273
P0139	0139	HO2S2 (B1)	×	2	×	EC-285
P0150	0150	A/F SENSOR1 (B2)	—	2	×	EC-237
P0151	0151	A/F SENSOR1 (B2)	—	2	×	EC-244
P0152	0152	A/F SENSOR1 (B2)	—	2	×	EC-250
P0153	0153	A/F SENSOR1 (B2)	×	2	×	EC-256
P0157	0157	HO2S2 (B2)	×	2	×	EC-264
P0158	0158	HO2S2 (B2)	×	2	×	EC-273
P0159	0159	HO2S2 (B2)	×	2	×	EC-285
P0171	0171	FUEL SYS-LEAN-B1	—	2	×	EC-294
P0172	0172	FUEL SYS-RICH-B1	—	2	×	EC-301
P0174	0174	FUEL SYS-LEAN-B2	—	2	×	EC-294
P0175	0175	FUEL SYS-RICH-B2	—	2	×	EC-301
P0181	0181	FTT SENSOR	—	2	×	EC-307
P0182	0182	FTT SEN/CIRCUIT	—	2	×	EC-312
P0183	0183	FTT SEN/CIRCUIT	—	2	×	EC-312
P0196	0196	EOT SENSOR	—	2	×	EC-316
P0197	0197	EOT SEN/CIRC	—	2	×	EC-319
P0198	0198	EOT SEN/CIRC	—	2	×	EC-319
P0222	0222	TP SEN 1/CIRC-B1	—	1	×	EC-323
P0223	0223	TP SEN 1/CIRC-B1	—	1	×	EC-323
P0227	0227	TP SEN 2/CIRC-B2	—	1	×	EC-224
P0228	0228	TP SEN 2/CIRC-B2	—	1	×	EC-224
P0300	0300	MULTI CYL MISFIRE	—	2	×	EC-329
P0301	0301	CYL 1 MISFIRE	—	2	×	EC-329
P0302	0302	CYL 2 MISFIRE	—	2	×	EC-329
P0303	0303	CYL 3 MISFIRE	—	2	×	EC-329
P0304	0304	CYL 4 MISFIRE	—	2	×	EC-329
P0305	0305	CYL 5 MISFIRE	—	2	×	EC-329
P0306	0306	CYL 6 MISFIRE	—	2	×	EC-329
P0327	0327	KNOCK SEN/CIRC-B1	—	2	—	EC-335
P0328	0328	KNOCK SEN/CIRC-B1	—	2	—	EC-335
P0332	0332	KNOCK SEN/CIRC-B2	—	2	—	EC-335
P0333	0333	KNOCK SEN/CIRC-B2	—	2	—	EC-335
P0335	0335	CKP SEN/CIRCUIT	—	2	×	EC-340
P0340	0340	CMP SEN/CIRC-B1	—	2	×	EC-346
P0345	0345	CMP SEN/CIRC-B2	—	2	×	EC-346

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P0420	0420	TW CATALYST SYS-B1	×	2	×	EC-353
P0430	0430	TW CATALYST SYS-B2	×	2	×	EC-353
P0441	0441	EVAP PURG FLOW/MON	×	2	×	EC-358
P0442	0442	EVAP SMALL LEAK	×	2	×	EC-363
P0443	0443	PURG VOLUME CONT/V	—	2	×	EC-369
P0444	0444	PURG VOLUME CONT/V	—	2	×	EC-375
P0445	0445	PURG VOLUME CONT/V	—	2	×	EC-375
P0447	0447	VENT CONTROL VALVE	—	2	×	EC-379
P0448	0448	VENT CONTROL VALVE	—	2	×	EC-385
P0451	0451	EVAP SYS PRES SEN	—	2	×	EC-391
P0452	0452	EVAP SYS PRES SEN	—	2	×	EC-395
P0453	0453	EVAP SYS PRES SEN	—	2	×	EC-402
P0455	0455	EVAP GROSS LEAK	—	2	×	EC-410
P0456	0456	EVAP VERY SML LEAK	×*6	2	×	EC-416
P0460	0460	FUEL LEV SEN SLOSH	—	2	×	EC-423
P0461	0461	FUEL LEVEL SENSOR	—	2	×	EC-425
P0462	0462	FUEL LEVL SEN/CIRC	—	2	×	EC-427
P0463	0463	FUEL LEVL SEN/CIRC	—	2	×	EC-427
P0500	0500	VEH SPEED SEN/CIRC*5	—	2	×	EC-429
P0506	0506	ISC SYSTEM	—	2	×	EC-431
P0507	0507	ISC SYSTEM	—	2	×	EC-433
P0550	0550	PW ST P SEN/CIRC	—	2	—	EC-435
P0603	0603	ECM BACK UP/CIRCUIT	—	2	×	EC-439
P0605	0605	ECM	—	1 or 2	× or —	EC-442
P0607	0607	ECM	—	1	×	EC-444
P0643	0643	SENSOR POWER/CIRC	—	1	×	EC-445
P0705	0705	T/M RANGE SENSOR A	—	2	×	AT-402
P0710	0710	ATF TEMP SEN/CIRC	—	2	×	AT-403
P0717	0717	INPUT SPEED SENSOR A	—	2	×	AT-405
P0720	0720	OUTPUT SPEED SENSOR	—	2	×	AT-407
P0729	0729	AT 6TH FUNCTN	—	2	×	AT-411
P0730	0730	BELT DAMG	—	2	×	AT-413
P0731	0731	1GR INCORRECT RATIO	—	2	×	AT-414
P0732	0732	2GR INCORRECT RATIO	—	2	×	AT-416
P0733	0733	3GR INCORRECT RATIO	—	2	×	AT-418
P0734	0734	4GR INCORRECT RATIO	—	2	×	AT-420
P0735	0735	5GR INCORRECT RATIO	—	2	×	AT-422
P0740	0740	TORQUE CONVERTER	—	2	×	AT-424
P0744	0744	TORQUE CONVERTER	—	2	×	AT-426
P0745	0745	PC SOLENOID A	—	2	×	AT-427

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P0750	0750	SHIFT SOLENOID A	—	2 (2WD) 1 (4WD)	×	AT-428
P0775	0775	PC SOLENOID B	—	2	×	AT-429
P0780	0780	SHIFT	—	1	×	AT-430
P0795	0795	PC SOLENOID C	—	2	×	AT-431
P0850	0850	P-N POS SW/CIRCUIT	—	2	×	EC-449
P1078	1078	EXH TIM SEN/CIRC-B1	—	2	×	EC-453
P1084	1084	EXH TIM SEN/CIRC-B2	—	2	×	EC-453
P1148	1148	CLOSED LOOP-B1	—	1	×	EC-461
P1168	1168	CLOSED LOOP-B2	—	1	×	EC-461
P1211	1211	TCS C/U FUNCTN	—	2	—	EC-462
P1212	1212	TCS/CIRC	—	2	—	EC-463
P1217	1217	ENG OVER TEMP	—	1	×	EC-464
P1225	1225	CTP LEARNING-B1	—	2	—	EC-468
P1226	1226	CTP LEARNING-B1	—	2	—	EC-470
P1233	1233	ETC FNCTN/CIRC-B2	—	1	×	EC-472
P1234	1234	CTP LEARNING-B2	—	2	—	EC-468
P1235	1235	CTP LEARNING-B2	—	2	—	EC-470
P1236	1236	ETC MOT-B2	—	1	×	EC-479
P1238	1238	ETC ACTR-B2	—	1	×	EC-484
P1239	1239	TP SENSOR-B2	—	1	×	EC-486
P1290	1290	ETC MOT PWR-B2	—	1	×	EC-492
P1421	1421	COLD START CONTROL	—	2	×	EC-496
P1550	1550	BAT CURRENT SENSOR	—	2	—	EC-498
P1551	1551	BAT CURRENT SENSOR	—	2	—	EC-504
P1552	1552	BAT CURRENT SENSOR	—	2	—	EC-504
P1553	1553	BAT CURRENT SENSOR	—	2	—	EC-510
P1554	1554	BAT CURRENT SENSOR	—	2	—	EC-516
P1564	1564	ASCD SW	—	1	—	EC-522 (with ASCD) EC-527 (with ICC)
P1568	1568	ICC COMMAND VALUE	—	1	—	EC-532
P1572	1572	ASCD BRAKE SW	—	1	—	EC-533 (with ASCD) EC-541 (with ICC)
P1574	1574	ASCD VHL SPD SEN	—	1	—	EC-549 (with ASCD) EC-551 (with ICC)
P1610	1610	LOCK MODE	—	2	—	BL-5
P1611	1611	ID DISCORD IMMU-ECM	—	2	—	BL-5
P1612	1612	CHAIN OF ECM-IMMU	—	2	—	BL-5

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P1614	1614	CHAIN OF IMMU-KEY	—	2	—	BL-5
P1715	1715	IN RULY SPEED	—	2	—	EC-553
P1730	1730	INTERLOCK	—	2 (2WD) 1 (4WD)	×	AT-435
P1734	1734	AT 7TH GR FNCTN	—	2	×	AT-437
P1752	1752	INPUT CLUTCH SOL	—	1	×	AT-151
P1757	1757	FR BRAKE SOLENOID	—	1	×	AT-153
P1762	1762	DRCT CLUTCH SOL	—	1	×	AT-155
P1767	1767	HLR CLUTCH SOLENOID	—	1	×	AT-157
P1772	1772	L C BRAKE SOLENOID	—	1	×	AT-159
P1774	1774	L C BRAKE SOLENOID	—	1	×	AT-161
P1805	1805	BRAKE SW/CIRCUIT	—	2	—	EC-554
P2100	2100	ETC MOT PWR-B1	—	1	×	EC-492
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	EC-472
P2103	2103	ETC MOT PWR	—	1	×	EC-492
P2118	2118	ETC MOT-B1	—	1	×	EC-479
P2119	2119	ETC ACTR-B1	—	1	×	EC-484
P2122	2122	APP SEN 1/CIRC	—	1	×	EC-558
P2123	2123	APP SEN 1/CIRC	—	1	×	EC-558
P2127	2127	APP SEN 2/CIRC	—	1	×	EC-563
P2128	2128	APP SEN 2/CIRC	—	1	×	EC-563
P2132	2132	TP SEN 1/CIRC-B2	—	1	×	EC-323
P2133	2133	TP SEN 1/CIRC-B2	—	1	×	EC-323
P2135	2135	TP SENSOR-B1	—	1	×	EC-486
P2138	2138	APP SENSOR	—	1	×	EC-569
P2713	2713	PC SOLENOID D	—	2	×	AT-445
P2722	2722	PC SOLENOID E	—	2	×	AT-446
P2731	2731	PC SOLENOID F	—	2	×	AT-447
P2807	2807	PC SOLENOID G	—	2	×	AT-448
P2A00	2A00	A/F SENSOR1 (B1)	—	2	×	EC-575
P2A03	2A03	A/F SENSOR1 (B2)	—	2	×	EC-575

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

*2: This number is prescribed by SAE J2012.

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

*4: The troubleshooting for this DTC needs CONSULT-III.

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

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

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

*8: When erasing this DTC, always use CONSULT-III or GST.

How to Set SRT Code

INFOID:0000000005353851

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

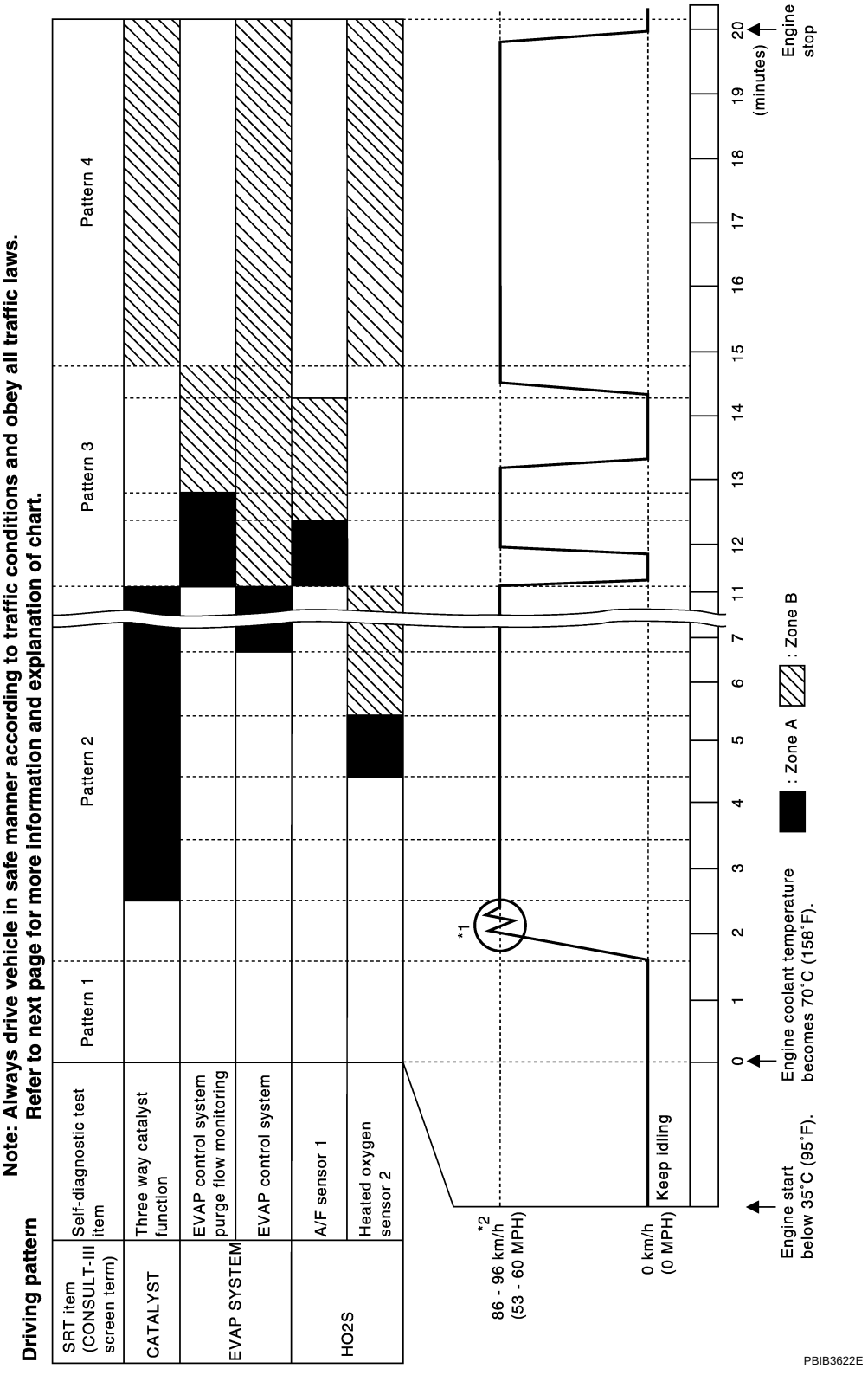
WITH CONSULT-III

Perform corresponding DTC Confirmation Procedure one by one based on Performance Priority in the table on “SRT Item”.

WITHOUT CONSULT-III

The most efficient driving pattern in which SRT codes can be properly set is explained below. The driving pattern should be performed one or more times to set all SRT codes.

DRIVING PATTERN



- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

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

Pattern 1:

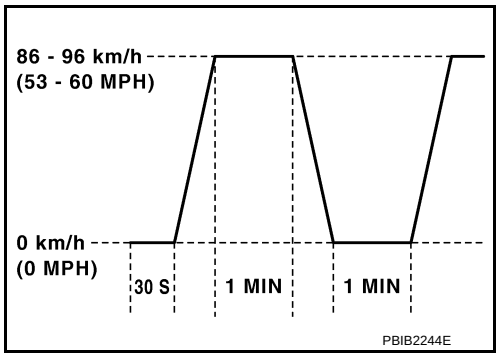
- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 71 and ground is 3.0 - 4.3 V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 71 and ground is lower than 1.4 V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 106 and ground is less than 4.1 V).**

Pattern 2:

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

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).



Pattern 4:

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

*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.

Suggested Transmission Gear Position for A/T Models
Set the selector lever position in the D with the overdrive switch turned ON.

Test Value and Test Limit

INFOID:0000000005353852

The following is the information specified in Service $06 of SAE J1979.
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. (eg., if bank 2 is not applied on this vehicle, only the items of bank 1 are displayed)

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	01H	Air fuel ratio (A/F) sensor 1 (Bank 1)	P0131	83H	0BH	Minimum sensor output voltage for test cycle
			P0131	84H	0BH	Maximum sensor output voltage for test cycle
			P0130	85H	0BH	Minimum sensor output voltage for test cycle
			P0130	86H	0BH	Maximum sensor output voltage for test cycle
			P0133	87H	04H	Response rate: Response ratio (Lean to Rich)
			P0133	88H	04H	Response rate: Response ratio (Rich to Lean)
			P2A00	89H	84H	The amount of shift in air fuel ratio
			P2A00	8AH	84H	The amount of shift in air fuel ratio
			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited frequency
	02H	Heated oxygen sensor 2 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle
			P0137	08H	0CH	Maximum sensor output voltage for test cycle
			P0138	80H	0CH	Sensor output voltage
			P0139	81H	0CH	Difference in sensor output voltage
	03H	Heated oxygen sensor 3 (Bank 1)	P0143	07H	0CH	Minimum sensor output voltage for test cycle
			P0144	08H	0CH	Maximum sensor output voltage for test cycle
			P0146	80H	0CH	Sensor output voltage
			P0145	81H	0CH	Difference in sensor output voltage

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	P0151	83H	0BH	Minimum sensor output voltage for test cycle
			P0151	84H	0BH	Maximum sensor output voltage for test cycle
			P0150	85H	0BH	Minimum sensor output voltage for test cycle
			P0150	86H	0BH	Maximum sensor output voltage for test cycle
			P0153	87H	04H	Response rate: Response ratio (Lean to Rich)
			P0153	88H	04H	Response rate: Response ratio (Rich to Lean)
			P2A03	89H	84H	The amount of shift in air fuel ratio
			P2A03	8AH	84H	The amount of shift in air fuel ratio
			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
	06H	Heated oxygen sensor 2 (Bank 2)	P0158	07H	0CH	Minimum sensor output voltage for test cycle
			P0157	08H	0CH	Maximum sensor output voltage for test cycle
			P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
	07H	Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
			P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
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

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
EGR SYSTEM	31H	EGR function	P0400	80H	96H	Low Flow Faults: EGR temp change rate (short term)
			P0400	81H	96H	Low Flow Faults: EGR temp change rate (long term)
			P0400	82H	96H	Low Flow Faults: Difference between max EGR temp and EGR temp under idling condition
			P0400	83H	96H	Low Flow Faults: Max EGR temp
			P1402	84H	96H	High Flow Faults: EGR temp increase rate
VVT SYSTEM	35H	VVT Monitor (Bank1)	P0011	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0014	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0011	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0014	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
	36H	VVT Monitor (Bank2)	P0021	80H	9DH	VTC intake function diagnosis (VTC alignment check diagnosis)
			P0024	81H	9DH	VTC exhaust function diagnosis (VTC alignment check diagnosis)
			P0021	82H	9DH	VTC intake function diagnosis (VTC drive failure diagnosis)
			P0024	83H	9DH	VTC exhaust function diagnosis (VTC drive failure diagnosis)
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
	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control valve close
O2 SENSOR HEATER	41H	A/F sensor 1 heater (Bank 1)	Low Input:P0031 High Input:P0032	81H	0BH	Converted value of Heater electric current to voltage
	42H	Heated oxygen sensor 2 heater (Bank 1)	Low Input:P0037 High Input:P0038	80H	0CH	Converted value of Heater electric current to voltage
	43H	Heated oxygen sensor 3 heater (Bank 1)	P0043	80H	0CH	Converted value of Heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input:P0051 High Input:P0052	81H	0BH	Converted value of Heater electric current to voltage
	46H	Heated oxygen sensor 2 heater (Bank 2)	Low Input:P0057 High Input:P0058	80H	0CH	Converted value of Heater electric current to voltage
	47H	Heated oxygen sensor 3 heater (Bank 2)	P0063	80H	0CH	Converted value of Heater electric current to voltage

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
SECONDARY AIR	71H	Secondary Air system	P0411	80H	01H	Secondary Air Injection System Incorrect Flow Detected
			Bank1: P0491 Bank2: P0492	81H	01H	Secondary Air Injection System Insufficient Flow
			P2445	82H	01H	Secondary Air Injection System Pump Stuck Off
			P2448	83H	01H	Secondary Air Injection System High Airflow
			Bank1: P2440 Bank2: P2442	84H	01H	Secondary Air Injection System Switching Valve Stuck Open
			P2440	85H	01H	Secondary Air Injection System Switching Valve Stuck Open
			P2444	86H	01H	Secondary Air Injection System Pump Stuck On
FUEL SYSTEM	81H	Fuel injection system function (Bank 1)	P0171 or P0172	80H	2FH	Long term fuel trim
			P0171 or P0172	81H	24H	The number of lambda control clamped
	82H	Fuel injection system function (Bank 2)	P0174 or P0175	80H	2FH	Long term fuel trim
			P0174 or P0175	81H	24H	The number of lambda control clamped

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

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

SYMPTOM DIAGNOSIS

ENGINE CONTROL SYSTEM SYMPTOMS

Symptom Table

INFOID:0000000005353853

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-602
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-692
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-598
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-86
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-635
	Incorrect idle speed adjustment						1	1	1	1		1			EC-22
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-472, EC-484
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-22
	Ignition circuit	1	1	2	2	2		2	2			2			EC-617
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-155
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-195, EC-205
Engine coolant temperature sensor circuit							3			3					EC-220, EC-230
Air fuel ratio (A/F) sensor 1 circuit			1	2	3	2		2	2			2			EC-237, EC-244, EC-250, EC-256, EC-575
Throttle position sensor circuit							2			2					EC-224, EC-323, EC-468, EC-470, EC-486
Accelerator pedal position sensor circuit				3	2	1									EC-558, EC-563, EC-569
Knock sensor circuit				2								3			EC-335

	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		2						3			EC-316, EC-319
Crankshaft position sensor circuit	2	2												EC-340
Camshaft position sensor circuit	3	2												EC-346
Vehicle speed signal circuit		2	3		3						3			EC-429
Power steering pressure sensor circuit		2					3	3						EC-435
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-439, EC-442
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-185
Exhaust valve timing control magnet retarder circuit		3	2		1	3	2	2	3		3			EC-190
PNP signal circuit			3		3		3	3			3			EC-449
Refrigerant pressure sensor circuit		2				3			3		4			EC-637
Electrical load signal circuit							3							EC-596
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-34
ABS actuator and electric unit (control unit)			4											BRC-12

1 - 6: The numbers refer to the order of inspection.

(continued on next figure)

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-10
	Fuel piping			5	5	5		5	5			5			EM-40
	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	5	5	5		5			EM-17
	Air cleaner														EM-17
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)														EM-17
	Electric throttle control actuator														EM-19
	Air leakage from intake manifold/ Collector/Gasket														EM-19, EM-22
Cranking	Battery	1	1	1		1		1	1			1		1	SC-4
	Generator circuit														SC-21
	Starter circuit	3													SC-8
	Signal plate	6													EM-120
	PNP signal	4													AT-110
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-96
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-119
	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-59
	Camshaft														EM-79
	Intake valve timing control														EM-59
	Exhaust valve timing control														EM-59
	Intake valve												3		EM-96
	Exhaust valve														
Exhaust	Exhaust manifold/Tube/Muffler/Gasket	5	5	5	5	5		5	5			5			EM-24, EX-3
	Three way catalyst														
Lubrication	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery/Oil cooler	5	5	5	5	5		5	5			5			EM-28, EM-32, LU-16, LU-8
	Oil level (Low)/Filthy oil														LU-5
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-13, CO-17
	Thermostat									5					CO-26
	Water pump														CO-23
	Water gallery														CO-28
	Cooling fan									5					CO-21
	Coolant level (Low)/Contaminated coolant														CO-10
IVIS (INFINITI Vehicle Immobilizer System — NATS)		1	1												BL-220

1 - 6: The numbers refer to the order of inspection.

NORMAL OPERATING CONDITION

Description

INFOID:0000000005353854

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.

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-41, "System Description".

PRECAUTION

PRECAUTIONS

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

INFOID:0000000005353855

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 “SUPPLEMENTAL RESTRAINT SYSTEM” and “SEAT BELTS” of this Service Manual.

WARNING:

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

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

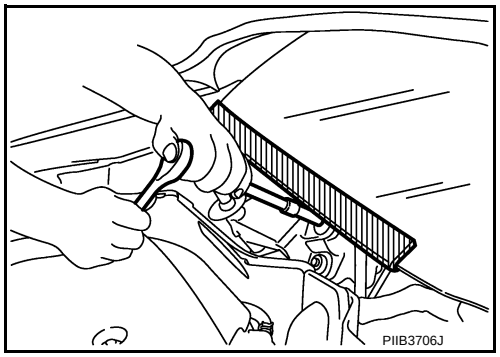
WARNING:

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Procedure without Cowl Top Cover

INFOID:0000000005353856

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



Precautions For Xenon Headlamp Service

INFOID:0000000005353857

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:0000000005353858

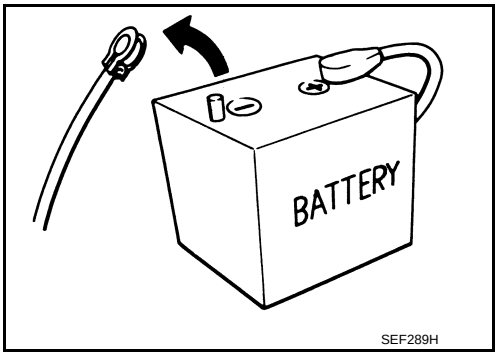
The ECM has an on board diagnostic system. It will illuminate the malfunction indicator lamp (MIL) to warn the driver of a malfunction causing emission deterioration.

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-74, "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

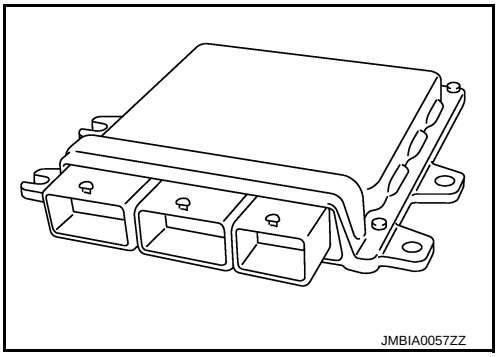
INFOID:0000000005353859

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



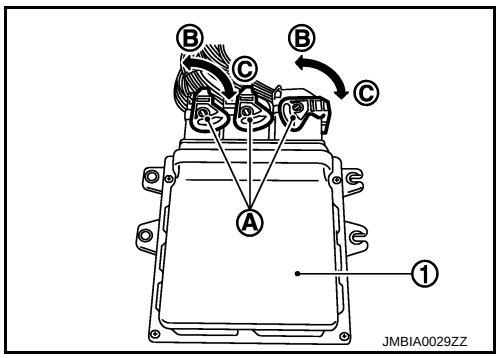
SEF289H

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

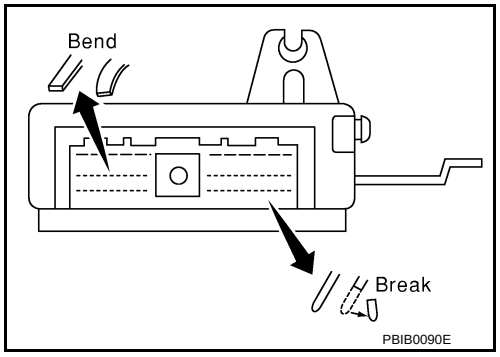

JMBIA0057ZZ

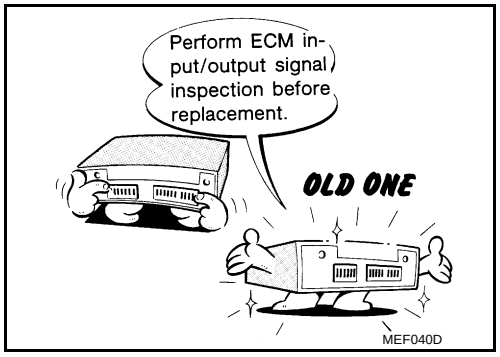
- **When connecting ECM harness connector (A), fasten (B) it securely with a lever as far as it will go as shown in the figure.**

1. ECM
C. Loosen

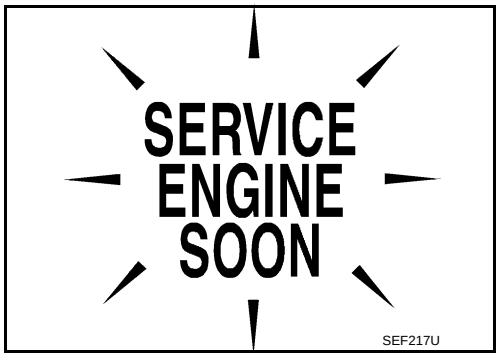


- **When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or break). Make sure that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.**
- **Securely connect ECM harness connectors. A poor connection can cause an extremely 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-645, "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, crankshaft position sensor.**

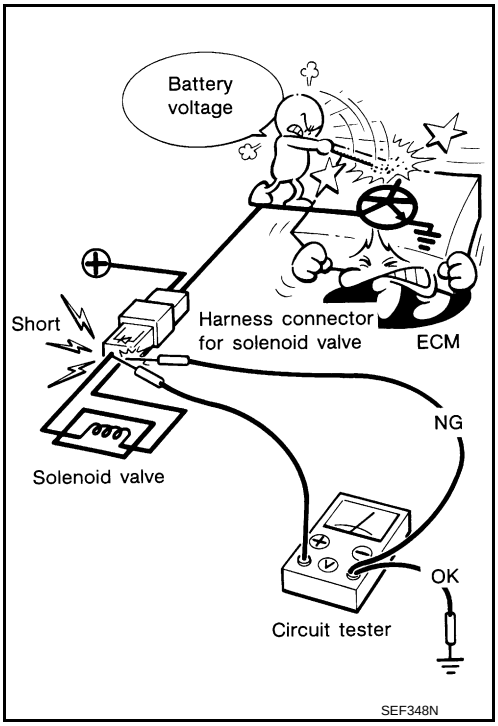




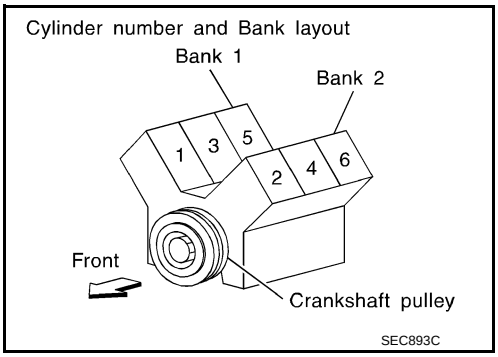
- **After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Component Function Check. The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Component Function Check should be a good result if the repair is completed.**



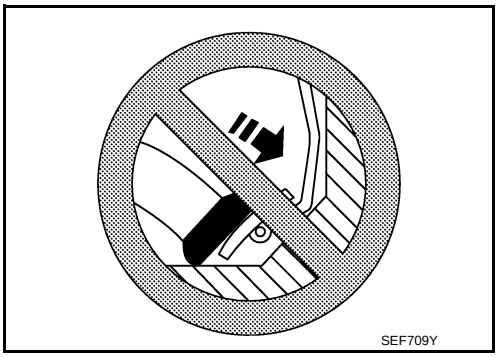
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



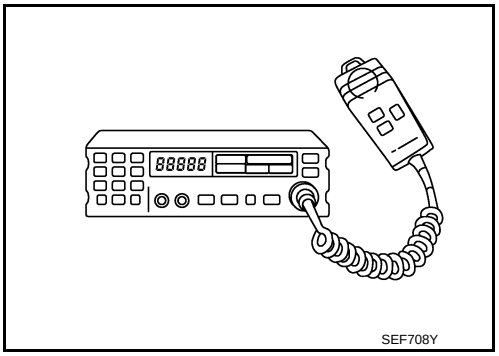
- **B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.**
- **Never operate fuel pump when there is no fuel in lines.**
- **Tighten fuel hose clamps to the specified torque.**



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



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



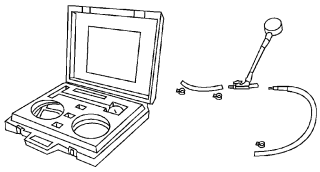
PREPARATION

PREPARATION

Special Service Tools

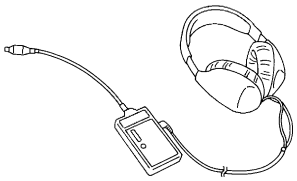
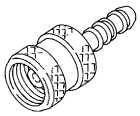
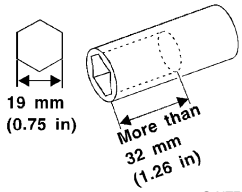
INFOID:0000000005353860

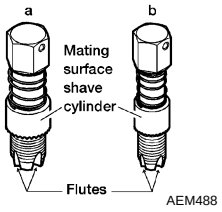
NOTE:
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
(J-44321) Fuel pressure gauge kit  LEC642	Checks fuel pressure

Commercial Service Tools

INFOID:0000000005353861

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

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

ON-VEHICLE MAINTENANCE

FUEL PRESSURE

Inspection

INFOID:0000000005353862

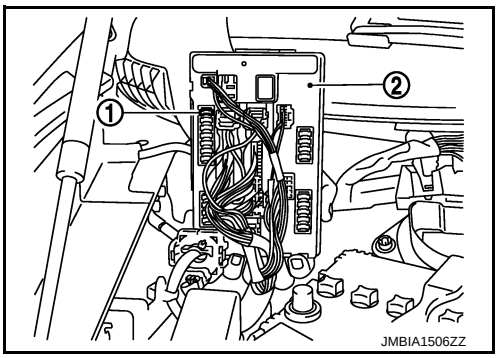
FUEL PRESSURE RELEASE

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-III.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.

Without CONSULT-III

1. Remove fuel pump fuse (1) located in IPDM E/R (2).
2. Start engine.
3. After engine stalls, crank it 2 or 3 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.

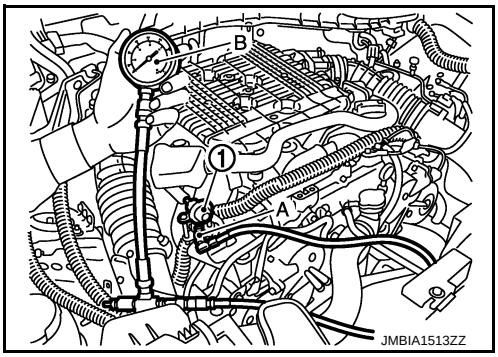
NOTE:

- **Prepare pans or saucers under the disconnected fuel line because the fuel may spill out. The fuel pressure cannot be completely released because S51 models do not have fuel return system.**
- **Use Fuel Pressure Gauge Kit [SST:(J-44321)] to check fuel pressure.**

1. Release fuel pressure to zero.
2. Install the inline fuel quick disconnect fitting (A) between fuel damper (1) and injector tube.
3. Connect the fuel pressure test gauge (with quick connector adapter hose) (B) to the inline fuel quick disconnect 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 malfunctioning part.



EVAP LEAK CHECK

Inspection

INFOID:0000000005353863

CAUTION:

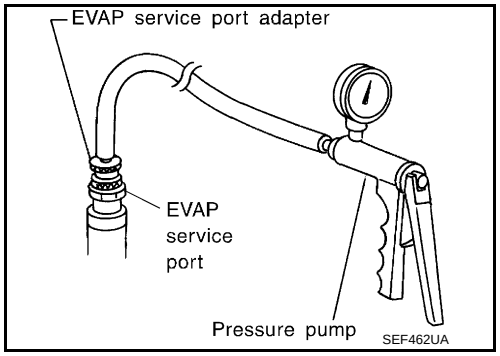
- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

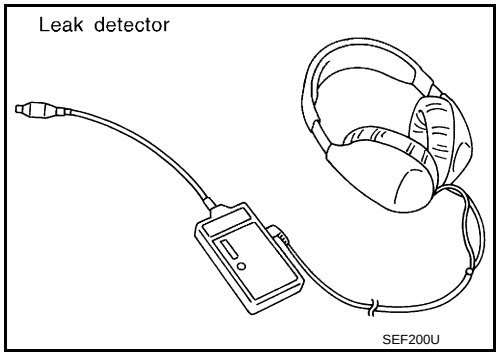
NOTE:

- Do not start engine.
- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leak.

WITH CONSULT-III

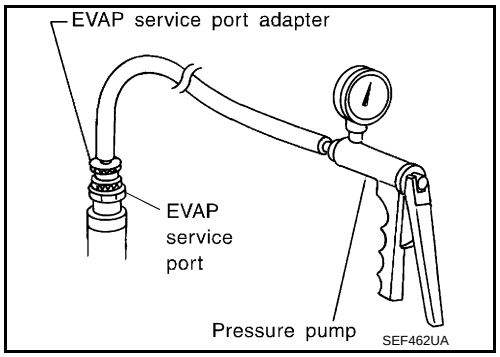
1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Turn ignition switch ON.
3. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-III.
4. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.
5. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.
6. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump.
7. Locate the leak using a leak detector (commercial service tool). Refer to EC-86, "System Diagram".



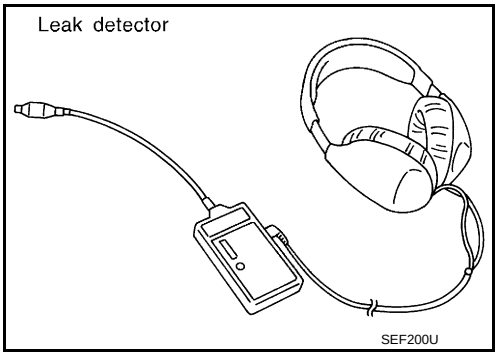


WITHOUT CONSULT-III

1. To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port.
2. Apply battery voltage between the terminals of EVAP canister vent control valve to make a closed EVAP system.
3. To locate the leak, deliver positive pressure to the EVAP system until pressure gauge points reach 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi).
4. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump.



5. Locate the leak using a leak detector (commercial service tool). Refer to EC-86, "System Diagram".

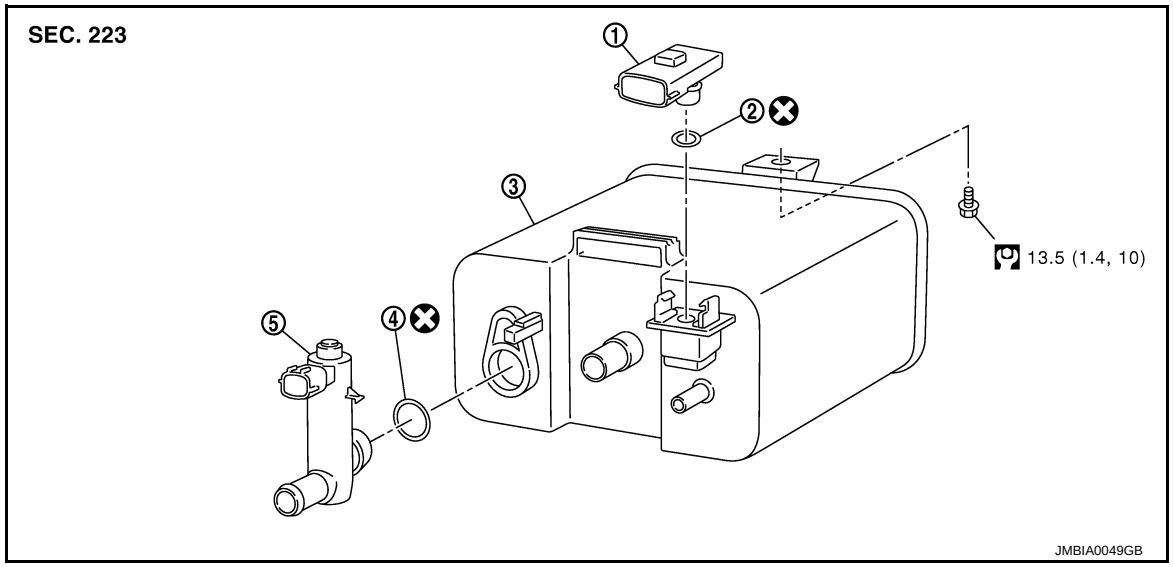


ON-VEHICLE REPAIR

EVAP CANISTER

Exploded View

INFOID:0000000005353864



1. EVAP canister system pressure sensor
2. O-ring
3. EVAP canister
4. O-ring
5. EVAP canister vent control valve

Refer to GI-8, "Contents" for symbols not described on the above.

Removal and Installation

INFOID:0000000005353865

REMOVAL

1. Lift up the vehicle.
2. Remove EVAP canister fixing bolt.
3. Remove EVAP canister.

NOTE:
The EVAP canister vent control valve and EVAP canister system pressure sensor can be removed without removing the EVAP canister.

INSTALLATION

Install in the reverse order of removal.

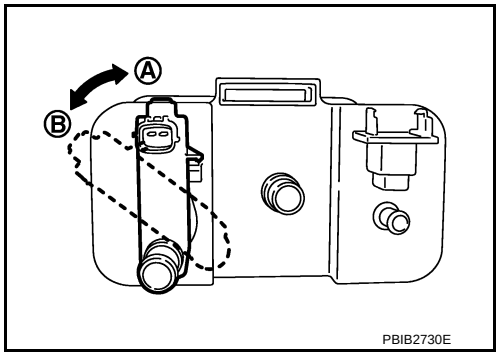
NOTE:
Tighten EVAP canister fixing bolt to the specified torque.

DISASSEMBLY

1. Turn EVAP canister vent control valve counterclockwise.

   A : Lock
   B : Unlock

2. Remove the EVAP canister vent control valve.



ASSEMBLY

Assemble in the reverse order of disassembly.

CAUTION:

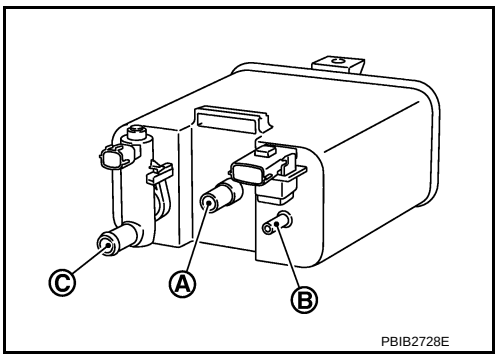
Always replace O-ring with a new one.

Inspection

INFOID:0000000005353866

Check EVAP canister as per the following:

1. Block port (B).
2. Blow air into port (A) and check that it flows freely out of port (C).
3. Release blocked port (B).
4. Apply vacuum pressure to port (B) and check that vacuum pressure exists at the ports (A) and (C).
5. Block port (A) and (B).
6. Apply pressure to port (C) and check that there is no leakage.



PBIB2728E

SERVICE DATA AND SPECIFICATIONS (SDS)

SERVICE DATA AND SPECIFICATIONS (SDS)

Idle Speed

INFOID:0000000005353867

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:0000000005353868

Condition	Specification
No load* (in P or N position)	15 ± 5° BTDC

*: Under the following conditions

- A/C switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000005353869

Condition	Specification (Using CONSULT-III or GST)
At idle	5 – 35%
At 2,500 rpm	5 – 35%

Mass Air Flow Sensor

INFOID:0000000005353870

Supply voltage	Battery voltage (11 – 14 V)
Output voltage at idle	0.8 – 1.1 V*
Mass air flow (Using CONSULT-III or GST)	2.0 – 6.0 g·m/sec at idle* 7.0 – 20.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

SERVICE INFORMATION

INDEX FOR DTC

U0101 - U1001

INFOID:0000000005353871

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
U0101	0101*4	LOST COMM (TCM)	EC-829
U1001	1001*4	CAN COMM CIRCUIT	EC-831

*1: 1st trip DTC No. is the same as DTC No.
*2: This number is prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.
*4: The troubleshooting for this DTC needs CONSULT-III.

P0011 - P0081

INFOID:0000000005353872

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0011	0011	INT/V TIM CONT-B1	EC-833
P0021	0021	INT/V TIM CONT-B2	EC-833
P0031	0031	A/F SEN1 HTR (B1)	EC-845
P0032	0032	A/F SEN1 HTR (B1)	EC-845
P0037	0037	HO2S2 HTR (B1)	EC-852
P0038	0038	HO2S2 HTR (B1)	EC-852
P0051	0051	A/F SEN1 HTR (B2)	EC-845
P0052	0052	A/F SEN1 HTR (B2)	EC-845
P0057	0057	HO2S2 HTR (B2)	EC-852
P0058	0058	HO2S2 HTR (B2)	EC-852
P0075	0075	INT/V TIM V/CIR-B1	EC-860
P0081	0081	INT/V TIM V/CIR-B2	EC-860

*1: 1st trip DTC No. is the same as DTC No.
*2: This number is prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

P0101 - P0128

INFOID:0000000005353873

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0101	0101	MAF SEN/CIRCUIT-B1	EC-867
P0102	0102	MAF SEN/CIRCUIT-B1	EC-874
P0103	0103	MAF SEN/CIRCUIT-B1	EC-874
P0112	0112	IAT SEN/CIRCUIT-B1	EC-881
P0113	0113	IAT SEN/CIRCUIT-B1	EC-881

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0116	0116	ECT SEN/CIRC	EC-885
P0117	0117	ECT SEN/CIRC	EC-888
P0118	0118	ECT SEN/CIRC	EC-888
P0122	0122	TP SEN 2/CIRC-B1	EC-893
P0123	0123	TP SEN 2/CIRC-B1	EC-893
P0125	0125	ECT SENSOR	EC-899
P0127	0127	IAT SENSOR-B1	EC-902
P0128	0128	THERMSTAT FNCTN	EC-905

*1: 1st trip DTC No. is the same as DTC No.
*2: This number is prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

P0130 - P0159

INFOID:0000000005353874

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0130	0130	A/F SENSOR1 (B1)	EC-907
P0131	0131	A/F SENSOR1 (B1)	EC-907
P0132	0132	A/F SENSOR1 (B1)	EC-923
P0133	0133	A/F SENSOR1 (B1)	EC-931
P0137	0137	HO2S2 (B1)	EC-940
P0138	0138	HO2S2 (B1)	EC-949
P0139	0139	HO2S2 (B1)	EC-961
P0150	0150	A/F SENSOR1 (B2)	EC-907
P0151	0151	A/F SENSOR1 (B2)	EC-907
P0152	0152	A/F SENSOR1 (B2)	EC-923
P0153	0153	A/F SENSOR1 (B2)	EC-931
P0157	0157	HO2S2 (B2)	EC-940
P0158	0158	HO2S2 (B2)	EC-949
P0159	0159	HO2S2 (B2)	EC-961

*1: 1st trip DTC No. is the same as DTC No.
*2: This number is prescribed by SAE J2012.
*3: In Diagnostic Test Mode II (Self-diagnostic results), this number is controlled by NISSAN.

P0171 - P0223

INFOID:0000000005353875

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0171	0171	FUEL SYS-LEAN-B1	EC-970
P0172	0172	FUEL SYS-RICH-B1	EC-979
P0174	0174	FUEL SYS-LEAN-B2	EC-970
P0175	0175	FUEL SYS-RICH-B2	EC-979

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0181	0181	FTT SENSOR	EC-988
P0182	0182	FTT SEN/CIRCUIT	EC-992
P0183	0183	FTT SEN/CIRCUIT	EC-992
P0222	0222	TP SEN 1/CIRC-B1	EC-996
P0223	0223	TP SEN 1/CIRC-B1	EC-996

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

*2: This number is prescribed by SAE J2012.

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

P0300 - P0308

INFOID:0000000005353876

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0300	0300	MULTI CYL MISFIRE	EC-1002
P0301	0301	CYL 1 MISFIRE	EC-1002
P0302	0302	CYL 2 MISFIRE	EC-1002
P0303	0303	CYL 3 MISFIRE	EC-1002
P0304	0304	CYL 4 MISFIRE	EC-1002
P0305	0305	CYL 5 MISFIRE	EC-1002
P0306	0306	CYL 6 MISFIRE	EC-1002
P0307	0307	CYL 7 MISFIRE	EC-1002
P0308	0308	CYL 8 MISFIRE	EC-1002

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

*2: This number is prescribed by SAE J2012.

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

P0327 - P0430

INFOID:0000000005353877

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0327	0327	KNOCK SEN/CIRC-B1	EC-1009
P0328	0328	KNOCK SEN/CIRC-B1	EC-1009
P0332	0332	KNOCK SEN/CIRC-B2	EC-1009
P0333	0333	KNOCK SEN/CIRC-B2	EC-1009
P0335	0335	CKP SEN/CIRCUIT	EC-1014
P0340	0340	CMP SEN/CIRC-B1	EC-1020
P0420	0420	TW CATALYST SYS-B1	EC-1026
P0430	0430	TW CATALYST SYS-B2	EC-1026

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

*2: This number is prescribed by SAE J2012.

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

P0441 - P0456

INFOID:0000000005353878

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0441	0441	EVAP PURG FLOW/MON	EC-1030
P0442	0442	EVAP SMALL LEAK	EC-1035
P0443	0443	PURG VOLUME CONT/V	EC-1042
P0444	0444	PURG VOLUME CONT/V	EC-1050
P0445	0445	PURG VOLUME CONT/V	EC-1050
P0447	0447	VENT CONTROL VALVE	EC-1056
P0448	0448	VENT CONTROL VALVE	EC-1061
P0451	0451	EVAP SYS PRES SEN	EC-1067
P0452	0452	EVAP SYS PRES SEN	EC-1070
P0453	0453	EVAP SYS PRES SEN	EC-1076
P0455	0455	EVAP GROSS LEAK	EC-1083
P0456	0456	EVAP VERY SML LEAK	EC-1089

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

*2: This number is prescribed by SAE J2012.

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

P0460 - P0643

INFOID:0000000005353879

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0460	0460	FUEL LEV SEN SLOSH	EC-1097
P0461	0461	FUEL LEVEL SENSOR	EC-1099
P0462	0462	FUEL LEVL SEN/CIRC	EC-1101
P0463	0463	FUEL LEVL SEN/CIRC	EC-1101
P0500	0500	VEH SPEED SEN/CIRC*4	EC-1103
P0506	0506	ISC SYSTEM	EC-1105
P0507	0507	ISC SYSTEM	EC-1107
P0550	0550	PW ST P SEN/CIRC	EC-1109
P0603	0603	ECM BACK UP/CIRCUIT	EC-1114
P0605	0605	ECM	EC-1118
P0607	0607	ECM	EC-1120
P0643	0643	SENSOR POWER/CIRC	EC-1121

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

*2: This number is prescribed by SAE J2012.

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

*4: When the fail-safe operations for both self-diagnoses (DTC P0500 and P0720) occur, the MIL illuminates.

P0700 - P0745

INFOID:0000000005353880

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0700	0700	TRANSMISSION CONT	AT-109
P0705	0705	T/M RANGE SENSOR A	AT-110
P0710	0710	ATF TEMP SEN/CIRC	AT-140
P0717	0717	INPUT SPEED SENSOR A	AT-113
P0720	0720	OUTPUT SPEED SENSOR*4	AT-115
P0731	0731	1GR INCORRECT RATIO	AT-122
P0732	0732	2GR INCORRECT RATIO	AT-124
P0733	0733	3GR INCORRECT RATIO	AT-126
P0734	0734	4GR INCORRECT RATIO	AT-128
P0735	0735	5GR INCORRECT RATIO	AT-130
P0740	0740	TORQUE CONVERTER	AT-132
P0744	0744	TORQUE CONVERTER	AT-134
P0745	0745	PC SOLENOID A	AT-136

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

*2: This number is prescribed by SAE J2012.

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

*5: When the fail-safe operations for both self-diagnoses (DTC P0500 and P0720) occur, the MIL illuminates.

P0850 - P1421

INFOID:0000000005353881

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P0850	0850	P-N POS SW/CIRCUIT	EC-1126
P1140	1140	INTK TIM S/CIRC-B1	EC-1131
P1145	1145	INTK TIM S/CIRC-B2	EC-1131
P1148	1148	CLOSED LOOP-B1	EC-1139
P1168	1168	CLOSED LOOP-B2	EC-1139
P1211	1211	TCS C/U FUNCTN	EC-1140
P1212	1212	TCS/CIRC	EC-1141
P1217	1217	ENG OVER TEMP	EC-1142
P1220	1220	FPCM/CIRCUIT	EC-1152
P1225	1225	CTP LEARNING-B1	EC-1159
P1226	1226	CTP LEARNING-B1	EC-1161
P1421	1421	COLD START CONTROL	EC-1163

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

*2: This number is prescribed by SAE J2012.

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

P1550 - P1574

INFOID:0000000005353882

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P1550	1550	BAT CURRENT SENSOR	EC-1165
P1551	1551	BAT CURRENT SENSOR	EC-1170
P1552	1552	BAT CURRENT SENSOR	EC-1170
P1553	1553	BAT CURRENT SENSOR	EC-1175
P1554	1554	BAT CURRENT SENSOR	EC-1180
P1564	1564	ASCD SW	EC-1186 (Models with ICC) EC-1192 (Models with ASCD)
P1568	1568	ICC COMMAND VALUE*4	EC-1198
P1572	1572	ASCD BRAKE SW	EC-1199 (Models with ICC) EC-1207 (Models with ASCD)
P1574	1574	ASCD VHL SPD SEN	EC-1214 (Models with ICC) EC-1216 (Models with ASCD)

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

*2: This number is prescribed by SAE J2012.

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

*4: Models with ICC.

P1610 - P1774

INFOID:0000000005353883

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P1610	1610	LOCK MODE	BL-5
P1611	1611	ID DISCORD, IMMU-ECM	BL-5
P1612	1612	CHAIN OF ECM-IMMU	BL-5
P1614	1614	CHAIN OF IMMU-KEY	BL-5
P1715	1715	IN PULY SPEED	EC-1218
P1730	1730	A/T INTERLOCK	AT-147
P1752	1752	INPUT CLUTCH SOL	AT-151
P1757	1757	FR BRAKE SOLENOID	AT-153
P1762	1762	DRCT CLUTCH SOL	AT-155
P1767	1767	HLR CLUTCH SOLENOID	AT-157
P1772	1772	L C BRAKE SOLENOID	AT-159
P1774	1774	L C BRAKE SOLENOID	AT-161

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

*2: This number is prescribed by SAE J2012.

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

P1800 - P2A03

INFOID:0000000005353884

DTC*1		Items (CONSULT-III screen terms)	Reference page
CONSULT-III GST*2	ECM*3		
P1800	1800	VIAS S/V-1	EC-1219
P1805	1805	BRAKE SW/CIRCUIT	EC-1224
P2100	2100	ETC MOT PWR-B1	EC-1231
P2101	2101	ETC FNCTN/CIRC-B1	EC-1235
P2103	2103	ETC MOT PWR	EC-1231
P2118	2118	ETC MOT-B1	EC-1241
P2119	2119	ETC ACTR-B1	EC-1246
P2122	2122	APP SEN 1/CIRC	EC-1248
P2123	2123	APP SEN 1/CIRC	EC-1248
P2127	2127	APP SEN 2/CIRC	EC-1253
P2128	2128	APP SEN 2/CIRC	EC-1253
P2135	2135	TP SENSOR-B1	EC-1259
P2138	2138	APP SENSOR	EC-1265
P2A00	2A00	A/F SENSOR1 (B1)	EC-1271
P2A03	2A03	A/F SENSOR1 (B2)	EC-1271

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

*2: This number is prescribed by SAE J2012.

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

PRECAUTIONS

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

INFOID:0000000005353885

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 “SUPPLEMENTAL RESTRAINT SYSTEM” and “SEAT BELTS” of this Service Manual.

WARNING:

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

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

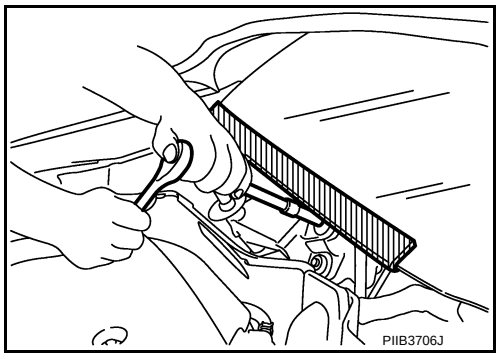
WARNING:

- **When working near the Air Bag Diagnosis Sensor Unit or other Air Bag System sensors with the ignition ON or engine running, DO NOT use air or electric power tools or strike near the sensor(s) with a hammer. Heavy vibration could activate the sensor(s) and deploy the air bag(s), possibly causing serious injury.**
- **When using air or electric power tools or hammers, always switch the ignition OFF, disconnect the battery, and wait at least 3 minutes before performing any service.**

Precaution for Procedure without Cowl Top Cover

INFOID:0000000005353886

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



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

INFOID:0000000005353887

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:

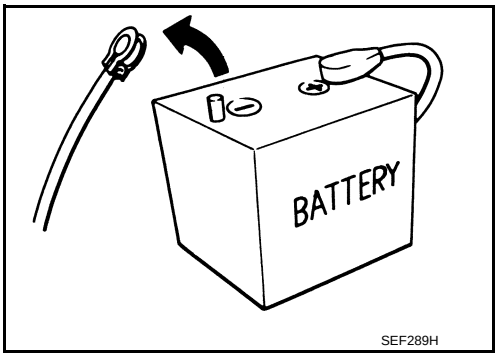
- **Be sure to turn the ignition switch OFF and disconnect the negative battery cable before any repair or inspection work. The open/short circuit of related switches, sensors, solenoid valves, etc. will cause the MIL to illuminate.**
- **Be sure to connect and lock the connectors securely after work. A loose (unlocked) connector will cause the MIL to illuminate due to the open circuit. (Check that 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-74, "Description".**
- **Be sure to route and secure the harnesses properly after work. The interference of the harness with a bracket, etc. may cause the MIL to illuminate due to the short circuit.**

- **Be sure to connect rubber tubes properly after work. A misconnected or disconnected rubber tube may cause the MIL to illuminate due to the malfunction of the EVAP system or fuel injection system, etc.**
- **Be sure to erase the unnecessary malfunction information (repairs completed) from the ECM and TCM (Transmission control module) before returning the vehicle to the customer.**

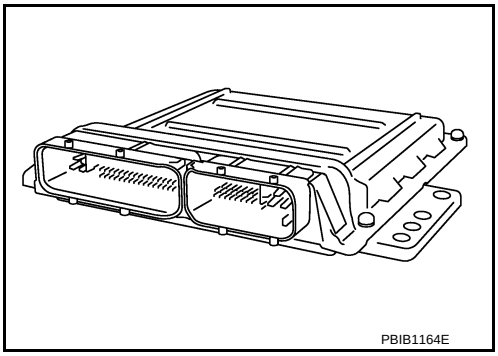
Precaution

INFOID:0000000005353888

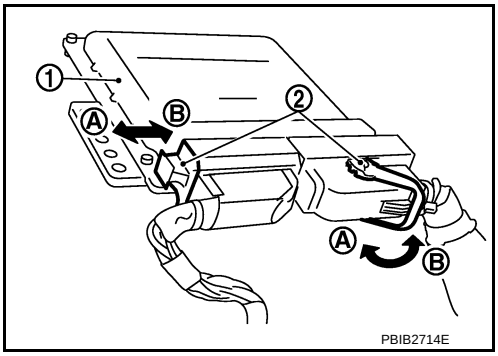
- **Always use a 12 volt battery as power source.**
- **Never attempt to disconnect battery cables while engine is running.**
- **Before connecting or disconnecting the ECM harness connector, turn ignition switch OFF and disconnect negative battery cable. Failure to do so may damage the ECM because battery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



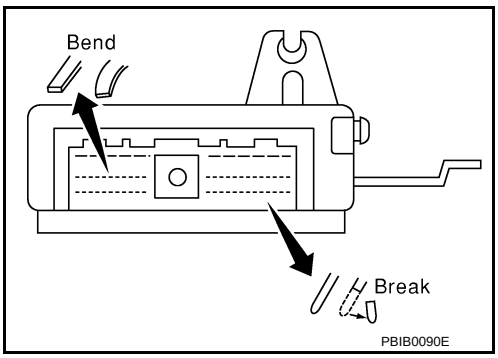
- **Never disassemble ECM.**
- **If a battery cable is disconnected, the memory will return to the ECM value.**
  The ECM will now start to self-control at its initial value. Thus, engine operation can vary slightly in this case. However, this is not an indication of a malfunction. Never replace parts 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**



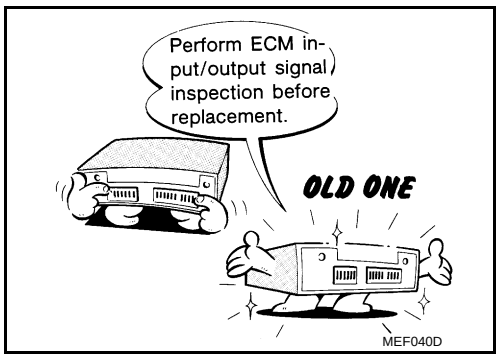
- **When connecting ECM harness connector, fasten (B) it securely with a lever (2) as far as it will go as shown in the figure.**
- ECM (1)
- Loosen (A)



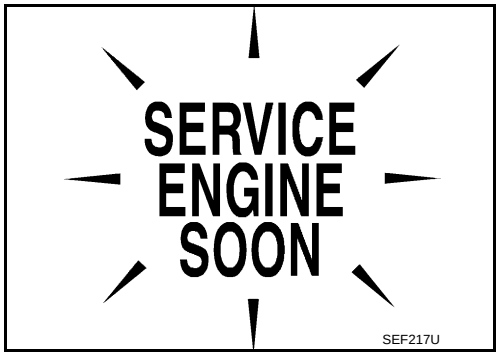
- **When connecting or disconnecting pin connectors into or from ECM, never damage pin terminals (bends or breaks).**
  Check that there are not any bends or breaks on ECM pin terminal, when connecting pin connectors.
- **Securely connect ECM harness connectors.**
  A poor connection can cause an extremely high (surge) voltage to develop in coil and condenser, thus resulting in damage to ICs.
- **Keep engine control system harness at least 10 cm (4 in) away from adjacent harness, to prevent engine control system malfunctions due to receiving external noise, degraded operation of ICs, etc.**
- **Keep engine control system parts and harness dry.**



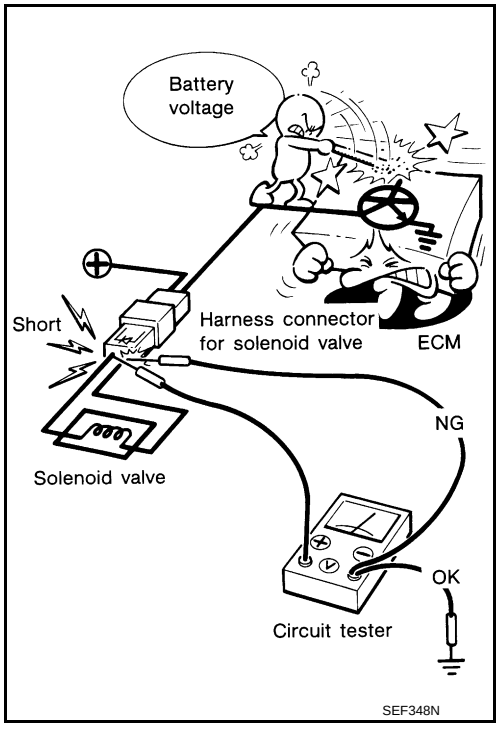
- **Before replacing ECM, perform ECM Terminals and Reference Value inspection and check that ECM functions properly. Refer to EC-791, "ECM Terminal and Reference Value".**
- **Handle mass air flow sensor carefully to avoid damage.**
- **Never clean mass air flow sensor with any type of detergent.**
- **Never disassemble electric throttle control actuator.**
- **Even a slight leakage in the air intake system can cause serious incidents.**
- **Never shock or jar the camshaft position sensor (PHASE), crankshaft position sensor (POS).**



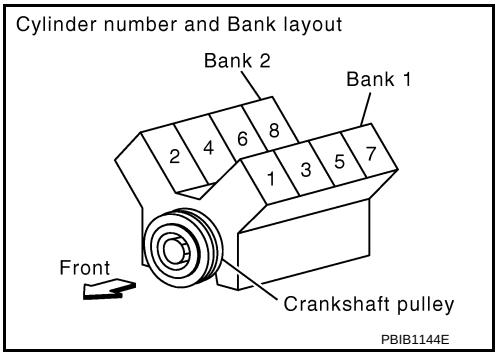
- **After performing each TROUBLE DIAGNOSIS, perform DTC Confirmation Procedure or Overall Function Check.**
  The DTC should not be displayed in the DTC Confirmation Procedure if the repair is completed. The Overall Function Check should be a good result if the repair is completed.



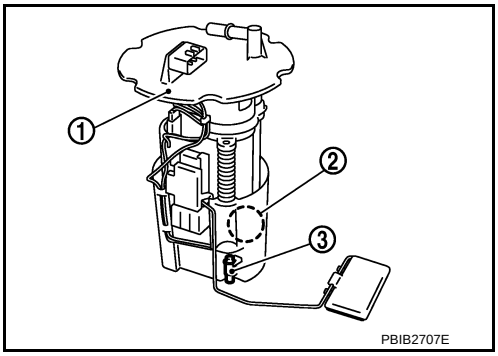
- **When measuring ECM signals with a circuit tester, never allow the two tester probes to contact.**
  Accidental contact of probes will cause a short circuit and damage the ECM power transistor.
- **Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.**



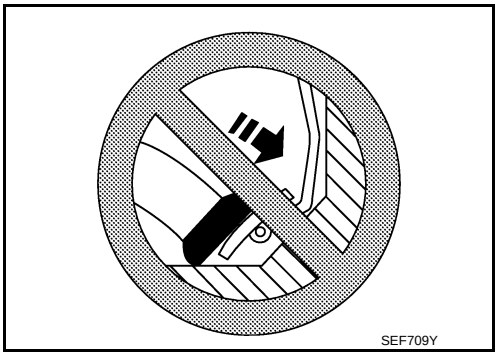
- **B1 indicates bank 1, B2 indicates bank 2 as shown in the figure.**



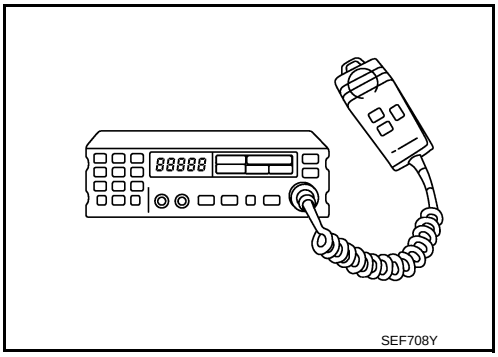
- **Never operate fuel pump when there is no fuel in lines.**
- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (3)
- **Tighten fuel hose clamps to the specified torque.**



- **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 radio can be kept smaller.**
- **Always ground the radio to vehicle body.**

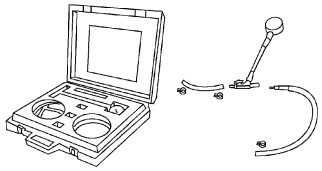


PREPARATION

Special Service Tool

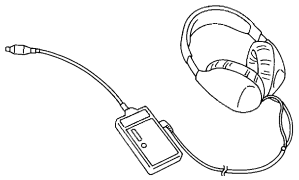
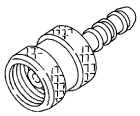
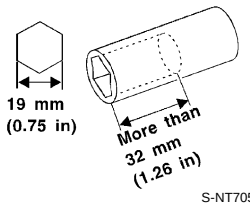
INFOID:0000000005353889

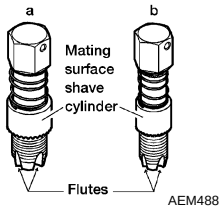
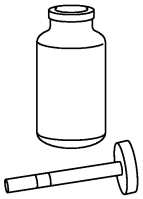
The actual shapes of Kent-Moore tools may differ from those of special service tools illustrated here.

Tool number (Kent-Moore No.) Tool name	Description
(J-44321) Fuel pressure gauge kit  LEC642	Checks fuel pressure.

Commercial Service Tool

INFOID:0000000005353890

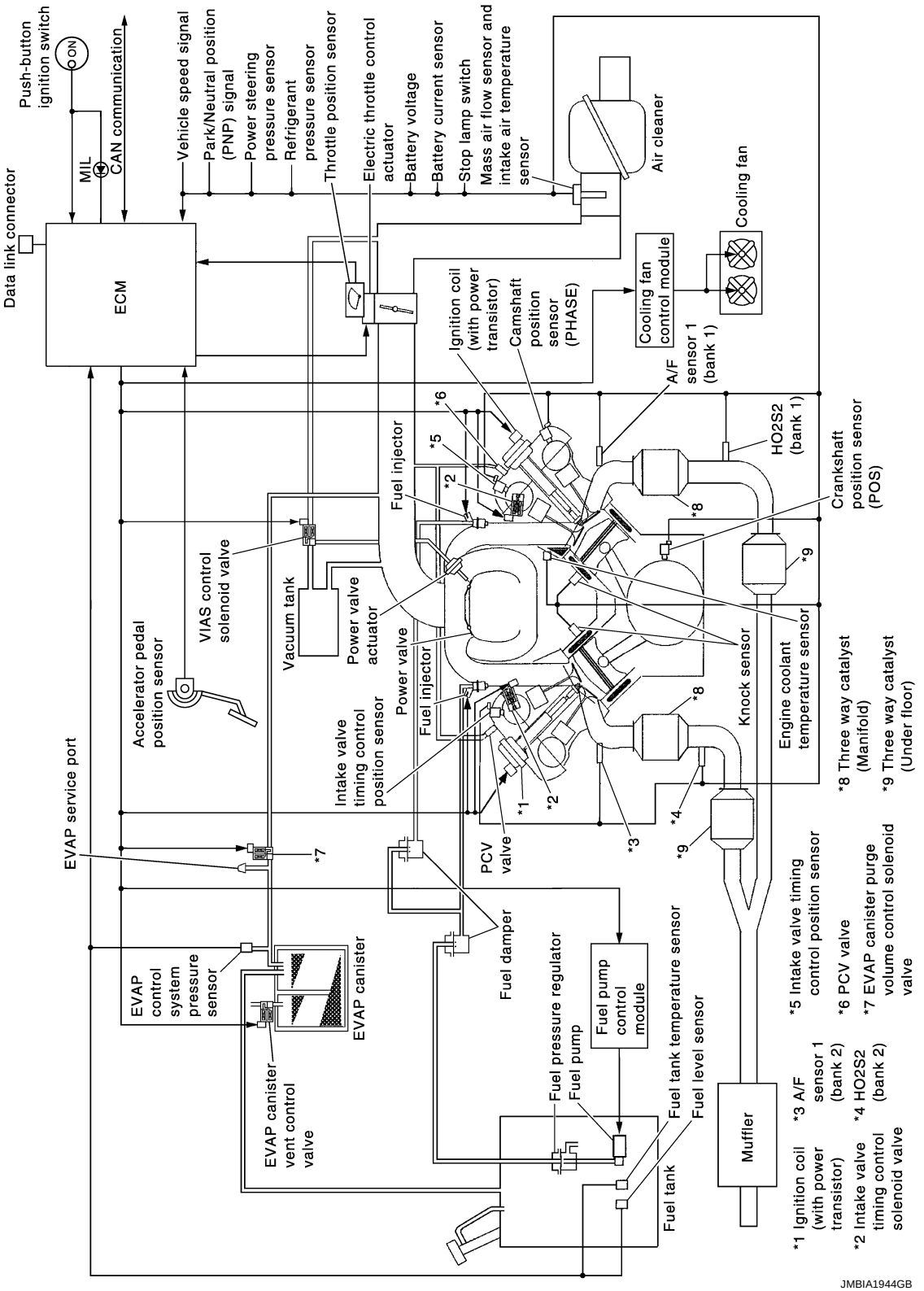
Tool name (Kent-Moore No.)	Description
Leak detector i.e.: (J-41416)  S-NT703	Locates the EVAP leak.
EVAP service port adapter i.e.: (J-41413-OBD)  S-NT704	Applies positive pressure through EVAP service port.
Fuel filler cap adapter i.e.: (MLR-8382)  S-NT815	Checks fuel tank vacuum relief valve opening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

Tool name (Kent-Moore No.)		Description
Oxygen sensor thread cleaner i.e.: (J-43897-18) (J-43897-12)	 AEM488	Reconditions the exhaust system threads before installing a new heated oxygen sensor. Use with anti-seize lubricant shown below. **a: 18 mm diameter with pitch 1.5 mm for Zirconia Oxygen Sensor** **b: 12 mm diameter with pitch 1.25 mm for Titania Oxygen Sensor**
Anti-seize lubricant i.e.: (Permatex™ 133AR or equivalent meeting MIL specification MIL-A-907)	 S-NT779	Lubricates oxygen sensor thread cleaning tool when reconditioning exhaust system threads.

ENGINE CONTROL SYSTEM

Schematic

INFOID:0000000005353891



Multiport Fuel Injection (MFI) System

INFOID:0000000005353892

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		
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)	VDC/TCS operation command*2		
Air conditioner switch	Air conditioner operation*2		
unified meter and A/C amp.	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.

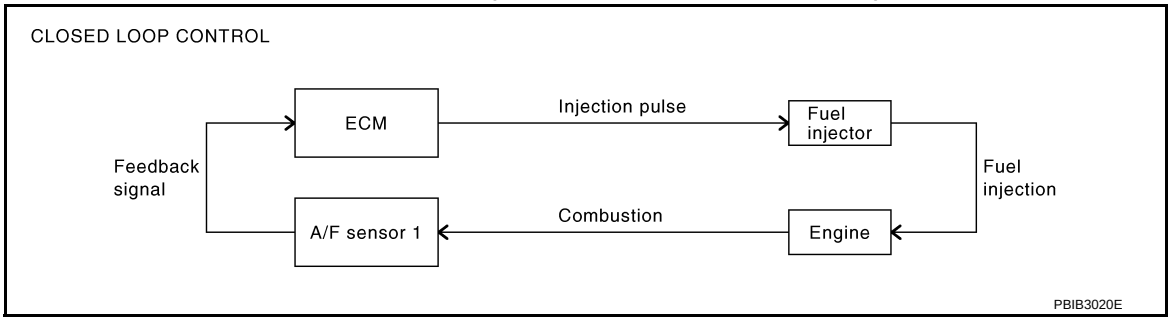
VARIOUS FUEL INJECTION INCREASE/DECREASE COMPENSATION

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 position is changed from N to D
- High-load, high-speed operation

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

MIXTURE RATIO FEEDBACK CONTROL (CLOSED LOOP CONTROL)



The mixture ratio feedback system provides the best air-fuel mixture ratio for driveability and emission control. The three way catalyst (manifold) can better reduce CO, HC and NOx emissions. This system uses A/F sensor 1 in the exhaust manifold to monitor whether the engine operation is rich or lean. The ECM adjusts the injection pulse width according to the sensor voltage signal. For more information about A/F sensor 1, refer to EC-907, "Component 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 (manifold). Even if the switching characteristics of A/F sensor 1 shift, the air-fuel ratio is controlled to stoichiometric by the signal from heated oxygen sensor 2.

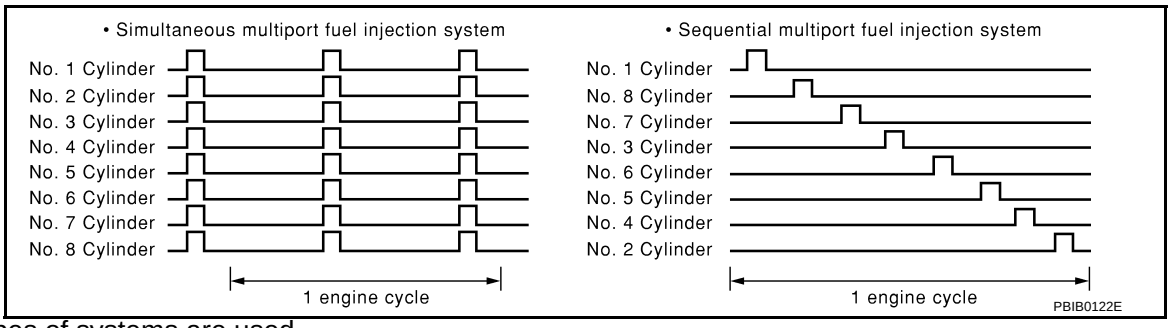
Open Loop Control

The open loop system condition refers to when the ECM detects any of the following conditions. Feedback control stops in order to maintain stabilized fuel combustion.
- Deceleration and acceleration
- High-load, high-speed operation
- Malfunction of A/F sensor 1 or its circuit
- Insufficient activation of A/F sensor 1 at low engine coolant temperature
- High engine coolant temperature
- During warm-up
- After shifting from N to D
- When starting the engine

MIXTURE RATIO SELF-LEARNING CONTROL

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

FUEL INJECTION TIMING



Two types of systems are used.

Sequential Multiport Fuel Injection System

Fuel is injected into each cylinder during each engine cycle according to the ignition order. This system is used when the engine is running.

Simultaneous Multiport Fuel Injection System

Fuel is injected simultaneously into all eight cylinders twice each engine cycle. In other words, pulse signals of the same width are simultaneously transmitted from the ECM.
The eight fuel 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.

Electronic Ignition (EI) System

INFOID:0000000005353893

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS)	Engine speed*2 Piston position	Ignition timing control	Power transistor
Camshaft position sensor (PHASE)			
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage*2		
Knock sensor	Engine knocking		
TCM	Gear position		
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 - 8 - 7 - 3 - 6 - 5 - 4 - 2

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

The ECM receives information such as the injection pulse width and camshaft position sensor (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.

Fuel Cut Control (At No Load and High Engine Speed)

INFOID:0000000005353894

INPUT/OUTPUT SIGNAL CHART

Sensor	Input signal to ECM	ECM function	Actuator
TCM	Neutral position	Fuel cut control	Fuel injector
Accelerator pedal position sensor	Accelerator pedal position		
Engine coolant temperature sensor	Engine coolant temperature		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed		
Unified meter and A/C amp.	Vehicle speed*		

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

SYSTEM DESCRIPTION

If the engine speed is above 1,400 rpm under no load (for example, the selector lever position is neutral and engine speed is over 1,400 rpm) fuel will be cut off after some time. The exact time when the fuel is cut off varies based on engine speed.

Fuel cut will be operated until the engine speed reaches 1,000 rpm, then fuel cut will be cancelled.

NOTE:

This function is different from deceleration control listed under Multiport Fuel Injection (MFI) System, EC-711, "Multiport Fuel Injection (MFI) System".

AIR CONDITIONING CUT CONTROL

Input/Output Signal Chart

INFOID:0000000005353895

Sensor	Input signal to ECM	ECM function	Actuator
Air conditioner switch	Air conditioner ON signal*1	Air conditioner cut control	Air conditioner relay
Accelerator pedal position sensor	Accelerator pedal position		
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*2		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*2		
Refrigerant pressure sensor	Refrigerant pressure		
Power steering pressure sensor	Power steering operation		
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

INFOID:0000000005353896

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.

AUTOMATIC SPEED CONTROL DEVICE (ASCD)

System Description

INFOID:0000000005353897

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 through CAN communication line

BASIC ASCD SYSTEM

Refer to Owner's Manual for ASCD operating instructions.

Automatic Speed Control Device (ASCD) allows a driver to keep vehicle at predetermined constant speed without depressing accelerator pedal. Driver can set vehicle speed in advance between approximately 40 km/h (25 MPH) and 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 lamp and SET lamp on combination meter. If any malfunction occurs in the ASCD system, it automatically deactivates control.

NOTE:

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

SET OPERATION

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

When vehicle speed reaches a desired speed between approximately 40 km/h (25 MPH) and 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 changed to 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 lamp 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 cancelling operation other than pressing MAIN switch, vehicle speed will return to the last set speed. To resume vehicle set speed, vehicle condition must meet following conditions.

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

Component Description

INFOID:0000000005353898

ASCD STEERING SWITCH

Refer to EC-1192.

ASCD BRAKE SWITCH

Refer to EC-1207 and EC-1281.

STOP LAMP SWITCH

Refer to EC-1207, EC-1224 and EC-1281.

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EC-1231, EC-1235, EC-1241 and EC-1246.

ASCD INDICATOR

Refer to EC-1286.

CAN COMMUNICATION

System Description

INFOID:0000000005353899

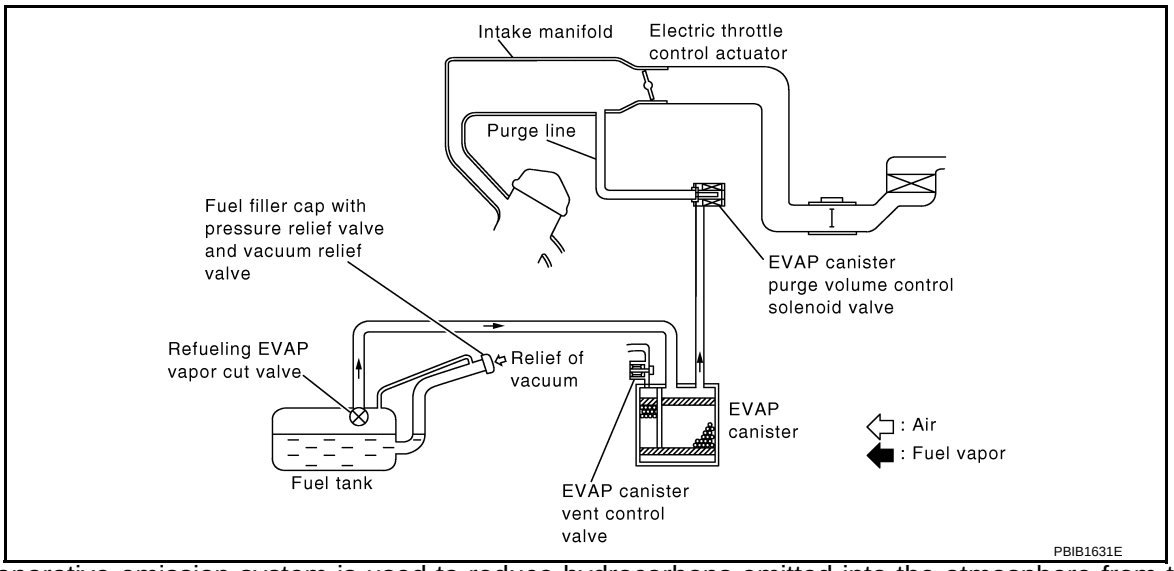
CAN (Controller Area Network) is a serial communication line for real time application. It is an on-vehicle multiplex communication line with high data communication speed and excellent error detection ability. Many electronic control units are equipped onto a vehicle, and each control unit shares information 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-29, "CAN Communication Signal Chart", about CAN communication for detail.

EVAPORATIVE EMISSION SYSTEM

Description

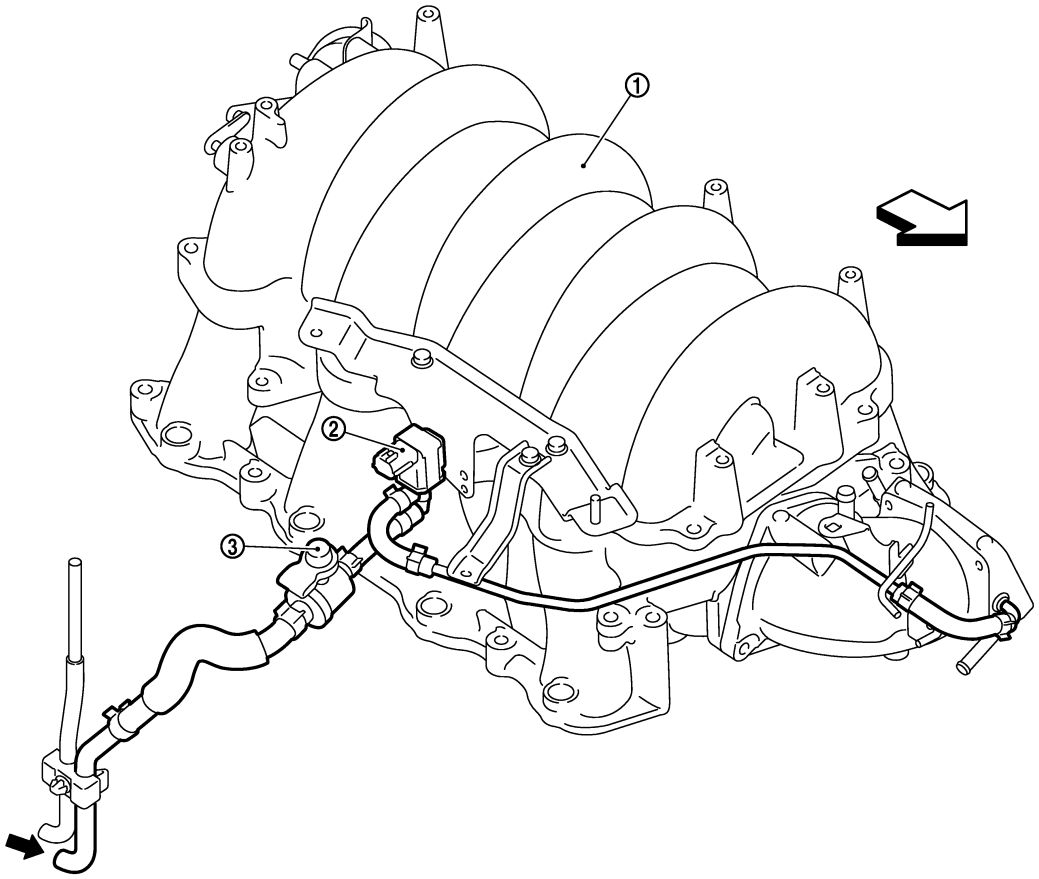
INFOID:0000000005353900

SYSTEM DESCRIPTION



The evaporative emission system is used to reduce hydrocarbons emitted into the atmosphere from the fuel system. This reduction of hydrocarbons is accomplished by activated charcoals in the EVAP canister.
The fuel vapor in the sealed fuel tank is led into the EVAP canister which contains activated carbon and the vapor is stored there when the engine is not operating or when refueling to the fuel tank.
The vapor in the EVAP canister is purged by the air through the purge line to the intake manifold when the engine is operating. EVAP canister purge volume control solenoid valve is controlled by ECM. When the engine operates, the flow rate of vapor controlled by EVAP canister purge volume control solenoid valve is proportionally regulated as the air flow increases.
EVAP canister purge volume control solenoid valve also shuts off the vapor purge line during decelerating and idling.

EVAPORATIVE EMISSION LINE DRAWING



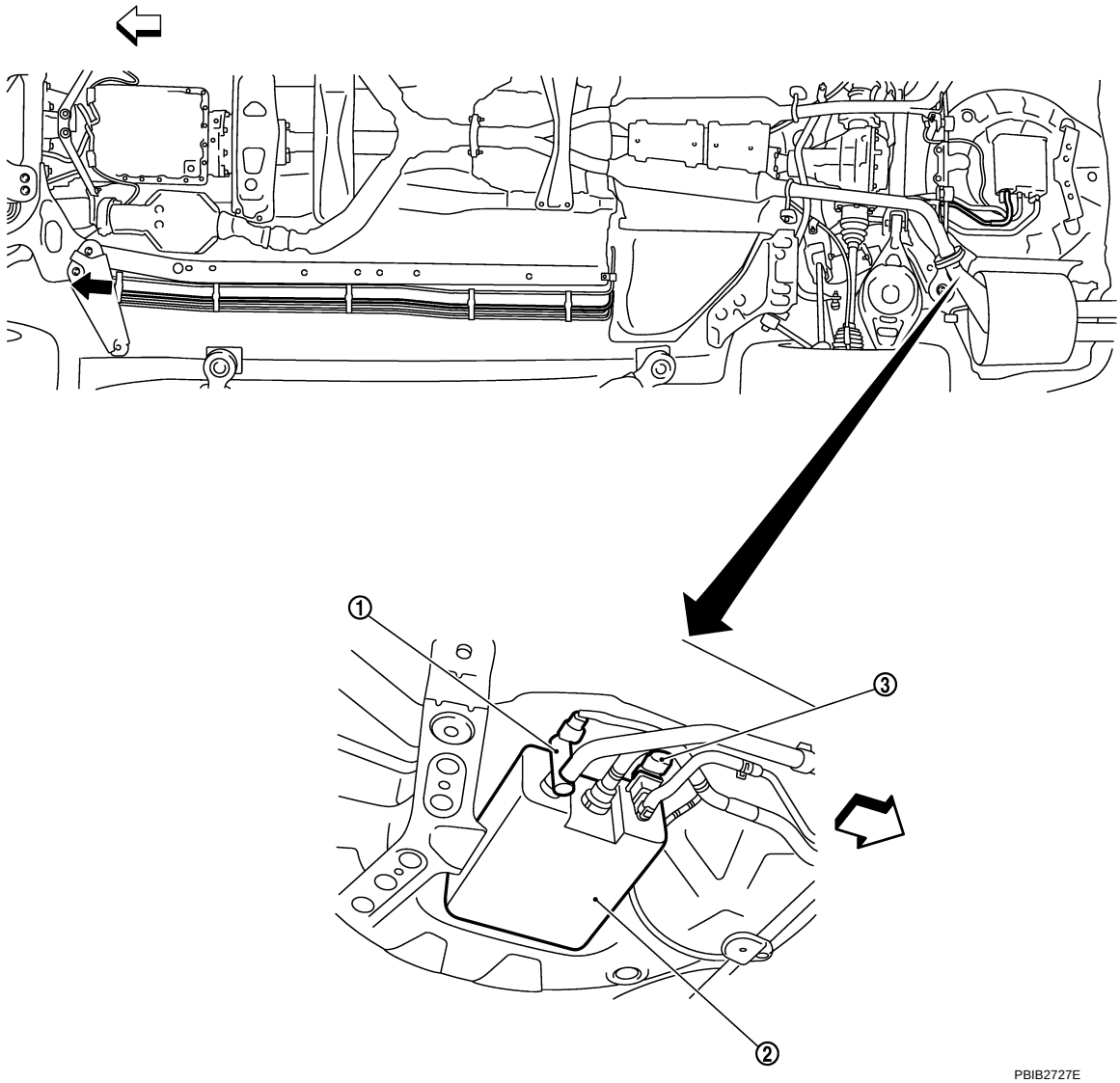
PBIB2726E

⇦ : Vehicle front

⬅ : From next figure

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

NOTE:
Never use soapy water or any type of solvent while installing vacuum hose or purge hoses.



PBIB2727E

⇦ : Vehicle front ⬅ : To previous figure

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

NOTE:
Never use soapy water or any type of solvent while installing vacuum hose or purge hoses.

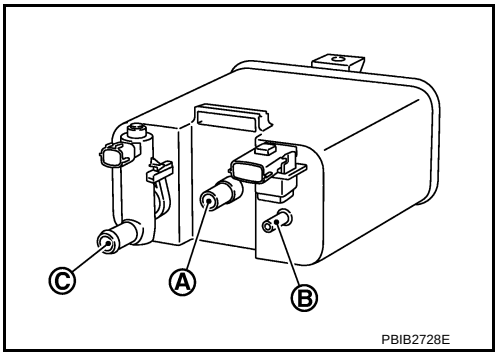
Component Inspection

INFOID:0000000005353901

EVAP CANISTER

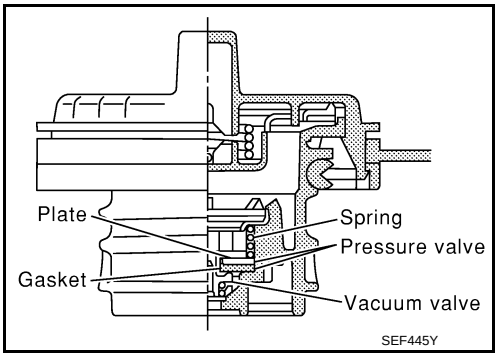
Check EVAP canister as per the following:

1. Block port (B).
2. Blow air into port (A) and check that it flows freely out of port (C).
3. Release blocked port (B).
4. Apply vacuum pressure to port (B) and check that vacuum pressure exists at the ports (A) and (C).
5. Block port (A) and (B).
6. Apply pressure to port (C) and check that there is no leakage.



FUEL TANK VACUUM RELIEF VALVE (BUILT INTO FUEL FILLER CAP)

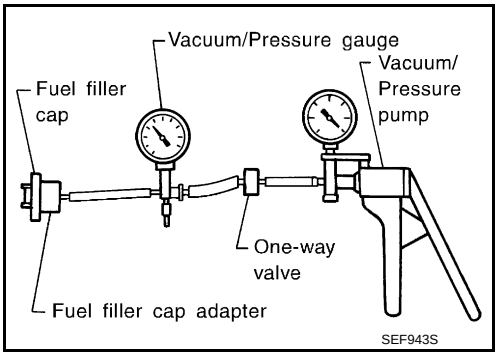
1. Wipe clean valve housing.



2. 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)**



3. If out of specification, replace fuel filler cap as an assembly.

CAUTION:
Use only a genuine fuel filler cap as a replacement. If an incorrect fuel filler cap is used, the MIL may illuminate.

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE
Refer to EC-1055.

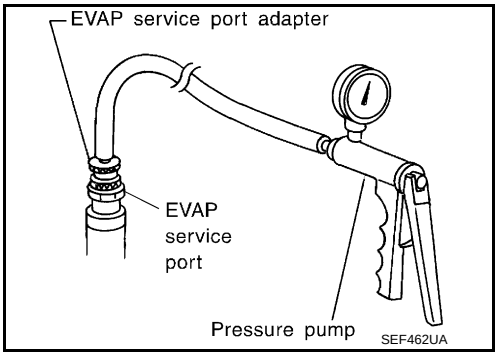
FUEL TANK TEMPERATURE SENSOR
Refer to EC-995.

EVAP CANISTER VENT CONTROL VALVE
Refer to EC-1060.

EVAP CONTROL SYSTEM PRESSURE SENSOR
Refer to EC-1067.

EVAP SERVICE PORT

Positive pressure is delivered to the EVAP system through the EVAP service port. If fuel vapor leakage in the EVAP system occurs, use a leak detector to locate the leakage.

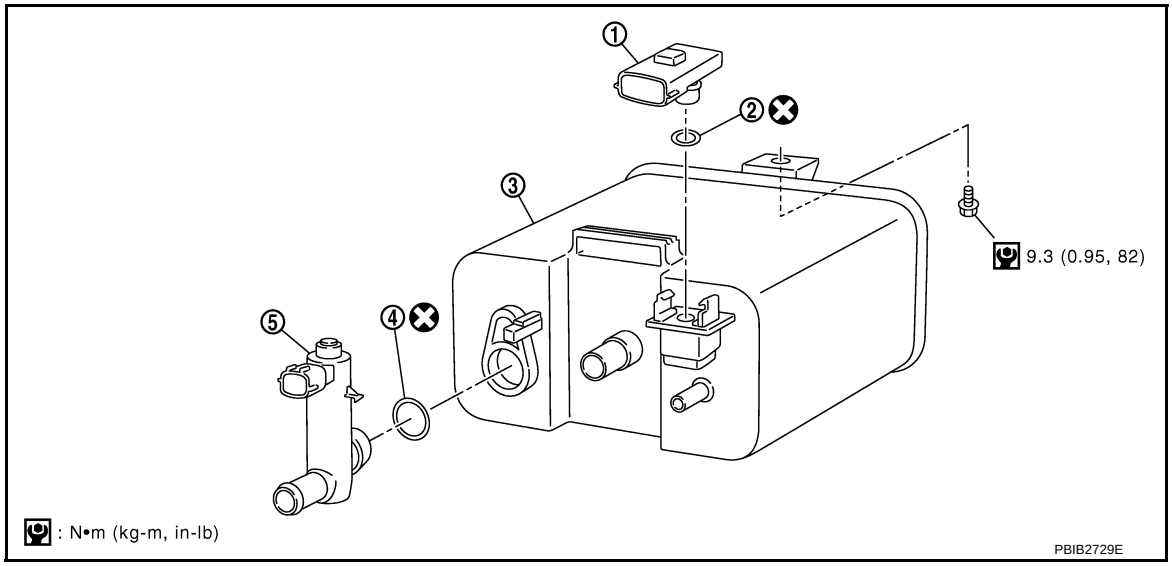


Removal and Installation

INFOID:0000000005353902

EVAP CANISTER

Tighten EVAP canister as shown in the figure.

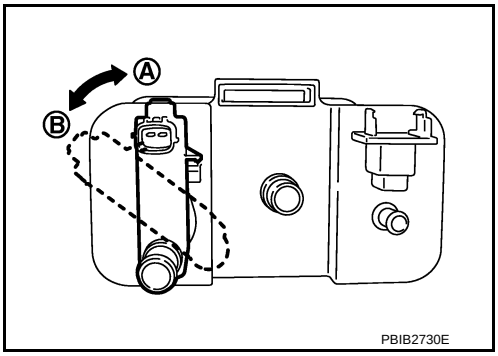


1. EVAP control system pressure sensor
2. O-ring
3. EVAP canister
4. O-ring
5. EVAP canister vent control valve

EVAP CANISTER VENT CONTROL VALVE

1. Turn EVAP canister vent control valve counterclockwise.
   - Lock (A)
   - Unlock (B)
2. Remove the EVAP canister vent control valve.

Always replace O-ring with a new one.



How to Detect EVAP Leakage

INFOID:0000000005353903

CAUTION:

- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in EVAP system.**

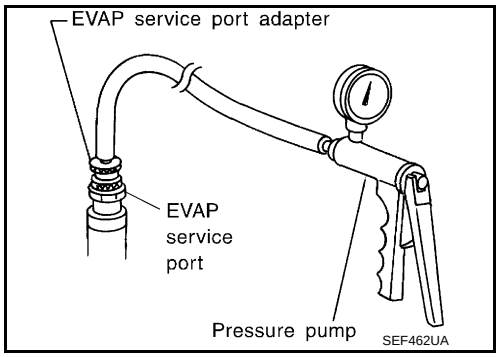
NOTE:

- Do not start engine.

- Improper installation of EVAP service port adapter (commercial service tool) to the EVAP service port may cause a leakage.

WITH CONSULT-III

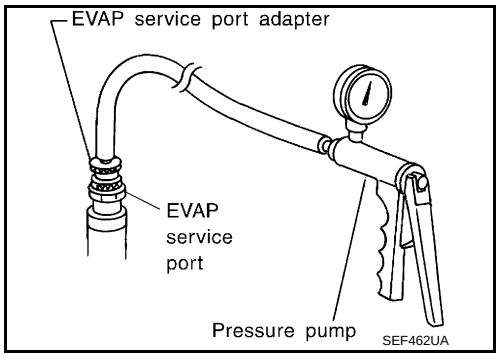
1. Attach the EVAP service port adapter (commercial service tool) securely to the EVAP service port.
2. Also attach the pressure pump and hose to the EVAP service port adapter (commercial service tool).
3. Turn ignition switch ON.
4. Select the “EVAP SYSTEM CLOSE” of “WORK SUPPORT MODE” with CONSULT-III.
5. Touch “START”. A bar graph (Pressure indicating display) will appear on the screen.
6. Apply positive pressure to the EVAP system until the pressure indicator reaches the middle of the bar graph.



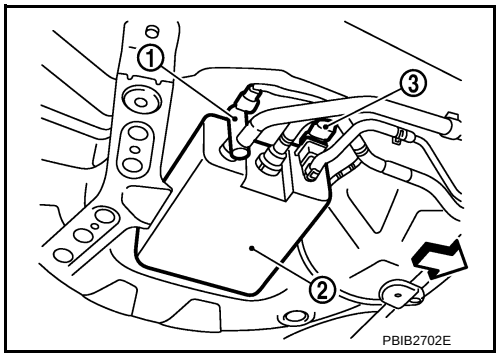
7. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump.
8. Locate the leakage using a leak detector (commercial service tool). Refer to EC-720, "Description".

WITHOUT CONSULT-III

1. Attach the EVAP service port adapter (commercial service tool) securely to the EVAP service port.
2. Also attach the pressure pump with pressure gauge to the EVAP service port adapter.



3. Apply battery voltage between the terminals of EVAP canister vent control valve (1) to make a closed EVAP system.
   - Illustration shows the view from under the vehicle
   - ⇦: Vehicle front
   - EVAP canister (2)
   - EVAP control system pressure sensor (3)
4. To locate the leakage, 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).
5. Remove EVAP service port adapter (commercial service tool) and hose with pressure pump.

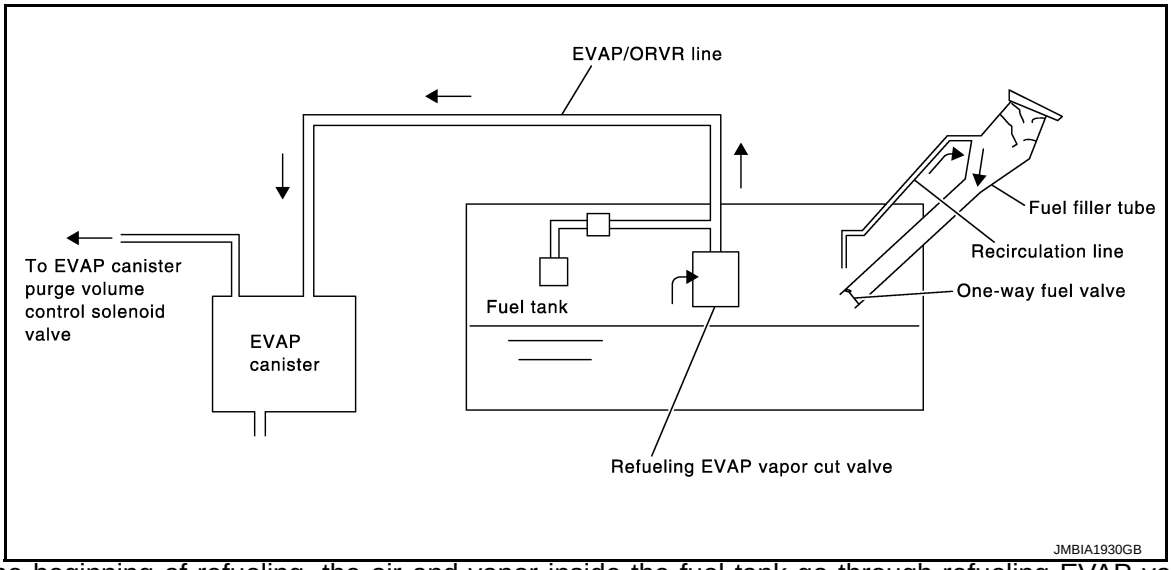


6. Locate the leakage using a leak detector (commercial service tool). Refer to EC-720, "Description".

ON BOARD REFUELING VAPOR RECOVERY (ORVR)

System Description

INFOID:0000000005353904



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, always 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-766, "Fuel Pressure Check".**
- **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 leakage at connection.**
- **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.**

Diagnosis Procedure

INFOID:0000000005353905

SYMPTOM: FUEL ODOR FROM EVAP CANISTER IS STRONG.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.0 kg (4.4 lb).

OK or NG

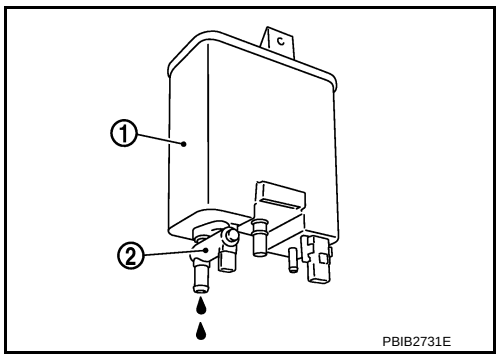
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Does water drain from the EVAP canister (1)?
• EVAP canister vent control valve (2)

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-728, "Component Inspection".

OK or NG

OK >> **INSPECTION END**
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

SYMPTOM: CANNOT REFUEL/FUEL ODOR FROM THE FUEL FILLER OPENING IS STRONG WHILE REFUELING.

1. CHECK EVAP CANISTER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Weigh the EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
   The weight should be less than 2.0 kg (4.4 lb).

OK or NG

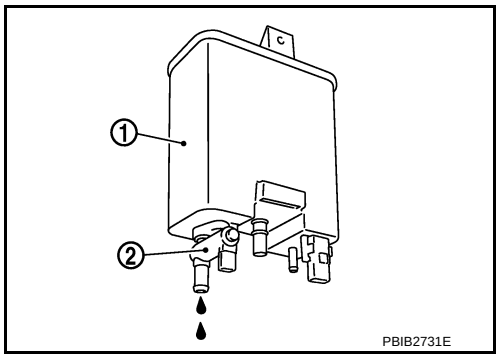
OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

Does water drain from the EVAP canister (1)?
• EVAP canister vent control valve (2)

Yes or No

Yes >> GO TO 3.
No >> GO TO 5.



3. REPLACE EVAP CANISTER

Replace EVAP canister with a new one.

>> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the EVAP hose between EVAP canister and vehicle frame for clogging or poor connection.

>> Repair or replace EVAP hose.

5. CHECK VENT HOSES AND VENT TUBES

Check hoses and tubes between EVAP canister and refueling control valve for clogging, kinks, looseness and improper connection.

OK or NG

OK >> GO TO 6.
NG >> Repair or replace hoses and tubes.

6. CHECK RECIRCULATION LINE

Check recirculation line for clogging, dents and cracks.

OK or NG

OK >> GO TO 7.
NG >> Replace fuel filler tube.

7. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-728, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

8. CHECK FUEL FILLER TUBE

Check fuel filler tube and hose connected to the fuel tank for clogging, dents and cracks.

OK or NG

OK >> GO TO 9.
NG >> Replace fuel filler tube.

9. CHECK ONE-WAY FUEL VALVE-I

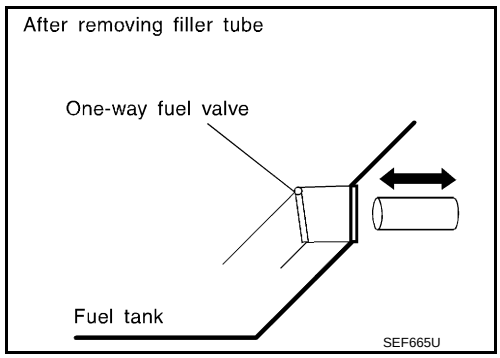
Check one-way valve for clogging.

OK or NG

OK >> GO TO 10.
NG >> Repair or replace one-way fuel valve with fuel tank.

10. CHECK ONE-WAY FUEL VALVE-II

1. Check that fuel is drained from the tank.
2. Remove fuel filler tube and hose.
3. Check one-way fuel valve for operation as per the following.
   When a stick is inserted, the valve should open, when removing stick it should close.
   Never drop any material into the tank.



OK or NG

OK >> **INSPECTION END**
NG >> Replace fuel filler tube or replace one-way fuel valve with fuel tank.

Component Inspection

INFOID:0000000005353906

REFUELING EVAP VAPOR CUT VALVE

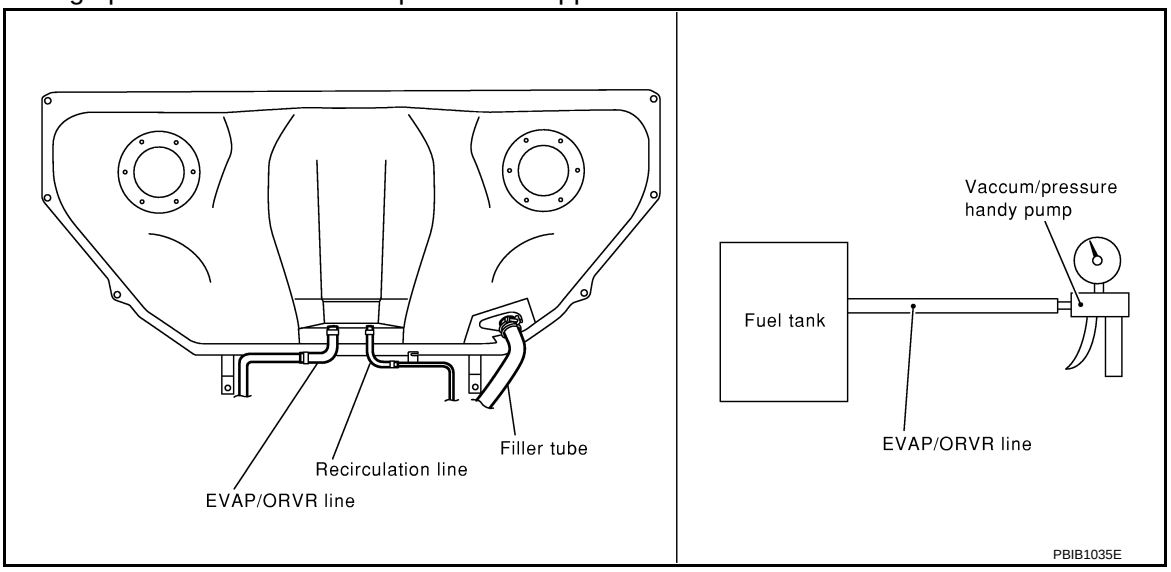
With CONSULT-III

1. Remove fuel tank. Refer to FL-10, "Removal and Installation".
2. Drain fuel from the tank as per the following:

a. Remove fuel feed hose located on the fuel gauge retainer.
b. Connect a spare fuel hose, one side to fuel gauge retainer where the hose was removed and the other side to a fuel container.
c. Drain fuel using “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-III.

3. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as per the following.

a. Connect vacuum pump to hose end.
b. Remove fuel gauge retainer with fuel gauge unit.
Always replace O-ring with new one.
c. Turn fuel tank upside down.
d. Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^2, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.



Without CONSULT-III

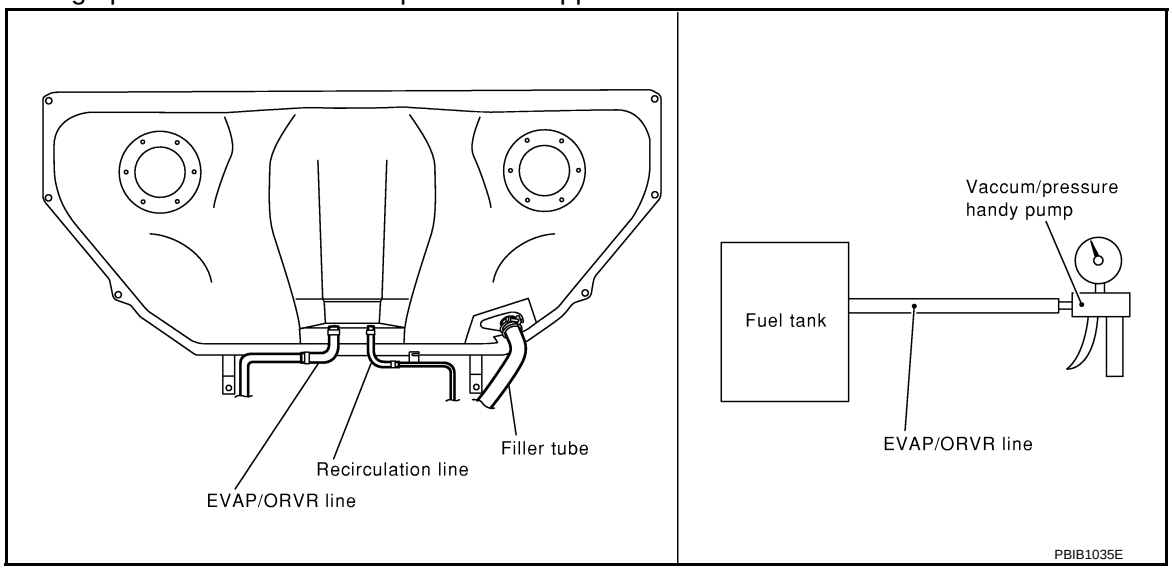
1. Remove fuel tank. Refer to FL-10, "Removal and Installation".
2. Drain fuel from the tank as per the following:

a. Remove fuel gauge retainer.
b. Drain fuel from the tank using a handy pump into a fuel container.

3. Check refueling EVAP vapor cut valve for being stuck to close as per the following.
Blow air into the refueling EVAP vapor cut valve (from the end of EVAP/ORVR line hose), and check that the air flows freely into the tank.
4. Check refueling EVAP vapor cut valve for being stuck to open as per the following.

a. Connect vacuum pump to hose end.
b. Remove fuel gauge retainer with fuel gauge unit.
Always replace O-ring with new one.
c. Turn fuel tank upside down.

d. Apply vacuum pressure to hose end [–13.3 kPa (–0.136 kg/cm^2, –1.93 psi)] with fuel gauge retainer remaining open and check that the pressure is applicable.

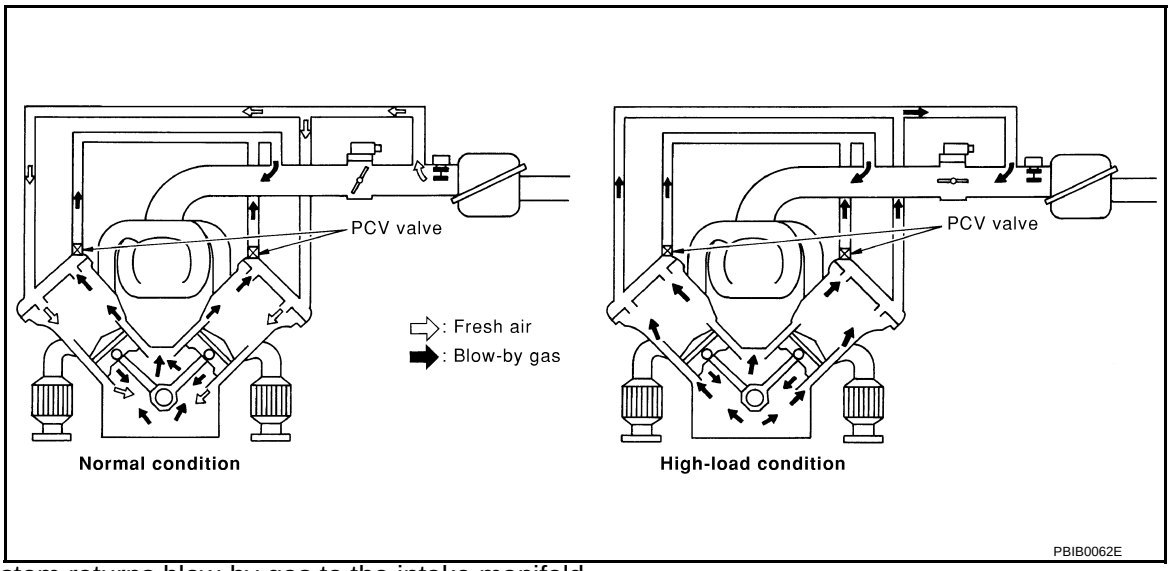


POSITIVE CRANKCASE VENTILATION

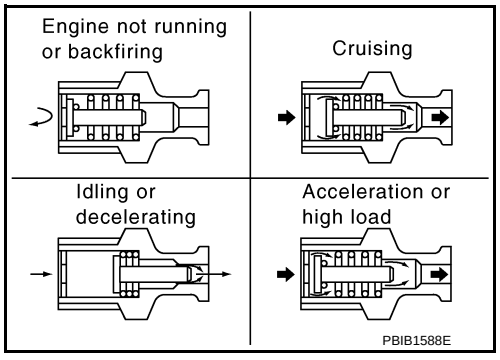
Description

INFOID:0000000005353907

SYSTEM DESCRIPTION



This system returns blow-by gas to the intake manifold.
The positive crankcase ventilation (PCV) valve is provided to conductcrankcase blow-by gas to the intake manifold.
During partial throttle operation of the engine, the intake manifoldsucks the blow-by gas through the PCV valve.
Normally, the capacity of the valve is sufficient to handle any blow-byand a small amount of ventilating air.
The ventilating air is drawn from the air inlet tubes into thecrankcase. In this process the air passes through the hose connecting airinlet tubes to rocker cover.
Under full-throttle condition, the manifold vacuum is insufficient todraw the blow-by flow through the valve. The flow goes through the hose connectionin the reverse direction.
On vehicles with an excessively high blow-by, the valve does not meetthe requirement. This is because some of the flow will go through the hoseconnection to the air inlet tubes under all conditions.

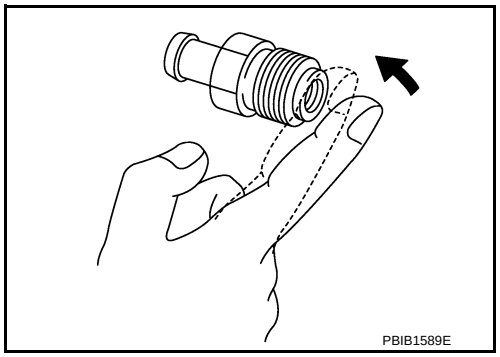


Component Inspection

INFOID:0000000005353908

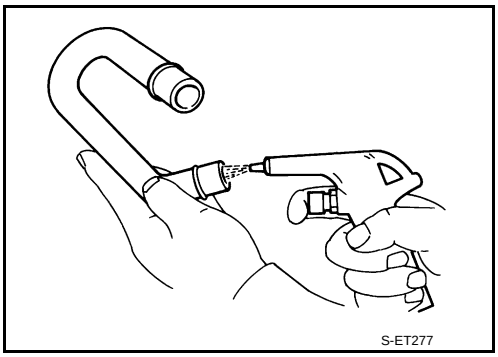
PCV (POSITIVE CRANKCASE VENTILATION) VALVE

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.



PCV VALVE VENTILATION HOSE

1. Check hoses and hose connections for leaking.
2. Disconnect all hoses and clean with compressed air. If any hosecannot be freed of obstructions, replace.



IVIS (INFINITI VEHICLE IMMOBILIZER SYSTEM-NATS)

Description

INFOID:0000000005353909

- **If the security indicator illuminates with the ignition switch ON or DTC P1610 - P1615 is displayed in "SELF DIAGNOSTIC RESULT" mode, perform the trouble diagnosis for corresponding to the detected DTC. Refer to EC-698, "U0101 - U1001".**
- **Check that no DTC is displayed in "SELF DIAGNOSIS RESULT" mode of "BCM" before erasing the detected DTC in "ENGINE" mode with CONSULT-III.**
- **When replacing ECM, refer to EC-764, "Procedure After Replacing ECM".**

ON BOARD DIAGNOSTIC (OBD) SYSTEM

Introduction

INFOID:0000000005353910

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

Emission-related diagnostic information	Diagnostic service
Diagnostic Trouble Code (DTC)	Service $03 of SAE J1979
Freeze Frame data	Service $02 of SAE J1979
System Readiness Test (SRT) code	Service $01 of SAE J1979
1st Trip Diagnostic Trouble Code (1st Trip DTC)	Service $07 of SAE J1979
1st Trip Freeze Frame data	—
Test values and Test limits	Service $06 of SAE J1979
Calibration ID	Service $09 of SAE J1979

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

×: Applicable —: Not applicable

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

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

The malfunction indicator lamp (MIL) on the instrument panel illuminates when the same malfunction is detected in two consecutive trips (Two trip detection logic), or when the ECM enters fail-safe mode. (Refer to EC-773, "Fail-Safe Chart".)

Two Trip Detection Logic

INFOID:0000000005353911

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 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-735, "Emission-Related Diagnostic Information".)	—	×	—	—	×	—	—	—
Except above	—	—	—	×	—	×	×	—

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.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

Emission-Related Diagnostic Information

INFOID:0000000005353912

EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS

×:Applicable —: Not applicable

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
U0101	0101*4	LOST COMM (TCM)	—	1	×	EC-829
U1001	1001*4	CAN COMM CIRCUIT	—	1 or 2	—	EC-829
P0000	**0000**	**NO DTC IS DETECTED. FURTHER TESTING MAY BE REQUIRED.**	—	—	**Blinking***8	**—**
P0011	0011	INT/V TIM CONT-B1	—	2	×	EC-833
P0021	0021	INT/V TIM CONT-B2	—	2	×	EC-833
P0031	0031	A/F SEN1 HTR (B1)	—	2	×	EC-845
P0032	0032	A/F SEN1 HTR (B1)	—	2	×	EC-845
P0037	0037	HO2S2 HTR (B1)	—	2	×	EC-852
P0038	0038	HO2S2 HTR (B1)	—	2	×	EC-852
P0051	0051	A/F SEN1 HTR (B2)	—	2	×	EC-845
P0052	0052	A/F SEN1 HTR (B2)	—	2	×	EC-845
P0057	0057	HO2S2 HTR (B2)	—	2	×	EC-852
P0058	0058	HO2S2 HTR (B2)	—	2	×	EC-852
P0075	0075	INT/V TIM V/CIR-B1	—	2	×	EC-860
P0081	0081	INT/V TIM V/CIR-B2	—	2	×	EC-860
P0101	0101	MAF SEN/CIRCUIT-B1	—	2	×	EC-867
P0102	0102	MAF SEN/CIRCUIT-B1	—	1	×	EC-874
P0103	0103	MAF SEN/CIRCUIT-B1	—	1	×	EC-874
P0112	0112	IAT SEN/CIRCUIT-B1	—	2	×	EC-881
P0113	0113	IAT SEN/CIRCUIT-B1	—	2	×	EC-881
P0116	0116	ECT SEN/CIRC	—	2	×	EC-885
P0117	0117	ECT SEN/CIRC	—	1	×	EC-888
P0118	0118	ECT SEN/CIRC	—	1	×	EC-888
P0122	0122	TP SEN 2/CIRC-B1	—	1	×	EC-893
P0123	0123	TP SEN 2/CIRC-B1	—	1	×	EC-893
P0125	0125	ECT SENSOR	—	2	×	EC-899
P0127	0127	IAT SENSOR-B1	—	2	×	EC-902
P0128	0128	THERMSTAT FNCTN	—	2	×	EC-905
P0130	0130	A/F SENSOR1 (B1)	—	2	×	EC-907
P0131	0131	A/F SENSOR1 (B1)	—	2	×	EC-915
P0132	0132	A/F SENSOR1 (B1)	—	2	×	EC-923
P0133	0133	A/F SENSOR1 (B1)	×	2	×	EC-931

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P0137	0137	HO2S2 (B1)	×	2	×	EC-940
P0138	0138	HO2S2 (B1)	×	2	×	EC-949
P0139	0139	HO2S2 (B1)	×	2	×	EC-961
P0150	0150	A/F SENSOR1 (B2)	—	2	×	EC-907
P0151	0151	A/F SENSOR1 (B2)	—	2	×	EC-915
P0152	0152	A/F SENSOR1 (B2)	—	2	×	EC-923
P0153	0153	A/F SENSOR1 (B2)	×	2	×	EC-931
P0157	0157	HO2S2 (B2)	×	2	×	EC-940
P0158	0158	HO2S2 (B2)	×	2	×	EC-949
P0159	0159	HO2S2 (B2)	×	2	×	EC-961
P0171	0171	FUEL SYS-LEAN-B1	—	2	×	EC-970
P0172	0172	FUEL SYS-RICH-B1	—	2	×	EC-979
P0174	0174	FUEL SYS-LEAN-B2	—	2	×	EC-970
P0175	0175	FUEL SYS-RICH-B2	—	2	×	EC-979
P0181	0181	FTT SENSOR	—	2	×	EC-988
P0182	0182	FTT SEN/CIRCUIT	—	2	×	EC-992
P0183	0183	FTT SEN/CIRCUIT	—	2	×	EC-992
P0222	0222	TP SEN 1/CIRC-B1	—	1	×	EC-996
P0223	0223	TP SEN 1/CIRC-B1	—	1	×	EC-996
P0300	0300	MULTI CYL MISFIRE	—	1 or 2	×	EC-1002
P0301	0301	CYL 1 MISFIRE	—	1 or 2	×	EC-1002
P0302	0302	CYL 2 MISFIRE	—	1 or 2	×	EC-1002
P0303	0303	CYL 3 MISFIRE	—	1 or 2	×	EC-1002
P0304	0304	CYL 4 MISFIRE	—	1 or 2	×	EC-1002
P0305	0305	CYL 5 MISFIRE	—	1 or 2	×	EC-1002
P0306	0306	CYL 6 MISFIRE	—	1 or 2	×	EC-1002
P0307	0307	CYL 7 MISFIRE	—	1 or 2	×	EC-1002
P0308	0308	CYL 8 MISFIRE	—	1 or 2	×	EC-1002
P0327	0327	KNOCK SEN/CIRC-B1	—	2	—	EC-1009
P0328	0328	KNOCK SEN/CIRC-B1	—	2	—	EC-1009
P0332	0332	KNOCK SEN/CIRC-B2	—	2	—	EC-1009
P0333	0333	KNOCK SEN/CIRC-B2	—	2	—	EC-1009
P0335	0335	CKP SEN/CIRCUIT	—	2	×	EC-1014
P0340	0340	CMP SEN/CIRC-B1	—	2	×	EC-1020
P0420	0420	TW CATALYST SYS-B1	×	2	×	EC-1026
P0430	0430	TW CATALYST SYS-B2	×	2	×	EC-1026
P0441	0441	EVAP PURG FLOW/MON	×	2	×	EC-1030
P0442	0442	EVAP SMALL LEAK	×	2	×	EC-1035
P0443	0443	PURG VOLUME CONT/V	—	2	×	EC-1042
P0444	0444	PURG VOLUME CONT/V	—	2	×	EC-1050
P0445	0445	PURG VOLUME CONT/V	—	2	×	EC-1050
P0447	0447	VENT CONTROL VALVE	—	2	×	EC-1056

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P0448	0448	VENT CONTROL VALVE	—	2	×	EC-1061
P0451	0451	EVAP SYS PRES SEN	—	2	×	EC-1067
P0452	0452	EVAP SYS PRES SEN	—	2	×	EC-1070
P0453	0453	EVAP SYS PRES SEN	—	2	×	EC-1076
P0455	0455	EVAP GROSS LEAK	—	2	×	EC-1083
P0456	0456	EVAP VERY SML LEAK	×*7	2	×	EC-1089
P0460	0460	FUEL LEV SEN SLOSH	—	2	×	EC-1097
P0461	0461	FUEL LEVEL SENSOR	—	2	×	EC-1099
P0462	0462	FUEL LEVL SEN/CIRC	—	2	×	EC-1101
P0463	0463	FUEL LEVL SEN/CIRC	—	2	×	EC-1101
P0500	0500	VEH SPEED SEN/CIRC*5	—	2	×	EC-1103
P0506	0506	ISC SYSTEM	—	2	×	EC-1105
P0507	0507	ISC SYSTEM	—	2	×	EC-1107
P0550	0550	PW ST P SEN/CIRC	—	2	—	EC-1109
P0603	0603	ECM BACK UP/CIRCUIT	—	2	×	EC-1114
P0605	0605	ECM	—	1 or 2	× or —	EC-1118
P0607	0607	ECM	—	1	×	EC-1120
P0643	0643	SENSOR POWER/CIRC	—	1	×	EC-1121
P0700	0700	TRANSMISSION CONT	—	1	×	AT-109
P0705	0705	T/M RANGE SENSOR A	—	2	×	AT-110
P0710	0710	ATF TEMP SEN/CIRC	—	2	×	AT-140
P0717	0717	INPUT SPEED SENSOR A	—	2	×	AT-113
P0720	0720	OUTPUT SPEED SENSOR*5	—	2	×	AT-115
P0731	0731	1GR INCORRECT RATIO	—	2	×	AT-122
P0732	0732	2GR INCORRECT RATIO	—	2	×	AT-124
P0733	0733	3GR INCORRECT RATIO	—	2	×	AT-126
P0734	0734	4GR INCORRECT RATIO	—	2	×	AT-128
P0735	0735	5GR INCORRECT RATIO	—	2	×	AT-130
P0740	0740	TORQUE CONVERTER	—	2	×	AT-132
P0744	0744	TORQUE CONVERTER	—	2	×	AT-134
P0745	0745	PC SOLENOID A	—	2	×	AT-136
P0850	0850	P-N POS SW/CIRCUIT	—	2	×	EC-1126
P1140	1140	INTK TIM S/CIRC-B1	—	2	×	EC-1131
P1145	1145	INTK TIM S/CIRC-B2	—	2	×	EC-1131
P1148	1148	CLOSED LOOP-B1	—	1	×	EC-1139
P1168	1168	CLOSED LOOP-B2	—	1	×	EC-1139
P1211	1211	TCS C/U FUNCTN	—	2	—	EC-1140
P1212	1212	TCS/CIRC	—	2	—	EC-1141
P1217	1217	ENG OVER TEMP	—	1	×	EC-1142
P1220	1220	FPCM/CIRCUIT	—	2	×	EC-1152
P1225	1225	CTP LEARNING-B1	—	2	—	EC-1159
P1226	1226	CTP LEARNING-B1	—	2	—	EC-1161

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P1421	1421	COLD START CONTROL	—	2	×	EC-1163
P1550	1550	BAT CURRENT SENSOR	—	2	—	EC-1165
P1551	1551	BAT CURRENT SENSOR	—	2	—	EC-1170
P1552	1552	BAT CURRENT SENSOR	—	2	—	EC-1170
P1553	1553	BAT CURRENT SENSOR	—	2	—	EC-1175
P1554	1554	BAT CURRENT SENSOR	—	2	—	EC-1180
P1564	1564	ASCD SW	—	1	—	EC-1186 (Models with ICC) EC-1192 (Models with ASCD)
P1568	1568	ICC COMMAND VALUE*6	—	1	—	EC-1198
P1572	1572	ASCD BRAKE SW	—	1	—	EC-1199 (Models with ICC) EC-1207 (Models with ASCD)
P1574	1574	ASCD VHL SPD SEN	—	1	—	EC-1214 (Models with ICC) EC-1216 (Models with ASCD)
P1610	1610	LOCK MODE	—	2	—	BL-5
P1611	1611	ID DISCORD, IMMU-ECM	—	2	—	BL-5
P1612	1612	CHAIN OF ECM-IMMU	—	2	—	BL-5
P1614	1614	CHAIN OF IMMU-KEY	—	2	—	BL-5
P1715	1715	IN PULY SPEED	—	2	—	EC-1218
P1730	1730	A/T INTERLOCK	—	1	×	AT-147
P1752	1752	INPUT CLUTCH SOL	—	1	×	AT-151
P1757	1757	FR BRAKE SOLENOID	—	1	×	AT-153
P1762	1762	DRCT CLUTCH SOL	—	1	×	AT-155
P1767	1767	HLR CLUTCH SOLENOID	—	1	×	AT-157
P1772	1772	L C BRAKE SOLENOID	—	1	×	AT-159
P1774	1774	L C BRAKE SOLENOID	—	1	×	AT-161
P1800	1800	VIAS S/V-1	—	2	—	EC-1219
P1805	1805	BRAKE SW/CIRCUIT	—	2	—	EC-1224
P2100	2100	ETC MOT PWR-B1	—	1	×	EC-1231
P2101	2101	ETC FNCTN/CIRC-B1	—	1	×	EC-1235
P2103	2103	ETC MOT PWR	—	1	×	EC-1231
P2118	2118	ETC MOT-B1	—	1	×	EC-1241
P2119	2119	ETC ACTR-B1	—	1	×	EC-1246
P2122	2122	APP SEN 1/CIRC	—	1	×	EC-1248
P2123	2123	APP SEN 1/CIRC	—	1	×	EC-1248
P2127	2127	APP SEN 2/CIRC	—	1	×	EC-1253

DTC*1		Items (CONSULT-III screen terms)	SRT code	Trip	MIL	Reference page
CONSULT-III GST*2	ECM*3					
P2128	2128	APP SEN 2/CIRC	—	1	×	EC-1253
P2135	2135	TP SENSOR-B1	—	1	×	EC-1259
P2138	2138	APP SENSOR	—	1	×	EC-1265
P2A00	2A00	A/F SENSOR1 (B1)	—	2	×	EC-1271
P2A03	2A03	A/F SENSOR1 (B2)	—	2	×	EC-1271

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

*2: This number is prescribed by SAE J2012.

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

*4: The troubleshooting for this DTC needs CONSULT-III.

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

*6: Models with ICC.

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

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

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 illuminate (two trip detection logic). If the same malfunction is not detected in the 2nd trip (meeting the required driving pattern), the 1st trip DTC is cleared from the ECM memory. If the same malfunction is detected in the 2nd trip, both the 1st trip DTC and DTC are stored in the ECM memory and the MIL illuminates. In other words, the DTC is stored in the ECM memory and the MIL illuminates when the same malfunction occurs in two consecutive trips. If a 1st trip DTC is saved 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 illuminate the MIL during the 1st trip, the DTC and 1st trip DTC are stored in the ECM memory.

Procedures for clearing the DTC and the 1st trip DTC from the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

For malfunctions in which 1st trip DTCs are displayed, refer to "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS". These items are required by legal regulations to continuously monitor the system/component. In addition, the items monitored non-continuously are also displayed on CONSULT-III.

1st trip DTC is specified in Service $07 of SAE J1979. 1st trip DTC detection occurs without lighting up the MIL and therefore does not warn the driver of a malfunction. However, 1st trip DTC detection will not prevent the vehicle from being tested, for example during Inspection/Maintenance (I/M) tests.

When a 1st trip DTC is detected, check, print out or write down and erase (1st trip) DTC and Freeze Frame data as specified in Work Flow procedure Step 2, refer to EC-768, "Trouble Diagnosis Introduction". Then perform DTC Confirmation Procedure or Overall Function Check to try to duplicate the malfunction. If the malfunction is duplicated, the item requires repair.

How to Read DTC and 1st Trip DTC

DTC and 1st trip DTC can be read by the following methods.

With CONSULT-III

CONSULT-III displays the DTC in “Self Diagnostic Result” mode. Examples: P0340, P0850, P1148, etc.
These DTCs are prescribed by SAE J2012.
(CONSULT-III also displays the malfunctioning component or system.)
Time data indicates how many times the vehicle was driven after the last detection of a DTC.
If the DTC is being detected currently, the time data will be [0].
If a 1st trip DTC is stored in the ECM, the time data will be [1t].

With GST

GST (Generic Scan Tool) displays the DTC in Diagnostic Service $03. Examples: P0340, P0850, P1148, etc.
These DTCs are prescribed by SAE J2012.

No Tools

The number of blinks of the MIL in the Diagnostic Test Mode II (Self-Diagnostic Results) indicates the DTC.
Example: 0340, 0850, 1148, etc.
These DTCs are controlled by NISSAN.

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

FREEZE FRAME DATA AND 1ST TRIP FREEZE FRAME DATA

The ECM records the driving conditions such as fuel system status, calculated load value, engine coolant temperature, short term fuel trim, long term fuel trim, engine speed, vehicle speed, absolute throttle position, base fuel schedule and intake air temperature at the moment a malfunction is detected.
Data which are stored in the ECM memory, along with the 1st trip DTC, are called 1st trip freeze frame data. The data, stored together with the DTC data, are called freeze frame data and displayed on CONSULT-III or GST. The 1st trip freeze frame data can only be displayed on the CONSULT-III screen, not on the GST. For details, see EC-799, "CONSULT-III Function".
Only one set of freeze frame data (either 1st trip freeze frame data or freeze frame data) can be stored in the ECM. 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 illuminates) 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 stored in the 2nd trip. After that when the misfire (Priority: 1) is detected in another trip, the freeze frame data will be updated from the EGR malfunction to the misfire. The 1st trip freeze frame data is updated each time a different malfunction is detected. There is no priority for 1st trip freeze frame data. However, once freeze frame data is stored in the ECM memory, 1st trip freeze data is no longer stored (because only one freeze frame data or 1st trip freeze frame data can be stored in the ECM). If freeze frame data is stored in the ECM memory and freeze frame data with the same priority occurs later, the first (original) freeze frame data remains unchanged in the ECM memory.
Both 1st trip freeze frame data and freeze frame data (along with the DTCs) are cleared when the ECM memory is erased. Procedures for clearing the ECM memory are described in "HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION".

SYSTEM READINESS TEST (SRT) CODE

System Readiness Test (SRT) code is specified in Service $01 of SAE J1979.
As part of an enhanced emissions test for Inspection & Maintenance (I/M), certain states require the status of SRT be used to indicate whether the ECM has completed self-diagnosis of major emission systems and components. Completion must be verified in order for the emissions inspection to proceed.
If a vehicle is rejected for a State emissions inspection due to one or more SRT items indicating “INCMP”, use the information in this Service Manual to set the SRT to “CMPLT”.
In most cases the ECM will automatically complete its self-diagnosis cycle during normal usage, and the SRT status will indicate “CMPLT” for each application system. Once set as “CMPLT”, the SRT status remains “CMPLT” until the self-diagnosis memory is erased.
Occasionally, certain portions of the self-diagnostic test may not be completed as a result of the customer's normal driving pattern; the SRT will indicate “INCMP” for these items.
NOTE:
The SRT will also indicate “INCMP” if the self-diagnosis memory is erased for any reason or if the ECM memory power supply is interrupted for several hours.
If, during the state emissions inspection, the SRT indicates “CMPLT” for all test items, the inspector will continue with the emissions test. However, if the SRT indicates “INCMP” for one or more of the SRT items the vehicle is returned to the customer untested.
NOTE:
If MIL 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”) and DTC (No DTCs) before the inspection.

SRT Item

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

SRT item (CONSULT-III indication)	Performance Priority*	Required self-diagnostic items to set the SRT to “CMPLT”	Corresponding DTC No.
CATALYST	2	Three way catalyst function	P0420, P0430
EVAP SYSTEM	2	EVAP control system purge flow monitoring	P0441
	1	EVAP control system	P0442
	2	EVAP control system	P0456
HO2S	2	Air fuel ratio (A/F) sensor 1	P0133, P0153
		Heated oxygen sensor 2	P0137, P0157
		Heated oxygen sensor 2	P0138, P0158
		Heated oxygen sensor 2	P0139, P0159

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

SRT Set Timing

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

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

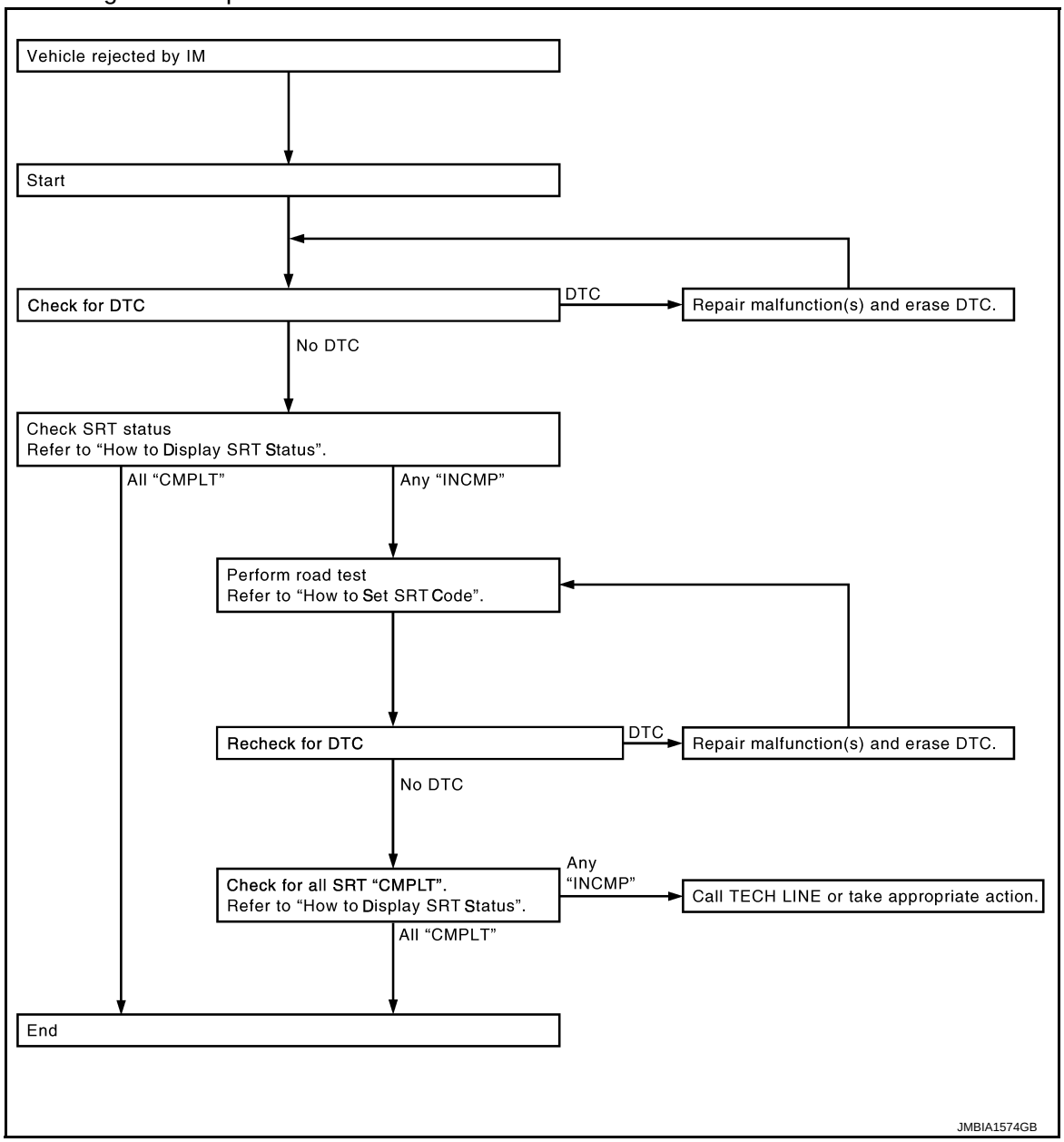
- The SRT will indicate “CMPLT” at the time the respective self-diagnoses have one (1) OK result.

- 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”.

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 below.



How to Display SRT Status

WITH CONSULT-III

Selecting “SRT STATUS” in “DTC CONFIRMATION” mode with CONSULT-III.
For items whose SRT codes are set, “CMPLT” is displayed on the CONSULT-III screen; for items whose SRT codes are not set, “INCMP” is displayed.
“INCMP” means the self-diagnosis is incomplete and SRT is not set. “CMPLT” means the self-diagnosis is complete and SRT is set.

NOTE:
Though displayed on the CONSULT-III screen, “HO2S HTR” is not SRT item.

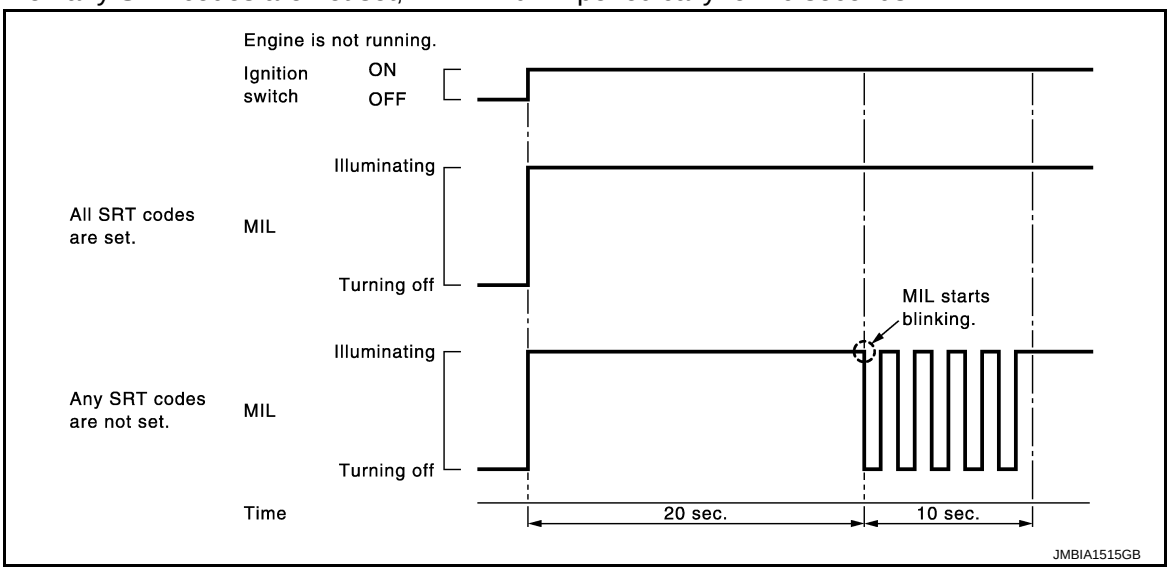
WITH GST

Selecting Service $01 with GST (Generic Scan Tool)

NO TOOLS

A SRT code itself cannot be displayed, however SRT status can be.

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



How to Set SRT Code

To set all SRT codes, self-diagnosis for the items indicated above must be performed one or more times. Each diagnosis may require a long period of actual driving under various conditions.

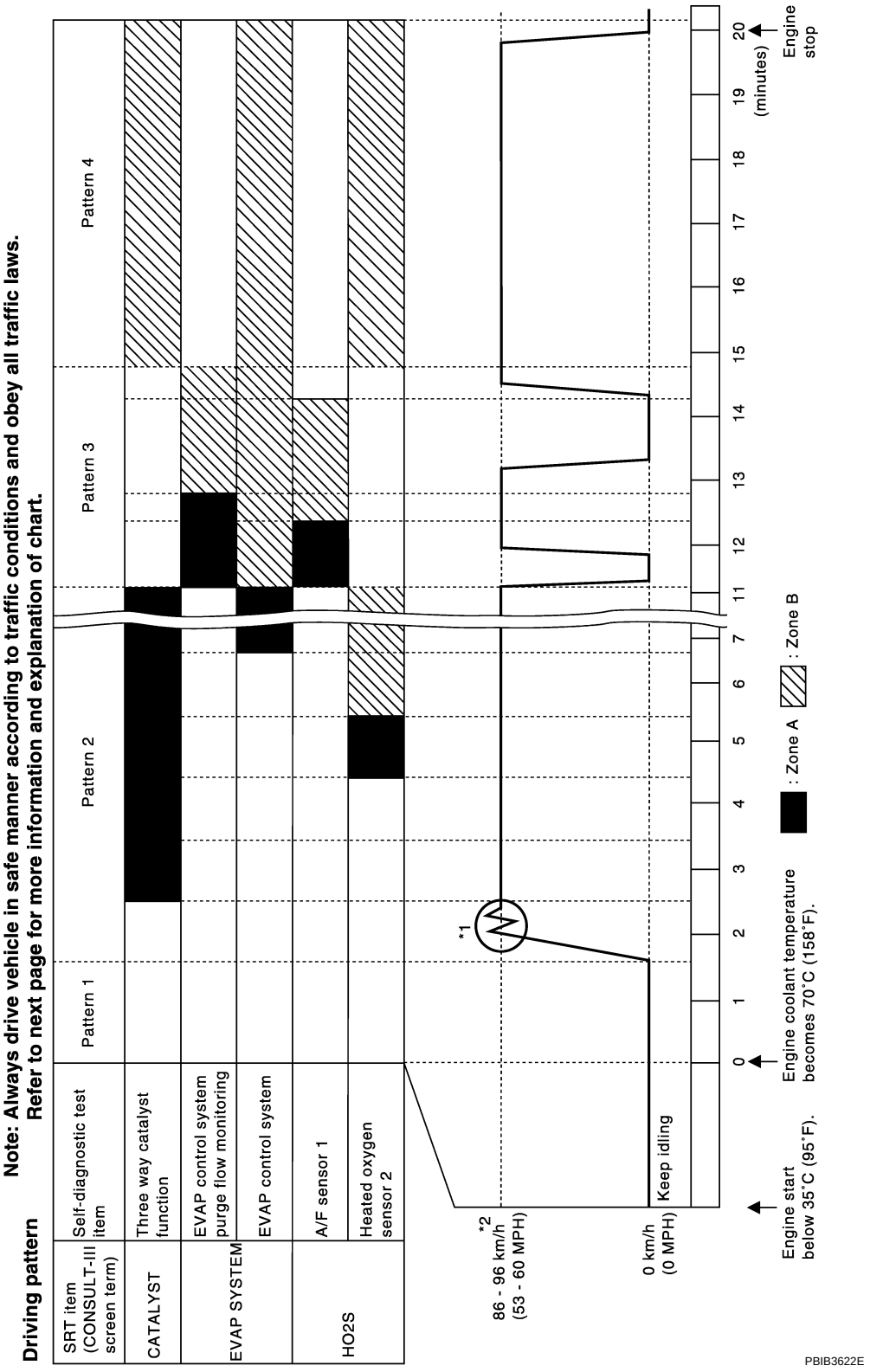
WITH CONSULT-III

Perform corresponding DTC Confirmation Procedure one by one based on Performance Priority in the table on "SRT Item".

WITHOUT CONSULT-III

The most efficient driving pattern in which SRT codes can be properly set is explained below. The driving pattern should be performed one or more times to set all SRT codes.

Driving Pattern



- The time required for each diagnosis varies with road surface conditions, weather, altitude, individual driving habits, etc.
  Zone A refers to the range where the time, required for the diagnosis under normal conditions*, is the shortest.
  Zone B refers to the range where the diagnosis can still be performed if the diagnosis is not completed within zone A.

*: Normal conditions refer to the following:

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

Pattern 1:

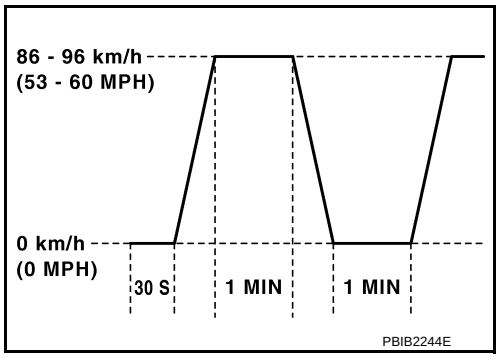
- **The engine is started at the engine coolant temperature of −10 to 35°C (14 to 95°F) (where the voltage between the ECM terminal 73 and ground is 3.0 - 4.3V).**
- **The engine must be operated at idle speed until the engine coolant temperature is greater than 70°C (158°F) (where the voltage between the ECM terminal 73 and ground is lower than 1.4V).**
- **The engine is started at the fuel tank temperature of warmer than 0°C (32°F) (where the voltage between the ECM terminal 107 and ground is less than 4.1V).**

Pattern 2:

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

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).



Pattern 4:

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

*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.

Suggested Transmission Gear Position
Set the selector lever in the D position with the overdrive switch turned ON.

TEST VALUE AND TEST LIMIT (GST ONLY — NOT APPLICABLE TO CONSULT-III)

The following is the information specified in Service $06 of SAE J1979.
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. (eg., if the bank 2 is not applied on this vehicle, only the items of the bank 1 is displayed)

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	01H	Air fuel ratio (A/F) sensor 1 (Bank 1)	P0131	83H	0BH	Minimum sensor output voltage for test cycle
			P0131	84H	0BH	Maximum sensor output voltage for test cycle
			P0130	85H	0BH	Minimum sensor output voltage for test cycle
			P0130	86H	0BH	Maximum sensor output voltage for test cycle
			P0133	87H	04H	Response rate: Response ratio (Lean to Rich)
			P0133	88H	04H	Response rate: Response ratio (Rich to Lean)
			P2A00	89H	84H	The amount of shift in air fuel ratio
			P2A00	8AH	84H	The amount of shift in air fuel ratio
			P0130	8BH	0BH	Difference in sensor output voltage
			P0133	8CH	83H	Response gain at the limited frequency
	02H	Heated oxygen sensor 2 (Bank 1)	P0138	07H	0CH	Minimum sensor output voltage for test cycle
			P0137	08H	0CH	Maximum sensor output voltage for test cycle
			P0138	80H	0CH	Sensor output voltage
			P0139	81H	0CH	Difference in sensor output voltage
	03H	Heated oxygen sensor 3 (Bank 1)	P0143	07H	0CH	Minimum sensor output voltage for test cycle
			P0144	08H	0CH	Maximum sensor output voltage for test cycle
			P0146	80H	0CH	Sensor output voltage
			P0145	81H	0CH	Difference in sensor output voltage

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
HO2S	05H	Air fuel ratio (A/F) sensor 1 (Bank 2)	P0151	83H	0BH	Minimum sensor output voltage for test cycle
			P0151	84H	0BH	Maximum sensor output voltage for test cycle
			P0150	85H	0BH	Minimum sensor output voltage for test cycle
			P0150	86H	0BH	Maximum sensor output voltage for test cycle
			P0153	87H	04H	Response rate: Response ratio (Lean to Rich)
			P0153	88H	04H	Response rate: Response ratio (Rich to Lean)
			P2A03	89H	84H	The amount of shift in air fuel ratio
			P2A03	8AH	84H	The amount of shift in air fuel ratio
			P0150	8BH	0BH	Difference in sensor output voltage
			P0153	8CH	83H	Response gain at the limited frequency
	06H	Heated oxygen sensor 2 (Bank 2)	P0158	07H	0CH	Minimum sensor output voltage for test cycle
			P0157	08H	0CH	Maximum sensor output voltage for test cycle
			P0158	80H	0CH	Sensor output voltage
			P0159	81H	0CH	Difference in sensor output voltage
	07H	Heated oxygen sensor 3 (Bank2)	P0163	07H	0CH	Minimum sensor output voltage for test cycle
			P0164	08H	0CH	Maximum sensor output voltage for test cycle
			P0166	80H	0CH	Sensor output voltage
			P0165	81H	0CH	Difference in sensor output voltage
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

Item	OBD-MID	Self-diagnostic test item	DTC	Test value and Test limit (GST display)		Description
				TID	Unit and Scaling ID	
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
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 0.04inch)
	3CH	EVAP control system (Very small leak)	P0456	80H	05H	Leak area index (for more than 0.02inch)
			P0456	81H	FDH	Maximum internal pressure of EVAP system during monitoring
	3DH	Purge flow system	P0441	83H	0CH	Difference in pressure sensor output voltage before and after vent control value close
O2 SENSOR HEATER	41H	A/F sensor 1 heater (Bank 1)	Low Input:P0031 High Input:P0032	81H	0BH	Converted value of Heater electric current to voltage
	42H	Heated oxygen sensor 2 (Bank 1)	Low Input:P0037 High Input:P0038	80H	0CH	Converted value of Heater electric current to voltage
	43H	Heated oxygen sensor 3 (Bank 1)	P0043	80H	0CH	Converted value of Heater electric current to voltage
	45H	A/F sensor 1 heater (Bank 2)	Low Input:P0051 High Input:P0052	81H	0BH	Converted value of Heater electric current to voltage
	46H	Heated oxygen sensor 2 (Bank 2)	Low Input:P0057 High Input:P0058	80H	0CH	Converted value of Heater electric current to voltage
	47H	Heated oxygen sensor 3 (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
	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
MISFIRE	A1H	Multiple Cylinder Misfire	P0301	80H	24H	Misfiring counter at 1000rev of the first cylinder
			P0302	81H	24H	Misfiring counter at 1000rev of the second cylinder
			P0303	82H	24H	Misfiring counter at 1000rev of the third cylinder
			P0304	83H	24H	Misfiring counter at 1000rev of the fourth cylinder
			P0305	84H	24H	Misfiring counter at 1000rev of the fifth cylinder
			P0306	85H	24H	Misfiring counter at 1000rev of the sixth cylinder
			P0307	86H	24H	Misfiring counter at 1000rev of the seventh cylinder
			P0308	87H	24H	Misfiring counter at 1000rev of the eighth cylinder
			P0300	88H	24H	Misfiring counter at 1000rev of the multiple cylinders
			P0301	89H	24H	Misfiring counter at 200rev of the first cylinder
			P0302	8AH	24H	Misfiring counter at 200rev of the second cylinder
			P0303	8BH	24H	Misfiring counter at 200rev of the third cylinder
			P0304	8CH	24H	Misfiring counter at 200rev of the fourth cylinder
			P0305	8DH	24H	Misfiring counter at 200rev of the fifth cylinder
			P0306	8EH	24H	Misfiring counter at 200rev of the fifth cylinder
			P0307	8FH	24H	Misfiring counter at 200rev of the fifth cylinder
			P0308	90H	24H	Misfiring counter at 200rev of the fifth cylinder
			P0300	91H	24H	Misfiring counter at 1000rev of the single cylinder
			P0300	92H	24H	Misfiring counter at 200rev of the single cylinder
			P0300	93H	24H	Misfiring counter at 200rev 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

HOW TO ERASE EMISSION-RELATED DIAGNOSTIC INFORMATION

How to Erase DTC

WITH CONSULT-III

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 "EMISSION-RELATED DIAGNOSTIC INFORMATION ITEMS"), skip step 1.**

1. Perform "HOW TO ERASE DTC" in AT-47, "OBD-II Diagnostic Trouble Code (DTC)". (The DTC in TCM will be erased)

2. Select “ENGINE” with CONSUILT-III.
3. Select “Self Diagnostic Result”.
4. Touch “ERASE”. (DTC in ECM will be erased.)

WITH GST

NOTE:

- **If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.**

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

No Tools

NOTE:

- **If the ignition switch stays ON after repair work, be sure to turn ignition switch OFF once. Wait at least 10 seconds and then turn it ON (engine stopped) again.**

1. Erase DTC in ECM. Refer to “How to Erase Diagnostic Test Mode II (Self-Diagnostic Results)” in EC-751, "Malfunction Indicator Lamp (MIL)".

- **If the battery is disconnected, the emission-related diagnostic information will be cleared within 24 hours.**
- **The following data are cleared when the ECM memory is erased.**

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

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

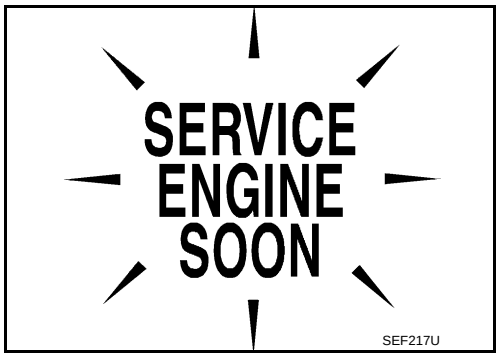
Malfunction Indicator Lamp (MIL)

INFOID:0000000005353913

DESCRIPTION

The MIL is located on the combination meter.

1. The MIL will illuminate when the ignition switch is turned ON without the engine running. This is a bulb check.
   If the MIL does not illuminate, check MIL circuit. Refer to EC-1335, "Wiring Diagram".
2. When the engine is started, the MIL should turn off.
   If the MIL remains illuminating, the on board diagnostic system has detected an engine system malfunction.



ON BOARD DIAGNOSTIC SYSTEM FUNCTION

The on board diagnostic system has the following three functions.

Diagnostic Test Mode	KEY and ENG. Status	Function	Explanation of Function
Mode I	Ignition switch in ON position  Engine stopped 	BULB CHECK	This function checks the MIL bulb for damage (blown, open circuit, etc.). If the MIL does not illuminate, check MIL circuit.
	Engine running 	MALFUNCTION WARNING	When a malfunction is detected twice in two consecutive driving cycles (two trip detection logic), the MIL will illuminate to inform the driver that a malfunction has been detected. The following malfunctions will illuminate or blink the MIL in the 1st trip. • Misfire (Possible three way catalyst damage) • One trip detection diagnoses
Mode II	Ignition switch in ON position  Engine stopped 	SELF-DIAGNOSTIC RESULTS	This function allows DTCs and 1st trip DTCs to be read.

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 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.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

MIL Blinking Without DTC
When any SRT codes are not set, MIL may blink without DTC. For the details, refer to EC-735, "Emission-Related Diagnostic Information".

HOW TO SWITCH DIAGNOSTIC TEST MODE

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

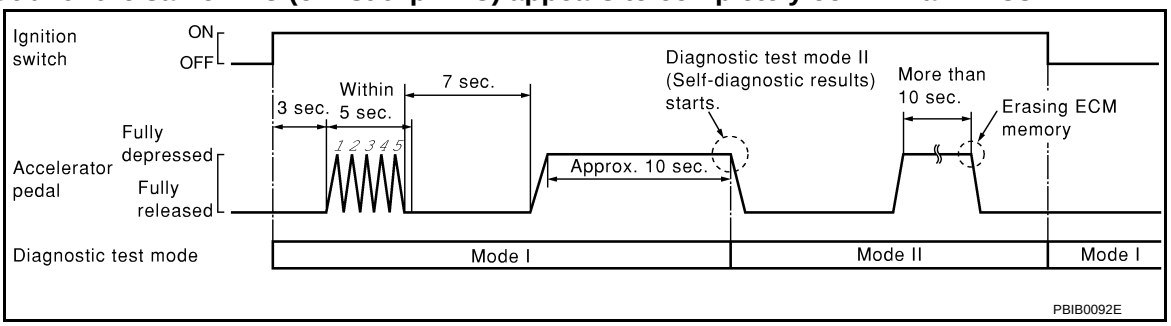
How to Set Diagnostic Test Mode II (Self-diagnostic Results)

1. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
2. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

3. Wait 7 seconds, fully depress the accelerator pedal and keep it 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 Diagnostic Test Mode II (Self-diagnostic results).
   NOTE:
   Wait until the same DTC (or 1st trip DTC) appears to completely confirm all DTCs.



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

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

DIAGNOSTIC TEST MODE I — BULB CHECK

In this mode, the MIL on the combination meter should stay ON. If it remains OFF, check MIL circuit. Refer to EC-1335, "Wiring Diagram".

DIAGNOSTIC TEST MODE I — MALFUNCTION WARNING

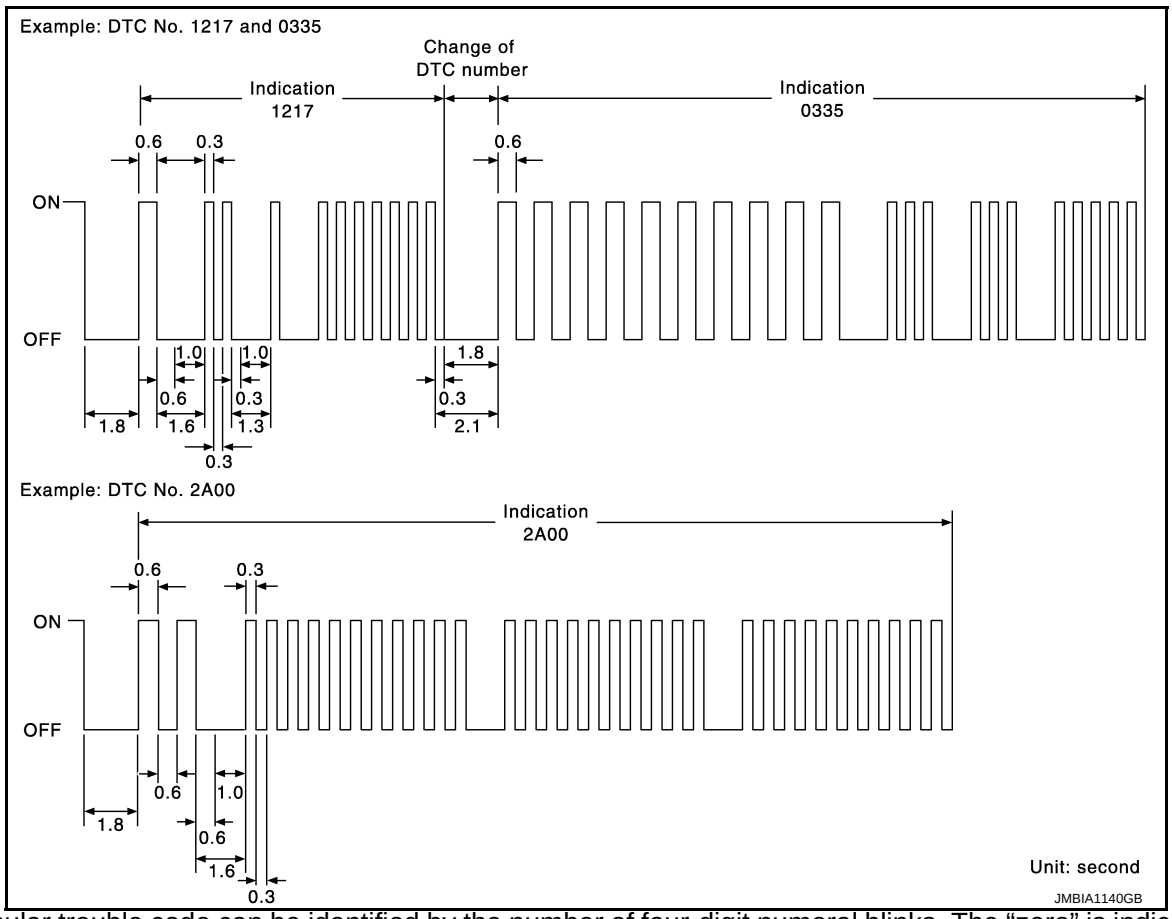
MIL	Condition
ON	When the malfunction is detected.
OFF	No malfunction.

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

DIAGNOSTIC TEST MODE II — SELF-DIAGNOSTIC RESULTS

In this mode, the DTC and 1st trip DTC are indicated by the number of blinks of the 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 diagnostic test mode II (SELF-DIAGNOSTIC RESULTS), it is a DTC; if two or more codes are displayed, they may be either DTCs or 1st trip DTCs. DTC No. is same as that of 1st trip DTC. These uniden-

tified codes can be identified by using the CONSULT-III or GST. A DTC will be used as an example for how to read a code.



A particular trouble code can be identified by the number of four-digit numeral blinks. The “zero” is indicated by the number of ten blinks. The “A” is indicated by the number of 11 blink. The length of time the 1,000th-digit numeral blinks 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.

How to Erase Diagnostic Test Mode II (Self-diagnostic Results)
The DTC can be erased from the back up memory in the ECM by depressing accelerator pedal. Refer to "How to Erase Diagnostic Test Mode II (Self-diagnostic Results)".
- **If the battery is disconnected, the DTC will be cleared from the backup memory within 24 hours.**
- **Be careful not to erase the stored memory before starting trouble diagnoses.**

OBD System Operation Chart

INFOID:0000000005353914

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 illuminate. For details, refer to EC-734, "Two Trip Detection Logic".
- The MIL will turn off after the vehicle is driven 3 times (driving pattern B) with no malfunction. A 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 Result” mode of CONSULT-III will count the number of times the vehicle is driven.

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

SUMMARY CHART

Items	Fuel Injection System	Misfire	Other
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)

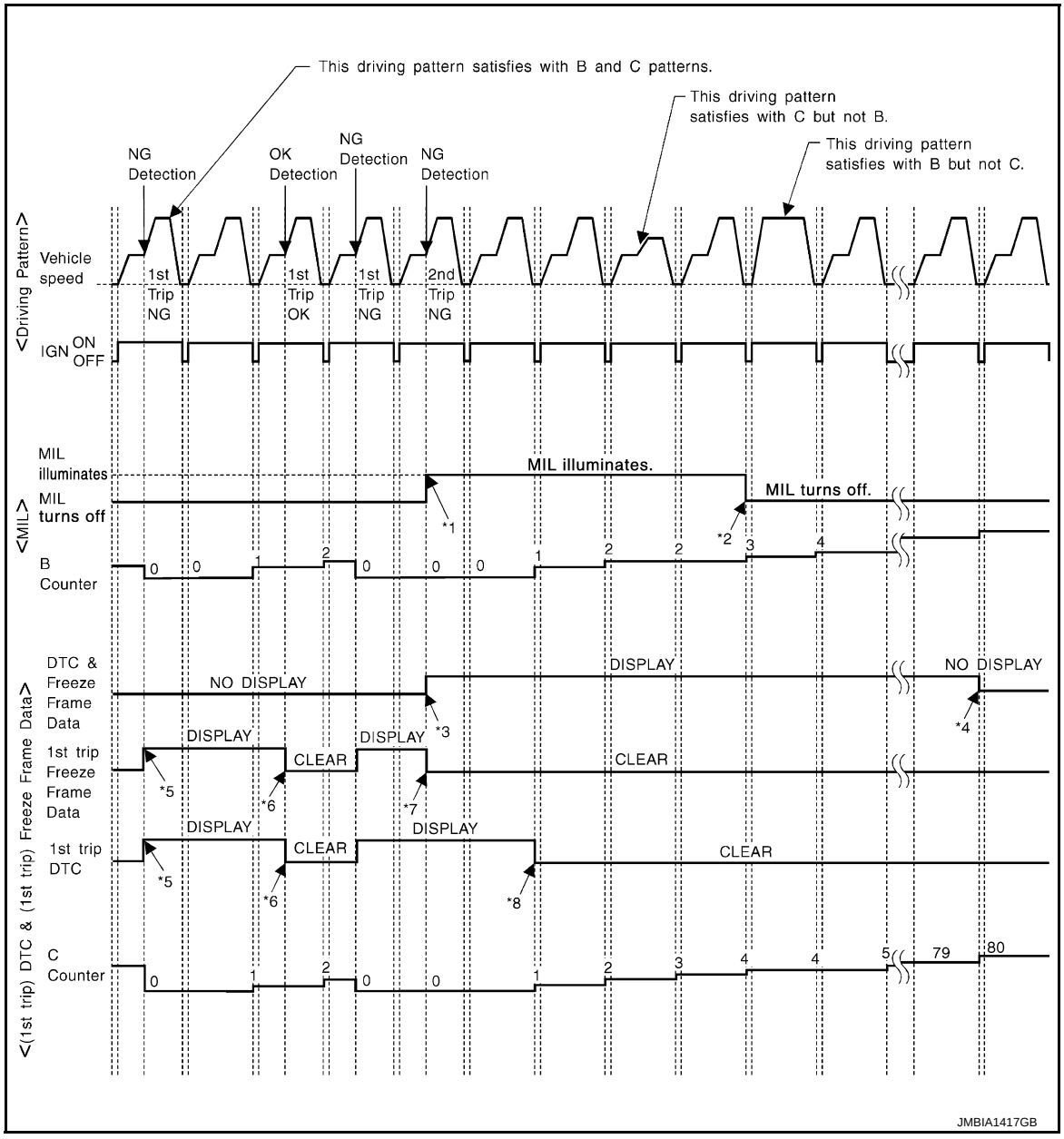
For details about patterns B and C under “Fuel Injection System” and “Misfire”, see "EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM””.

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 illuminate.

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

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

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

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

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

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

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

EXPLANATION FOR DRIVING PATTERNS FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

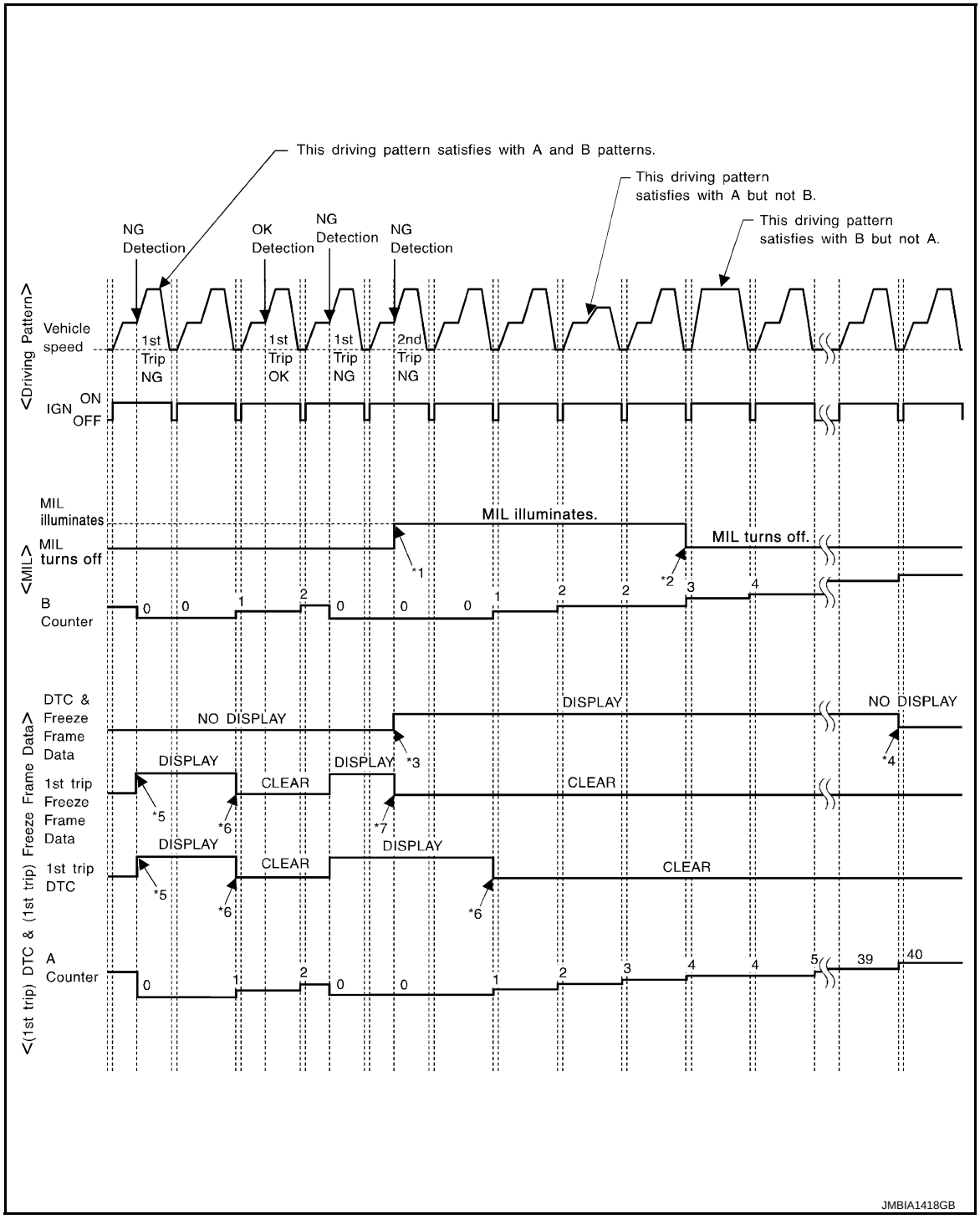
<Driving Pattern B>
Driving pattern B means the vehicle operation as per the following:

All components and systems should be monitored at least once by the OBD system.
- The B counter will be cleared when the malfunction is detected once regardless of the driving pattern.
- The B counter will be counted up when driving pattern B is satisfied without any malfunction.
- The MIL will turn off when the B counter reaches 3. (*2 in “OBD SYSTEM OPERATION CHART”)

<Driving Pattern C>
Driving pattern C means operating vehicle as per the following:
The following conditions should be satisfied at the same time:
Engine speed: (Engine speed in the freeze frame data) ±375 rpm
Calculated load value: (Calculated load value in the freeze frame data) x (1±0.1) [%]
Engine coolant temperature (T) condition:
- When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
- When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

Example:
If the stored freeze frame data is as per the following:
Engine speed: 850 rpm, Calculated load value: 30%, Engine coolant temperature: 80°C (176°F)
To be satisfied with driving pattern C, the vehicle should run under the following conditions:
Engine speed: 475 - 1,225 rpm, Calculated load value: 27 - 33%, Engine coolant temperature: more than 70°C (158°F)
- The C counter will be cleared when the malfunction is detected regardless of vehicle conditions above.
- The C counter will be counted up when vehicle conditions above are satisfied without the same malfunction.
- The DTC will not be displayed after C counter reaches 80.
- The 1st trip DTC will be cleared when C counter is counted once without the same malfunction after DTC is stored in ECM.

RELATIONSHIP BETWEEN MIL, DTC, 1ST TRIP DTC AND DRIVING PATTERNS EXCEPT FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”



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

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

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

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

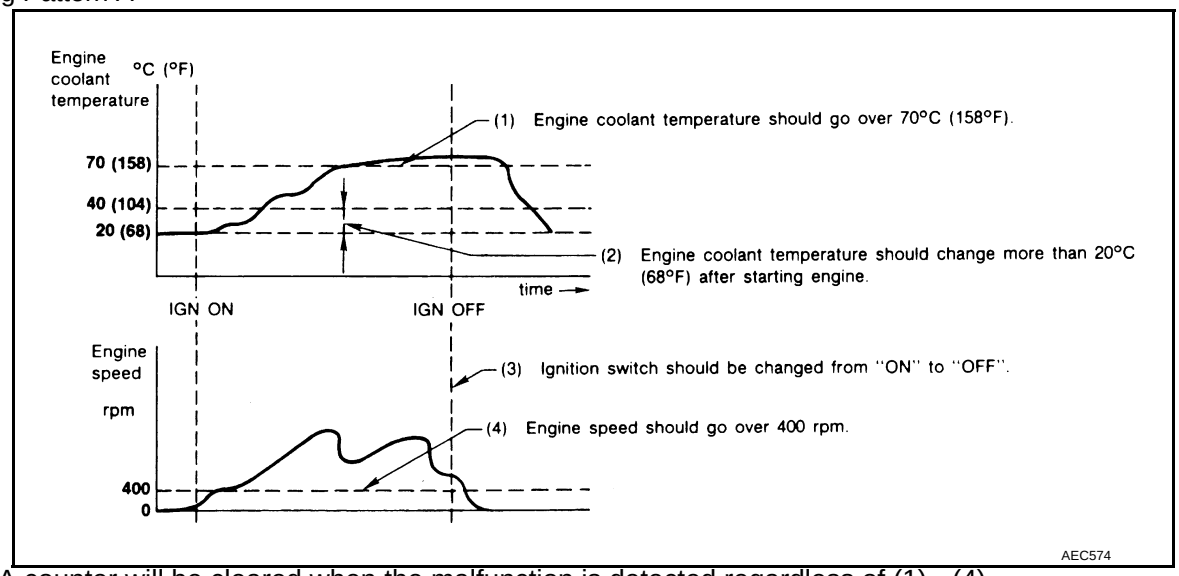
*5: When a malfunction is detected for the first time, the 1st trip DTC and the 1st trip freeze frame data will be stored in ECM.

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

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

EXPLANATION FOR DRIVING PATTERNS EXCEPT FOR “MISFIRE <EXHAUST QUALITY DETERIORATION>”, “FUEL INJECTION SYSTEM”

<Driving Pattern A>



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

<Driving Pattern B>

Driving pattern B means operating vehicle as per the following:
All components and systems should be monitored at least once by the OBD system.

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

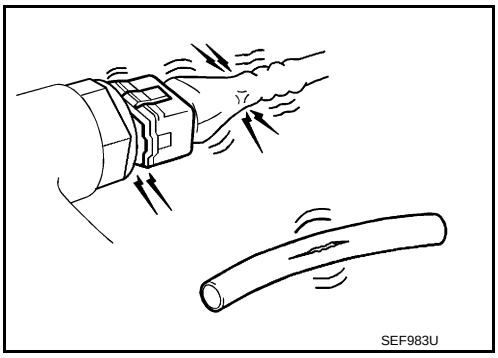
BASIC SERVICE PROCEDURE

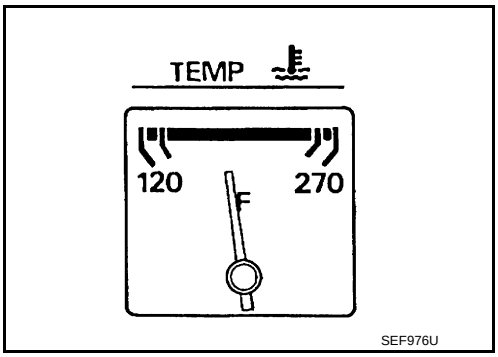
Basic Inspection

INFOID:0000000005353915

1.INSPECTION START

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


SEF983U

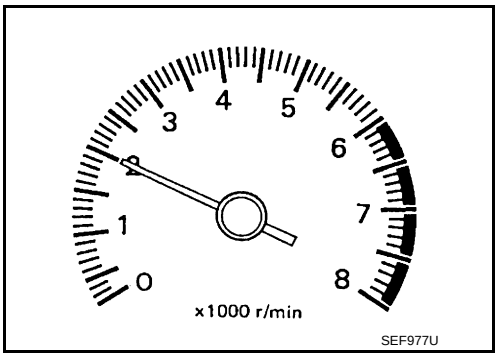


SEF976U

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

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



SEF977U

2.REPAIR OR REPLACE

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

>> GO TO 3

3.CHECK TARGET IDLE SPEED

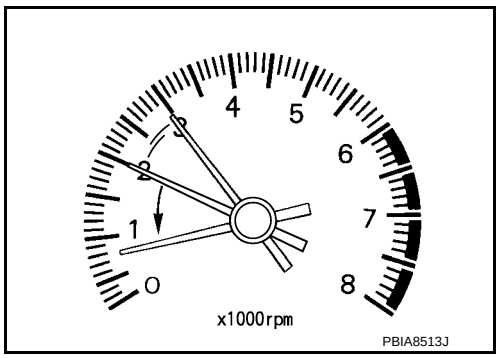
1. Run engine at approximately 2,000 rpm for approximately 2 minutes under no load.

2. Rev engine between 2,000 and 3,000 rpm two or three times under no load, then run engine at idle speed for approximately 1 minute.
3. Check idle speed.
Refer to EC-763, "Idle Speed and Ignition Timing Check".

650 ± 50 rpm (in P or N position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 4.



4. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".

>> GO TO 5.

5. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-764, "Throttle Valve Closed Position Learning".

>> GO TO 6.

6. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-765, "Idle Air Volume Learning".
Is Idle Air Volume Learning carried out successfully?

Yes or No

Yes >> GO TO 7.
No >> 1. Follow the instructions of Idle Air Volume Learning.
2. GO TO 4.

7. CHECK TARGET IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
Refer to EC-763, "Idle Speed and Ignition Timing Check".

650 ± 50 rpm (in P or N position)

OK or NG

OK >> GO TO 10.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the Following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1020, "DTC Confirmation Procedure".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1014, "DTC Confirmation Procedure".

OK or NG

OK >> GO TO 9.
NG >> 1. Repair or replace malfunctioning part.
2. GO TO 4.

9. CHECK ECM FUNCTION

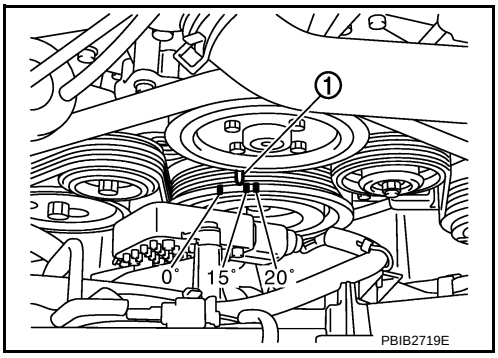
1. Substitute with non-malfunctioning ECM to check ECM function. (ECM may be the cause of the incident, although this is rare.)
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".

>> GO TO 4.

10. CHECK IGNITION TIMING

1. Run engine at idle.
2. Check ignition timing with a timing light.
   Refer to EC-763, "Idle Speed and Ignition Timing Check".

- Timing indicator (1)



12 ± 5°BTDC (in P or N position)

OK or NG

OK >> GO TO 19.
NG >> GO TO 11.

11. PERFORM ACCELERATOR PEDAL RELEASED POSITION LEARNING

1. Stop engine.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".

>> GO TO 12.

12. PERFORM THROTTLE VALVE CLOSED POSITION LEARNING

Perform EC-764, "Throttle Valve Closed Position Learning".

>> GO TO 13.

13. PERFORM IDLE AIR VOLUME LEARNING

Refer to EC-765, "Idle Air Volume Learning".

Is Idle Air Volume Learning carried out successfully?

Yes or No

Yes >> GO TO 14.
No >> 1. Follow the instructions of Idle Air Volume Learning.
2. GO TO 4.

14. CHECK TARGET IDLE SPEED AGAIN

1. Start engine and warm it up to normal operating temperature.
2. Check idle speed.
   Refer to EC-763, "Idle Speed and Ignition Timing Check".

650 ± 50 rpm (in P or N position)

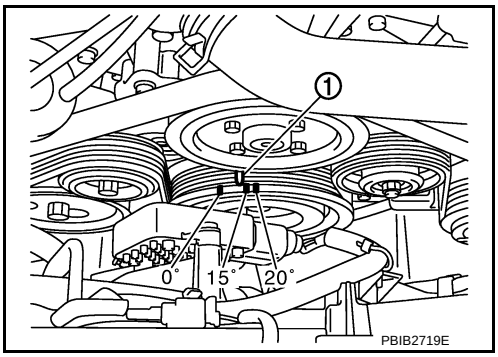
OK or NG

OK >> GO TO 15.
NG >> GO TO 17.

15. CHECK IGNITION TIMING AGAIN

1. Run engine at idle.
2. Check ignition timing with a timing light.
   Refer to EC-763, "Idle Speed and Ignition Timing Check".

- Timing indicator (1)



12 ± 5°BTDC (in P or N position)

OK or NG

OK >> GO TO 19.
NG >> GO TO 16.

16. CHECK TIMING CHAIN INSTALLATION

Check timing chain installation. Refer to EM-200, "Removal and Installation".

OK or NG

OK >> GO TO 17.
NG >> 1. Repair the timing chain installation.
2. GO TO 4.

17. DETECT MALFUNCTIONING PART

Check the following.
- Check camshaft position sensor (PHASE) and circuit. Refer to EC-1020, "DTC Confirmation Procedure".
- Check crankshaft position sensor (POS) and circuit. Refer to EC-1014, "DTC Confirmation Procedure".

OK or NG

OK >> GO TO 18.
NG >> 1. Repair or replace malfunctioning part.
2. GO TO 4.

18. CHECK ECM FUNCTION

1. Substitute with 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 BL-224, "ECM Re-Communicating Function".

>> GO TO 4.

19. INSPECTION END

If ECM is replaced during this Basic Inspection procedure, perform EC-764, "Procedure After Replacing ECM".

>> **INSPECTION END**

Idle Speed and Ignition Timing Check

INFOID:0000000005353916

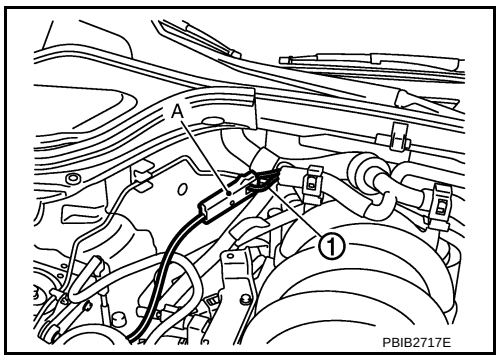
IDLE SPEED

With CONSULT-III
Check idle speed in “DATA MONITOR” mode with CONSULT-III.

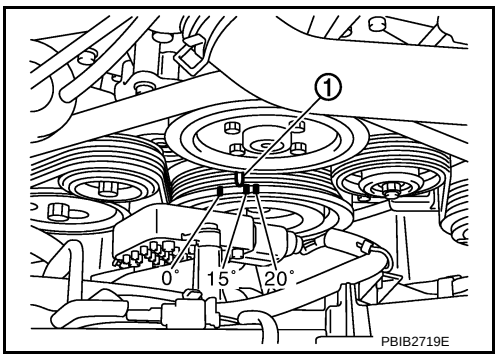
With GST
Check idle speed with GST.

IGNITION TIMING

1. Attach timing light A to loop wire (1) as shown.



2. Check ignition timing.
   • Timing indicator (1)



Procedure After Replacing ECM

INFOID:0000000005353917

When replacing ECM, the following procedure must be performed.

1. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
2. Perform EC-764, "VIN Registration".
3. Perform EC-764, "Accelerator Pedal Released Position Learning".
4. Perform EC-764, "Throttle Valve Closed Position Learning".
5. Perform EC-765, "Idle Air Volume Learning".

VIN Registration

INFOID:0000000005353918

DESCRIPTION

VIN Registration is a function of ECM to register VIN in ECM. It must be performed each time ECM is replaced.

NOTE:

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

OPERATION PROCEDURE

With CONSULT-III

1. Check the VIN of the vehicle and note it. Refer to EM-189, "Component".
2. Turn ignition switch ON with engine stopped.
3. Select “VIN REGISTRATION” in “WORK SUPPORT” mode.
4. Follow the instructions on CONSULT-III display.

Accelerator Pedal Released Position Learning

INFOID:0000000005353919

DESCRIPTION

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.

OPERATION PROCEDURE

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

Throttle Valve Closed Position Learning

INFOID:0000000005353920

DESCRIPTION

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

OPERATION PROCEDURE

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

Idle Air Volume Learning

INFOID:0000000005353921

DESCRIPTION

Idle Air Volume Learning is a function of ECM to learn the idle air volume that keeps each engine within the specific range. It must be performed under the following conditions:

- Each the time electric throttle control actuator or ECM is replaced.
- Idle speed or ignition timing is out of the specification.

PREPARATION

Before performing Idle Air Volume Learning, check that all of the following conditions are satisfied.
Learning will be cancelled if any of the following conditions are missed for even a moment.

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

OPERATION PROCEDURE

With CONSULT-III

1. Perform EC-764, "Accelerator Pedal Released Position Learning".
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Start engine and warm it up to normal operating temperature.
4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Select “IDLE AIR VOL LEARN” in “WORK SUPPORT” mode.
6. Touch “START” and wait 20 seconds.
7. Check that “CMPLT” is displayed on CONSULT-III screen. If “CMPLT” is not displayed, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the DIAGNOSTIC PROCEDURE below.
8. Rev up engine two or three times and check that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	12 ± 5°BTDC (in P or N position)

Without CONSULT-III

NOTE:

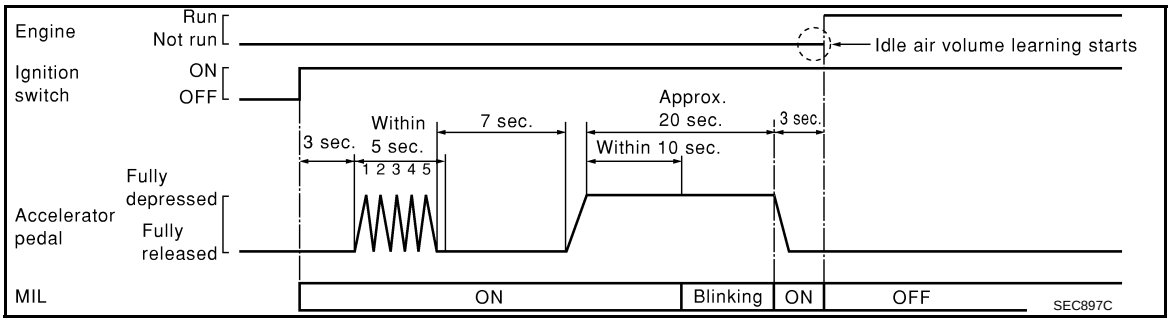
- **It is better to count the time accurately with a clock.**
- **It is impossible to switch the diagnostic mode when an accelerator pedal position sensor circuit has a malfunction.**

1. Perform EC-764, "Accelerator Pedal Released Position Learning".
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Start engine and warm it up to normal operating temperature.

4. Check that all items listed under the topic PREPARATION (previously mentioned) are in good order.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Confirm that accelerator pedal is fully released, turn ignition switch ON and wait 3 seconds.
7. Repeat the following procedure quickly five times within 5 seconds.

a. Fully depress the accelerator pedal.
b. Fully release the accelerator pedal.

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



12. Rev up engine two or three times and check that idle speed and ignition timing are within the specifications.

ITEM	SPECIFICATION
Idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	12 ± 5° BTDC (in P or N position)

13. If idle speed and ignition timing are not within the specifications, Idle Air Volume Learning will not be carried out successfully. In this case, find the cause of the incident by referring to the Diagnostic Procedure below.

DIAGNOSTIC PROCEDURE

If idle air volume learning cannot be performed successfully, proceed as per the following:

1. **Check that throttle valve is fully closed.**
2. **Check PCV valve operation.**
3. **Check that downstream of throttle valve is free from air leakage.**
4. **When the above three items check out OK, engine component parts and their installation condition are questionable. Check and eliminate the cause of the incident.**
   It is useful to perform EC-814, "Inspection Procedure".
5. **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.**

Fuel Pressure Check

INFOID:0000000005353922

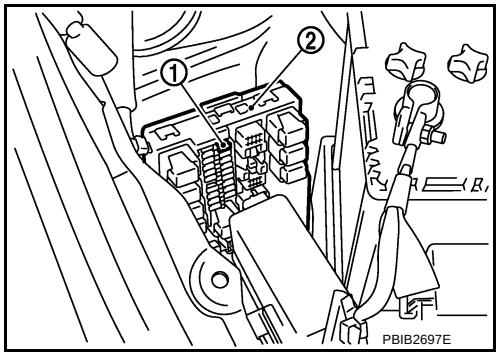
FUEL PRESSURE RELEASE

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “FUEL PRESSURE RELEASE” in “WORK SUPPORT” mode with CONSULT-III.
3. Start engine.
4. After engine stalls, crank it 2 or 3 times to release all fuel pressure.
5. Turn ignition switch OFF.

Without CONSULT-III

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



FUEL PRESSURE CHECK

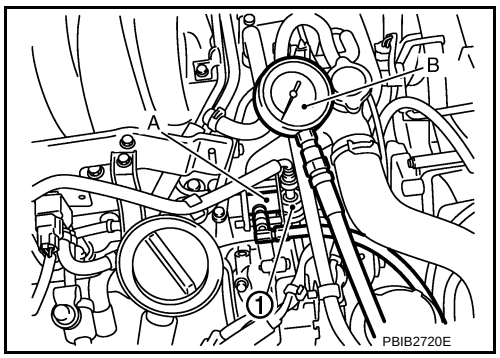
CAUTION:

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 Y50 models do not have fuel return system.**
- **Use Fuel Pressure Gauge Kit [SST (J-44321)] to check fuel pressure.**

1. Release fuel pressure to zero. Refer to "FUEL PRESSURE RELEASE".
2. Install the inline fuel quick disconnect fitting [SST (J-44321] (A) between fuel damper (1) and fuel tube.
3. Connect the fuel pressure gauge [SST (J-44321] (B) (quick connect adapter hose) to the inline fuel quick disconnect fitting [SST (J-44321].
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, go to next step.
8. Check the following.
   - Fuel hoses and fuel tubes for clogging
   - Fuel filter for clogging
   - Fuel pump
   - Fuel pressure regulator for clogging

   If OK, replace fuel level sensor unit, fuel filter and fuel pump assembly.
   If NG, repair or replace malfunctioning part.

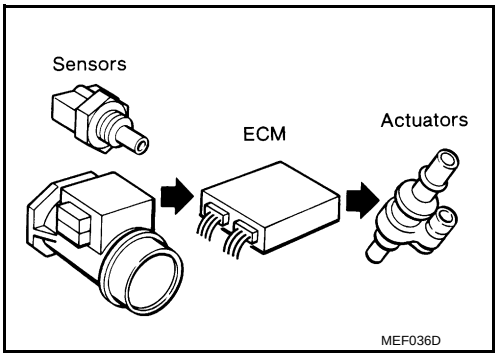
TROUBLE DIAGNOSIS

Trouble Diagnosis Introduction

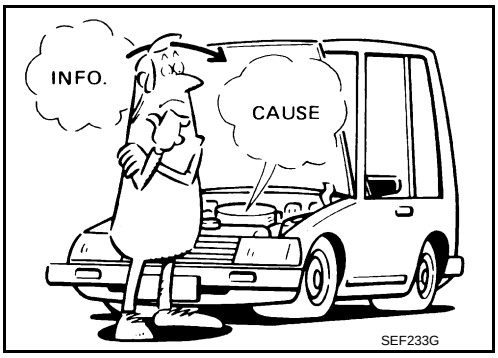
INFOID:0000000005353923

INTRODUCTION

The engine has an ECM to control major systems such as fuel control, ignition control, idle air control system, etc. The ECM accepts input signals from sensors and instantly drives actuators. It is essential that both input and output signals are proper and stable. At the same time, it is important that there are no malfunctions such as vacuum leakage, fouled spark plugs, or other malfunctions with the engine.



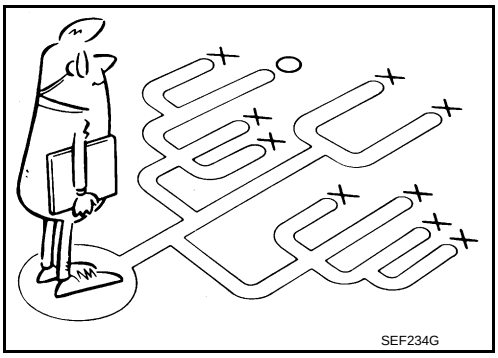
It is much more difficult to diagnose an incident that occurs intermittently rather than continuously. Most intermittent incidents are caused by poor electric connections or improper wiring. In this case, careful checking of suspected circuits may help prevent the replacement of good parts.



A visual check only may not find the cause of the incidents. A road test with CONSULT-III (or GST) or a circuit tester connected should be performed. Follow the WORK FLOW below.

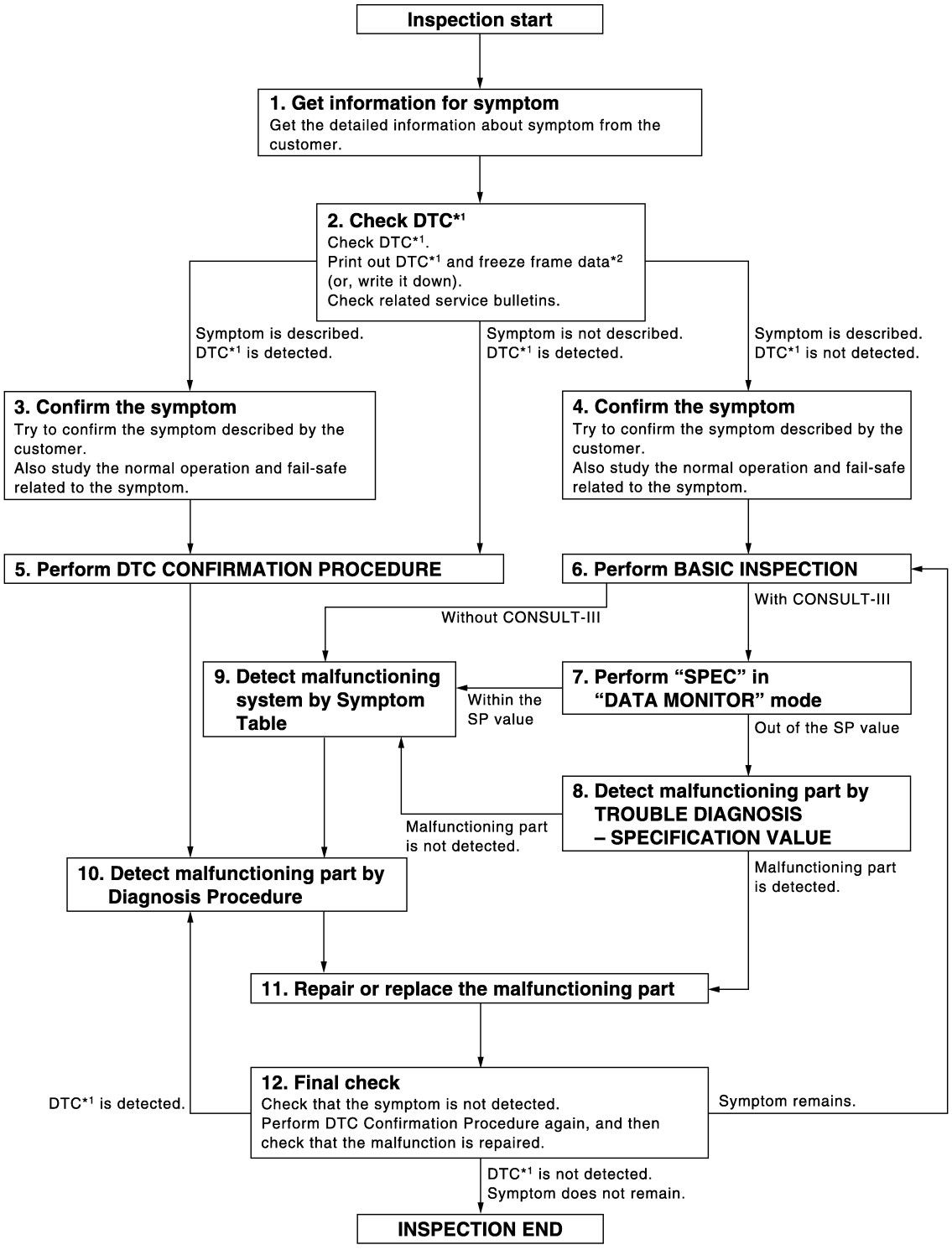
Before undertaking actual checks, take a few minutes to talk with a customer who approaches with a driveability complaint. The customer can supply good information about such incidents, especially intermittent ones. Find out what symptoms are present and under what conditions they occur. A Diagnostic Worksheet like the example on "Worksheet Sample" should be used.

Start your diagnosis by looking for conventional malfunctions first. This will help troubleshoot driveability malfunctions on an electronically controlled engine vehicle.



WORK FLOW

Overall Sequence



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

JMBIA1416GB

Detailed Flow

1. GET INFORMATION FOR SYMPTOM

Get the detailed information from the customer about the symptom (the condition and the environment when the incident/malfunction occurred) using the DIAGNOSTIC WORKSHEET.

>> GO TO 2.

2.CHECK DTC*1

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

- Record DTC*1 and freeze frame data*2. (Print them out with CONSULT-III or GST.)
- Erase DTC*1. (Refer to “How to Erase DTC” in EC-735, "Emission-Related Diagnostic Information".)
- Study the relationship between the cause detected by DTC*1 and the symptom described by the customer. (Symptom Matrix Chart is useful. Refer to EC-775, "Symptom Matrix Chart".)

3. Check related service bulletins for information.

Are any symptoms described and any DTCs detected?

Symptom is described, DTC*1 is displayed>>GO TO 3.
Symptom is described, DTC*1 is not displayed>>GO TO 4.
Symptom is not described, DTC*1 is displayed>>GO TO 5.

3.CONFIRM THE SYMPTOM

Try to confirm the symptom described by the customer (except MIL ON).
DIAGNOSIS WORKSHEET 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.
DIAGNOSIS WORKSHEET 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*1, and then check that DTC*1 is detected again.
If two or more DTCs*1 are detected, refer to EC-772, "DTC Inspection Priority Chart" and determine trouble diagnosis order.

NOTE:

- Freeze frame data*2 is useful if the DTC*1 is not detected.
- Perform Overall Function Check if DTC Confirmation Procedure is not included on Service Manual. This simplified check procedure is an effective alternative though DTC*1 cannot be detected during this check.
  If the result of Overall Function Check is NG, it is the same as the detection of DTC*1 by DTC Confirmation Procedure.

Is DTC*1 detected?

Yes >> GO TO 10.
No >> Check according to EC-822, "Diagnosis Procedure".

6.PERFORM BASIC INSPECTION

Perform EC-760, "Basic Inspection".

With CONSULT-III>>GO TO 7.
Without CONSULT-III>>GO TO 9.

7.PERFORM SPEC IN DATA MONITOR MODE

With CONSULT-III
Check that “MAS A/F SE-B1”, “B/FUEL SCHDL”, “A/F ALPHA-B1” and “A/F ALPHA-B2” are within the SP value using “SPEC” in “DATA MONITOR” mode with CONSULT-III. Refer to EC-814, "Inspection Procedure".

Are they 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-815, "Diagnosis Procedure".

Is a malfunctioning part detected?

Yes >> GO TO 11.
No >> GO TO 9.

9. DETECT MALFUNCTIONING SYSTEM BY SYMPTOM MATRIX CHART

Detect malfunctioning system according to EC-775, "Symptom Matrix Chart" 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 DIAGNOSTIC PROCEDURE

Inspect according to Diagnostic Procedure of the system.

NOTE:

The Diagnostic Procedure in EC section described based on open circuit inspection. A short circuit inspection is also required for the circuit check in the Diagnostic Procedure. For details, refer to Circuit Inspection in GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident".

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-III. Refer to EC-810, "CONSULT-III Reference Value in Data Monitor Mode", EC-791, "ECM Terminal and Reference Value".

11. REPAIR OR REPLACE THE MALFUNCTIONING PART

1. Repair or replace the malfunctioning part.
2. Reconnect parts or connectors disconnected during Diagnostic Procedure again after repair and replacement.
3. Check DTC. If DTC is displayed, erase it, refer to “How to Erase DTC” in EC-735, "Emission-Related Diagnostic Information".

>> GO TO 12.

12. FINAL CHECK

When DTC was detected in step 2, perform DTC Confirmation Procedure or Overall Function Check again, and then check that the malfunction have been completely repaired.
When symptom was described from the customer, refer to confirmed symptom in step 3 or 4, and check that the symptom is not detected.

OK or NG

NG (DTC*1 is detected)>>GO TO 10.
NG (Symptom remains)>>GO TO 6.
OK >> 1. Before returning the vehicle to the customer, always erase unnecessary DTC*1 in TCM (Transmission Control Module) and ECM. (Refer to “How to Erase DTC” in AT-47, "OBD-II Diagnostic Trouble Code (DTC)" and “How to Erase DTC” in EC-735, "Emission-Related Diagnostic Information".)
2. If the completion of SRT is needed, drive vehicle under the specific driving pattern. Refer to “How to Set SRT Code” in EC-735, "Emission-Related Diagnostic Information".
3. **INSPECTION END**

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

DIAGNOSTIC WORKSHEET

Description

There are many operating conditions that lead to the malfunction of engine components. A good grasp of such conditions can make troubleshooting faster and more accurate.
In general, each customer feels differently about symptoms. It is important to fully understand the symptoms or conditions for a customer complaint.
Utilize a diagnostic worksheet like the Worksheet Sample below in order to organize all the information for troubleshooting.
Some conditions may cause the MIL to illuminate or blink and DTC to be detected. Examples:

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

KEY POINTS

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

SEF907L

Worksheet Sample

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

MTBL0017

DTC Inspection Priority Chart

INFOID:0000000005353924

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

Priority	Detected items (DTC)
1	• U0101 U1001 CAN communication line • P0101 P0102 P0103 Mass air flow sensor • P0112 P0113 P0127 Intake air temperature sensor • P0116 P0117 P0118 P0125 Engine coolant temperature sensor • P0122 P0123 P0222 P0223 P1225 P1226 P2135 Throttle position sensor • P0128 Thermostat function • P0181 P0182 P0183 Fuel tank temperature sensor • P0327 P0328 P0332 P0333 Knock sensor • P0335 Crankshaft position sensor (POS) • P0340 Camshaft position sensor (PHASE) • P0460 P0461 P0462 P0463 Fuel level sensor • P0500 Vehicle speed sensor • P0605 ECM • P0607 ECM • P0643 Sensor power supply • P0700 TCM • P0705 Transmission renge switch • P0850 Park/Neutral position (PNP) switch • P1550 P1551 P1552 P1553 P1554 Battery current sensor • P1610 - P1615 NATS • P2122 P2123 P2127 P2128 P2138 Accelerator pedal position sensor
2	• P0031 P0032 P0051 P0052 Air fuel ratio (A/F) sensor 1 heater • P0037 P0038 P0057 P0058 Heated oxygen sensor 2 heater • P0075 P0081 Intake valve timing control solenoid valve • P0130 P0131 P0132 P0133 P0150 P0151 P0152 P0153 P2A00 P2A03 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 P0731 P0732 P0733 P0734 P0735 P0740 P0744 P0745 P1730 P1752 P1757 P1762 P1767 P1772 P1774 A/T related sensors, solenoid valves and switches • P1140 P1145 Intake valve timing control position sensor • P1217 Engine over temperature (OVERHEAT) • P1220 Fuel pump control module • P1805 Brake switch • P2100 P2103 Throttle control motor relay • P2101 Electric throttle control function • P2118 Throttle control motor
3	• P0011 P0021 Intake valve timing control • P0171 P0172 P0174 P0175 Fuel injection system function • P0300 - P0308 Misfire • P0420 P0430 Three way catalyst function • P0442 P0456 EVAP control system (SMALL LEAK, VERY SMALL LEAK) • P0455 EVAP control system (GROSS LEAK) • P0506 P0507 Idle speed control system • P1148 P1168 Closed loop control • P1211 TCS control unit • P1212 TCS communication line • P1421 Cold start control • 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 • P1715 Turbine revolution sensor • P1800 VIAS control solenoid valve • P2119 Electric throttle control actuator

Fail-Safe Chart

INFOID:0000000005353925

When the DTC listed below is detected, the ECM enters fail-safe mode and the MIL illuminates.

<table>
<tr><th>DTC No.</th><th>Detected items</th><th colspan="2">Engine operating condition in fail-safe mode</th></tr>
<tr><td>P0102
P0103</td><td>Mass air flow sensor circuit</td><td colspan="2">Engine speed will not rise more than 2,400 rpm due to the fuel cut.</td></tr>
<tr><td rowspan="6">P0117
P0118</td><td rowspan="6">Engine coolant temperature sensor circuit</td><td colspan="2">Engine coolant temperature will be determined by ECM based on the following conditions.
CONSULT-III displays the engine coolant temperature decided by ECM.</td></tr>
<tr><td>Condition</td><td>Engine coolant temperature decided
(CONSULT-III display)</td></tr>
<tr><td>Just as ignition switch is turned ON or START</td><td>40°C (104°F)</td></tr>
<tr><td>Approx. 4 minutes or more after engine starting.</td><td>80°C (176°F)</td></tr>
<tr><td>Except as shown above</td><td>40 - 80°C (104 - 176°F)
(Depends on the time)</td></tr>
<tr><td colspan="2">When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.</td></tr>
<tr><td>P0122
P0123
P0222
P0223
P2135</td><td>Throttle position sensor</td><td colspan="2">The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees.
The ECM regulates the opening speed of the throttle valve to be slower than the normal condition.
So, the acceleration will be poor.</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>
<tr><td>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>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>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">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 the N or P position, and engine speed will not exceed 1,000 rpm or more.</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.
So, the acceleration will be poor.</td></tr>
</table>

- 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.

Engine operating condition in fail-safe mode	Engine speed will not rise more than 2,500 rpm due to the fuel cut

Symptom Matrix Chart

INFOID:0000000005353926

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-1296
	Fuel pressure regulator system	3	3	4	4	4	4	4	4	4		4			EC-766
	Fuel injector circuit	1	1	2	3	2		2	2			2			EC-1291
	Evaporative emission system	3	3	4	4	4	4	4	4	4		4			EC-720
Air	Positive crankcase ventilation system	3	3	4	4	4	4	4	4	4		4	1		EC-731
	Incorrect idle speed adjustment						1	1	1	1		1			EC-760
	Electric throttle control actuator	1	1	2	3	3	2	2	2	2		2		2	EC-1235 EC-1246
Ignition	Incorrect ignition timing adjustment	3	3	1	1	1		1	1			1			EC-760
	Ignition circuit	1	1	2	2	2		2	2			2			EC-1307
Main power supply and ground circuit		2	2	3	3	3		3	3		2	3			EC-823
Mass air flow sensor circuit		1	1	2	2	2		2	2			2			EC-867 EC-874
Engine coolant temperature sensor circuit							3			3					EC-885 EC-888 EC-899
Air fuel ratio (A/F) sensor 1 circuit			1	2	3	2		2	2			2			EC-907 EC-915 EC-923 EC-931 EC-1271
Throttle position sensor circuit							2			2					EC-893 EC-996 EC-1159 EC-1161 EC-1259
Accelerator pedal position sensor circuit				3	2	1									EC-1121 EC-1248 EC-1253 EC-1265
Knock sensor circuit				2								3			EC-1009
Crankshaft position sensor (POS) circuit		2	2												EC-1014

	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	
Camshaft position sensor (PHASE) circuit	3	2												EC-1020
Vehicle speed signal circuit		2	3		3						3			EC-1103
Power steering pressure sensor circuit		2					3	3						EC-1109
ECM	2	2	3	3	3	3	3	3	3	3	3			EC-1114 EC-1118
Intake valve timing control solenoid valve circuit		3	2		1	3	2	2	3		3			EC-860
PNP signal circuit			3		3		3	3			3			EC-1126
Refrigerant pressure sensor circuit		2				3			3		4			EC-1318
Electrical load signal circuit							3							EC-1289
Air conditioner circuit	2	2	3	3	3	3	3	3	3		3		2	ATC-34
VIAS control solenoid valve circuit					1									EC-1219
ABS actuator and electric unit (control unit)			4											BRC-30

1 - 6: The numbers refer to the order of inspection.

(continued on next table)

SYSTEM — ENGINE MECHANICAL & OTHER

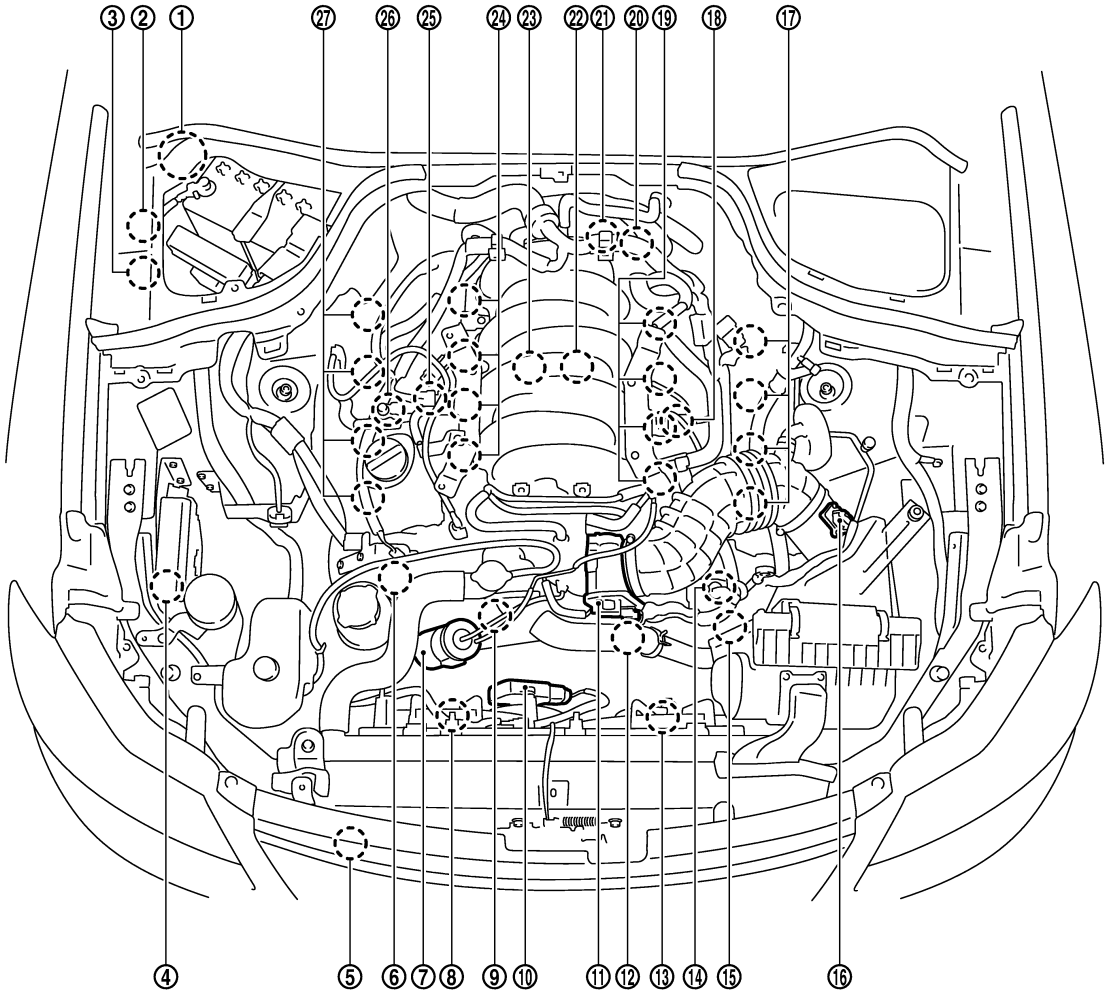
		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Fuel	Fuel tank	5	5												FL-10
	Fuel piping			5	5	5		5	5			5			EM-189
	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	5	5	5		5			EM-172
	Air cleaner														EM-172
	Air leakage from air duct (Mass air flow sensor — electric throttle control actuator)														EM-172
	Electric throttle control actuator														EM-174
	Air leakage from intake manifold/ Collector/Gasket														EM-174
Cranking	Battery	1	1	1		1		1	1			1		1	SC-4
	Generator circuit														SC-21
	Starter circuit	3													SC-8
	Signal plate	6													EM-246
	Transmission range switch	4													AT-110
Engine	Cylinder head	5	5	5	5	5		5	5			5			EM-227
	Cylinder head gasket										4		3		
	Cylinder block	6	6	6	6	6		6	6			6	4		EM-246
	Piston														
	Piston ring														
	Connecting rod														
	Bearing														
	Crankshaft														
Valve mecha-nism	Timing chain	5	5	5	5	5		5	5			5			EM-199
	Camshaft														EM-211
	Intake valve timing control														EM-211
	Intake valve												3		EM-227
	Exhaust valve														

		SYMPTOM													Reference page
		HARD/NO START/RESTART (EXCP. HA)	ENGINE STALL	HESITATION/SURGING/FLAT SPOT	SPARK KNOCK/DETONATION	LACK OF POWER/POOR ACCELERATION	HIGH IDLE/LOW IDLE	ROUGH IDLE/HUNTING	IDLING VIBRATION	SLOW/NO RETURN TO IDLE	OVERHEATS/WATER TEMPERATURE HIGH	EXCESSIVE FUEL CONSUMPTION	EXCESSIVE OIL CONSUMPTION	BATTERY DEAD (UNDER CHARGE)	
Warranty symptom code		AA	AB	AC	AD	AE	AF	AG	AH	AJ	AK	AL	AM	HA	
Exhaust	Exhaust manifold/Tube/Muffler/ Gasket	5	5	5	5	5		5	5			5			EM-178 EX-3
	Three way catalyst														
Lubrica-tion	Oil pan/Oil strainer/Oil pump/Oil filter/Oil gallery	5	5	5	5	5		5	5			5			EM-182 LU-28 LU-27
	Oil level (Low)/Filthy oil														LU-24
Cooling	Radiator/Hose/Radiator filler cap	5	5	5	5	5		5	5		4	5			CO-39 CO-43
	Thermostat									5					CO-51
	Water pump														CO-49
	Water gallery														CO-35
	Cooling fan									5					CO-47
	Coolant level (Low)/Contaminat-ed coolant														CO-36
IVIS (INFINITI Vehicle Immobilizer System — NATS)		1	1												EC-733 or BL-220

1 - 6: The numbers refer to the order of inspection.

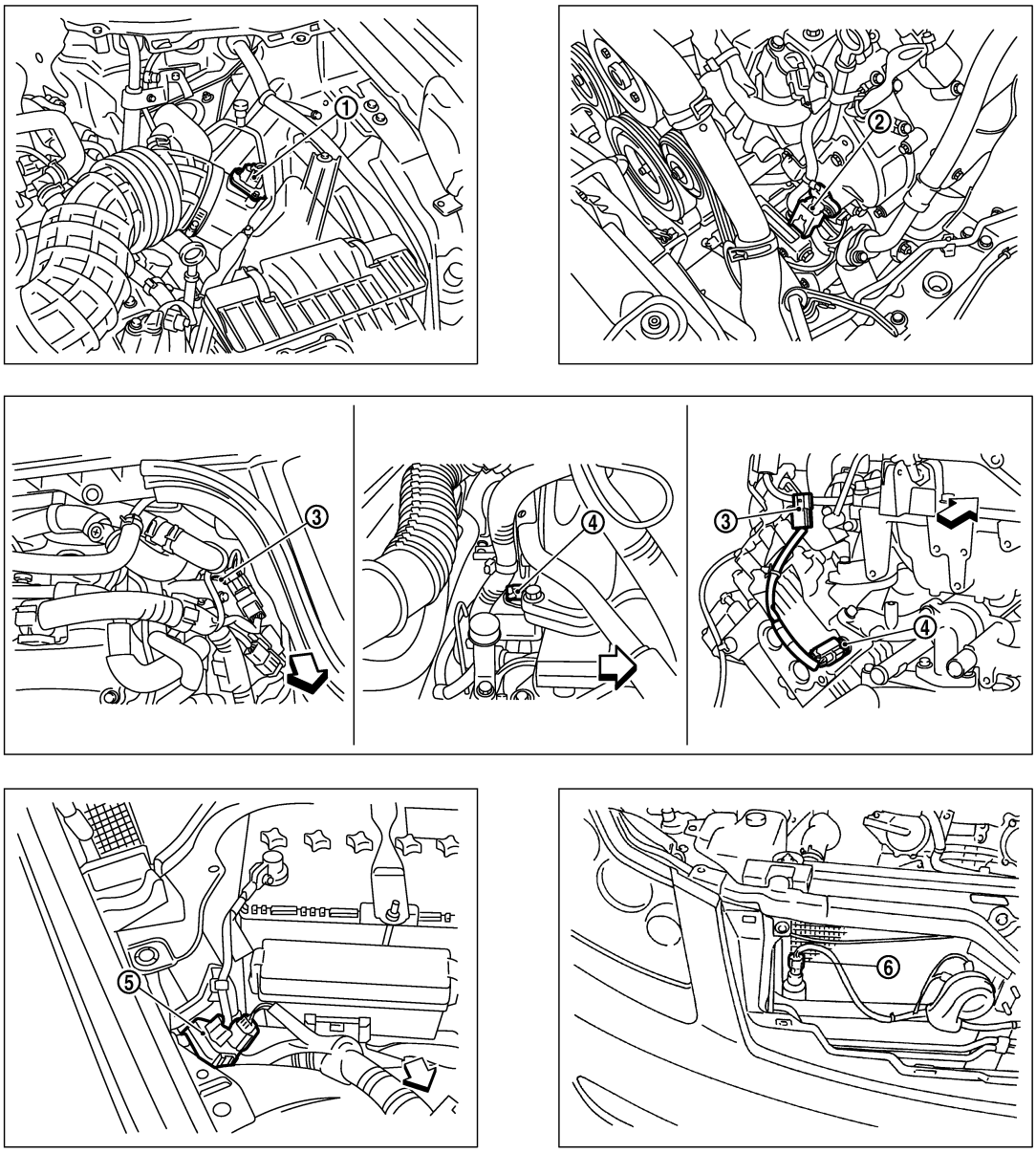
Engine Control Component Parts Location

INFOID:0000000005353927



PBIB2674E

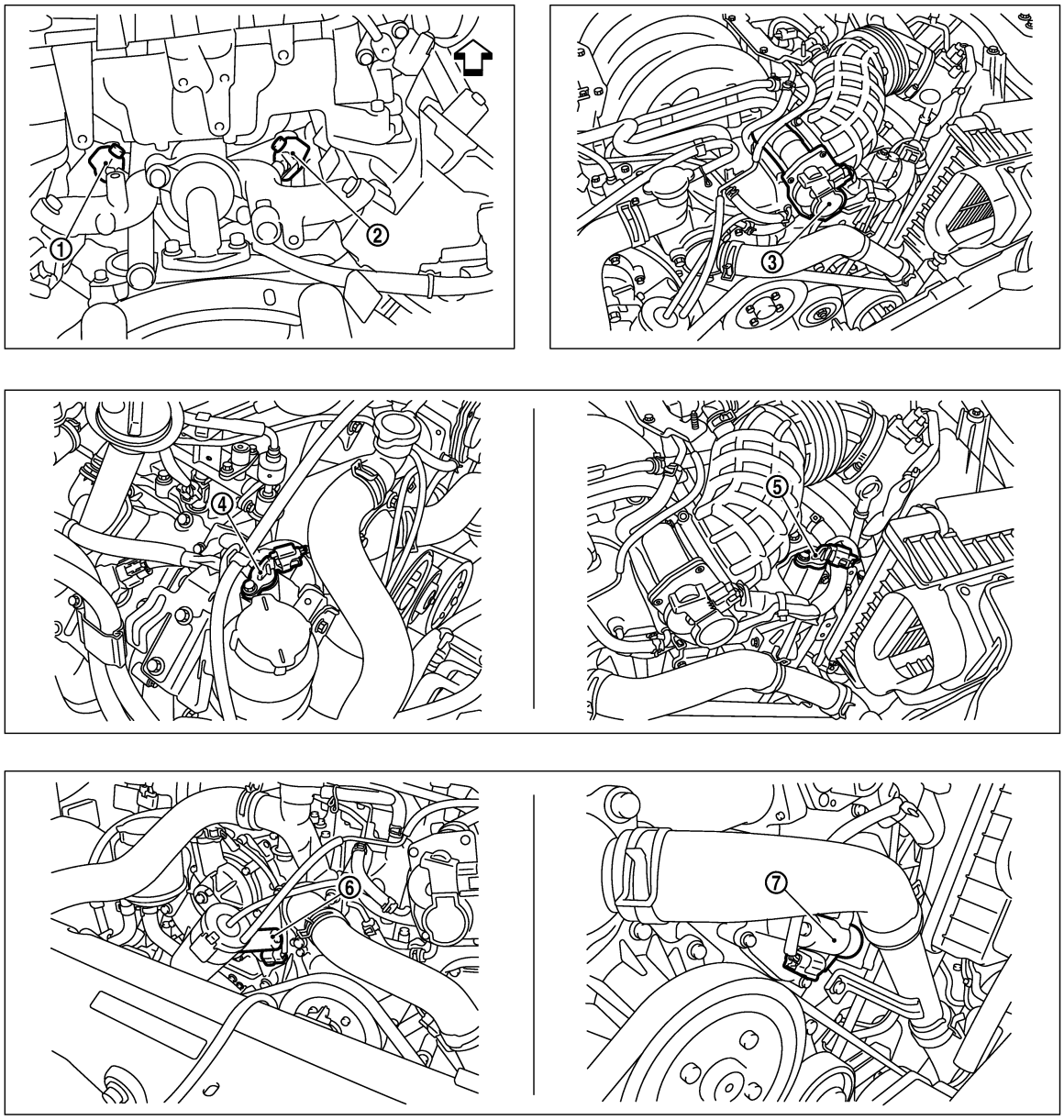
1. IPDM E/R	2. ICC brake hold relay (ICC models only)	3. Battery current sensor
4. Cooling fan relay	5. Refrigerant pressure sensor	6. Intake valve timing control position sensor (bank 2)
7. Vacuum tank	8. Cooling fan motor-2	9. Intake valve timing control solenoid valve (bank 2)
10. Cooling fan control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



PBIB2675E

⇦ : Vehicle front

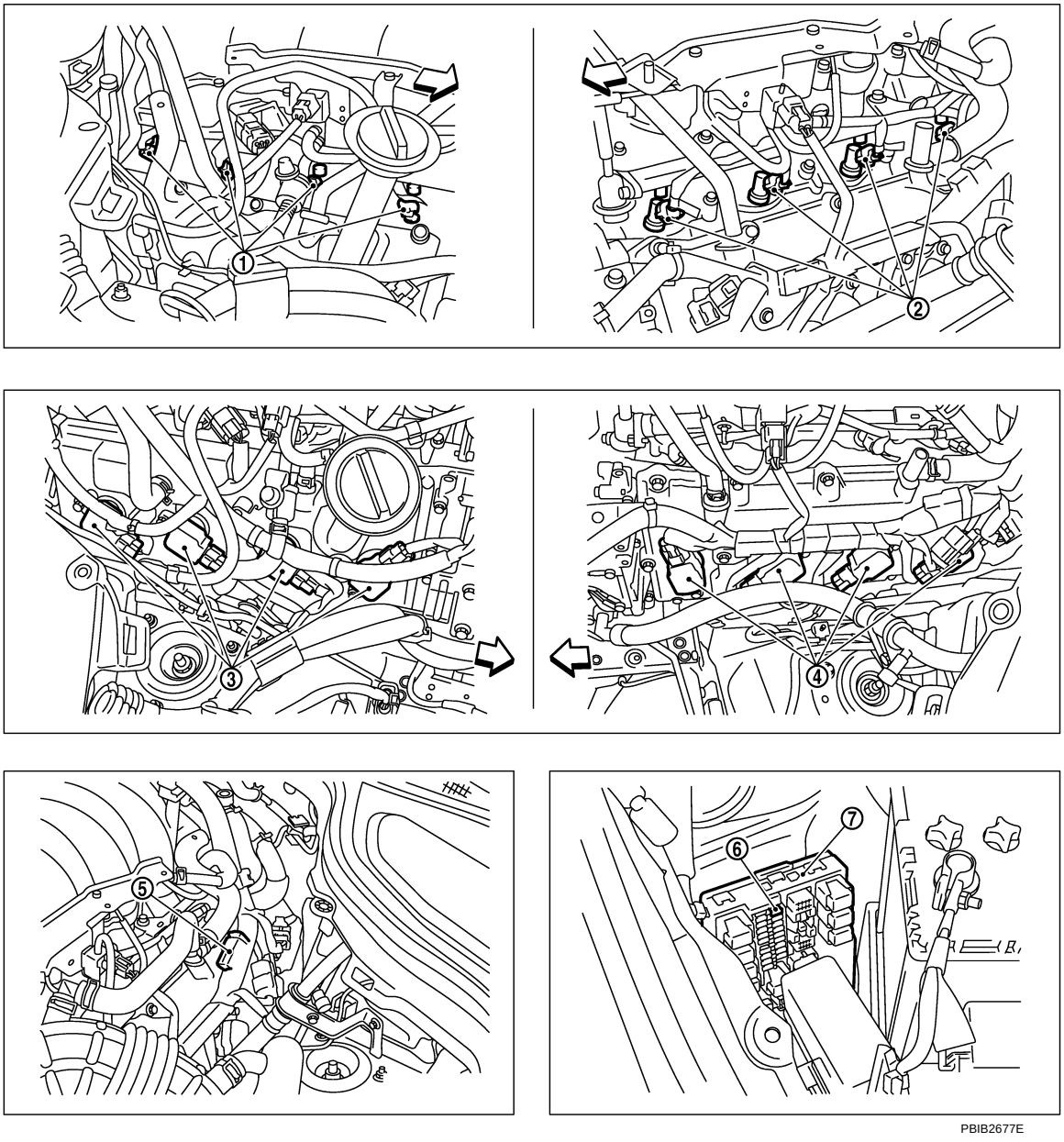
1. Mass air flow sensor
2. Camshaft position sensor (PHASE)
3. Engine coolant temperature sensor sub-harness connector
4. Engine coolant temperature sensor
5. Battery current sensor
6. Refrigerant pressure sensor



PBIB2676E

⇦ : Vehicle front

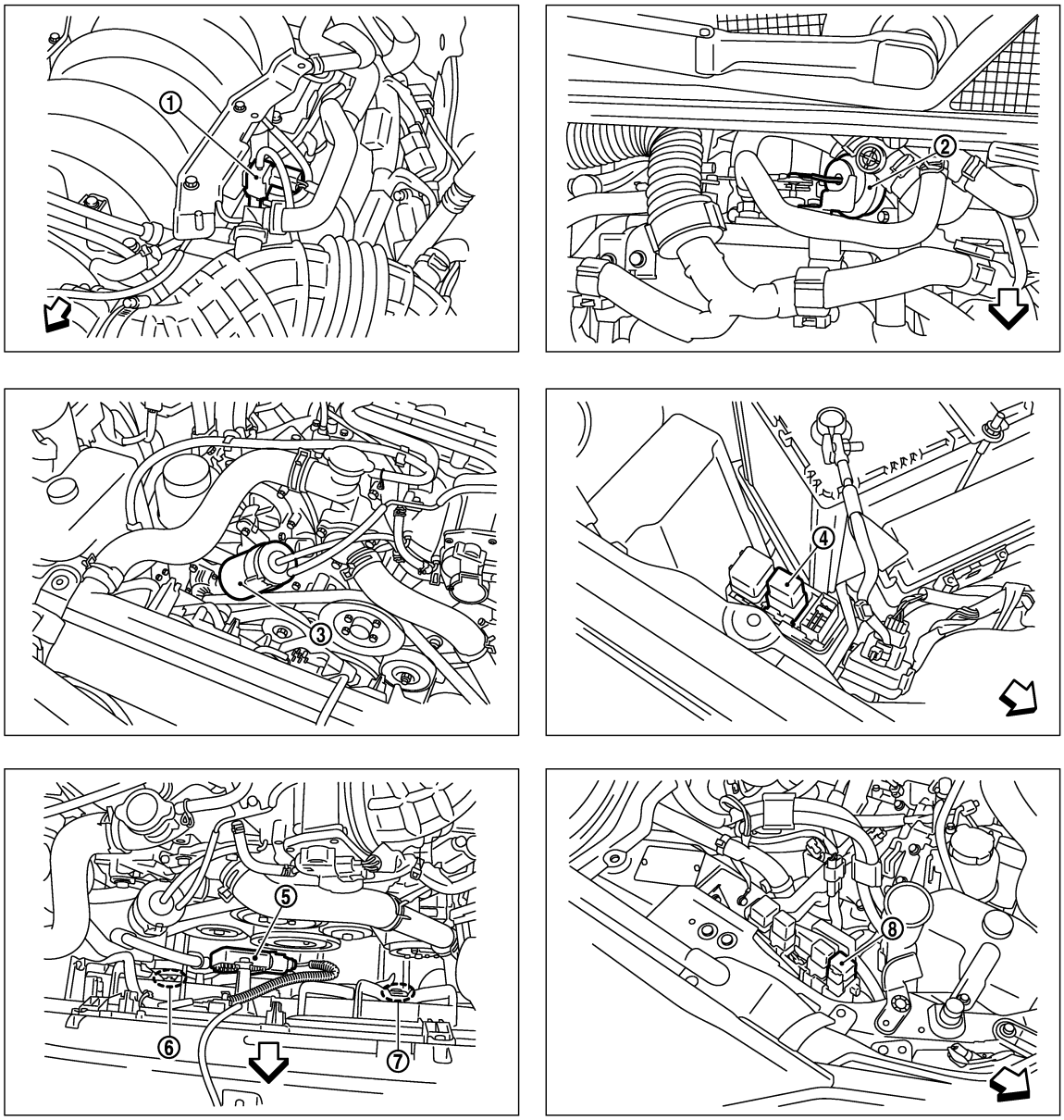
1. Knock sensor (bank 1)
2. Knock sensor (bank 2)
3. Electric throttle control actuator
4. Intake valve timing control position sensor (bank 2)
5. Intake valve timing control position sensor (bank 1)
6. Intake valve timing control solenoid valve (bank 2)
7. Intake valve timing control solenoid valve (bank 1)



PBIB2677E

⇦ : Vehicle front

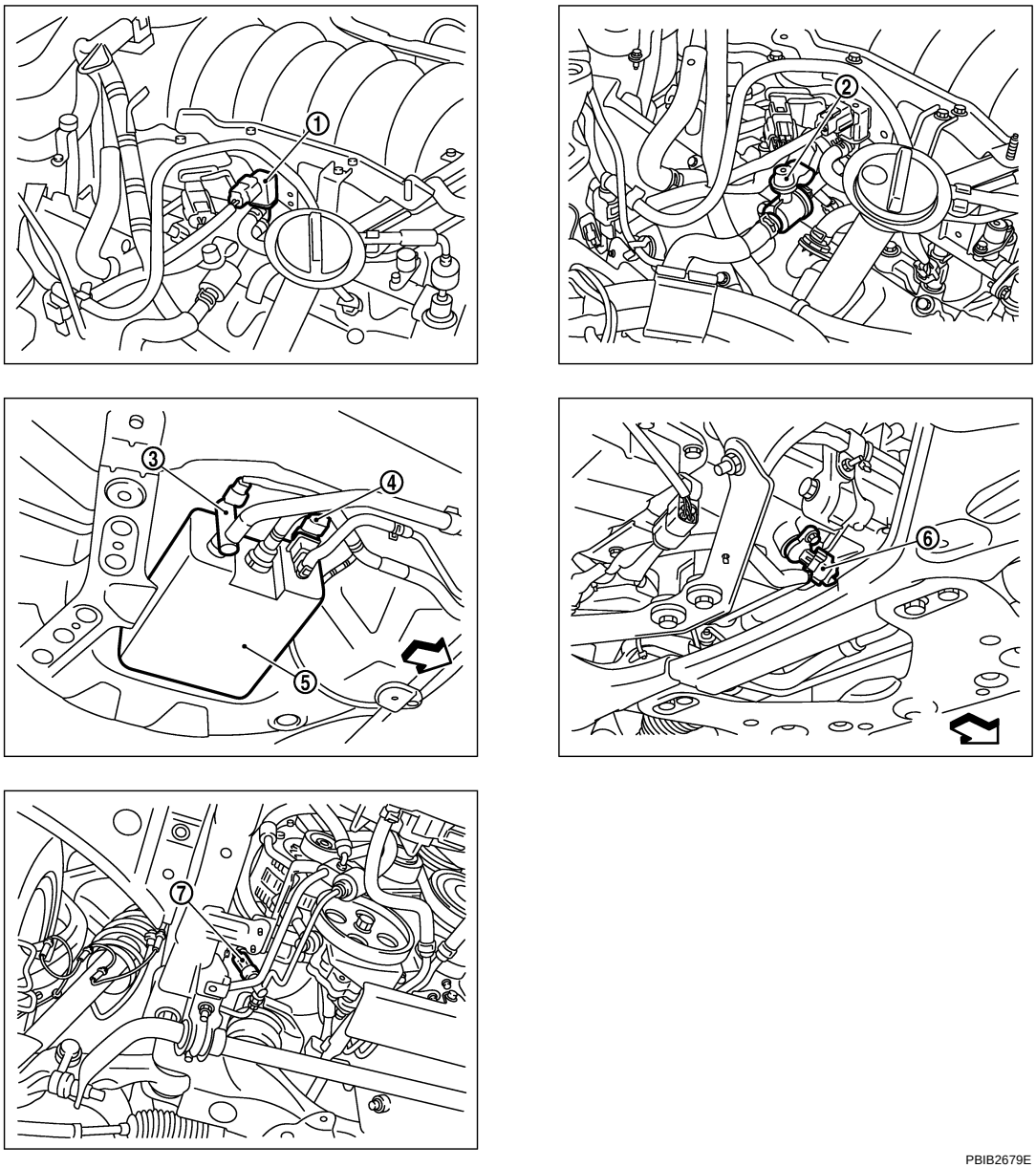
1. Fuel injector (bank 2)
2. Fuel injector (bank 1)
3. Ignition coil (with power transistor) (bank 2)
4. Ignition coil (with power transistor) (bank 1)
5. Condenser
6. Fuel pump fuse
7. IPDM E/R



PBIB3347E

⇦ : Vehicle front

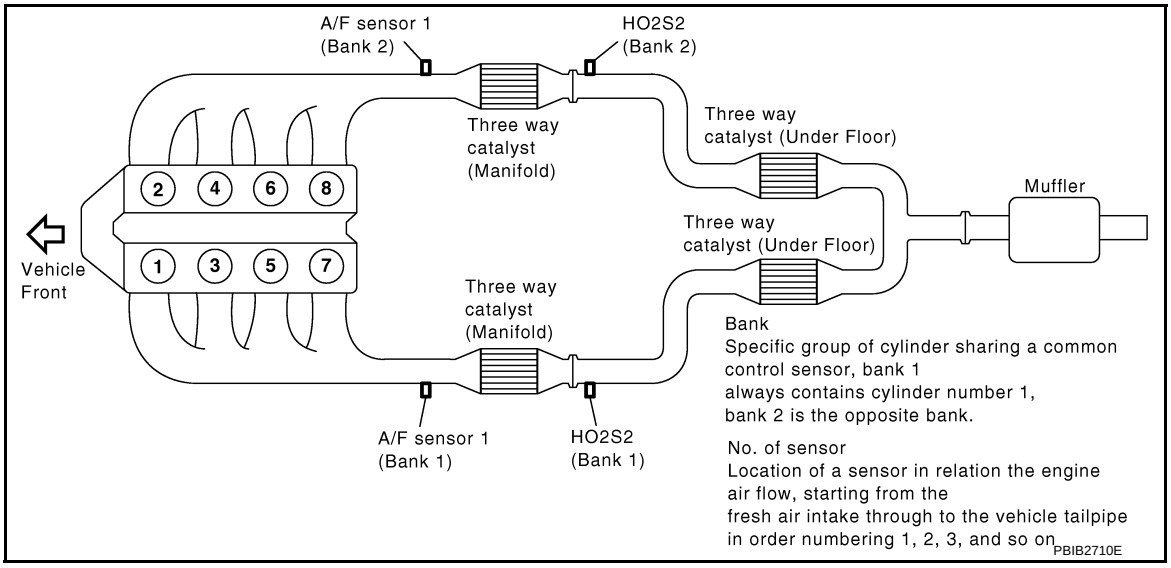
1. VIAS control solenoid valve
2. Power valve actuator
3. Vacuum tank
4. ICC brake hold relay (ICC models only)
5. Cooling fan control module
6. Cooling fan motor-2
7. Cooling fan motor-1
8. Cooling fan relay

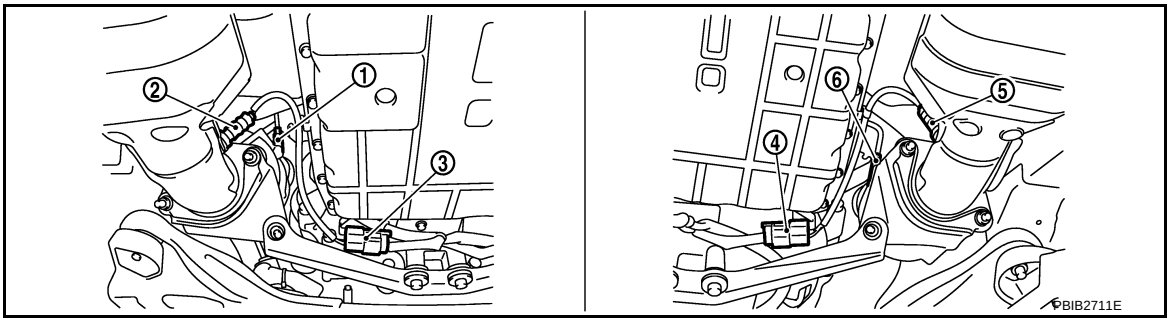


PBIB2679E

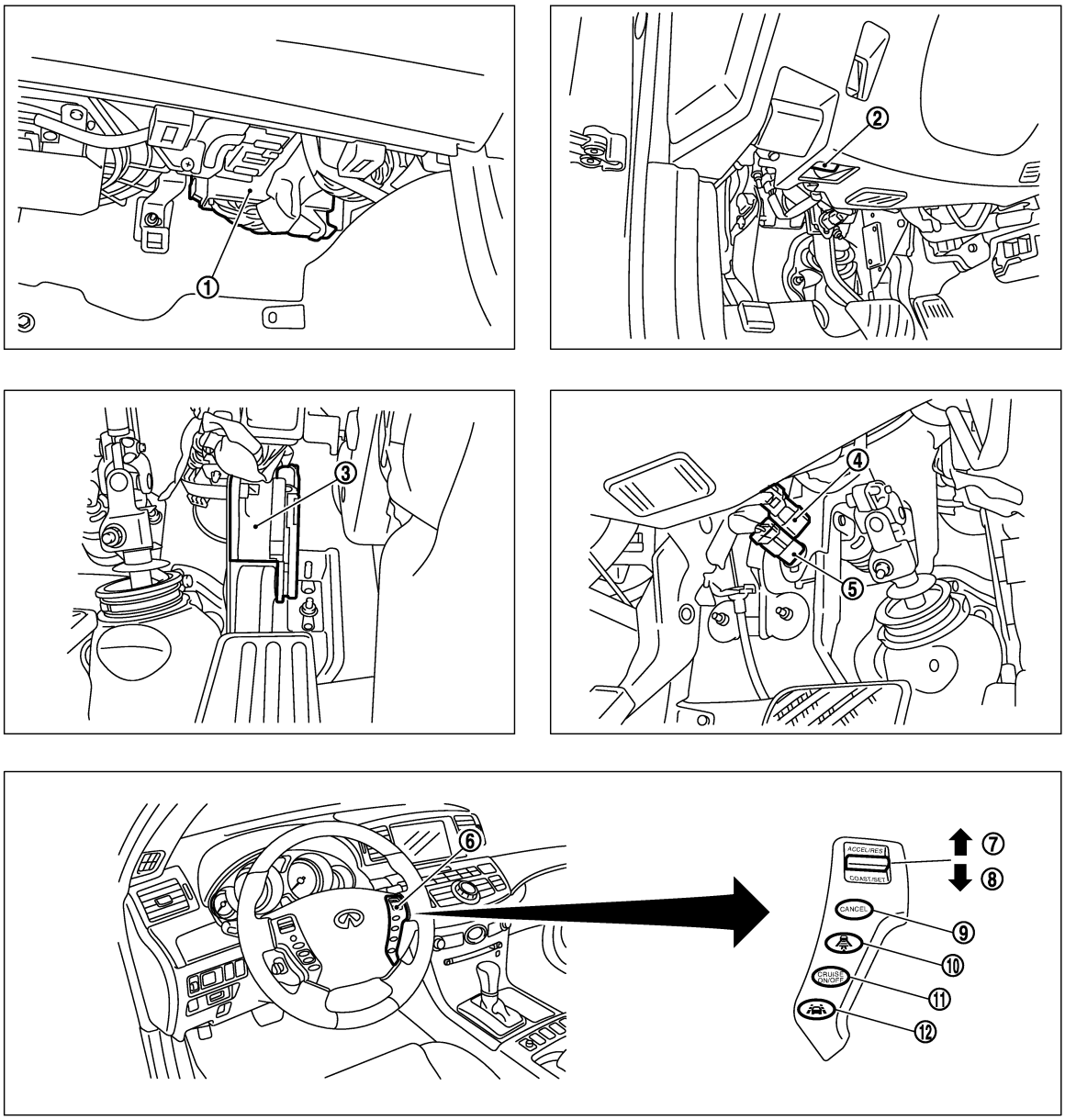
⇦ : Vehicle front

1. EVAP canister purge volume control solenoid valve
2. EVAP service port
3. EVAP canister vent control valve
4. EVAP control system pressure sensor
5. EVAP canister
6. Crankshaft position sensor (POS)
7. Power steering pressure sensor



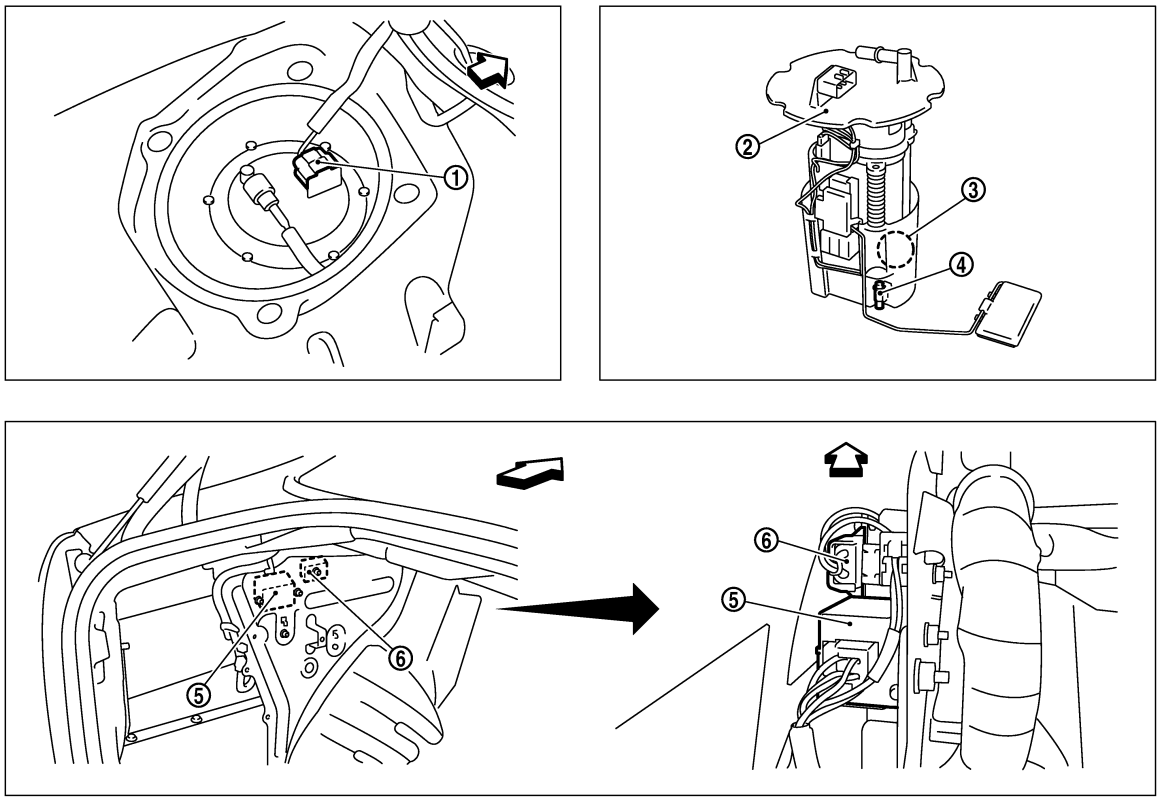


1. Air fuel ratio (A/F) sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. Air fuel ratio (A/F) sensor 1 (bank 2)



JMBIA1088ZZ

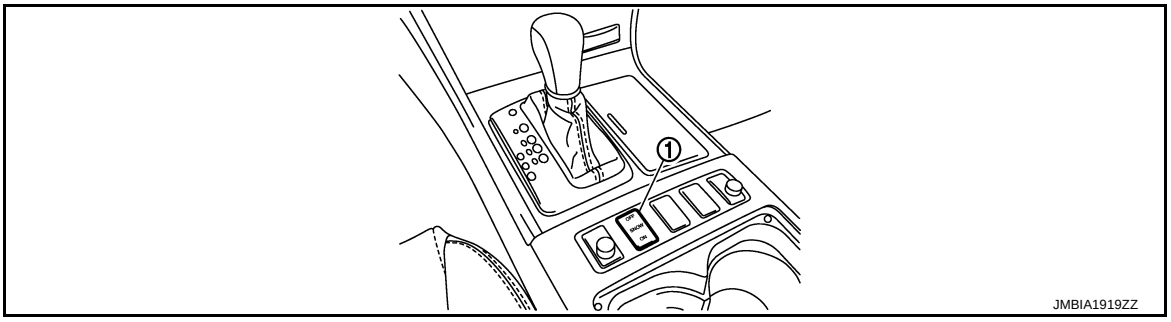
1. ECM
2. Data link connector
3. Accelerator pedal position sensor
4. Stop lamp switch
5. ICC brake switch (models with ICC) ASCD brake switch (models with ASCD)
6. ICC steering switch (models with ICC) ASCD steering switch (models with ASCD)
7. RESUME/ACCELERATE switch
8. SET/COAST switch
9. CANCEL switch
10. DISTANCE switch (ICC models only)
11. MAIN switch
12. LDP ON switch (ICC models only)



PBIB2681E

⇦ : 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
5. FPCM
6. Dropping resistor

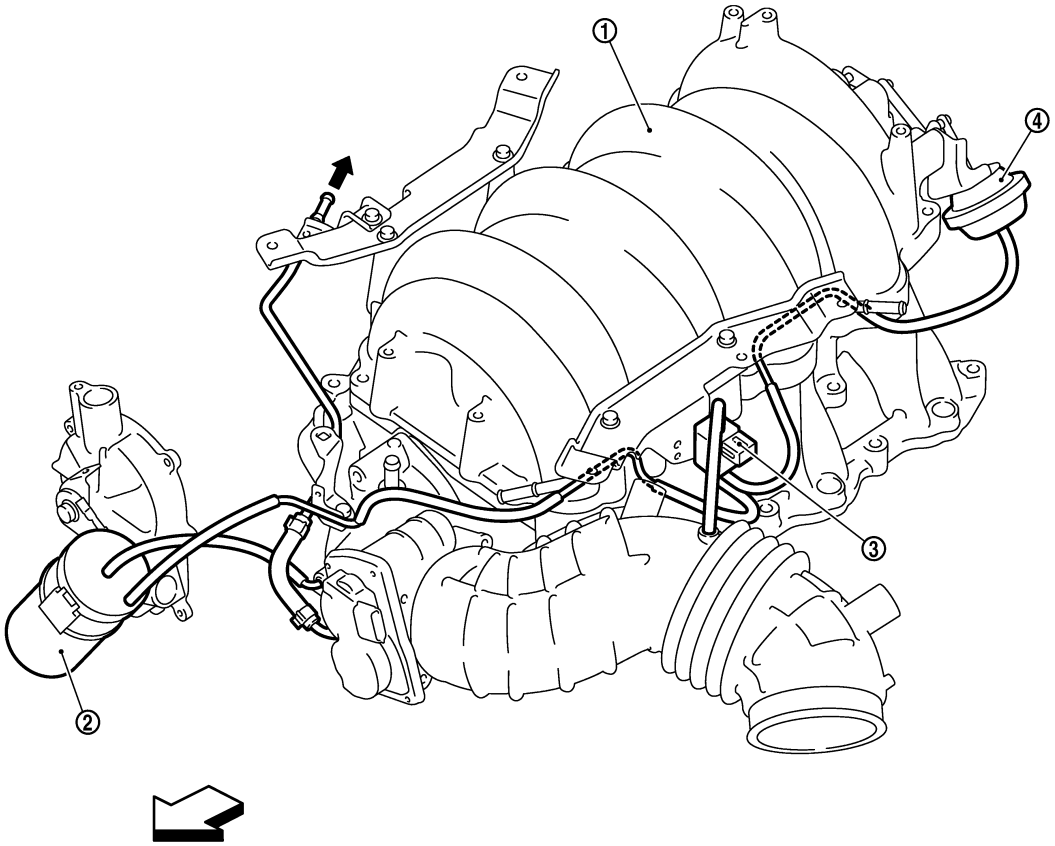


JMBIA1919ZZ

1. Snow mode switch

Vacuum Hose Drawing

INFOID:0000000005353928



PBIB2732E

⇦ : Vehicle front

⬅ : To EVAP canister purge volume control solenoid valve

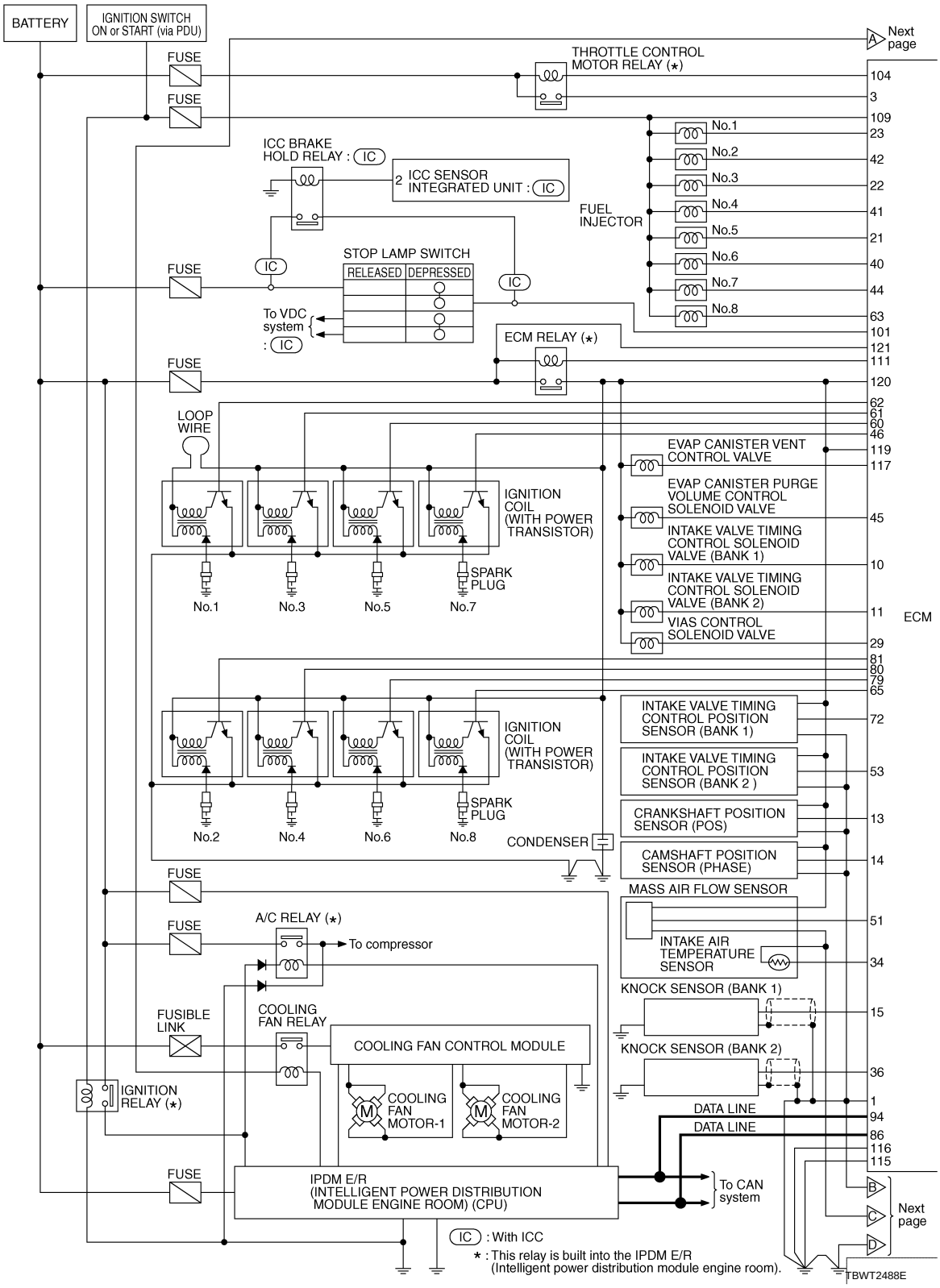
1. Intake manifold collector
2. Vacuum tank
3. VIAS control solenoid valve
4. Power valve actuator

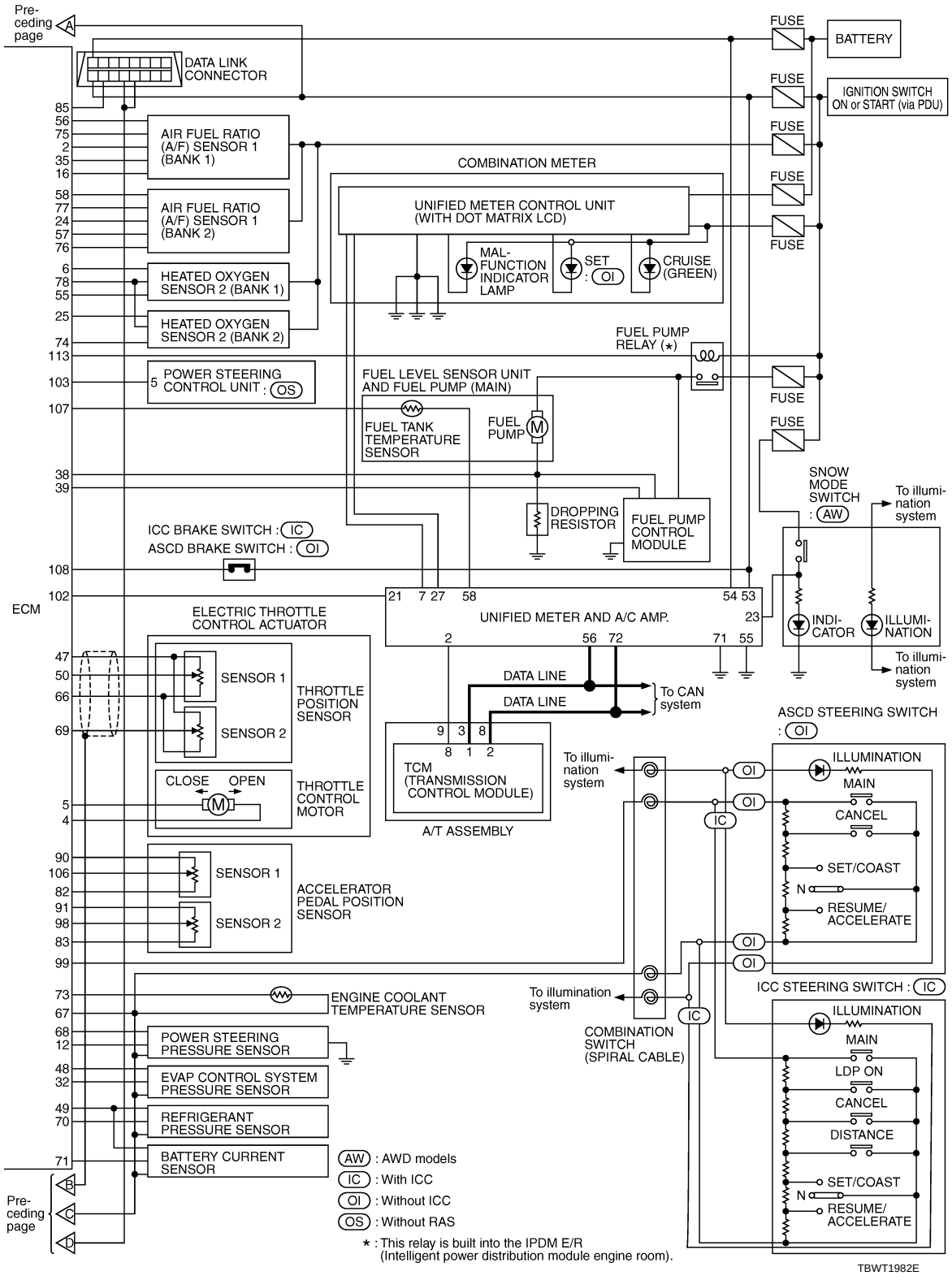
NOTE:
Never use soapy water or any type of solvent while installing vacuum hoses or purge hoses.

Refer to EC-711, "Schematic" for Vacuum Control System.

Circuit Diagram

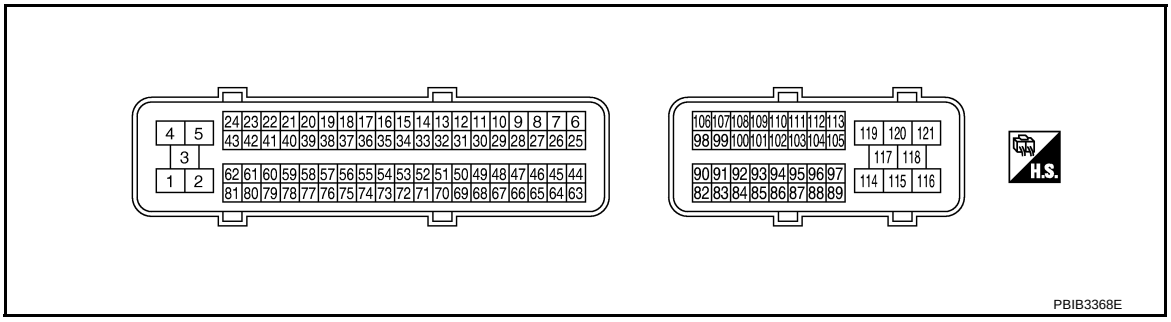
INFOID:0000000005353929




Pre-ceding page
A
DATA LINK CONNECTOR
FUSE
BATTERY
IGNITION SWITCH ON or START (via PDU)
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 1)
AIR FUEL RATIO (A/F) SENSOR 1 (BANK 2)
HEATED OXYGEN SENSOR 2 (BANK 1)
HEATED OXYGEN SENSOR 2 (BANK 2)
COMBINATION METER
UNIFIED METER CONTROL UNIT (WITH DOT MATRIX LCD)
MAL-FUNCTION INDICATOR LAMP
SET : OI
CRUISE (GREEN)
FUEL PUMP RELAY (*)
POWER STEERING CONTROL UNIT : OS
FUEL LEVEL SENSOR UNIT AND FUEL PUMP (MAIN)
FUEL TANK TEMPERATURE SENSOR
FUEL PUMP
DROPPING RESISTOR
FUEL PUMP CONTROL MODULE
SNOW MODE SWITCH : AW
To illumi-nation system
ICC BRAKE SWITCH : IC
ASCD BRAKE SWITCH : OI
ECM
ELECTRIC THROTTLE CONTROL ACTUATOR
UNIFIED METER AND A/C AMP.
INDI-CATOR
ILLUMI-NATION
DATA LINE
To CAN system
THROTTLE POSITION SENSOR
SENSOR 1
SENSOR 2
CLOSE
OPEN
THROTTLE CONTROL MOTOR
TCM (TRANSMISSION CONTROL MODULE)
A/T ASSEMBLY
ASCD STEERING SWITCH : OI
ILLUMINATION
MAIN
CANCEL
SET/COAST
RESUME/ ACCELERATE
ACCELERATOR PEDAL POSITION SENSOR
ENGINE COOLANT TEMPERATURE SENSOR
ICC STEERING SWITCH : IC
COMBINATION SWITCH (SPIRAL CABLE)
LDP ON
DISTANCE
POWER STEERING PRESSURE SENSOR
EVAP CONTROL SYSTEM PRESSURE SENSOR
REFRIGERANT PRESSURE SENSOR
BATTERY CURRENT SENSOR
B
C
D
AW : AWD models
IC : With ICC
OI : Without ICC
OS : Without RAS
* : This relay is built into the IPDM E/R (Intelligent power distribution module engine room).
TBWT1982E

ECM Harness Connector Terminal Layout

INFOID:0000000005353930

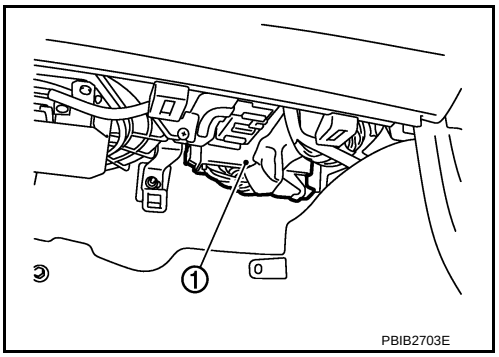


ECM Terminal and Reference Value

INFOID:0000000005353931

PREPARATION

1. ECM (1) is located behind the passenger side instrument lower panel. For this inspection, remove passenger side instrument lower panel.

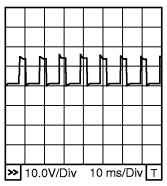
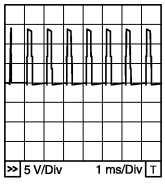


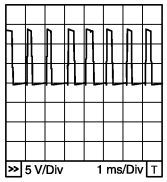
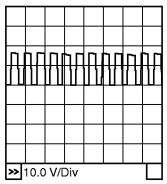
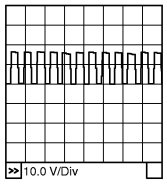
ECM INSPECTION TABLE

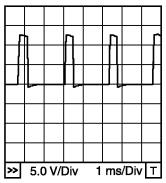
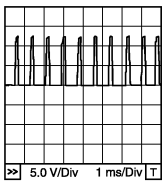
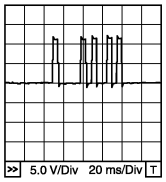
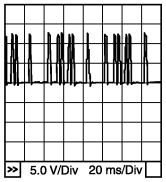
Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

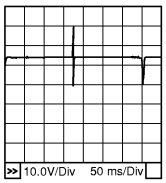
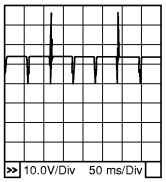
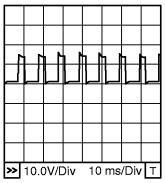
CAUTION:

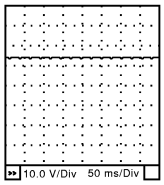
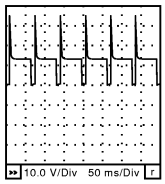
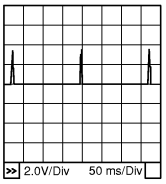
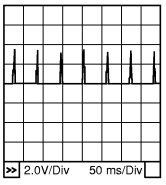
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECMs transistor. Use a ground other than ECM terminals, such as the ground.

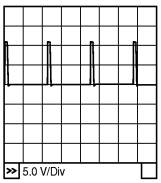
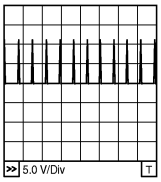
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** • Idle speed	Body ground
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
3	R	Throttle control motor power supply	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
4	W	Throttle control motor (Close)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever: D position • Accelerator pedal: Released	0 - 14 V★  PBIB1104E

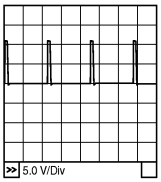
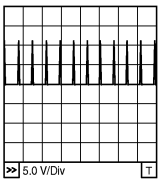
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
5	B	Throttle control motor (Open)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	0 - 14 V★  PBIB1105E
6	R/L	Heated oxygen sensor 2 heater (bank 1)	**[Engine is running]** • Engine 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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
10	W/G	Intake valve timing control solenoid valve (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	7 - 12 V★  PBIB1790E
11	G/O	Intake valve timing control solenoid valve (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	7 - 12 V★  PBIB1790E
12	R/G	Power steering pressure sensor	**[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

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	W/R	Crankshaft position sensor (POS)	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	1.0 - 2.0 V★  PBIB1041E
			[Engine is running] • Engine speed: 2,000 rpm	1.0 - 2.0 V★  PBIB1042E
14	G	Camshaft position sensor (PHASE)	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	1.0 - 4.0 V★  PBIB1039E
			[Engine is running] • Engine speed: 2,000 rpm	1.0 - 4.0 V★  PBIB1040E
15	W	Knock sensor (bank 1)	**[Engine is running]** • Idle speed	Approximately 2.5 V
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23 40 41 42 44 63	W/B R/Y R/B V/R P/L R/W O G/Y	Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1 Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2 Fuel injector No. 7 Fuel injector No. 8	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  PBIB0042E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  PBIB0043E
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
25	P/B	Heated oxygen sensor 2 heater (bank 2)	**[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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
29	V	VIAS control solenoid valve	**[Engine is running]** • Selector lever: P or N position	0 - 1.0 V
			[Engine is running] • Selector lever: D position • Engine speed: Below 5,000 rpm	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • Engine speed: Above 5,000 rpm	0 - 1.0 V
32	R/G	EVAP control system pressure sensor	**[Ignition switch: ON]**	Approximately 1.8 - 4.8 V
34	Y/G	Intake air temperature sensor	**[Engine is running]**	Approximately 0 - 4.8 V Output voltage varies with intake air temperature.
36	W	Knock sensor (bank 2)	**[Engine is running]** • Idle speed	Approximately 2.5 V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
38	G/B	Fuel pump control module (FPCM) check	**[When cranking engine]**	Approximately 0 V
			[Engine is running] • **Warm-up condition** • Idle speed	4 - 6 V
39	B/R	Fuel pump control module (FPCM)	**[When cranking engine]**	0 - 0.5 V
			[Engine is running] • **Warm-up condition** • Idle speed	8 - 12 V
45	V	EVAP canister purge volume control solenoid valve	**[Engine is running]** • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)★  SEC990C
			[Engine is running] • Engine speed: Approx. 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★  SEC991C
46 60 61 62 65 79 80 81	L/O V/W P Y/R BR/R GR/R GR/B G/R	Ignition signal No. 7 Ignition signal No. 5 Ignition signal No. 3 Ignition signal No. 1 Ignition signal No. 8 Ignition signal No. 6 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★  PBIB0044E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	0.1 - 0.4 V★  PBIB0045E
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch: ON]**	Approximately 5 V
48	BR	Sensor power supply (EVAP control system pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V
49	B/Y	Sensor power supply (Refrigerant pressure sensor, Battery current sensor)	**[Ignition switch: ON]**	Approximately 5 V

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
50	W	Throttle position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	More than 0.36 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	Less than 4.75 V
51	W	Mass air flow sensor	**[Engine is running]** • **Warm-up condition** • Idle speed	0.9 - 1.2 V
			[Engine is running] • **Warm-up condition** • Engine speed: 2,500 rpm	1.6 - 1.9 V
53	LG	Intake valve timing control position sensor (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 1.0 V★  PBIB2734E
			[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0 V★  PBIB2735E
55	L/R	Heated oxygen sensor 2 (bank 1)	**[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 - Approximately 1.0 V
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
67	B/W	Sensor ground	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
68	L/Y	Sensor power supply (Power steering pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
69	R	Throttle position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully released	Less than 4.75 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever: D position • Accelerator pedal: Fully depressed	More than 0.36 V
70	L/R	Refrigerant pressure sensor	**[Engine is running]** • **Warm-up condition** • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0 V
71	L/R	Battery current sensor	**[Engine is running]** • Battery: Fully charged* • Idle speed	Approximately 2.6 - 3.5 V
72	L	Intake valve timing control position sensor (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 1.0 V★  PBIB2734E
			[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0 V★  PBIB2735E
73	Y/B	Engine coolant temperature sensor	**[Engine is running]**	Approximately 0 - 4.8 V Output voltage varies with engine coolant temperature.
74	W	Heated oxygen sensor 2 (bank 2)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
82	W	Sensor ground (APP sensor 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
83	P	Sensor ground (APP sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
85	V	Data link connector	—	—
86	P	CAN communication line	—	—
90	L	Sensor power supply (APP sensor 1)	**[Ignition switch: ON]**	Approximately 5 V

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V
94	L	CAN communication line	—	—
98	R	Accelerator pedal position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.20 - 0.55 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	1.85 - 2.40 V
99	Y	ICC steering switch (models with ICC system)	**[Ignition switch: ON]** • ICC steering switch: OFF	Approximately 4.3 V
			[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0 V
			[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1.9 V
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3.8 V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 3.3 V
			[Ignition switch: ON] • DISTANCE switch: Pressed	Approximately 2.6 V
			[Ignition switch: ON] • LDP ON switch: Pressed	Approximately 1.1 V
99	Y	ASCD steering switch (models with ASCD system)	**[Ignition switch: ON]** • ASCD steering switch: OFF	Approximately 4 V
			[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0 V
			[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1 V
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3 V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 2 V
101	V/R	Stop lamp switch	**[Ignition switch: OFF]** • Brake pedal: Fully released	Approximately 0 V
			[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
102	G	Transmission range switch	**[Ignition switch: ON]** • Selector lever: P or N position	Approximately 0 V
			[Ignition switch: ON] • Selector lever: Except above position	BATTERY VOLTAGE (11 - 14 V)
104	O	Throttle control motor relay	**[Ignition switch: OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch: ON]	0 - 1.0 V
106	LG	Accelerator pedal position sensor 1	**[Ignition switch: ON]** • Engine stopped • Accelerator pedal: Fully released	0.4 - 1.1 V
			[Ignition switch: ON] • Engine stopped • Accelerator pedal: Fully depressed	3.7 - 4.8 V

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
107	V/W	Fuel tank temperature sensor	**[Engine is running]**	Approximately 0 - 4.8 V Output voltage varies with fuel tank temperature.
108	BR	ICC brake switch (models with ICC system) ASCD brake switch (models with ASCD system)	**[Ignition switch: ON]** • Brake pedal: Slightly depressed	Approximately 0 V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)
109	L	Ignition switch	**[Ignition switch: OFF]**	0 V
			[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
113	GR	Fuel pump relay	**[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)
115 116	B B	ECM ground	**[Engine is running]** • Idle speed	Body ground
117	GR/L	EVAP canister vent control valve	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTER Y VOLTAGE (11 - 14V)
121	L	Power supply for ECM (Back up)	**[Ignition switch: OFF]**	BATTERY VOLTAGE (11 - 14 V)

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

*: Before measuring the terminal voltage, check that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

CONSULT-III Function

INFOID:0000000005353932

FUNCTION

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

ENGINE CONTROL COMPONENT PARTS/CONTROL SYSTEMS APPLICATION

Item			Direct Diagnostic Mode						
			Work Support	Self Diagnostic Result		Data Monitor	Active Test	DTC & SRT Confirmation	
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	INPUT	Crankshaft position sensor (POS)		×	×	×			
		Camshaft position sensor (PHASE)		×	×	×			
		Mass air flow sensor		×		×			
		Engine coolant temperature sensor		×	×	×	×		
		Air fuel ratio (A/F) sensor 1		×		×		×	×
		Heated oxygen sensor 2		×		×		×	×
		Vehicle speed signal		×	×	×			
		Accelerator pedal position sensor		×		×			
		Throttle position sensor		×	×	×			
		Fuel tank temperature sensor		×		×	×		
		EVAP control system pressure sensor		×		×			
		Intake air temperature sensor		×	×	×			
		Knock sensor		×					
		Refrigerant pressure sensor				×			
		Closed throttle position switch (accelerator pedal position sensor signal)				×			
		Air conditioner switch				×			
		Park/neutral position (PNP) signal		×		×			
		Stop lamp switch		×		×			
		Power steering pressure sensor		×		×			
		Battery voltage				×			
		Load signal				×			
		Intake valve timing control position sensor		×		×			
		Fuel level sensor		×		×			
		Battery current sensor		×		×			
		ICC steering switch		×		×			
		ASCD steering switch		×		×			
		ICC brake switch		×		×			
		ASCD brake switch		×		×			

Item			Direct Diagnostic Mode						
			Work Support	Self Diagnostic Result		Data Monitor	Active Test	DTC & SRT Confirmation	
				DTC*1	FREEZE FRAME DATA*2			SRT STATUS	DTC WORK SUPPORT
ENGINE CONTROL COMPONENT PARTS	OUTPUT	Fuel injector				×	×		
		Power transistor (Ignition timing)				×	×		
		Throttle control motor relay		×		×			
		Throttle control motor		×					
		EVAP canister purge volume control solenoid valve		×		×	×		×
		FPCM		×		×			
		Air conditioner relay				×			
		Fuel pump relay	×			×	×		
		Cooling fan control module		×		×	×		
		Air fuel ratio (A/F) sensor 1 heater		×		×		×*3	
		Heated oxygen sensor 2 heater		×		×		×*3	
		EVAP canister vent control valve	×	×		×	×		
		Intake valve timing control solenoid valve		×		×	×		
		VIAS control solenoid valve		×		×	×		
		Alternator				×	×		
		Calculated load value			×	×			

X: Applicable

*1: This item includes 1st trip DTCs.

*2: This mode includes 1st trip freeze frame data or freeze frame data. The items appear on CONSULT-III screen in freeze frame data mode only if a 1st trip DTC or DTC is detected. For details, refer to EC-735, "Emission-Related Diagnostic Information".

*3: Always “CMPLT” is displayed.

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-III WILL DISCONTINUE IT AND DISPLAY APPROPRIATE INSTRUCTION. **NOTE:** **WHEN STARTING ENGINE, CONSULT-III MAY DISPLAY “BATTERY VOLTAGE IS LOW. CHARGE BATTERY”, EVEN IN USING CHARGED BATTERY.**	When detecting EVAP leakage 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 the coefficient of self-learning control value
VIN REGISTRATION	• IN THIS MODE VIN IS REGISTERED IN ECM	When registering VIN in ECM
TARGET IDLE RPM ADJ*	• IDLE CONDITION	When setting target idle speed
TARGET IGN TIM ADJ*	• IDLE CONDITION	When adjusting target ignition timing

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

SELF DIAGNOSTIC RESULT MODE

Self Diagnostic Item

Regarding items of DTC and 1st trip DTC, refer to EC-735, "Emission-Related Diagnostic Information".

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-735, "Emission-Related Diagnostic Information".)
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.

Freeze frame data item*	Description
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

Monitored Item

Monitored item	Unit	Description	Remarks
ENG SPEED	rpm	• Indicates the engine speed computed from the signal of the crankshaft position sensor (POS) and camshaft position sensor (PHASE).	• Accuracy becomes poor if engine speed drops below the idle rpm. • If the signal is interrupted while the engine is running, an abnormal value may be indicated.
MAS A/F SE-B1	V	• The signal voltage of the mass air flow sensor is displayed.	• When the engine is stopped, a certain value is indicated. • When engine is running, specification range is indicated in "SPEC".
B/FUEL SCHDL	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)	V		
HO2S2 (B1)	×V	• The signal voltage of the heated oxygen sensor 2 is displayed.	
HO2S2 (B2)	V		
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)	RICH/ LEAN		
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter (Unified meter and A/C amp.) 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 be ECM internally. Thus, it differs from ECM terminal voltage signal.
ACCEL SEN 2	V		

Monitored item	Unit	Description	Remarks
TP SEN 1-B1	V	• The throttle position sensor signal voltage is displayed.	• TP SEN 2-B1 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.
TP SEN 2-B1	V		
FUEL T/TMP SE	°C or °F	• The fuel temperature (determined by the signal voltage of the fuel tank temperature sensor) is displayed.	
EVAP SYS PRES	V	• The signal voltage of EVAP control system pressure sensor is displayed.	
FUEL LEVEL SE	V	• The signal voltage of the fuel level sensor is displayed.	
START SIGNAL	ON/OFF	• Indicates start signal status [ON/OFF] computed by the ECM according to the signals of engine speed and battery voltage.	• After starting the engine, [OFF] is displayed regardless of the starter signal.
CLSD THL POS	ON/OFF	• Indicates idle position [ON/OFF] computed by ECM according to the accelerator pedal position sensor signal.	
AIR COND SIG	ON/OFF	• Indicates [ON/OFF] condition of the air conditioner switch as determined by the air conditioner signal.	
PW/ST SIGNAL	ON/OFF	• [ON/OFF] condition of the power steering system (determined by the signal voltage of the power steering pressure sensor signal) is indicated.	
LOAD SIGNAL	ON/OFF	• Indicates [ON/OFF] condition from the electrical load signal. ON: Rear window defogger switch is ON and/or lighting switch is in 2nd position. OFF: Both rear window defogger switch and lighting switch are OFF.	
IGNITION SW	ON/OFF	• Indicates [ON/OFF] condition from ignition switch signal.	
HEATER FAN SW	ON/OFF	• Indicates [ON/OFF] condition from the heater fan switch signal.	
BRAKE SW	ON/OFF	• Indicates [ON/OFF] condition from the stop lamp switch signal.	
INJ PULSE-B1	msec	• Indicates the actual fuel injection pulse width compensated by ECM according to the input signals.	• When the engine is stopped, a certain computed value is indicated.
INJ PULSE-B2	msec		
IGN TIMING	BTDC	• Indicates the ignition timing computed by ECM according to the input signals.	• When the engine is stopped, a certain value is indicated.
CAL/LD VALUE	%	• “Calculated load value” indicates the value of the current air flow divided by peak air flow.	
MASS AIRFLOW	g·m/s	• Indicates the mass air flow computed by ECM according to the signal voltage of the mass air flow sensor.	
PURG VOL C/V	%	• Indicates the EVAP canister purge volume control solenoid valve control value computed by the ECM according to the input signals. • The opening becomes larger as the value increases.	
INT/V TIM (B1)	°CA	• Indicates [°CA] of intake camshaft advanced angle.	
INT/V TIM (B2)	°CA		
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)	%		

Monitored item	Unit	Description	Remarks
VIAS S/V-1	ON/OFF	• The control condition of the VIAS control solenoid valve (determined by ECM according to the input signals) is indicated. • OFF: VIAS control solenoid valve is not operating. ON: VIAS control solenoid valve is operating.	
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.	
FPCM	HI/LOW	• The control condition of the fuel pump control module (FPCM) (determined by the ECM according to the input signal) is indicated.	
VENT CONT/V	ON/OFF	• The control condition of the EVAP canister vent control valve (determined by ECM according to the input signals) is indicated. ON: Closed OFF: Open	
THRTL RELAY	ON/OFF	• Indicates the throttle control motor relay control condition determined by the ECM according to the input signals.	
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)	ON/OFF		
ALT DUTY SIG	ON/OFF	• The control condition of the power generation voltage variable control (determined by ECM according to the input signals) is indicated. ON: Power generation voltage variable control is active. OFF: Power generation voltage variable control is inactive.	
I/P PULLY SPD	rpm	• Indicates the engine speed computed from the input speed 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	• Display the condition of idle air volume learning YET: Idle air volume learning has not been performed yet. CMPLT: Idle air volume learning has already been performed successfully.	
TRVL AFTER MIL	km or mile	• Distance traveled while MIL is activated.	
SNOW MODE SW	ON/OFF	• Indicates [ON/OFF] condition from the snow mode switch signal.	
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)	%		
VHCL SPEED SE	km/h or mph	• The vehicle speed computed from the vehicle speed signal sent from combination meter (Unified meter and A/C amp.) is displayed.	
SET VHCL SPD	km/h or mph	• The preset vehicle speed is displayed.	
MAIN SW	ON/OFF	• Indicates [ON/OFF] condition from MAIN switch signal.	
CANCEL SW	ON/OFF	• Indicates [ON/OFF] condition from CANCEL switch signal.	

Monitored item	Unit	Description	Remarks
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.	
SET LAMP	ON/OFF	• Indicates [ON/OFF] condition of SET lamp determined by the ECM according to the input signals.	
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.”.	
ALT DUTY	%	• Indicates the duty ratio of the power generation command value. The ratio is calculated by ECM based on the battery current sensor signal.	
BAT CUR SEN	mV	• The signal voltage of battery current sensor is displayed.	
A/F ADJ-B1	—	• Indicates the correction 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 air fuel ratio (A/F) sensor 1 signal.	
A/F ADJ-B2	—		
P/N POSI SW	ON/OFF	• Indicates [ON/OFF] condition from the park/neutral position (PNP) signal.	
INT/A TEMP SE	°C or °F	• The intake air temperature (determined by the signal voltage of the intake air temperature sensor) is indicated.	
AC PRESS SEN	V	• The signal voltage from the refrigerant pressure sensor is displayed.	
FPCM DR VOLT	V	• The voltage between fuel pump and FPCM is displayed.	

NOTE:

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

ACTIVE TEST MODE

Test Item

TEST ITEM	CONDITION	JUDGMENT	CHECK ITEM (REMEDY)
VENT CONTROL/V	• Ignition switch: ON (Engine stopped) • Turn solenoid valve ON and OFF using the CONSULT-III 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-III.	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-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Fuel injector • Air fuel ratio (A/F) sensor 1
FUEL/T TEMP SEN	• Change the fuel tank temperature using CONSULT-III.		
PURG VOL CONT/V	• Engine: After warming up, run engine at 1,500 rpm. • Change the EVAP canister purge volume control solenoid valve opening percent using CONSULT-III.	Engine speed changes according to the opening percent.	• Harness and connectors • Solenoid valve
FUEL PUMP RELAY	• Ignition switch: ON (Engine stopped) • Turn the fuel pump relay ON and OFF using CONSULT-III and listen to operating sound.	Fuel pump relay makes the operating sound.	• Harness and connectors • Fuel pump relay
V/T ASSIGN ANGLE	• Engine: Return to the original trouble condition • Change intake valve timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Harness and connectors • Intake valve timing control solenoid valve
VIAS SOL VALVE	• Ignition switch: ON • Turn solenoid valve ON and OFF using CONSULT-III and listen to operating sound.	Solenoid valve makes an operating sound.	• Harness and connectors • Solenoid valve
FAN DUTY CONTROL*	• Ignition switch: ON • Change duty ratio using CONSULT-III.	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-III.	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 position • Cut off each fuel injector signal one at a time using CONSULT-III.	Engine runs rough or dies.	• Harness and connectors • Compression • Fuel injector • Power transistor • Spark plug • Ignition coil
IGNITION TIMING	• Engine: Return to the original trouble condition • Timing light: Set • Retard the ignition timing using CONSULT-III.	If trouble symptom disappears, see CHECK ITEM.	• Perform Idle Air Volume Learning.

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

DTC & SRT CONFIRMATION MODE

SRT STATUS Mode

For details, refer to “How to Display SRT Status” in EC-735, "Emission-Related Diagnostic Information".

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

DTC WORK SUPPORT Mode

Test mode	Test item	Corresponding DTC No.	Reference page
HO2S2	HO2S2 (B1) P1146	P0138	EC-949
	HO2S2 (B1) P1147	P0137	EC-940
	HO2S2 (B1) P0139	P0139	EC-961
	HO2S2 (B2) P1166	P0158	EC-949
	HO2S2 (B2) P1167	P0157	EC-940
	HO2S2 (B2) P0159	P0159	EC-961
A/F SEN1	A/F SEN1 (B1) P1278/P1279	P0133	EC-931
	A/F SEN1 (B1) P1276	P0130	EC-907
	A/F SEN1 (B2) P1288/P1289	P0153	EC-931
	A/F SEN1 (B2) P1286	P0150	EC-907
EVAPORATIVE SYSTEM	EVP SML LEAK P0442/P1442*	P0442	EC-1035
		P0455	EC-1083
	EVP V/S LEAK P0456/P1456*	P0456	EC-1089
	PURG VOL CN/V P1444	P0443	EC-1042
	PURG FLOW P0441	P0441	EC-1030

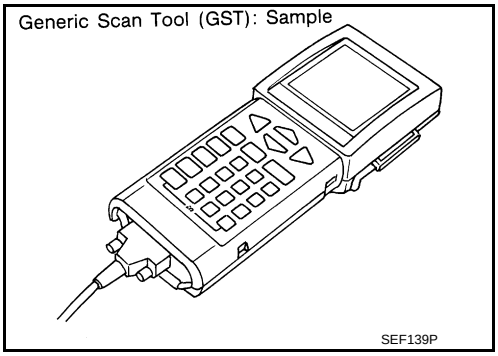
*: DTC P1442 and P1456 does not apply to Y50 models but appears in DTC WORK SUPPORT Mode screens.

Generic Scan Tool (GST) Function

INFOID:0000000005353933

DESCRIPTION

Generic Scan Tool (OBD II scan tool) complying with SAE J1978 has several functions explained below.
ISO9141 is used as the protocol.
The name “GST” or “Generic Scan Tool” is used in this service manual.



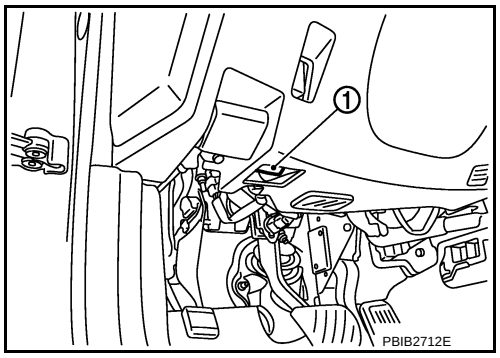
FUNCTION

Diagnostic service		Function
Service $01	READINESS TESTS	This diagnostic service gains access to current emission-related data values, including analog inputs and outputs, digital inputs and outputs, and system status information.
Service $02	(FREEZE DATA)	This diagnostic service gains access to emission-related data value which were stored by ECM during the freeze frame. For details, refer to EC-735, "Emission-Related Diagnostic Information".
Service $03	DTCs	This diagnostic service gains access to emission-related power train trouble codes which were stored by ECM.

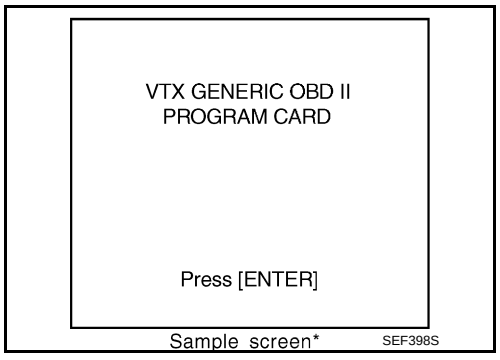
Diagnostic service		Function
Service $04	CLEAR DIAG INFO	This diagnostic service can clear all emission-related diagnostic information. This includes: • Clear number of diagnostic trouble codes (Service $01) • Clear diagnostic trouble codes (Service $03) • Clear trouble code for freeze frame data (Service $01) • Clear freeze frame data (Service $02) • Reset status of system monitoring test (Service $01) • Clear on board monitoring test results (Service $06 and $07)
Service $06	(ON BOARD TESTS)	This diagnostic service accesses the results of on board diagnostic monitoring tests of specific components/systems that are not continuously monitored.
Service $07	(ON BOARD TESTS)	This diagnostic service enables the off board test drive to obtain test results for emission-related powertrain components/systems that are continuously monitored during normal driving conditions.
Service $08	—	This diagnostic service can close EVAP system in ignition switch ON position (Engine stopped). When this diagnostic service is performed, EVAP canister vent control valve can be closed. In the following conditions, this diagnostic service cannot function. • Low ambient temperature • Low battery voltage • Engine running • Ignition switch OFF • Low fuel temperature • Too much pressure is applied to EVAP system
Service $09	(CALIBRATION ID)	This diagnostic service enables the off-board test device to request specific vehicle information such as Vehicle Identification Number (VIN) and Calibration IDs.

INSPECTION PROCEDURE

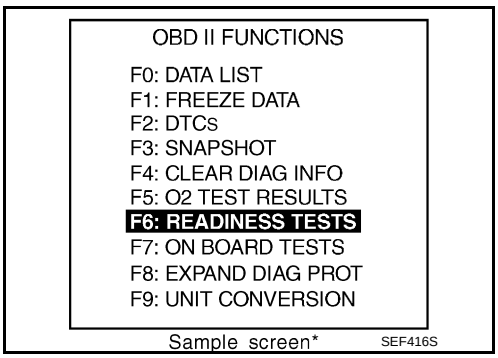
1. Turn ignition switch OFF.
2. Connect GST to data link connector (1), which is located under LH dash panel near the hood opener handle.



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



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



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353934

Remarks:
- Specification data are reference values.
- Specification data are output/input values which are detected or supplied by the ECM at the connector.
  * Specification data may not be directly related to their components signals/values/operations.
  i.e. Adjust ignition timing with a timing light before monitoring IGN TIMING, because the monitor may show the specification data in spite of the ignition timing not being adjusted to the specification data. This IGN TIMING monitors the data calculated by the ECM according to the signals input from the camshaft position sensor and other ignition timing related sensors.

MONITOR ITEM	CONDITION		SPECIFICATION
ENG SPEED	• Run engine and compare CONSULT-III value with the tachometer indication.		Almost the same speed as the tachometer indication.
MAS A/F SE-B1	See EC-814, "Inspection Procedure".		
B/FUEL SCHDL	See EC-814, "Inspection Procedure".		
A/F ALPHA-B1 A/F ALPHA-B2	See EC-814, "Inspection Procedure".		
COOLAN TEMP/S	• Engine: After warming up		More than 70°C (158°F)
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V
HO2S2 (B1) HO2S2 (B2)	• 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 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)			LEAN ←→ RICH
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as speedometer indication
BATTERY VOLT	• Ignition switch: ON (Engine stopped)		11 - 14 V
ACCEL SEN 1 ACCEL SEN 2*1	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.4 - 1.1 V
		Accelerator pedal: Fully depressed	3.7 - 4.8 V
TP SEN 1-B1 TP SEN 2-B1*1	• Ignition switch: ON (Engine stopped) • Selector lever position: D	Accelerator pedal: Fully released	More than 0.36 V
		Accelerator pedal: Fully depressed	Less than 4.75 V
EVAP SYS PRES	• Ignition switch: ON		Approx. 1.8 - 4.8 V
START SIGNAL	• Ignition switch: ON → START → ON		OFF → ON → OFF
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF
AIR COND SIG	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates.)	ON

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel: Not being turned (Forward direction)	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 INJ PULSE-B2	• Engine: After warming up • Selector lever position: 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 position: P or N • Air conditioner switch: OFF • No load	Idle	7 - 17°BTDC
		2,000 rpm	25 - 45°BTDC
CAL/LD VALUE	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	14 - 33%
		2,500 rpm	12 - 25%
MASS AIRFLOW	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s
PURG VOL C/V	• Engine: After warming up • Selector lever position: 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) INT/V TIM (B2)	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 20°CA
INT/V SOL (B1) INT/V SOL (B2)	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 25 - 50%
VIAS S/V-1	• Selector lever position: P or N		ON
	• Engine speed: More than 5,000 rpm		
	• Selector lever position: Except P or N • Engine speed: Less than 5,000 rpm		OFF
AIR COND RLY	• Engine: After warming up, idle the engine	Air conditioner switch: OFF	OFF
		Air conditioner switch: ON (Compressor operates)	ON
FUEL PUMP RLY	• For 1 seconds after turning ignition switch: ON • Engine running or cranking		ON
	• Except above		OFF

MONITOR ITEM	CONDITION		SPECIFICATION
FPCM	• Engine: Cranking		HI
	• Engine: Idle • Engine coolant temperature: More than 10°C (50°F)		LOW
VENT CONT/V	• Ignition switch: ON		OFF
THRTL RELAY	• Ignition switch: ON		ON
HO2S2 HTR (B1) HO2S2 HTR (B2)	• Engine speed: Below 3,600 rpm after the following conditions are met. - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load		ON
	• Engine speed: Above 3,600 rpm		OFF
ALT DUTY SIG	• Power generation voltage variable control: Operating		ON
	• Power generation voltage variable control: Not operating		OFF
I/P PULLY SPD	• Vehicle speed: More than 20 km/h (12 MPH)		Almost the same speed as the tachometer indication
VEHICLE SPEED	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
TRVL AFTER MIL	• Ignition switch: ON	Vehicle has traveled after MIL has turned ON.	0 - 65,535 km (0 - 40,723 miles)
SNOW MODE SW	• Ignition switch: ON	Snow mode switch: ON	ON
		Snow mode switch: OFF	OFF
A/F S1 HTR (B1) A/F S1 HTR (B2)	• Engine: After warming up, idle the engine		0 - 100%
VHCL SPEED SE	• Turn drive wheels and compare CONSULT-III value with the speedometer indication.		Almost the same speed as the speedometer indication
SET VHCL SPD	• Engine: Running	ASCD: Operating	The preset vehicle speed is displayed
MAIN SW	• Ignition switch: ON	MAIN switch: Pressed	ON
		MAIN switch: Released	OFF
CANCEL SW	• Ignition switch: ON	CANCEL switch: Pressed	ON
		CANCEL switch: Released	OFF
RESUME/ACC SW	• Ignition switch: ON	RESUME/ACCELERATE switch: Pressed	ON
		RESUME/ACCELERATE switch: Released	OFF
SET SW	• Ignition switch: ON	SET/COAST switch: Pressed	ON
		SET/COAST switch: Released	OFF
BRAKE SW1 (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
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
FAN DUTY	• Engine: Running		0 - 100%

MONITOR ITEM	CONDITION		SPECIFICATION
ALT DUTY	• Engine: Idle		0 - 80%
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged*2 • Selector lever position: P or N • Air conditioner switch: OFF • No load		Approx. 2,600 - 3,500 mV
P/N POSI SW	• Ignition switch: ON	Selector lever position: P or N	ON
		Selector lever position: Except above	OFF
AC PRESS SEN	• Engine: Idle • Both A/C switch and blower fan switch: ON (Compressor operates)		1.0 - 4.0 V

*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 SC-4, "How to Handle Battery".

TROUBLE DIAGNOSIS - SPECIFICATION VALUE

Description

INFOID:0000000005353935

The specification (SP) value indicates the tolerance of the value that is displayed in “SPEC” of “DATA MONITOR” mode of CONSULT-III during normal operation of the Engine Control System. When the value in “SPEC” of “DATA MONITOR” mode is within the SP value, the Engine Control System is confirmed OK. When the value in “SPEC” of “DATA MONITOR” mode is NOT within the SP value, the Engine Control System may have one or more malfunctions.
The SP value is used to detect malfunctions that may affect the Engine Control System, but will not 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 (The signal voltage of the mass air flow sensor)

Testing Condition

INFOID:0000000005353936

- 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)
- Engine speed: Idle
- Transmission: Warmed-up
  - After the engine is warmed up to normal operating temperature, drive vehicle until “ATF TEMP SE 1” (A/T fluid temperature sensor signal) in “DATA MONITOR” mode of “TRANSMISSION” 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.

Inspection Procedure

INFOID:0000000005353937

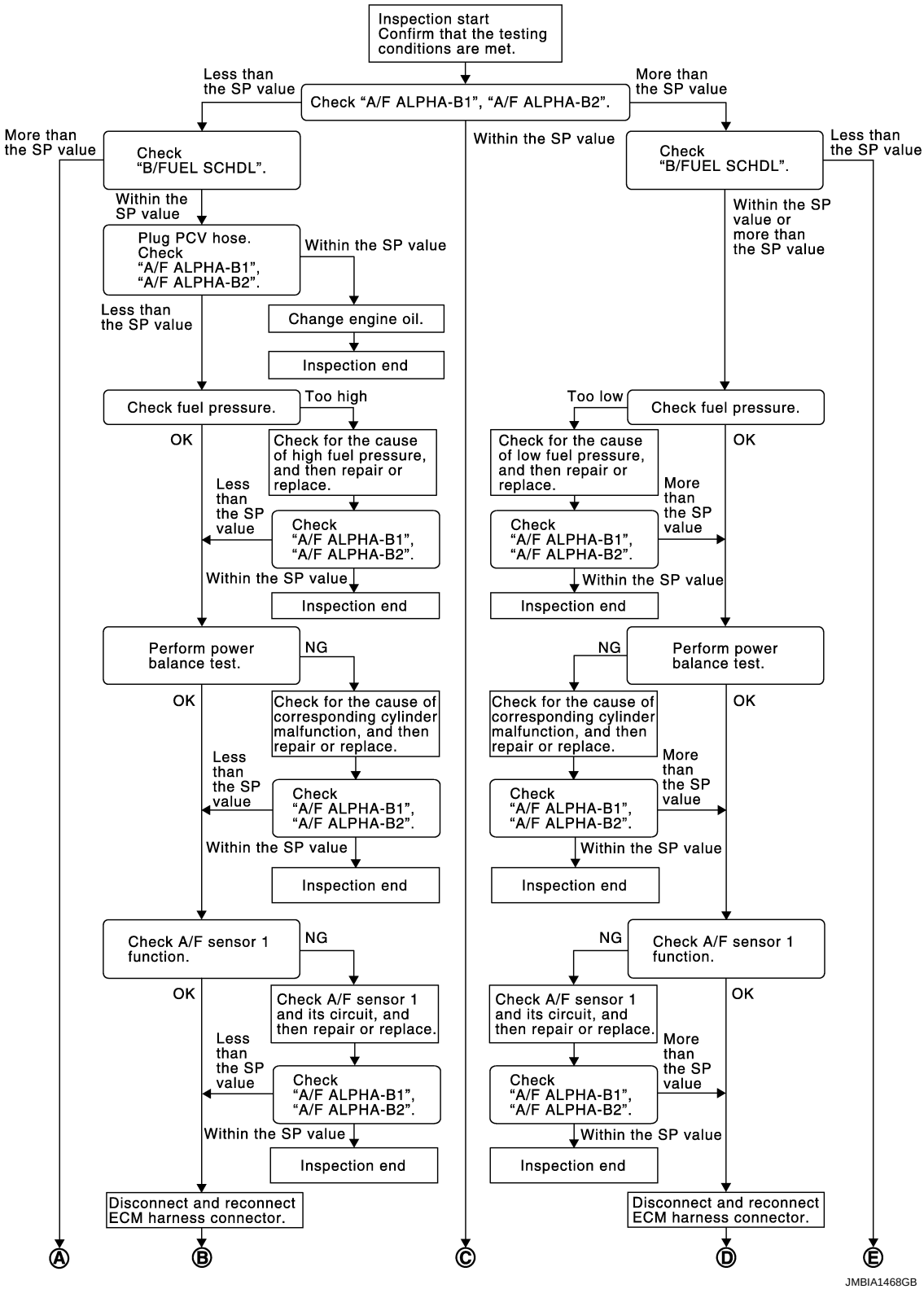
NOTE:
Perform “SPEC” of “DATA MONITOR” mode in maximum scale display.

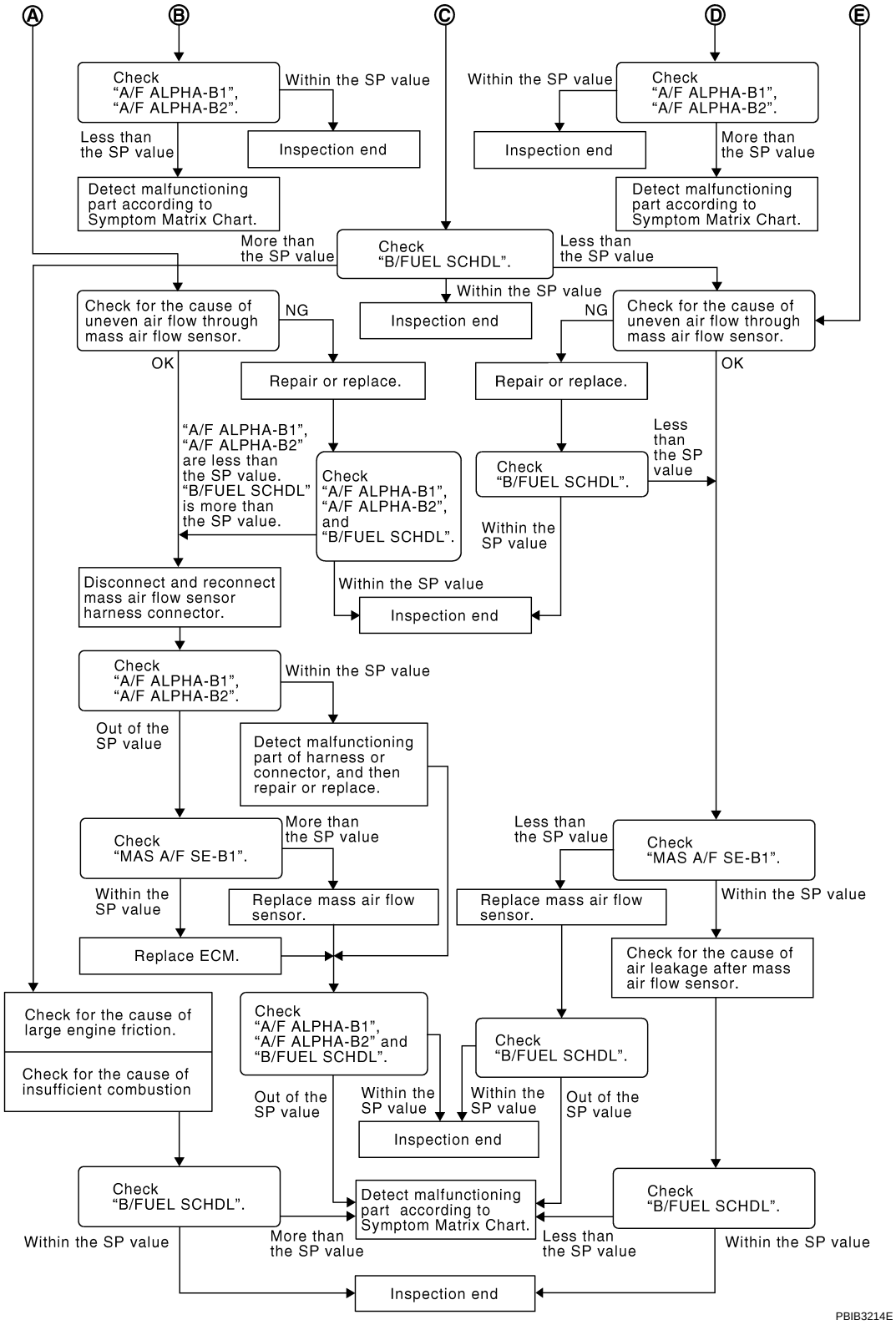
1. Perform EC-760, "Basic Inspection".
2. Check that the testing conditions are met. Refer to EC-814, "Testing Condition".
3. Select “B/FUEL SCHDL”, “A/F ALPHA-B1”, “A/F ALPHA-B2” and “MAS A/F SE-B1” in “SPEC” of “DATA MONITOR” mode with CONSULT-III.
4. Check that monitor items are within the SP value.
5. If NG, go to EC-815, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005353938

OVERALL SEQUENCE





DETAILED PROCEDURE

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

1. Start engine.
2. Check that the testing conditions are met. Refer to EC-814, "Testing Condition".
3. Select “A/F ALPHA-B1”, “A/F ALPHA-B2” in “SPEC” of “DATA MONITOR” mode, and check that each indication is within the SP value.

NOTE:

Check “A/F ALPHA-B1”, “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.

OK or NG

OK >> GO TO 17.
NG (Less than the SP value)>>GO TO 2.
NG (More than the SP value)>>GO TO 3.

2. CHECK “B/FUEL SCHDL”

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

OK or NG

OK >> GO TO 4.
NG (More than the SP value)>>GO TO 19.

3. CHECK “B/FUEL SCHDL”

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

OK or NG

OK >> GO TO 6.
NG (More than the SP value)>>GO TO 6.
NG (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 check that each indication is within the SP value.

OK or NG

OK >> GO TO 5.
NG >> 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-766, "Fuel Pressure Check".)

OK or NG

OK >> GO TO 9.
NG (Fuel pressure is too high)>>Replace “fuel level sensor unit and fuel pump (main)”. GO TO 8.
NG (Fuel pressure is too low)>>GO TO 7.

7. DETECT MALFUNCTIONING PART

1. Check the following.
- Clogged and bent fuel hose and fuel tube
- Clogged fuel filter
- Fuel pump and its circuit (Refer to EC-1298, "Diagnosis Procedure".)
2. If NG, repair or replace the malfunctioning part.
   If OK, replace “fuel level sensor unit and fuel pump (main)”.

>> 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 check that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 9.

9. PERFORM POWER BALANCE TEST

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

OK or NG

OK >> GO TO 12.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

1. Check the following below.

- Ignition coil and its circuit (Refer to EC-1313, "Diagnosis Procedure".)
- Fuel injector and its circuit (Refer to EC-1293, "Diagnosis Procedure".)
- Intake air leakage
- Low compression pressure (Refer to “CHECKING COMPRESSION PRESSURE” in EM-227, "On-Vehicle Service".)

2. If NG, repair or replace the malfunctioning part.
   If OK, replace malfunctioning fuel injector. (It may be caused by leakage from fuel injector or clogging.)

>> 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 check that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**
NG >> 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-907, "DTC Confirmation Procedure".
- For DTC P0131, P0151, refer to EC-915, "DTC Confirmation Procedure".
- For DTC P0132, P0152, refer to EC-923, "DTC Confirmation Procedure".
- For DTC P0133, P0153, refer to EC-931, "DTC Confirmation Procedure".
- For DTC P2A00, P2A03, refer to EC-1271, "DTC Confirmation Procedure".

OK or NG

OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK A/F SENSOR 1 CIRCUIT

Perform Diagnostic Procedure according to corresponding DTC.

>> GO TO 14.

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

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

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 15.

15. DISCONNECT AND RECONNECT ECM HARNESS CONNECTOR

1. Stop the engine.
2. Disconnect ECM harness connector.
3. Check pin terminals 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 check that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**
NG >> Detect malfunctioning part according to EC-775, "Symptom Matrix Chart".

17. CHECK “B/FUEL SCHDL”

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

OK or NG

OK >> **INSPECTION END**
NG (More than the SP value)>>GO TO 18.
NG (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

OK or NG

OK >> GO TO 21.
NG >> 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 check that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**
NG (“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.
3. Check pin terminals 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 check that each indication is within the SP value.

OK or NG

OK >> 1. Detect malfunctioning part of mass air flow sensor circuit and repair it. Refer to EC-877, "Diagnosis Procedure".
2. GO TO 29.

NG >> GO TO 23.

23. CHECK “MAS A/F SE-B1”

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

OK or NG

OK >> GO TO 24.

NG (More than the SP value)>>Replace mass air flow sensor, and then GO TO 29.

24. REPLACE ECM

1. Replace ECM.
2. Perform initialization of IVIS(NATS) system and registration of all IVIS(NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
3. Perform EC-764, "VIN Registration".
4. Perform EC-764, "Accelerator Pedal Released Position Learning".
5. Perform EC-764, "Throttle Valve Closed Position Learning".
6. Perform EC-765, "Idle Air Volume Learning".

>> 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

OK or NG

OK >> GO TO 27.

NG >> 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 check that the indication is within the SP value.

OK or NG

OK >> **INSPECTION END**

NG (Less than the SP value)>>GO TO 27.

27. CHECK “MAS A/F SE-B1”

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

OK or NG

OK >> GO TO 28.

NG (Less than the SP value)>>Replace mass air flow sensor, and then GO TO 30.

28. CHECK INTAKE SYSTEM

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

>> GO TO 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 check that each indication is within the SP value.

OK or NG

OK >> **INSPECTION END**
NG >> Detect malfunctioning part according to EC-775, "Symptom Matrix Chart".

30. CHECK “B/FUEL SCHDL”

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

OK or NG

OK >> **INSPECTION END**
NG >> Detect malfunctioning part according to EC-775, "Symptom Matrix Chart".

TROUBLE DIAGNOSIS FOR INTERMITTENT INCIDENT

Description

INFOID:0000000005353939

Intermittent incidents may occur. In many cases, the malfunction resolves itself (the part or circuit function returns to normal without intervention). It is important to realize that the symptoms described in the customer's complaint often do not recur on (1st trip) DTC visits. Realize also that the most frequent cause of intermittent incidents occurrences is poor electrical connections. Because of this, the conditions under which the incident occurred may not be clear. Therefore, circuit checks made as part of the standard diagnostic procedure may not indicate the specific malfunctioning area.

Common Intermittent Incidents Report Situations

STEP in Work Flow	Situation
2	The CONSULT-III is used. The SELF DIAGNOSTIC RESULT screen shows time data other than [0] or [1t].
3 or 4	The symptom described by the customer does not recur.
5	(1st trip) DTC does not appear during the DTC Confirmation Procedure.
10	The Diagnostic Procedure for PXXXX does not indicate the malfunctioning area.

Diagnosis Procedure

INFOID:0000000005353940

1.INSPECTION START

Erase (1st trip) DTCs. Refer to “How to Erase DTC” in EC-735, "Emission-Related Diagnostic Information".

>> GO TO 2.

2.CHECK GROUND TERMINALS

Check ground terminals for corroding or loose connection.
Refer to EC-828, "Ground Inspection".

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3.SEARCH FOR ELECTRICAL INCIDENT

Perform GI-26, "How to Perform Efficient Diagnosis for an Electrical Incident", “INCIDENT SIMULATION TESTS”.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace malfunctioning part.

4.CHECK CONNECTOR TERMINALS

Refer to GI-23, "How to Check Terminal", “HOW TO PROBE CONNECTORS”, “How to Check Enlarged Contact Spring of Terminal”.

OK or NG

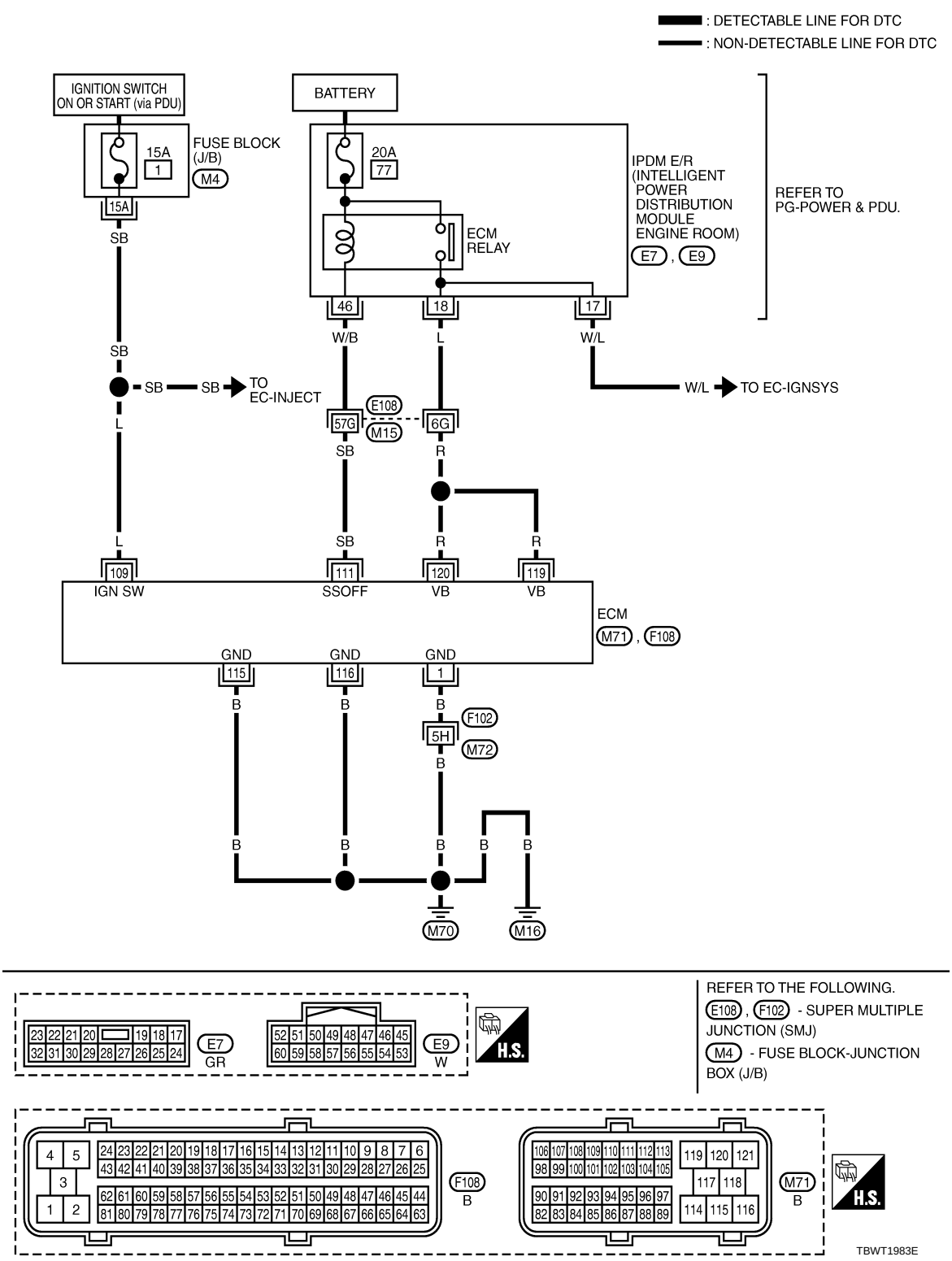
OK >> **INSPECTION END**
NG >> Repair or replace malfunctioning part.

POWER SUPPLY AND GROUND CIRCUIT

Wiring Diagram

INFOID:0000000005353941

EC-MAIN-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
1	B	ECM ground	**[Engine is running]** • Idle speed	Body ground
109	L	Ignition switch	**[Ignition switch: OFF]**	0 V
			[Ignition switch: ON]	BATTERY VOLTAGE (11 - 14 V)
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
115 116	B B	ECM ground	**[Engine is running]** • Idle speed	Body ground
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005353942

1.INSPECTION START

Start engine.
Is engine running?

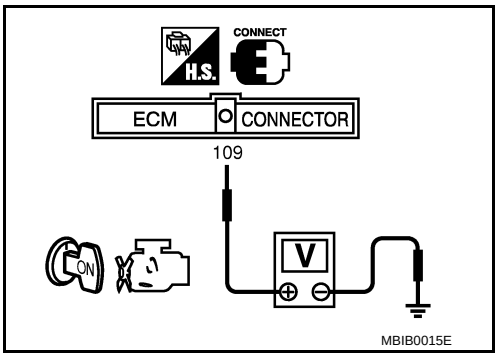
Yes or No

Yes >> GO TO 8.
No >> GO TO 2.

2.CHECK ECM POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF and then ON.
2. Check voltage between ECM terminal 109 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

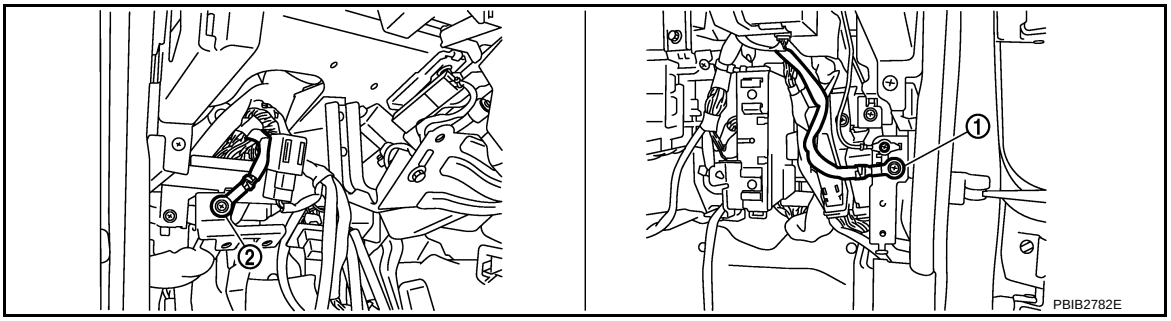
3.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector M4
- 15 A fuse
- Harness for open or short between ECM and fuse

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

4.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70 2. Body ground M16

OK or NG

OK >> GO TO 5.
NG >> Repair or replace ground connections.

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

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 1, 115, 116 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

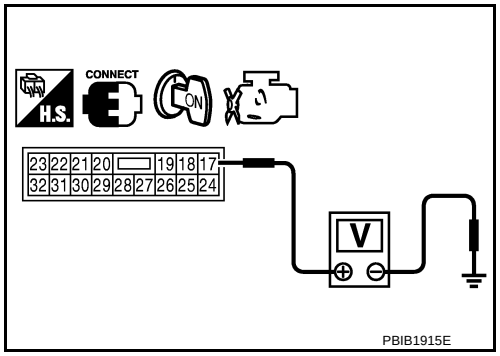
Check the following.
- Harness connectors F102, M72
- Harness for open or short between ECM and ground

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

7. CHECK ECM POWER SUPPLY CIRCUIT-II

1. Reconnect ECM harness connector.
2. Turn ignition switch ON.
3. Check voltage between IPDM E/R terminal 17 and ground with CONSULT-III or tester.

Voltage: Battery voltage



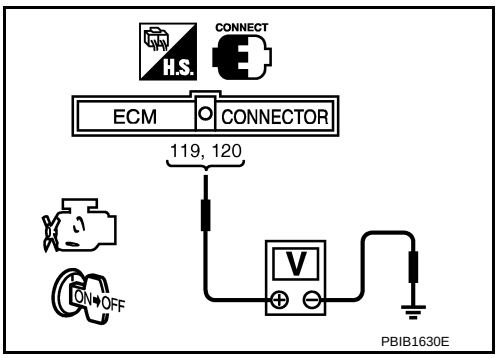
OK or NG

OK >> Go to EC-1313, "Diagnosis Procedure".
NG >> GO TO 8.

8. CHECK ECM POWER SUPPLY CIRCUIT-III

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

3. Check voltage between ECM terminals 119, 120 and ground with CONSULT-III or tester.



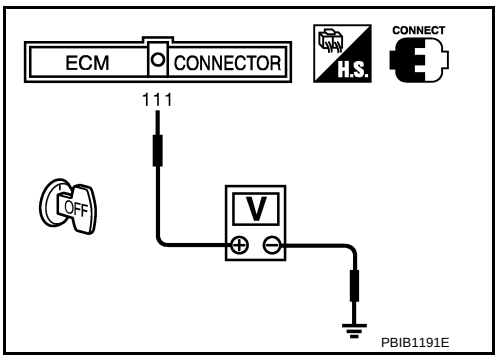
Voltage: After turning ignition switch OFF, battery voltage will exist for a few seconds, then drop approximately 0V.

OK or NG

OK >> GO TO 15.
NG (Battery voltage does not exist.)>>GO TO 9.
NG (Battery voltage exists for more than a few seconds.)>>GO TO 12.

9. CHECK ECM POWER SUPPLY CIRCUIT-IV

Check voltage between ECM terminal 111 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 12.

10. CHECK ECM POWER SUPPLY CIRCUIT-V

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E7.
3. Check harness continuity between ECM terminals 119, 120 and IPDM E/R terminal 18. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 18.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E108, M15
- Harness for open or short between ECM and IPDM E/R

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

12. CHECK ECM POWER SUPPLY CIRCUIT-VI

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E9.
3. Check harness continuity between ECM terminal 111 and IPDM E/R terminal 46. Refer to Wiring Diagram.

Continuity should exist.

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

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors E108, M15
- Harness for open or short between ECM and IPDM E/R

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

14. CHECK 20 A FUSE

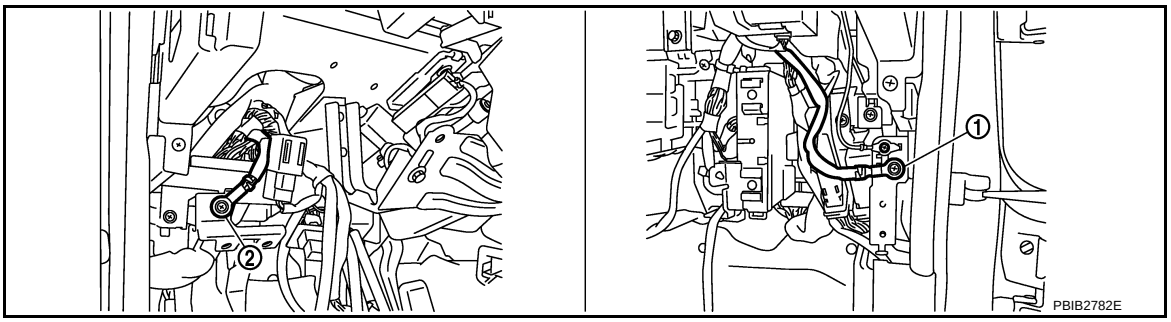
1. Disconnect 20 A fuse from IPDM E/R.
2. Check 20 A fuse.

OK or NG

OK >> GO TO 18.
NG >> Replace 20 A fuse.

15. CHECK GROUND CONNECTIONS

1. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 16.
NG >> Repair or replace ground connections.

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

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 1, 115, 116 and ground.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 18.
NG >> GO TO 17.

17. DETECT MALFUNCTIONING PART

Check the following.
- Harness or connectors F102, M72
- Harness for open or short between ECM and ground

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

18. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> Replace IPDM E/R.
NG >> Repair open circuit or short to power in harness or connectors.

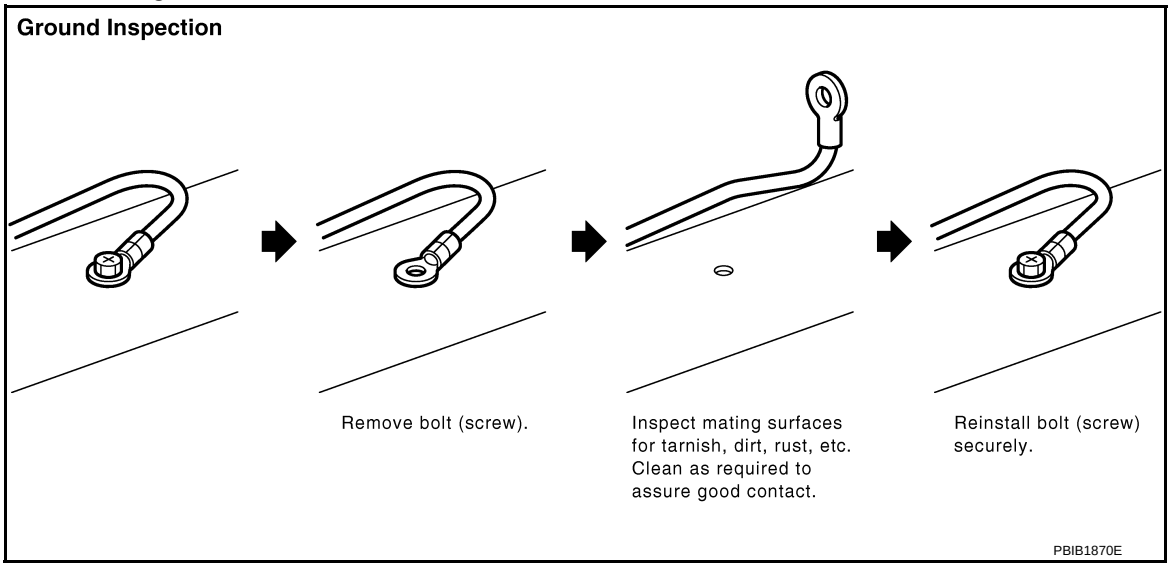
Ground Inspection

INFOID:0000000005353943

Ground connections are very important to the proper operation of electrical and electronic circuits. Ground connections are often exposed to moisture, dirt and other corrosive elements. The corrosion (rust) can become an unwanted resistance. This unwanted resistance can change the way a circuit works.
Electronically controlled circuits are very sensitive to proper grounding. A loose or corroded ground can drastically affect an electronically controlled circuit. A poor or corroded ground can easily affect the circuit. Even when the ground connection looks clean, there can be a thin film of rust on the surface.
When inspecting a ground connection follow these rules:

- Remove the ground bolt or screw.
- Inspect all mating surfaces for tarnish, dirt, rust, etc.
- Clean as required to assure good contact.
- Reinstall bolt or screw securely.
- Inspect for “add-on” accessories which may be interfering with the ground circuit.
- If several wires are crimped into one ground eyelet terminal, check for proper crimps. Check that all of the wires are clean, securely fastened and providing a good ground path. If multiple wires are cased in one eyelet, check that no ground wires have excess wire insulation.

Ground Inspection



DTC U0101 CAN COMMUNICATION LINE

Description

INFOID:0000000005353944

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.

On Board Diagnosis Logic

INFOID:0000000005353945

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U0101 0101	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

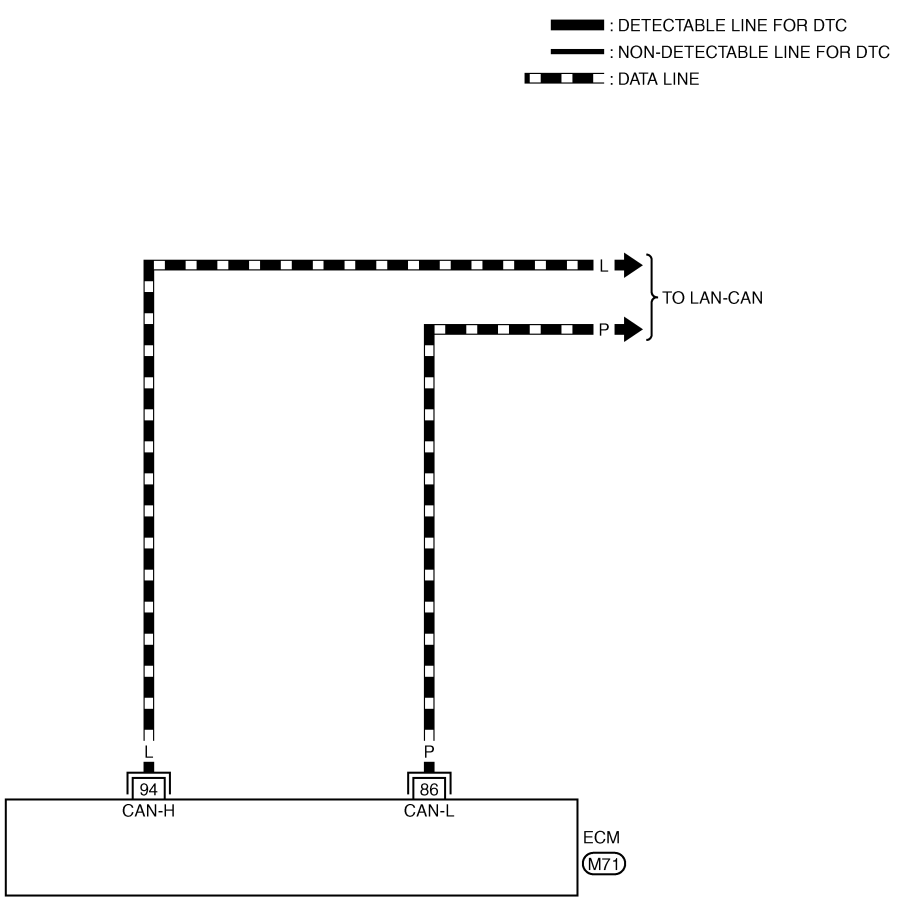
INFOID:0000000005353946

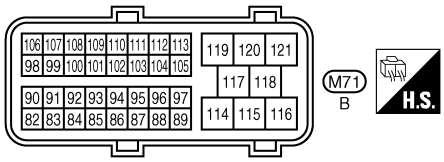
1. Turn ignition switch ON and wait at least 3 seconds.
2. Check DTC.
3. If DTC is detected, go to EC-830, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353947

EC-CAN-01





TBWT1011E

Diagnosis Procedure

INFOID:0000000005353948

Go to LAN-20, "Trouble Diagnosis Flow Chart".

DTC U1001 CAN COMMUNICATION LINE

Description

INFOID:0000000005353949

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.

On Board Diagnosis Logic

INFOID:0000000005353950

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
U1001 1001	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

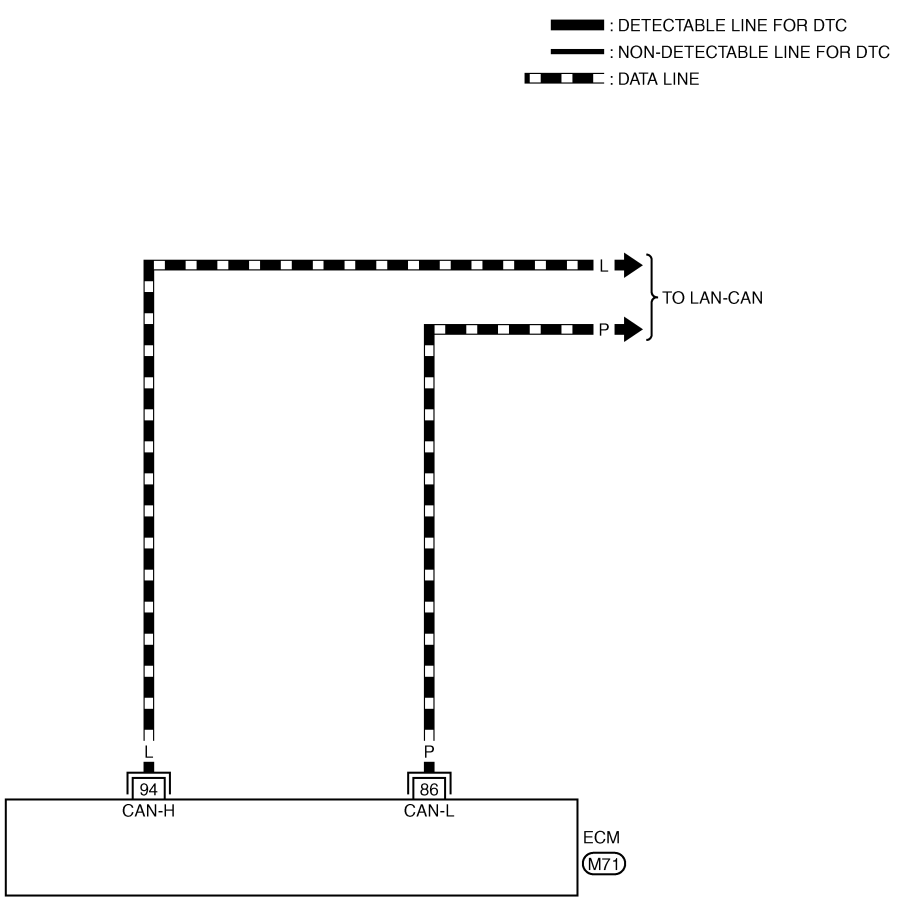
INFOID:0000000005353951

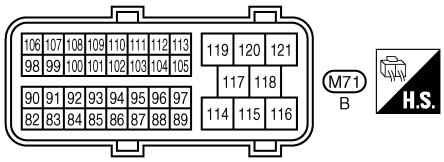
1. Turn ignition switch ON and wait at least 3 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-832, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353952

EC-CAN-01





TBWT1011E

Diagnosis Procedure

INFOID:0000000005353953

Go to LAN-20, "Trouble Diagnosis Flow Chart".

DTC P0011, P0021 IVT CONTROL

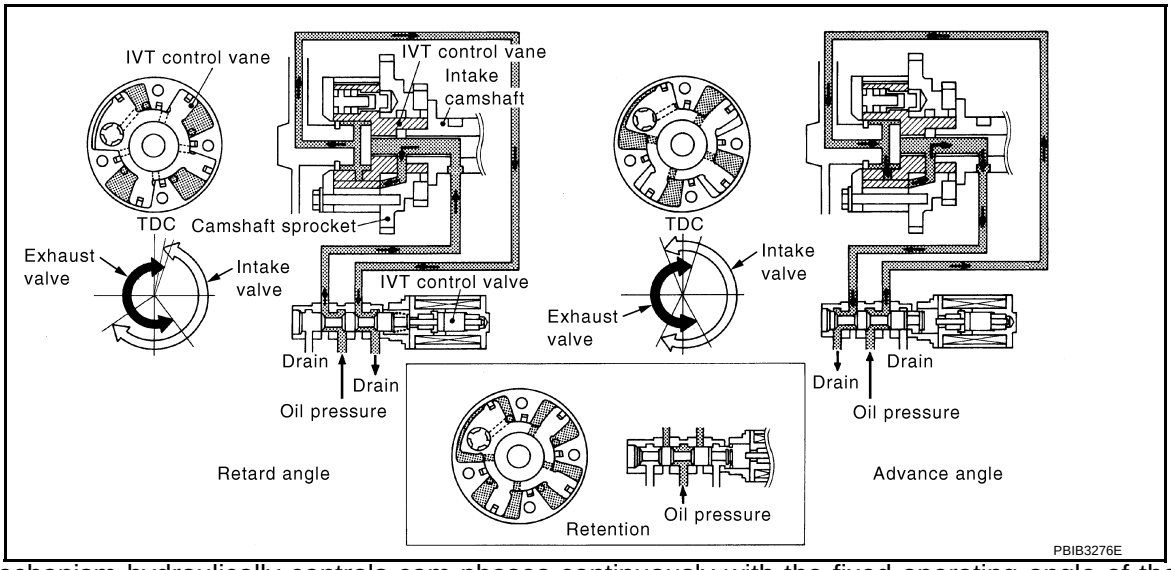
Description

INFOID:0000000005353954

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed	Intake valve timing control	Intake valve timing control solenoid valve
Intake valve timing control position sensor	Intake valve timing signal		
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



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 INSPECTION

Intake Valve Timing Control Solenoid Valve

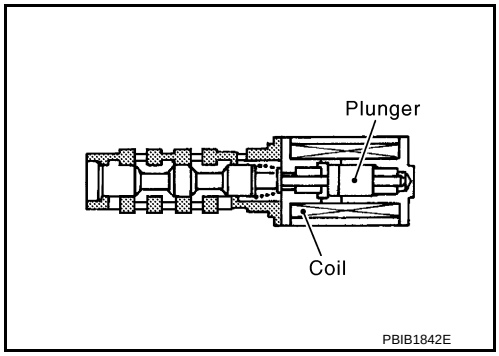
Intake Valve Timing (IVT) control solenoid valve is activated by ON/OFF pulse duty (ratio) signals from the ECM.

The IVT 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.

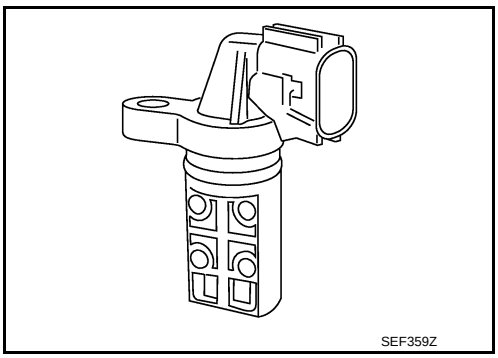
The shorter pulse width retards valve angle.

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.



Intake Valve Timing Control Position Sensor

Intake valve timing control position sensors are located in the front of cylinder heads in both bank 1 and bank 2.
This sensor uses a Hall IC.
The cam position is determined by the intake primary cam sprocket concave (in three places). The ECM provides feedback to the intake valve timing control for appropriate target valve open-close timing according to drive conditions based on detected cam position.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353955

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1) INT/V TIM (B2)	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 20°CA
INT/V SOL (B1) INT/V SOL (B2)	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 25 - 50%

On Board Diagnosis Logic

INFOID:0000000005353956

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-860, "DTC Confirmation Procedure").**
- **If DTC P0011 or P0021 is displayed with DTC P1140 or P1145, first perform the trouble diagnosis for DTC P1140, P1145 (Refer to EC-1131, "DTC Confirmation Procedure").**

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0011 0011 (Bank 1)	Intake valve timing control performance	A	The alignment of the intake valve timing control has been misresistered.	• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Harness or connectors (Intake valve timing control position sensor circuit is open or shorted.) • Intake valve timing control solenoid valve • Intake valve timing control position sensor • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Accumulation of debris to the signal pick-up portion of the camshaft sprocket • Timing chain installation • Foreign matter caught in the oil groove for intake valve timing control
P0021 0021 (Bank 2)		B	There is a gap between angle of target and phase-control angle degree.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode.

Detected items	Engine operating condition in fail-safe mode
Intake valve timing control	The signal is not energized to the solenoid valve and the valve control does not function

DTC Confirmation Procedure

INFOID:0000000005353957

CAUTION:
Always drive at a safe speed.

NOTE:
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 10V and 16V at idle.

PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Maintain the following conditions for at least 10 consecutive seconds.

Engine speed	1,200 - 2,000 rpm (A constant rotation is maintained.)
Engine coolant temperature	More than 70°C (158°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

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

Engine speed	Idle
Engine coolant temperature	More than 70°C (158°F)
Selector lever	P or N position

4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to EC-839, "Diagnosis Procedure".

PROCEDURE FOR MALFUNCTION B

1. Start engine and warm it up to normal operating temperature.
2. Maintain the following conditions for at least 10 consecutive seconds.

Engine speed	1,700 - 3,175 rpm (A constant rotation is maintained.)
Engine coolant temperature	70 - 105°C (158 - 221°F)
Selector lever	1st or 2nd position
Driving location uphill	Driving vehicle uphill (Increased engine load will help maintain the driving conditions required for this test.)

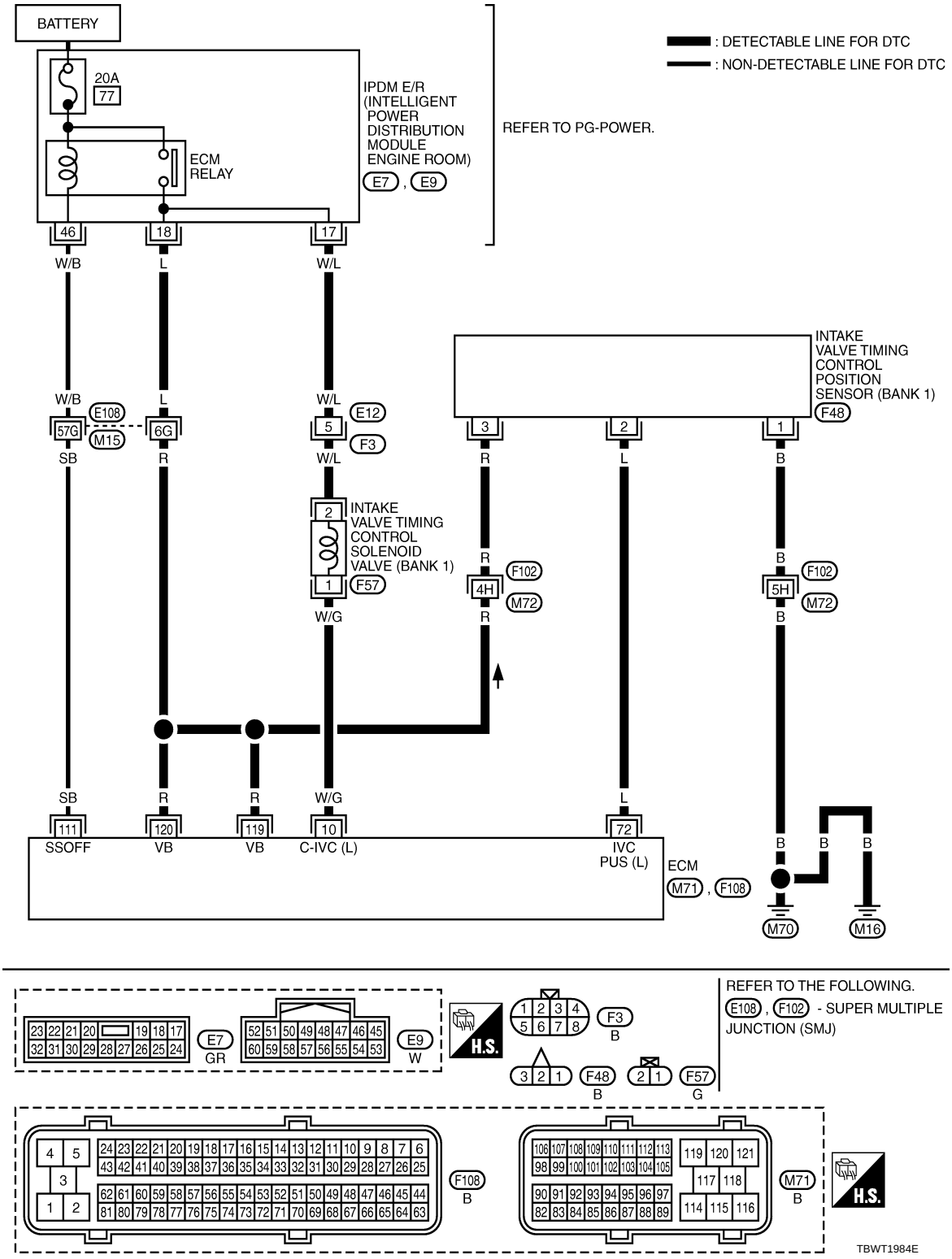
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-839, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353958

BANK 1

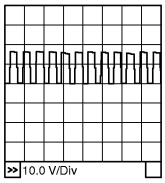
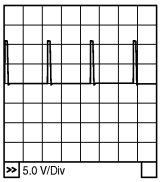
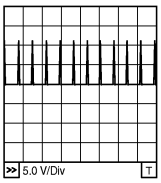
EC-IVTB1-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

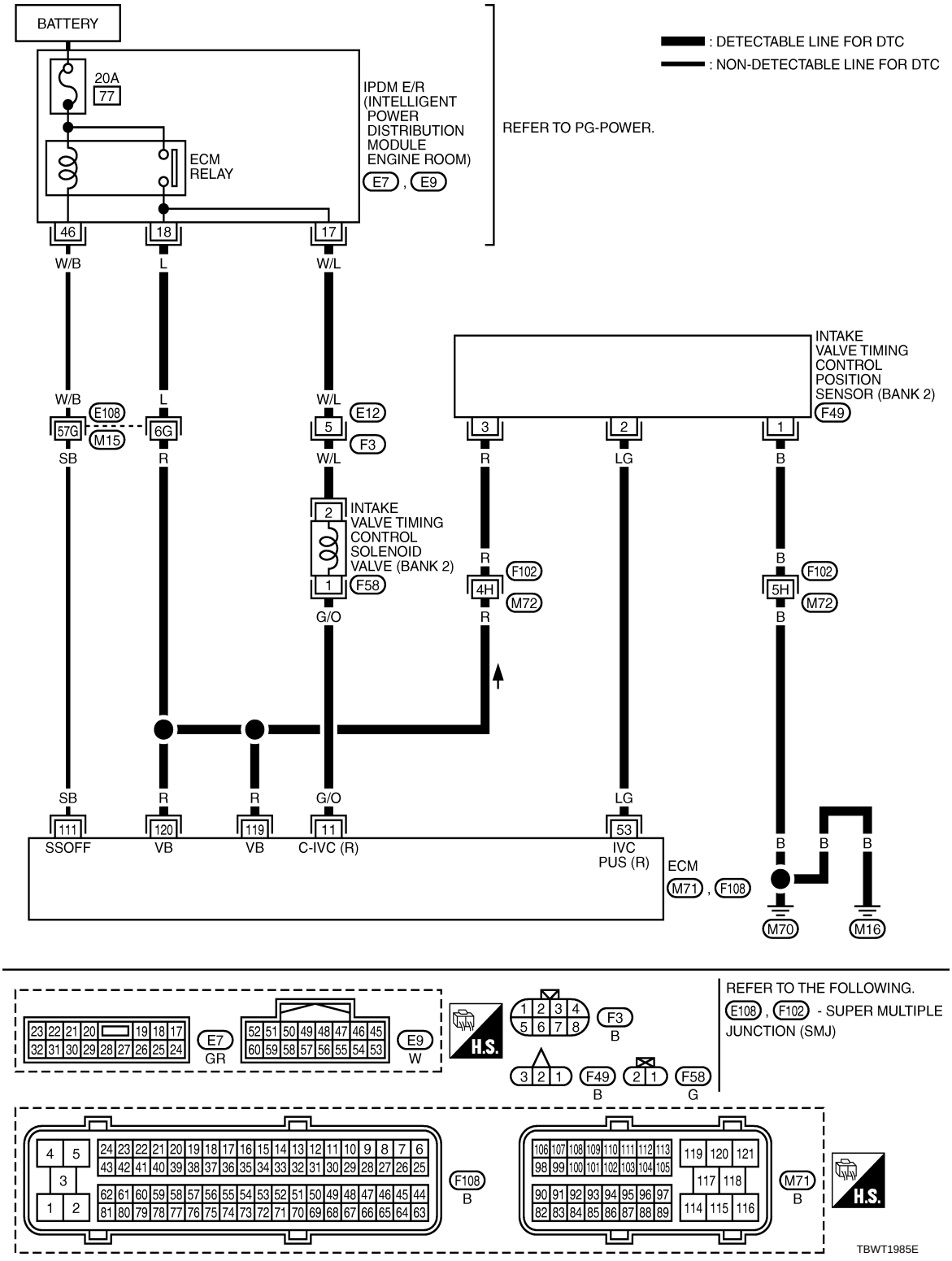
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
10	W/G	Intake valve timing control solenoid valve (bank 1)	**[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★  PBIB1790E
72	L	Intake valve timing control position sensor (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 1.0 V★  PBIB2734E
			[Engine is running] • Engine speed: 2,000rpm	0 - 1.0 V★  PBIB2735E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

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

BANK 2

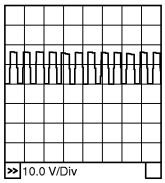
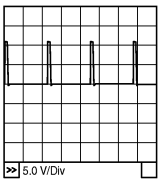
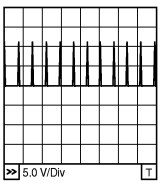
EC-IVTB2-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	G/O	Intake valve timing control solenoid valve (bank 2)	**[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★  PBIB1790E
53	LG	Intake valve timing control position sensor (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 1.0 V★  PBIB2734E
			[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0 V★  PBIB2735E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

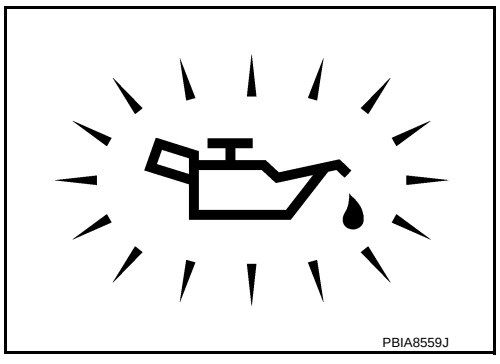
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005353959

1. CHECK OIL PRESSURE WARNING LAMP

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

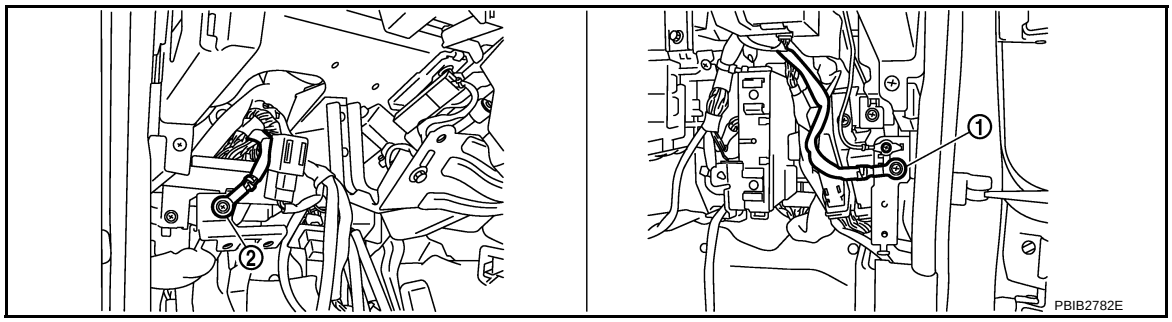

PBIA8559J

OK or NG

OK >> GO TO 2.
NG >> Go to LU-24, "Inspection".

2.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



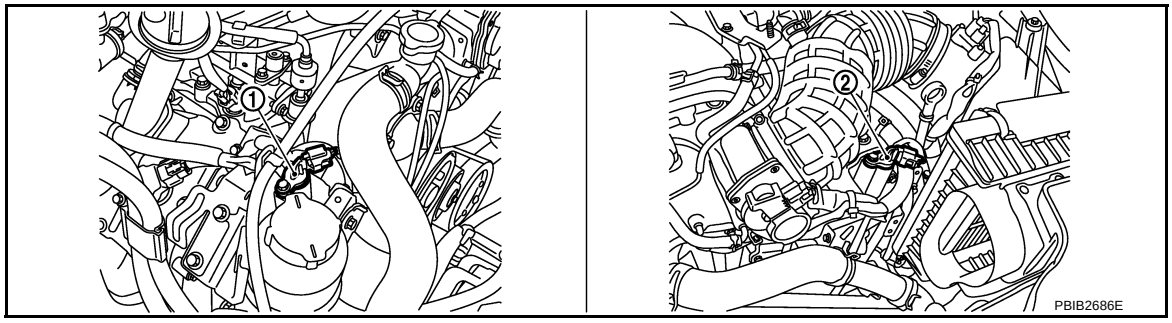
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 3.
NG >> Repair or replace ground connections.

3.CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

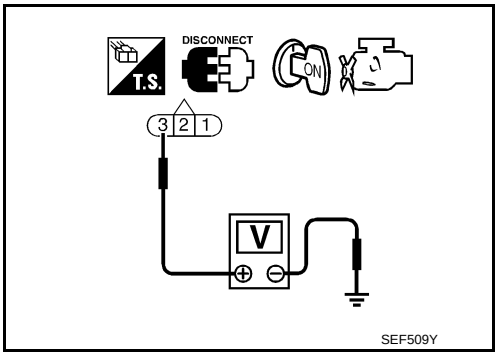
1. Disconnect intake valve timing control position sensor harness connector.



1. Intake valve timing control position sensor (bank 2)
2. Intake valve timing control position sensor (bank 1)

2. Turn ignition switch ON.
3. Check voltage between intake valve timing control position sensor terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors F102, M72
- Harness for open or short between intake valve timing control position sensor and ECM
- Harness for open or short between intake valve timing control position sensor and IPDM E/R

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

5. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between intake valve timing control position sensor terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F102, M72
- Harness for open or short between intake valve timing control position sensor and ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between the following;
   ECM terminal 72 and intake valve timing control position sensor (bank 1) terminal 2 or
   ECM terminal 53 and intake valve timing control position sensor (bank 2) terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

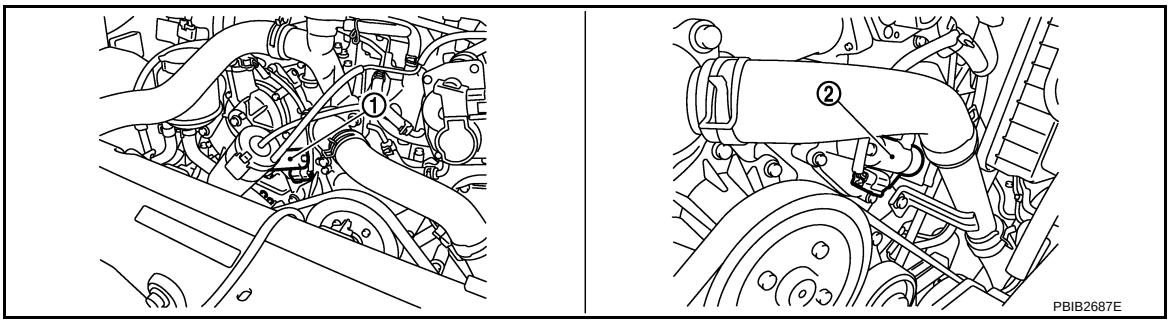
Refer to EC-843, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace intake valve timing control position sensor.

9. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

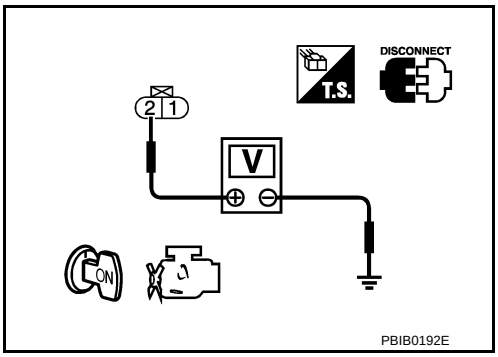
1. Reconnect ECM harness connector.
2. Disconnect intake valve timing control solenoid valve harness connector.



1. Intake valve timing control solenoid valve (bank 2)
2. Intake valve timing control solenoid valve (bank 1)

3. Turn ignition switch ON.
4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R.

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between the following;
   ECM terminal 10 and intake valve timing control solenoid valve (bank 1) terminal 1 or
   ECM terminal 11 and intake valve timing control solenoid valve (bank 2) terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-843, "Component Inspection".

OK or NG

OK >> GO TO 13.
NG >> Replace intake valve timing control solenoid valve.

13. CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1018, "Component Inspection".

OK or NG

OK >> GO TO 14.
NG >> Replace crankshaft position sensor (POS).

14. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1024, "Component Inspection".

OK or NG

OK >> GO TO 15.
NG >> Replace camshaft position sensor (PHASE).

15. CHECK CAMSHAFT SPROCKET

Check accumulation of debris to the signal pick-up portion of the camshaft sprocket. Refer to EM-211, "Removal and Installation".

OK or NG

OK >> GO TO 16.

NG >> Remove debris and clean the signal pick-up cutout of camshaft sprocket.

16. 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 or No

Yes >> Check timing chain installation. Refer to EM-200, "Removal and Installation".
No >> GO TO 17.

17. CHECK LUBRICATION CIRCUIT

Refer to “Inspection of Camshaft Sprocket (INT) Oil Groove” in EM-211, "Component".

OK or NG

OK >> GO TO 18.
NG >> Clean lubrication line.

18. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

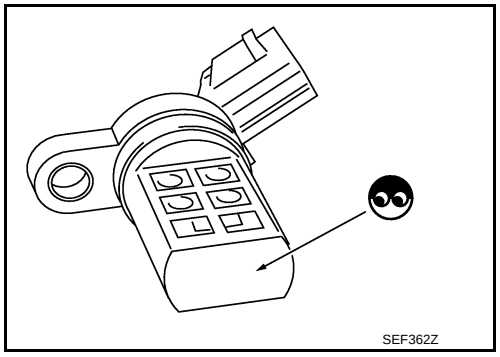
>> **INSPECTION END**

Component Inspection

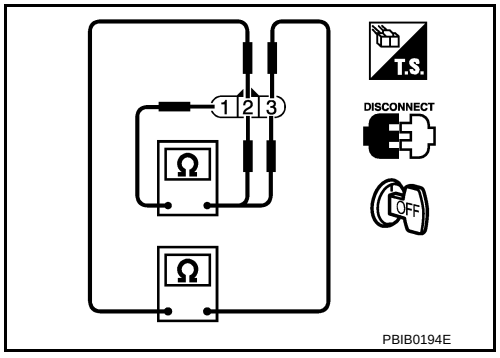
INFOID:0000000005353960

INTAKE VALVE TIMING CONTROL POSITION SENSOR

1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.
4. Visually check the sensor for chipping.


SEF362Z

5. Check resistance as per the following.



PBIB0194E

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞ Ω
2 (+) - 1 (-)	
3 (+) - 2 (-)	

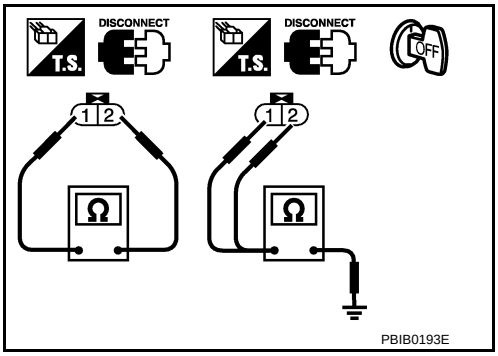
6. If NG, replace intake valve timing control position sensor.

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.

2. Check resistance between intake valve timing control solenoid valve terminals as per the following.

Terminals	Resistance [at 20°C (68°F)]
1 and 2	7.0 - 7.5 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

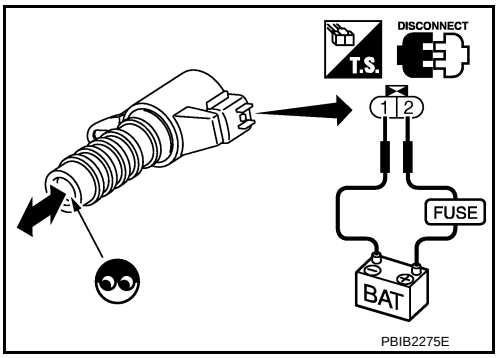


If NG, replace intake valve timing control solenoid valve.
If OK, go to next step.

3. Remove intake valve timing control solenoid valve.

4. Provide 12V DC between intake valve timing control solenoid valve terminals and then interrupt it. Check that the plunger moves as shown in the figure.

CAUTION:
Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
If NG, replace intake valve timing control solenoid valve.
NOTE:
Always replace O-ring when intake valve timing control solenoid valve is removed.



Removal and Installation

INFOID:0000000005353961

INTAKE VALVE TIMING CONTROL POSITION SENSOR
Refer to EM-199, "Component".

INTAKE VALVE TIMING CONTROL SOLENOID VALVE
Refer to EM-199, "Component".

DTC P0031, P0032, P0051, P0052 A/F SENSOR 1 HEATER

Description

INFOID:0000000005353962

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.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353963

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
A/F S1 HTR (B1) A/F S1 HTR (B2)	• Engine: After warming up, idle the engine	0 - 100%

On Board Diagnosis Logic

INFOID:0000000005353964

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0031 0031 (Bank 1) P0051 0051 (Bank 2)	Air fuel ratio (A/F) sensor 1 heater control circuit low	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is open or shorted.) • A/F sensor 1 heater
P0032 0032 (Bank 1) P0052 0052 (Bank 2)	Air fuel ratio (A/F) sensor 1 heater control circuit high	The current amperage in the A/F sensor 1 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the A/F sensor 1 heater.)	• Harness or connectors (The A/F sensor 1 heater circuit is shorted.) • A/F sensor 1 heater

DTC Confirmation Procedure

INFOID:0000000005353965

NOTE:
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 11V and 16V at idle.

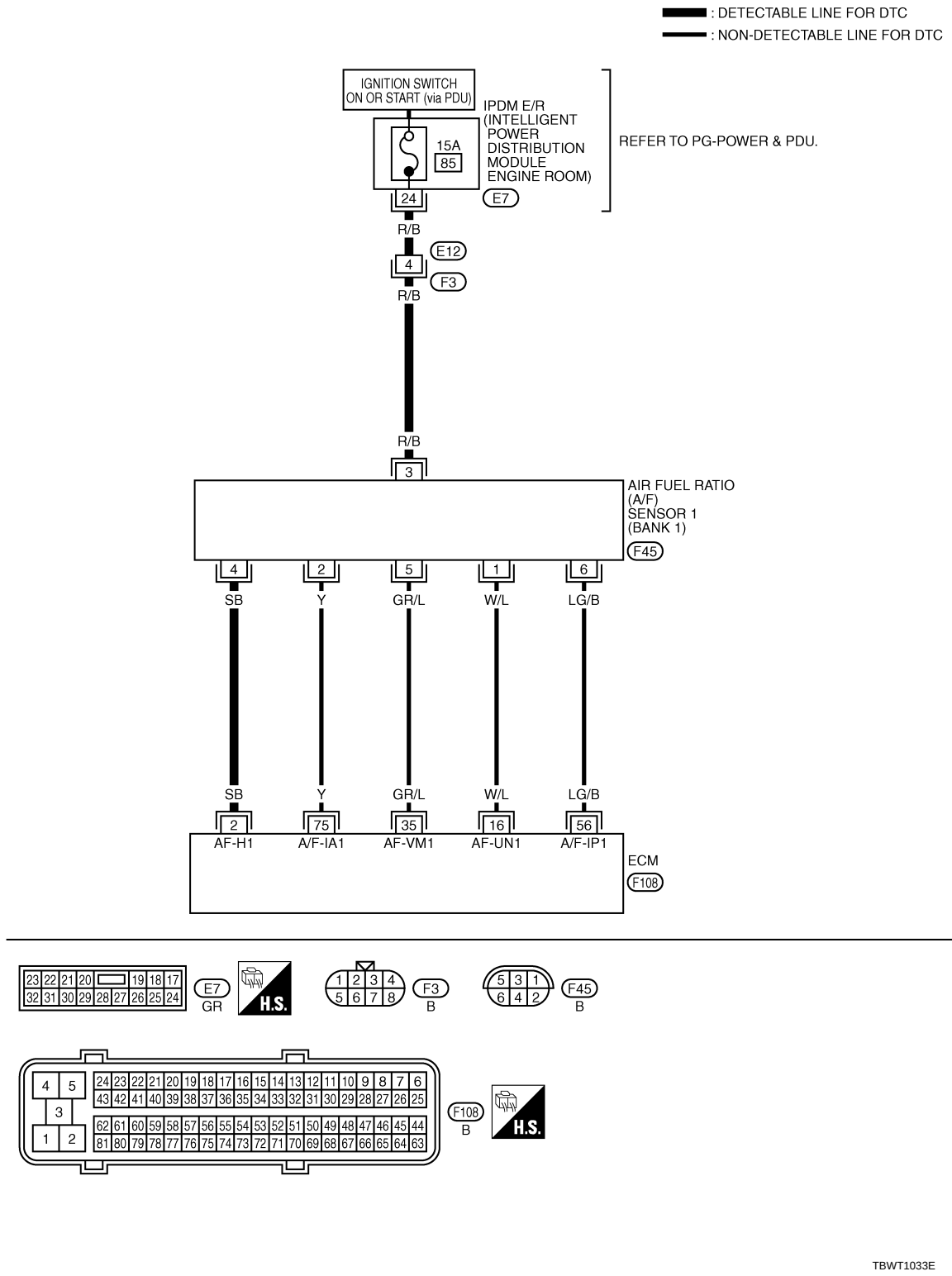
1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-849, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353966

BANK 1

EC-AF1HB1-01

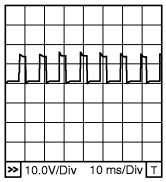


TBWT1033E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

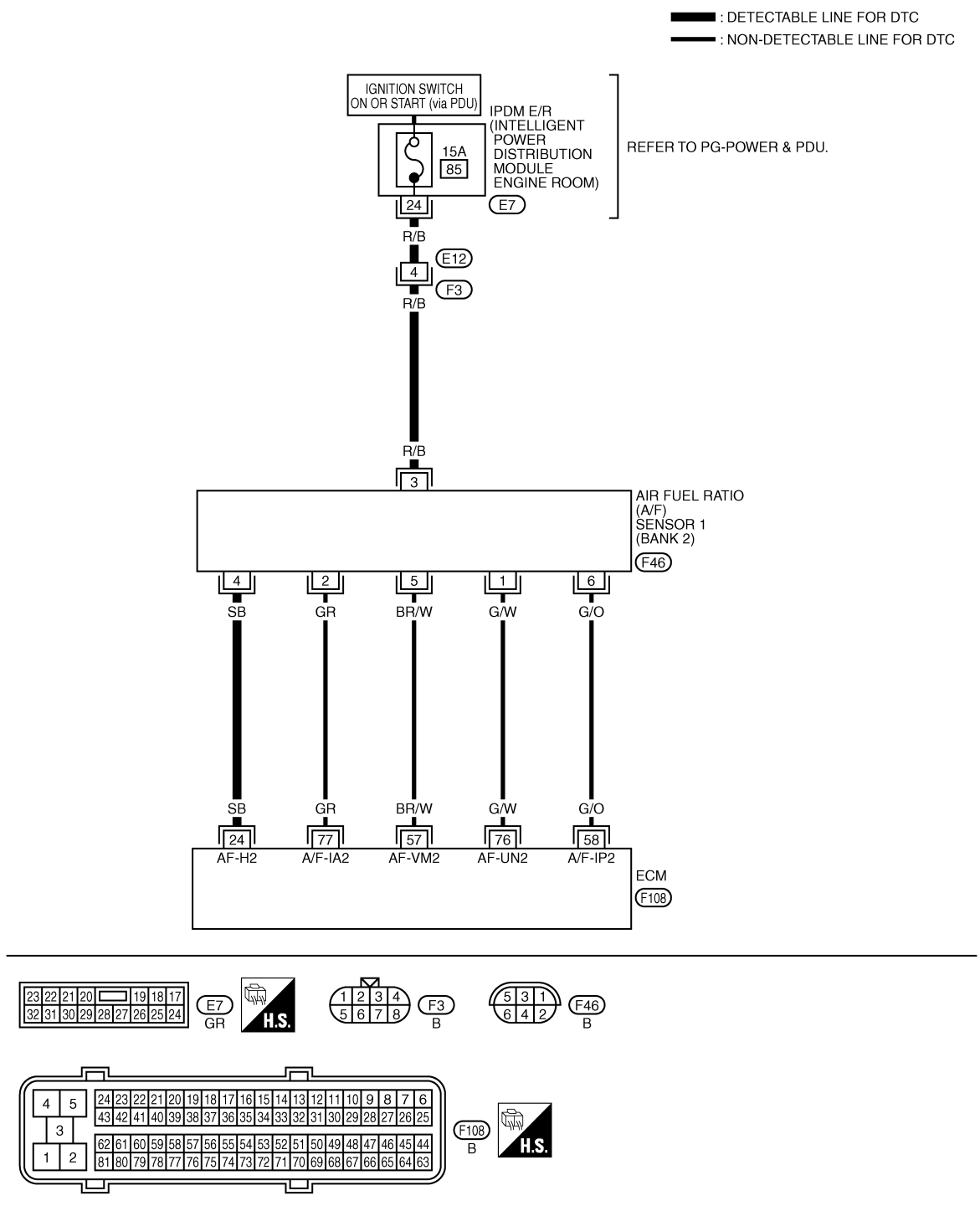
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

BANK 2

EC-AF1HB2-01

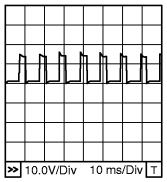


TBWT1034E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

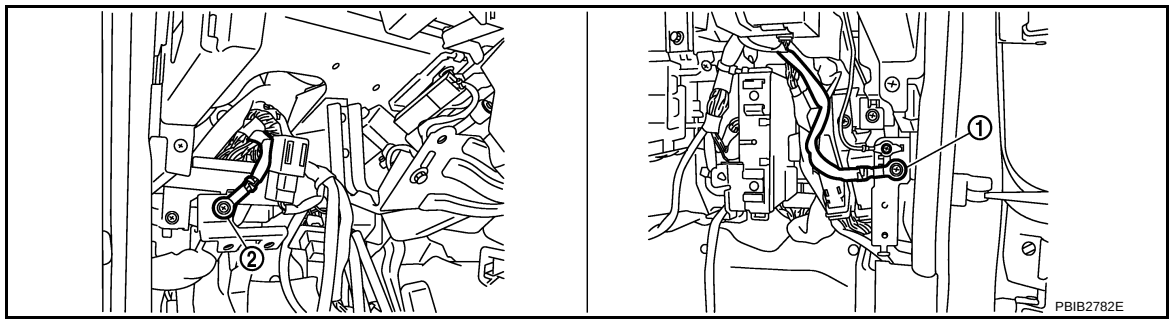
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005353967

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



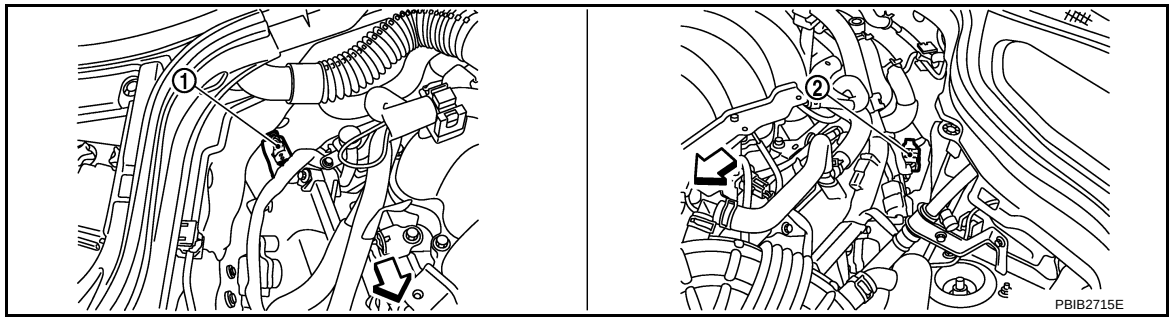
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

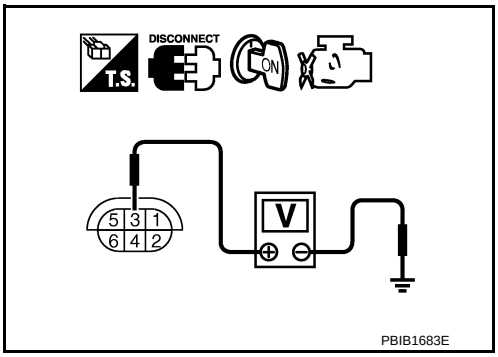
1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



⇦ : Vehicle front
1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

2. Turn ignition switch ON.
3. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse
- 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 harness continuity between the following;
   ECM terminal 2 and A/F sensor 1 (bank 1) terminal 4 or
   ECM terminal 24 and A/F sensor 1 (bank 2) terminal 4.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK A/F SENSOR 1 HEATER

Refer to EC-851, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> GO TO 7.

6. CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 7.
NG >> Repair or replace malfunctioning part.

7. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace air fuel ratio (A/F) sensor 1.

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**

Component Inspection

INFOID:0000000005353968

AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Check resistance between terminals 3 and 4.

Resistance: 2.3 - 4.3Ω [at 25°C (77°F)]

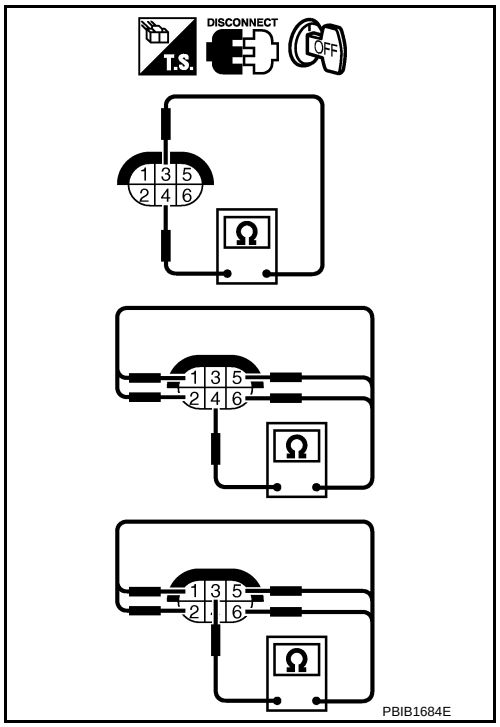
Check continuity between terminals 3 and 1, 2, 5, 6, terminals 4 and 1, 2, 5, 6.

Continuity should not exist.

If NG, replace the A/F sensor 1.

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).**



Removal and Installation

INFOID:0000000005353969

AIR FUEL RATIO (A/F) SENSOR 1

Refer to EM-178, "Component".

DTC P0037, P0038, P0057, P0058 HO2S2 HEATER

Description

INFOID:0000000005353970

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Camshaft position sensor (PHASE) Crankshaft position sensor (POS)	Engine speed	Heated oxygen sensor 2 heater control	Heated oxygen sensor 2 heater
Engine coolant temperature sensor	Engine coolant temperature		
Mass air flow sensor	Amount of intake air		

The ECM performs ON/OFF control of the heated oxygen sensor 2 heater corresponding to the engine speed, amount of intake air and engine coolant temperature.

OPERATION

Engine speed	Heated oxygen sensor 2 heater
Above 3,600 rpm	OFF
Below 3,600 rpm after the following conditions are met. • Engine: After warming up • Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	ON

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353971

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 HTR (B1) 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

On Board Diagnosis Logic

INFOID:0000000005353972

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0037 0037 (Bank 1)	Heated oxygen sensor 2 heater control circuit low	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively low voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is open or shorted.) • Heated oxygen sensor 2 heater
P0057 0057 (Bank 2)			
P0038 0038 (Bank 1)	Heated oxygen sensor 2 heater control circuit high	The current amperage in the heated oxygen sensor 2 heater circuit is out of the normal range. (An excessively high voltage signal is sent to ECM through the heated oxygen sensor 2 heater.)	• Harness or connectors (The heated oxygen sensor 2 heater circuit is shorted.) • Heated oxygen sensor 2 heater
P0058 0058 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005353973

NOTE:
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.

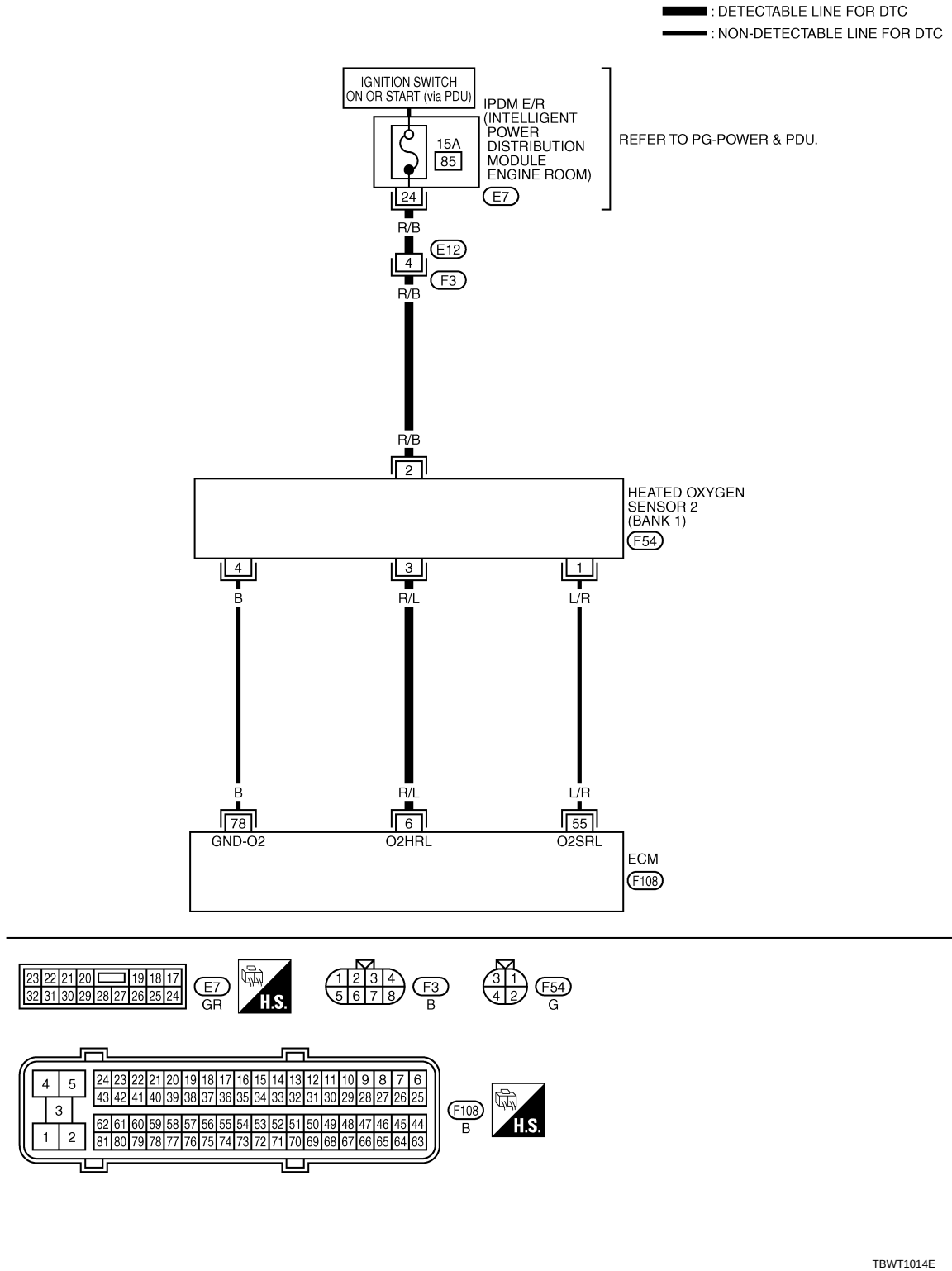
1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-857, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353974

BANK 1

EC-O2H2B1-01



TBWT1014E

Specification data are reference values and are measured between each terminal and ground.

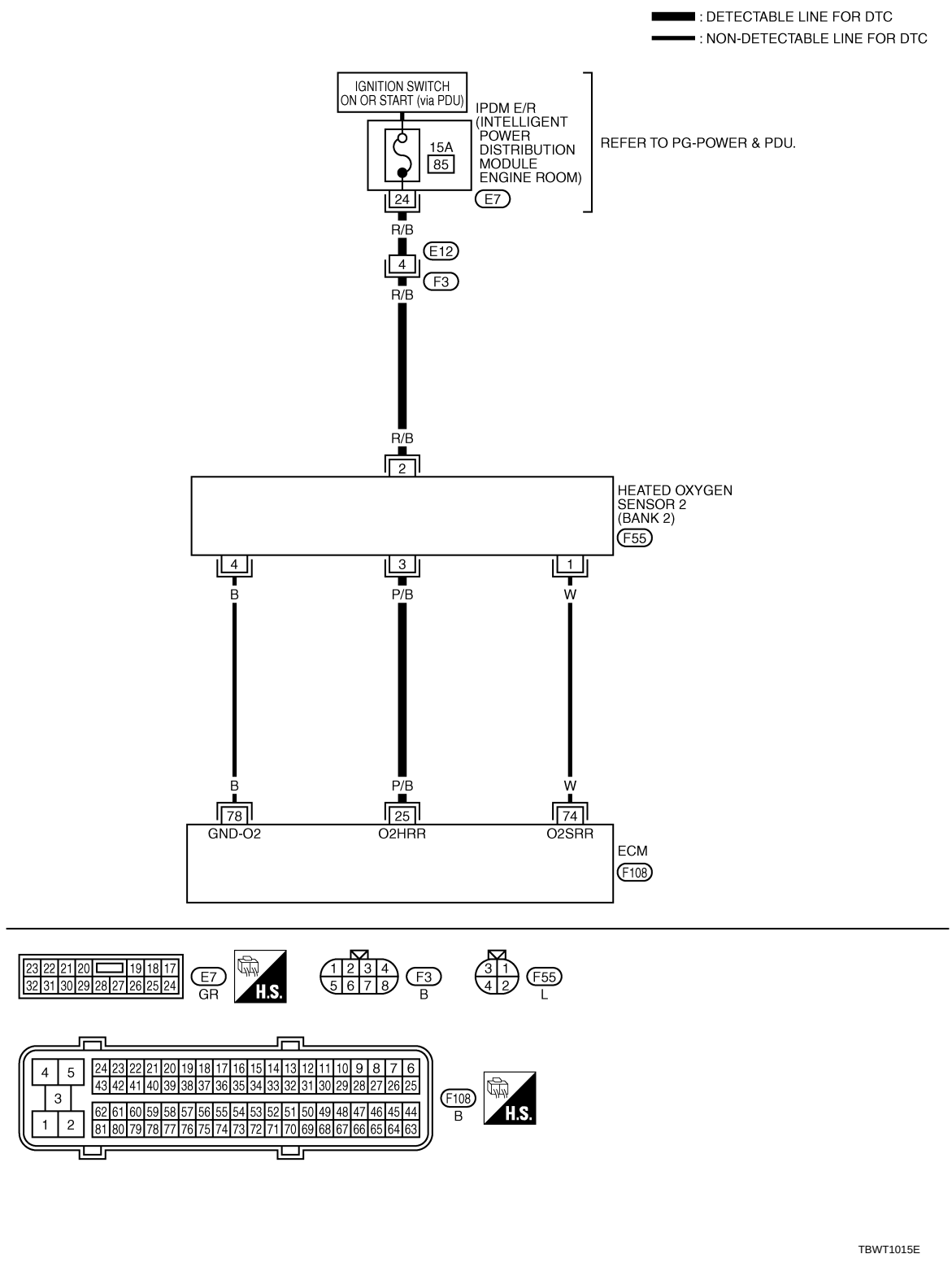
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6	R/L	Heated oxygen sensor 2 heater (bank 1)	**[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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
55	L/R	Heated oxygen sensor 2 (bank 1)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

BANK 2

EC-O2H2B2-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

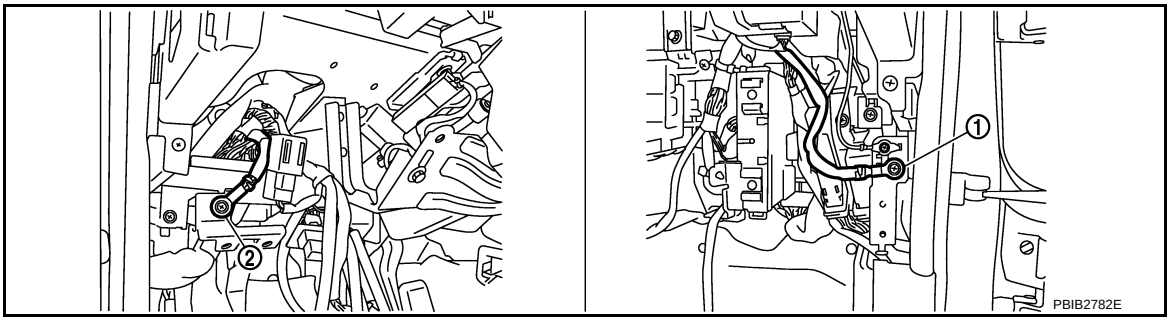
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	P/B	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
74	W	Heated oxygen sensor 2 (bank 2)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

Diagnosis Procedure

INFOID:0000000005353975

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



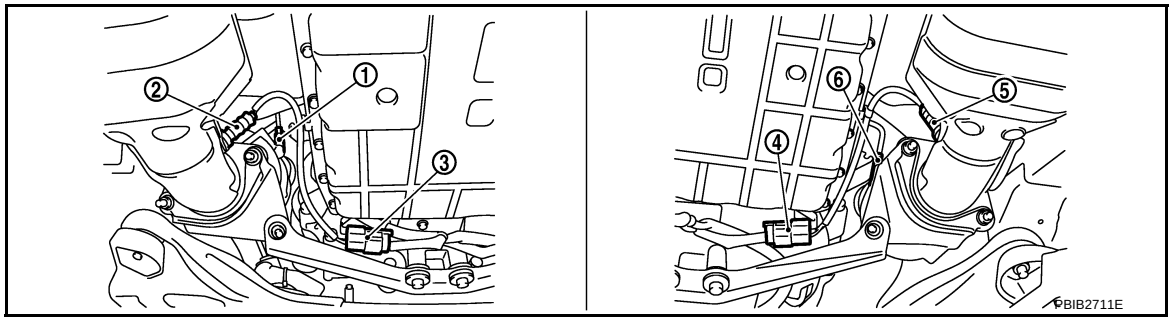
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

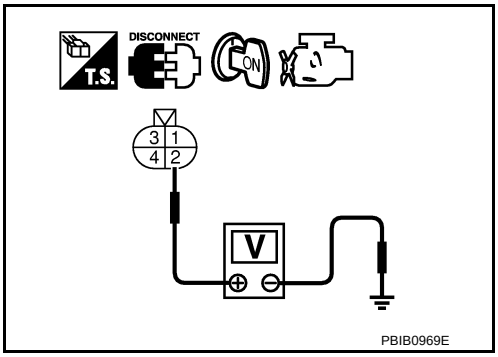
2.CHECK HEATED OXYGEN SENSOR 2 HEATER POWER SUPPLY CIRCUIT

1. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.



1. Air fuel ratio (A/F) sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. Air fuel ratio (A/F) sensor 1 (bank 2)

2. Turn ignition switch ON.
3. Check voltage between HO2S2 terminal 2 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R connector E7
- 15 A fuse
- Harness for open or short between heated oxygen sensor 2 and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 HEATER OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal and HO2S2 terminal as follows. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0037, P0038	6	3	1
P0057, P0058	25	3	2

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2 HEATER

Refer to EC-859, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

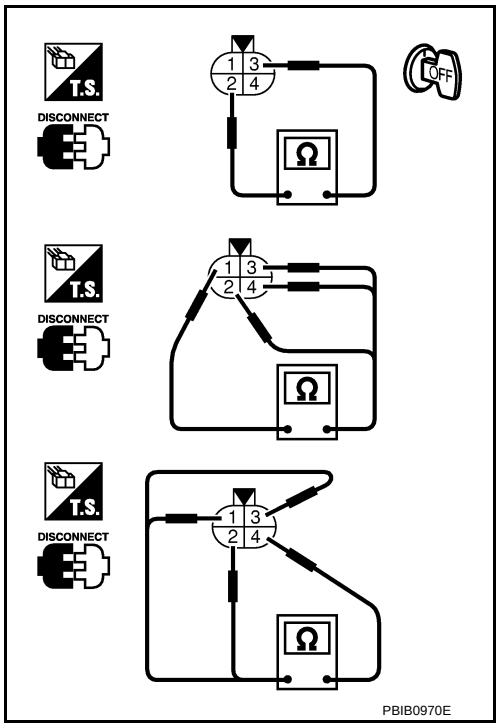
Component Inspection

INFOID:0000000005353976

HEATED OXYGEN SENSOR 2 HEATER

1. Check resistance between HO2S2 terminals as per the following.

Terminal No.	Resistance
2 and 3	5.0 - 7.0 Ω [at 25°C (77°F)]
1 and 2, 3, 4	∞ Ω (Continuity should not exist)
4 and 1, 2, 3	



2. If NG, replace heated oxygen sensor 2.

CAUTION:

- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new heated oxygen 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).**

Removal and Installation

INFOID:0000000005353977

HEATED OXYGEN SENSOR 2

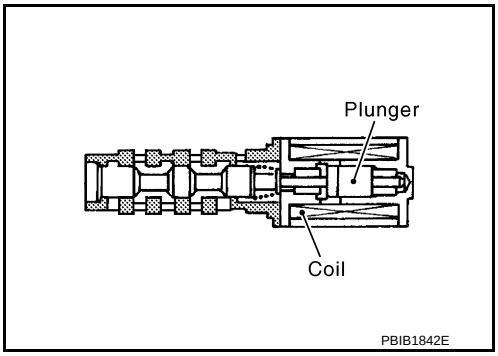
Refer to EM-178, "Component".

DTC P0075, P0081 IVT CONTROL SOLENOID VALVE

Component Description

INFOID:0000000005353978

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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353979

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V SOL (B1) INT/V SOL (B2)	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	0 - 2%
		2,000 rpm	Approx. 25 - 50%

On Board Diagnosis Logic

INFOID:0000000005353980

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0075 0075 (Bank 1)	Intake valve timing control solenoid valve circuit	An improper voltage is sent to the ECM through intake valve timing control solenoid valve.	• Harness or connectors (Intake valve timing control solenoid valve circuit is open or shorted.) • Intake valve timing control solenoid valve
P0081 0081 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005353981

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

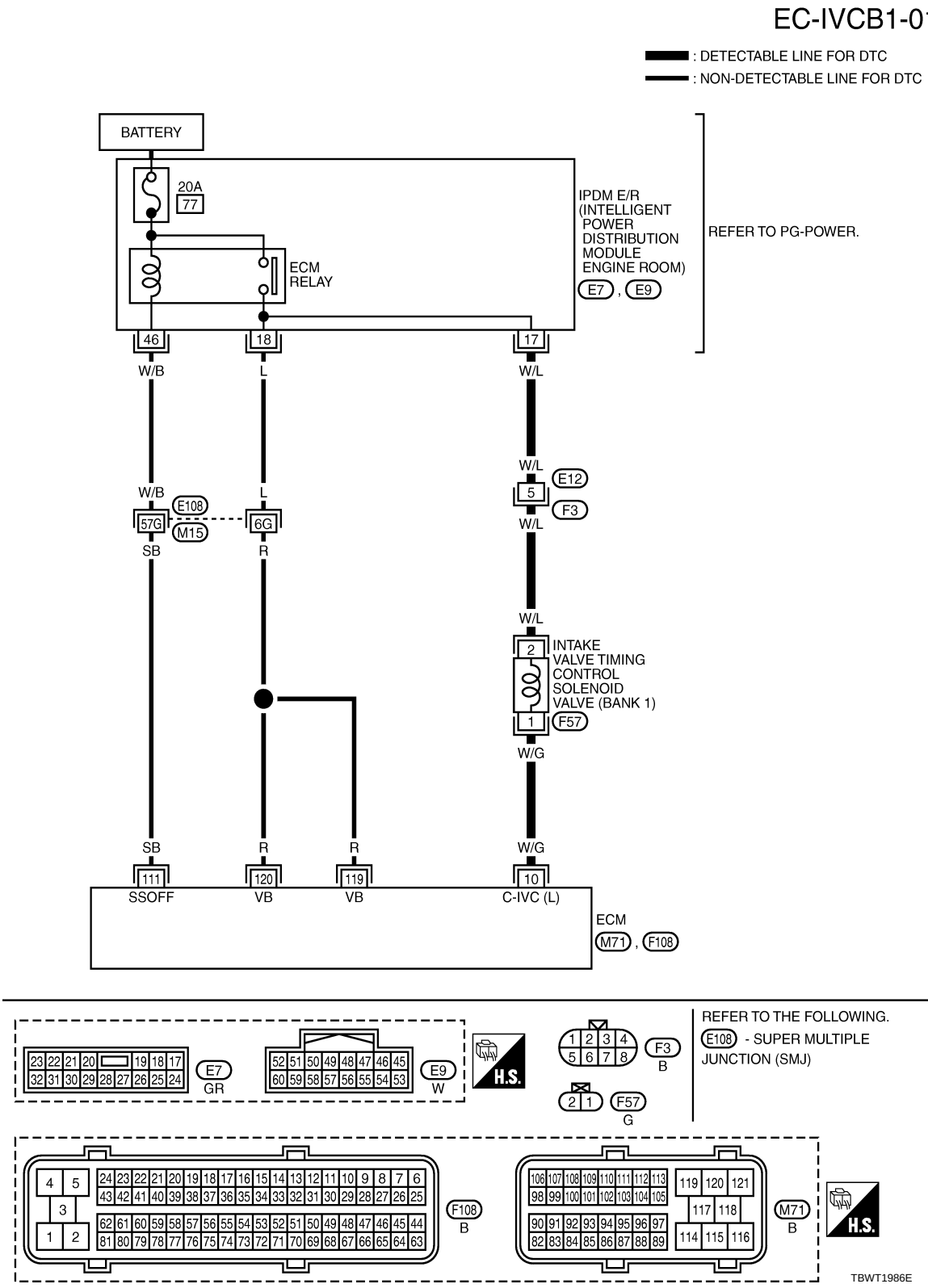
2. Start engine and let it idle for 5 seconds.
3. Check 1st rip DTC.
4. If 1st trip DTC is detected, go to EC-864, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353982

BANK 1

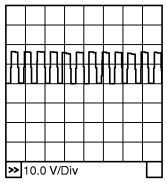
EC-IVCB1-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

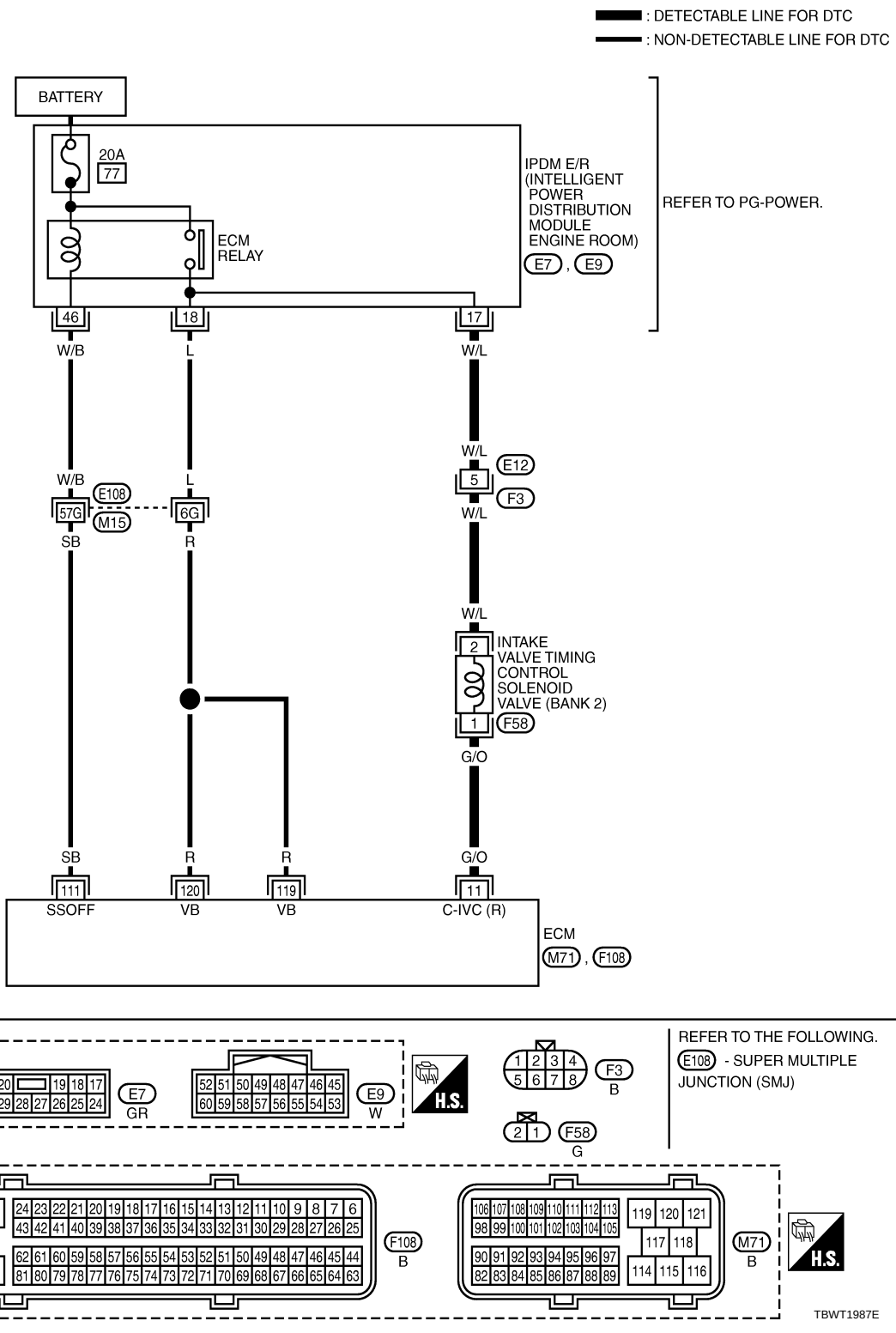
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
10	W/G	Intake valve timing control solenoid valve (bank 1)	**[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★  PBIB1790E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

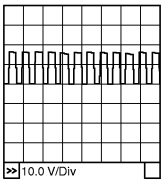
EC-IVCB2-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
11	G/O	Intake valve timing control solenoid valve (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	BATTERY VOLTAGE (11 - 14V)
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000rpm	7 - 12 V★  PBIB1790E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

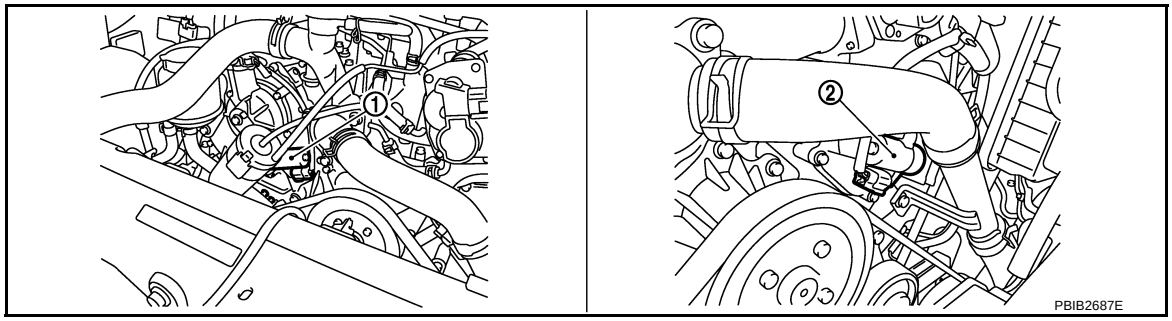
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005353983

1. CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect intake valve timing control solenoid valve harness connector.

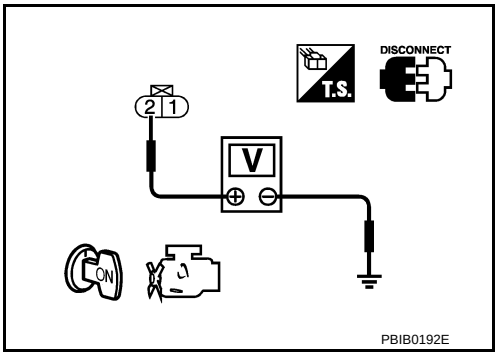


PBIB2687E

1. Intake valve timing control solenoid valve (bank 2)
2. Intake valve timing control solenoid valve (bank 1)

3. Turn ignition switch ON.
4. Check voltage between intake valve timing control solenoid valve terminal 2 and ground with CONSULT-III or tester.

Voltage: Battery voltage



PBIB0192E

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- Harness for open or short between intake valve timing control solenoid valve and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following;
   ECM terminal 10 and intake valve timing control solenoid valve (bank 1) terminal 1 or
   ECM terminal 11 and intake valve timing control solenoid valve (bank 2) terminal 1.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK INTAKE VALVE TIMING CONTROL SOLENOID VALVE

Refer to EC-865, "Component Inspection".

OK or NG

OK >> GO TO 5.
NG >> Replace intake valve timing control solenoid valve.

5.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

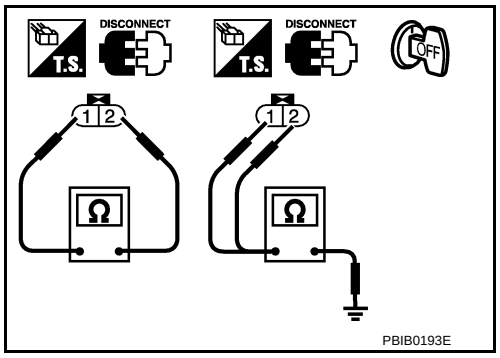
>> **INSPECTION END**

Component Inspection

INFOID:0000000005353984

INTAKE VALVE TIMING CONTROL SOLENOID VALVE

1. Disconnect intake valve timing control solenoid valve harness connector.
2. Check resistance between intake valve timing control solenoid valve terminals as per the following.

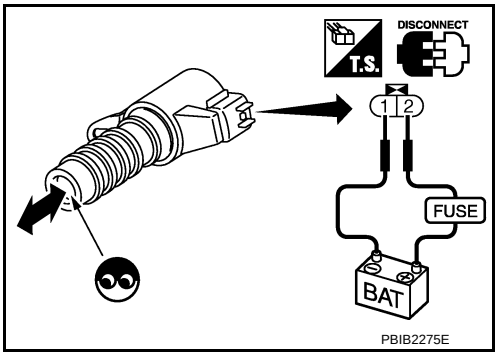


Terminals	Resistance [at 20°C (68°F)]
1 and 2	7.0 - 7.5 Ω
1 or 2 and ground	∞ Ω (Continuity should not exist)

If NG, replace intake valve timing control solenoid valve.
If OK, go to next step.

3. Remove intake valve timing control solenoid valve.

4. Provide 12 V DC between intake valve timing control solenoid valve terminals and then interrupt it. Check that the plunger moves as shown in the figure.
   CAUTION:
   Never apply 12 V DC continuously for 5 seconds or more. Doing so may result in damage to the coil in intake valve timing control solenoid valve.
   If NG, replace intake valve timing control solenoid valve.
   NOTE:
   Always replace O-ring when intake valve timing control solenoid valve is removed.



Removal and Installation

INFOID:0000000005353985

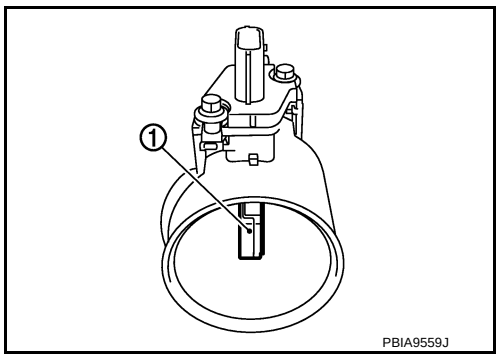
INTAKE VALVE TIMING CONTROL SOLENOID VALVE
Refer to EM-199, "Component".

DTC P0101 MAF SENSOR

Component Description

INFOID:0000000005353986

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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353987

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	See EC-814, "Inspection Procedure".		
CAL/LD VALUE	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	14 - 33%
		2,500 rpm	12 - 25%
MASS AIRFLOW	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s

On Board Diagnosis Logic

INFOID:0000000005353988

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0101 0101	Mass air flow sensor circuit range/performance	A	A high voltage from the sensor is sent to ECM under light load driving condition.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor • EVAP control system pressure sensor • Intake air temperature sensor
		B	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.) • Intake air leakage • Mass air flow sensor • EVAP control system pressure sensor • Intake air temperature sensor

DTC Confirmation Procedure

INFOID:0000000005353989

Perform PROCEDURE FOR MALFUNCTION A first.
If DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.
NOTE:
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.

PROCEDURE FOR MALFUNCTION A

NOTE:

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.

1. Start engine and warm it up to normal operating temperature.
2. Run engine for at least 10 seconds at idle speed.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-870, "Diagnosis Procedure".

PROCEDURE FOR MALFUNCTION B

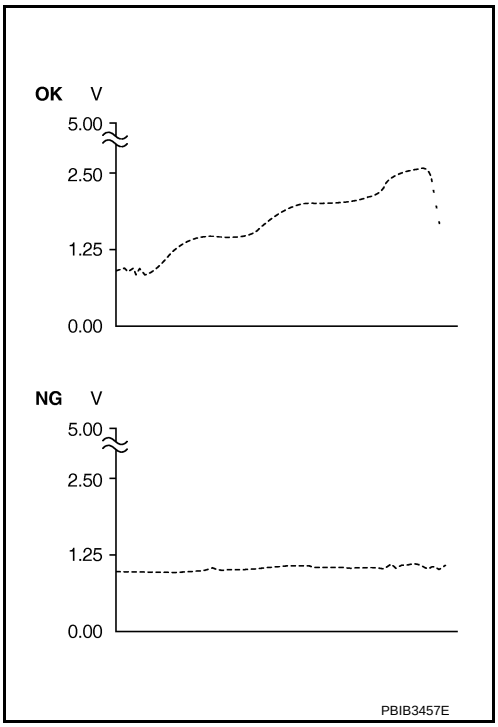
CAUTION:
Always drive vehicle at a safe speed.

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
   If engine cannot be started, go to EC-870, "Diagnosis Procedure".
2. Check the voltage of “MAS A/F SE-B1” in “DATA MONITOR” mode with CONSULT-III.
3. Increases engine speed to approximately 4,000 rpm.
4. Monitor the linear voltage rise in response to engine speed increases.
   If NG, go to EC-870, "Diagnosis Procedure".
   If OK, go to the following step.
5. Maintain the following conditions for at least 10 consecutive seconds.

ENG SPEED	More than 2,000 rpm
TP SEN 1-B1	More than 1.5V
TP SEN 2-B1	More than 1.5V
Selector lever	Suitable position
Driving location	Driving vehicle uphill (Increased engine load) will help maintain the driving conditions required for this test.

6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to EC-870, "Diagnosis Procedure".



Overall Function Check

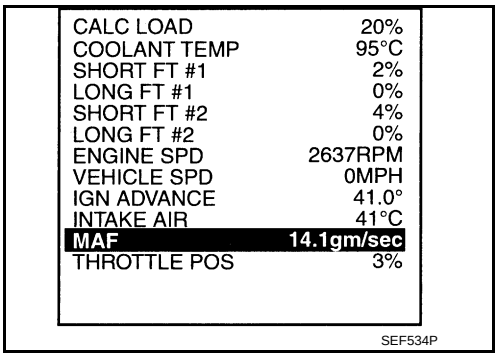
INFOID:0000000005353990

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the mass air flow sensor circuit. During this check, a 1st trip DTC might not be confirmed.

With GST

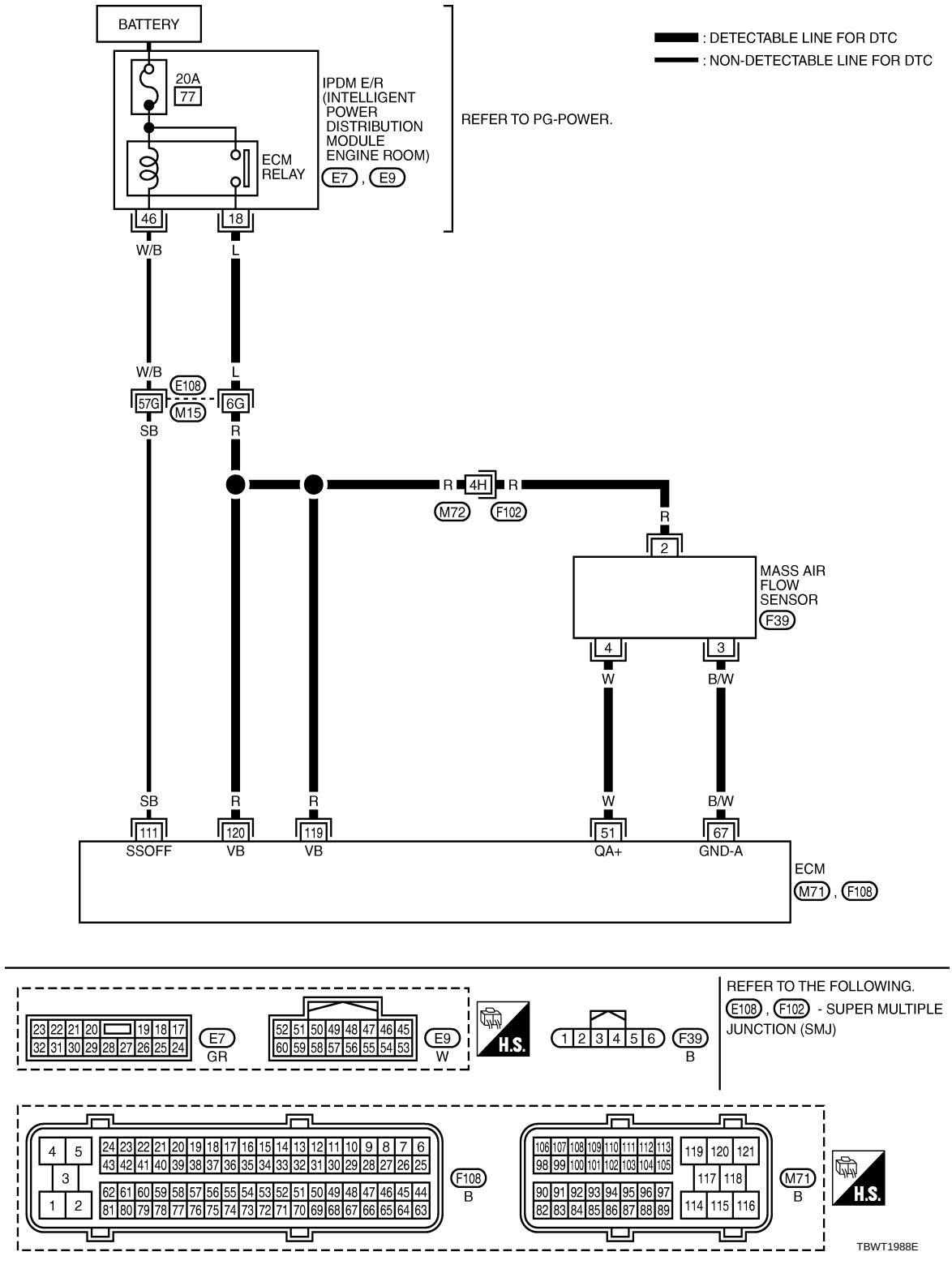
1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Check the mass air flow sensor signal with Service $01.
4. Check for linear mass air flow sensor signal value rise in response to increases to approximately 4,000 rpm in engine speed.
5. If NG, go to EC-870, "Diagnosis Procedure".



Wiring Diagram

INFOID:0000000005353991

EC-MAFS-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
51	W	Mass air flow sensor	**[Engine is running]** • **Warm-up condition** • Idle speed	1.0 - 1.3 V
			[Engine is running] • **Warm-up condition** • Engine speed: 2,500 rpm	1.6 - 2.0 V
67	B/W	Sensor ground (MAF sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005353992

1.INSPECTION START

Which malfunction (A or B) is duplicated?

A or B

A >> GO TO 3.
B >> GO TO 2.

2.CHECK INTAKE SYSTEM

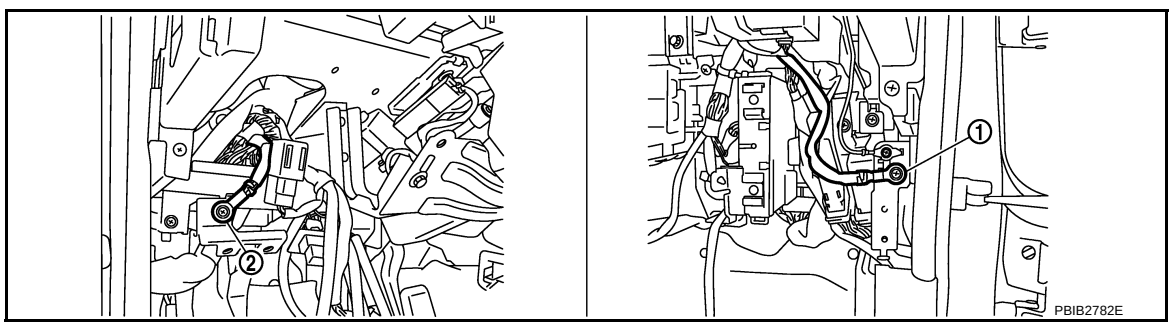
Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



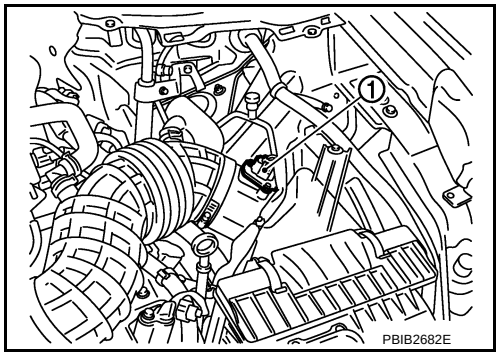
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 4.
NG >> Repair or replace ground connections.

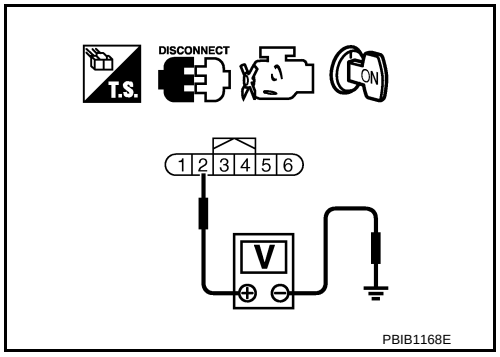
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between MAF sensor terminal 2 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors M72, F102
- 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 or 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 harness continuity between MAF sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 4 and ECM terminal 51. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-884, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace intake air temperature sensor.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK MASS AIR FLOW SENSOR

Refer to EC-872, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> Replace mass air flow sensor.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005353993

MASS AIR FLOW SENSOR

With CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT-III and select “DATA MONITOR” mode.
4. Select “MAS A/F SE-B1” and check indication under the following conditions.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

5. If the voltage is out of specification, proceed the following.

a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
- Crushed air ducts
- Malfunctioning seal of air cleaner element
- Uneven dirt of air cleaner element
- Improper specification of intake air system parts

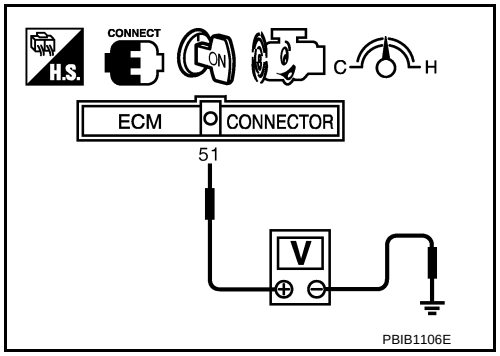
b. If NG, repair or replace malfunctioning part and perform steps 2 to 4 again.
If OK, go to next step.

6. Turn ignition switch OFF.
7. Disconnect mass air flow sensor harness connector and reconnect it again.
8. Perform steps 2 to 4 again.

9. If NG, clean or replace mass air flow sensor.

Without CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
   - Crushed air ducts
   - Malfunctioning seal of air cleaner element
   - Uneven dirt of air cleaner element
   - Improper specification of intake air system parts

b. If NG, repair or replace malfunctioning part and perform steps 2 and 3 again.
   If OK, go to next step.

5. Turn ignition switch OFF.
6. Disconnect mass air flow sensor harness connector and reconnect it again.
7. Perform steps 2 and 3 again.
8. If NG, clean or replace mass air flow sensor.

Removal and Installation

INFOID:0000000005353994

MASS AIR FLOW SENSOR

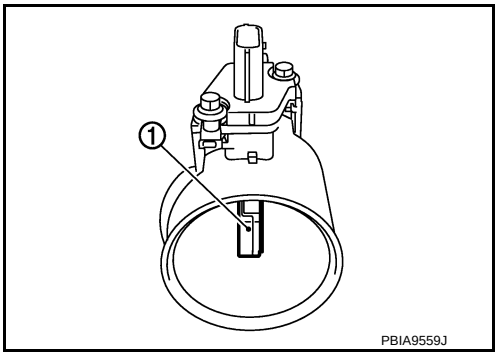
Refer to EM-172, "Component".

DTC P0102, P0103 MAF SENSOR

Component Description

INFOID:0000000005353995

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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005353996

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
MAS A/F SE-B1	See EC-814, "Inspection Procedure".		
CAL/LD VALUE	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	14 - 33%
		2,500 rpm	12 - 25%
MASS AIRFLOW	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 6.0 g·m/s
		2,500 rpm	7.0 - 20.0 g·m/s

On Board Diagnosis Logic

INFOID:0000000005353997

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0102 0102	Mass air flow sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Intake air leakage • Mass air flow sensor
P0103 0103	Mass air flow sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Mass air flow sensor

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode
Mass air flow sensor circuit	Engine speed will not rise more than 2,400 rpm due to the fuel cut.

DTC Confirmation Procedure

INFOID:0000000005353998

NOTE:
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.

PROCEDURE FOR DTC P0102

1. Start engine and wait at least 5 seconds.
2. Check DTC.
3. If DTC is detected, go to EC-877, "Diagnosis Procedure".

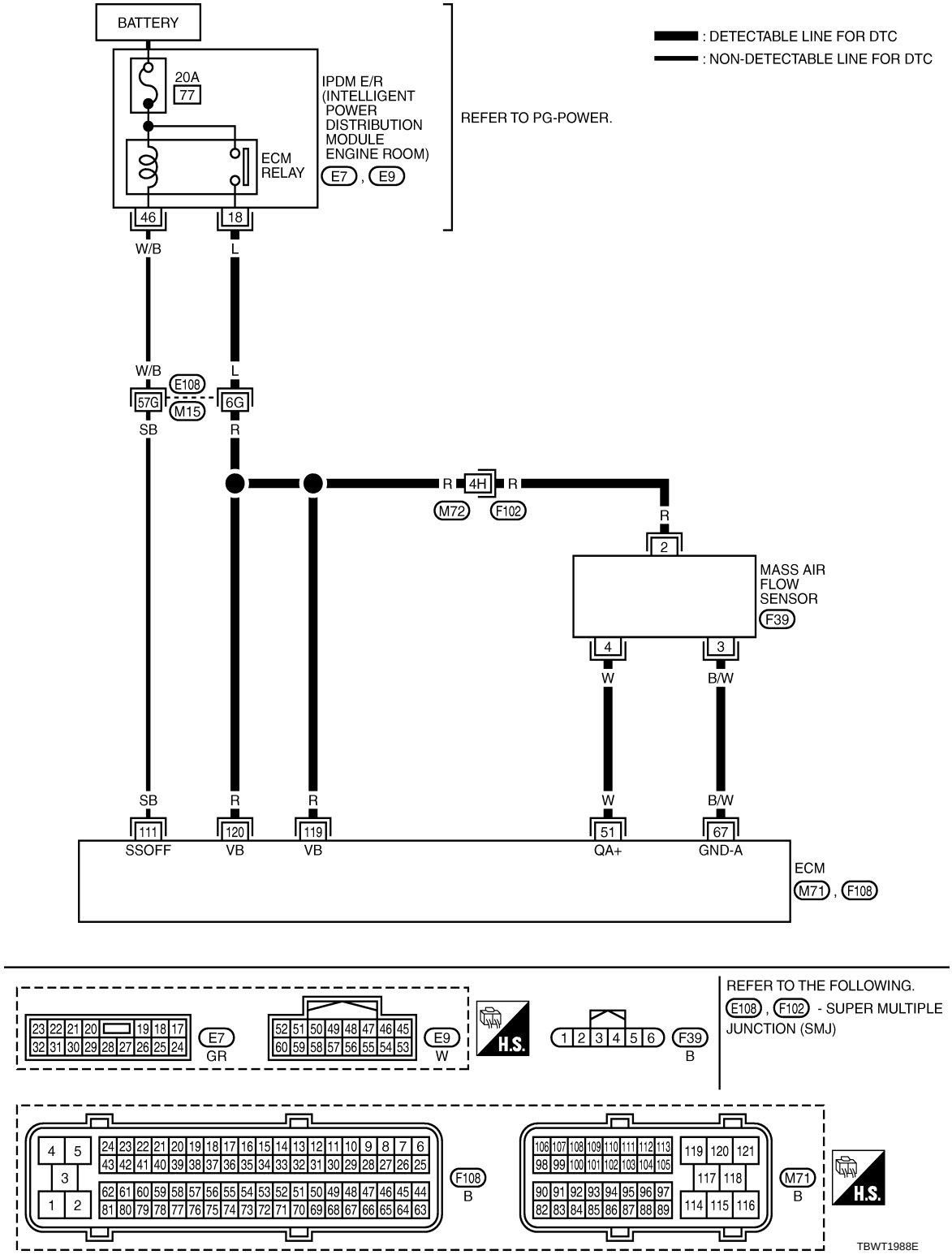
PROCEDURE FOR DTC P0103

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check DTC.
3. If DTC is detected, go to EC-877, "Diagnosis Procedure".
   If DTC is not detected, go to next step.
4. Start engine and wait at least 5 seconds.
5. Check DTC.
6. If DTC is detected, go to EC-877, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005353999

EC-MAFS-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
51	W	Mass air flow sensor	**[Engine is running]** • **Warm-up condition** • Idle speed	1.0 - 1.3 V
			[Engine is running] • **Warm-up condition** • Engine speed: 2,500 rpm	1.6 - 2.0 V
67	B/W	Sensor ground (MAF sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354000

1.INSPECTION START

Which malfunction (P0102 or P0103) is duplicated?

P0102 or P0103

P0102 >> GO TO 2.
P0103 >> GO TO 3.

2.CHECK INTAKE SYSTEM

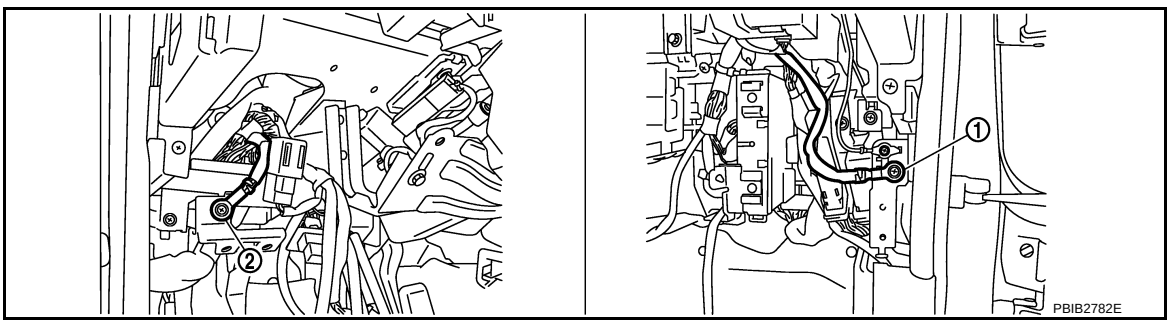
Check the following for connection.
- Air duct
- Vacuum hoses
- Intake air passage between air duct and intake manifold

OK or NG

OK >> GO TO 3.
NG >> Reconnect the parts.

3.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



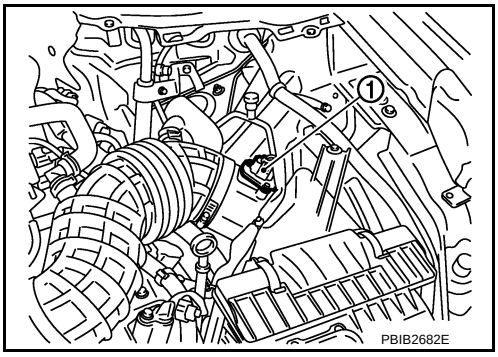
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 4.
NG >> Repair or replace ground connections.

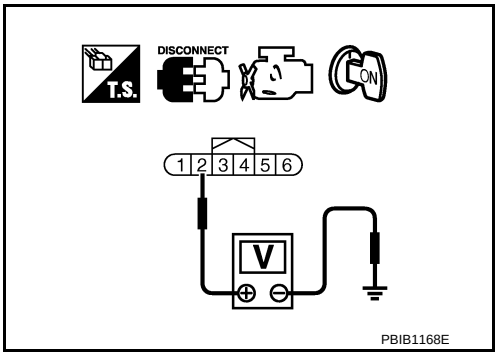
4. CHECK MAF SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow (MAF) sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between MAF sensor terminal 2 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors M72, F102
- 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 or 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 harness continuity between MAF sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK MAF SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between MAF sensor terminal 4 and ECM terminal 51. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK MASS AIR FLOW SENSOR

Refer to EC-879, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace mass air flow sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354001

MASS AIR FLOW SENSOR

With CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.
3. Connect CONSULT-III and select “DATA MONITOR” mode.
4. Select “MAS A/F SE-B1” and check indication under the following conditions.

Condition	MAS A/F SE-B1 (V)
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

5. If the voltage is out of specification, proceed the following.

a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
   - Crushed air ducts
   - Malfunctioning seal of air cleaner element
   - Uneven dirt of air cleaner element
   - Improper specification of intake air system parts

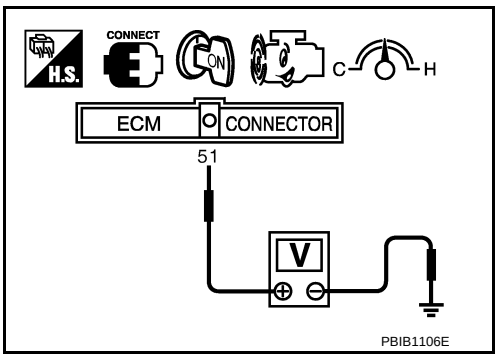
b. If NG, repair or replace malfunctioning part and perform steps 2 to 4 again.
   If OK, go to next step.

6. Turn ignition switch OFF.
7. Disconnect mass air flow sensor harness connector and reconnect it again.
8. Perform steps 2 to 4 again.
9. If NG, clean or replace mass air flow sensor.

Without CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine and warm it up to normal operating temperature.

3. Check voltage between ECM terminal 51 (Mass air flow sensor signal) and ground.



Condition	Voltage V
Ignition switch ON (Engine stopped.)	Approx. 0.4
Idle (Engine is warmed-up to normal operating temperature.)	1.0 - 1.3
2,500 rpm (Engine is warmed-up to normal operating temperature.)	1.6 - 2.0
Idle to about 4,000 rpm	1.0 - 1.3 to Approx. 2.4*

*: Check for linear voltage rise in response to engine being increased to approximately 4,000 rpm.

4. If the voltage is out of specification, proceed the following.

a. Check for the cause of uneven air flow through mass air flow sensor. Refer to the following.
   - Crushed air ducts
   - Malfunctioning seal of air cleaner element
   - Uneven dirt of air cleaner element
   - Improper specification of intake air system parts

b. If NG, repair or replace malfunctioning part and perform steps 2 and 3 again.
   If OK, go to next step.

5. Turn ignition switch OFF.
6. Disconnect mass air flow sensor harness connector and reconnect it again.
7. Perform steps 2 and 3 again.
8. If NG, clean or replace mass air flow sensor.

Removal and Installation

INFOID:0000000005354002

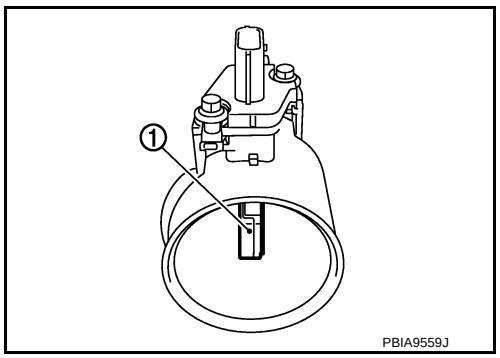
MASS AIR FLOW SENSOR
Refer to EM-172, "Component".

DTC P0112, P0113 IAT SENSOR

Component Description

INFOID:0000000005354003

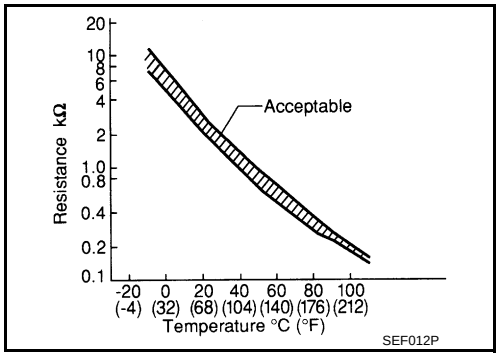
The intake air temperature sensor is built-into the mass air flow sensor (1). The sensor detects intake air temperature and transmits a signal to the ECM.
The temperature sensing unit uses a thermistor which is sensitive to the change in temperature. Electrical resistance of the thermistor decreases 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

*: This data is reference value and is measured between ECM terminal 34 (Intake air temperature sensor) and ground.



CAUTION:
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:0000000005354004

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0112 0112	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 0113	Intake air temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:0000000005354005

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

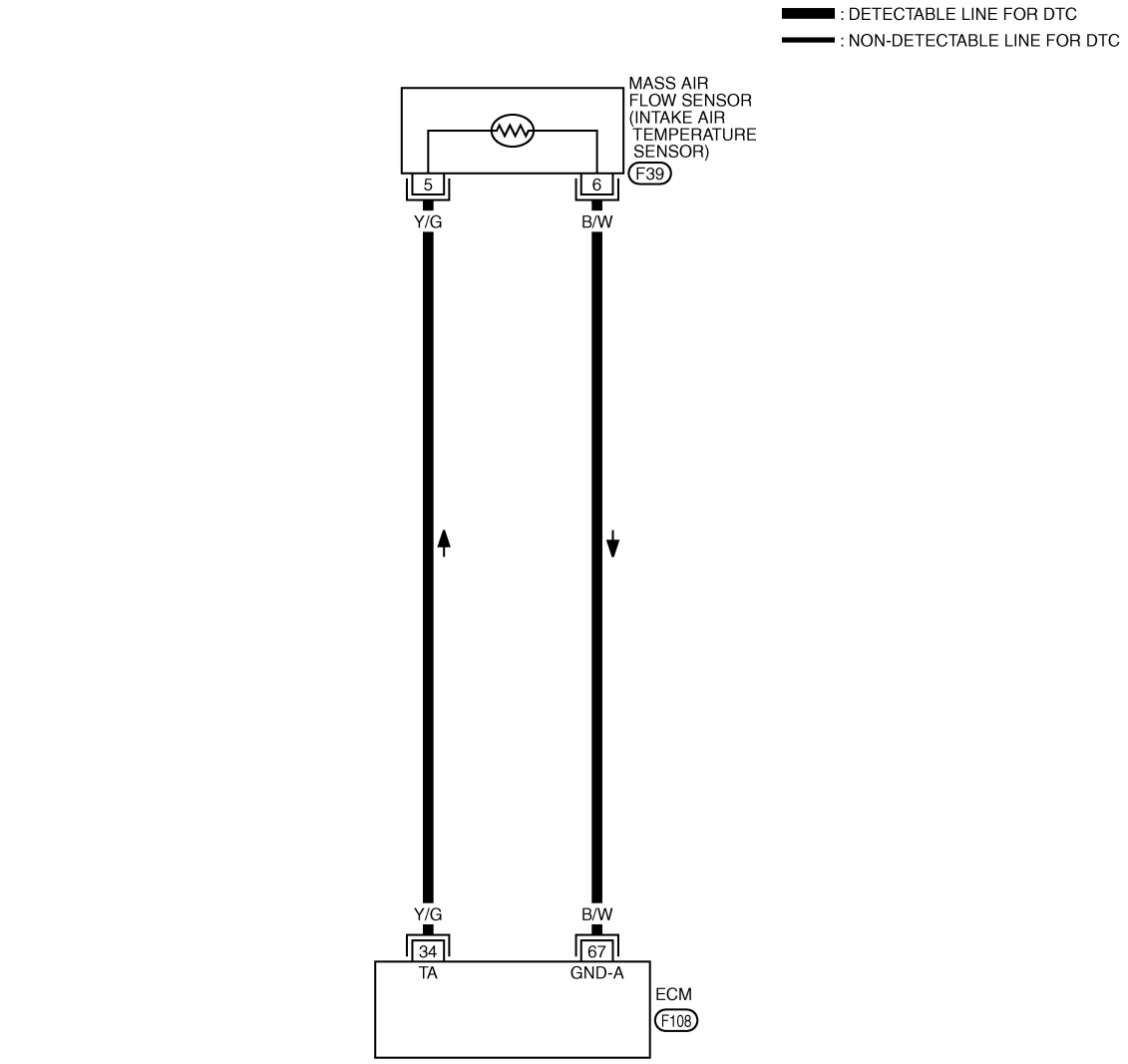
a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

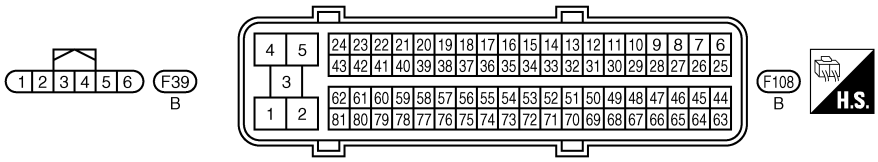
2. Turn ignition switch ON and wait at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-882, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354006

EC-IATS-01





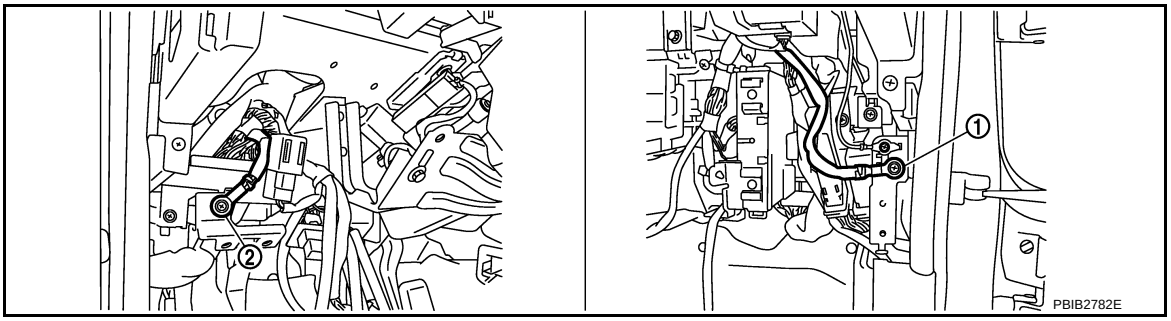
TBWT1017E

Diagnosis Procedure

INFOID:0000000005354007

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



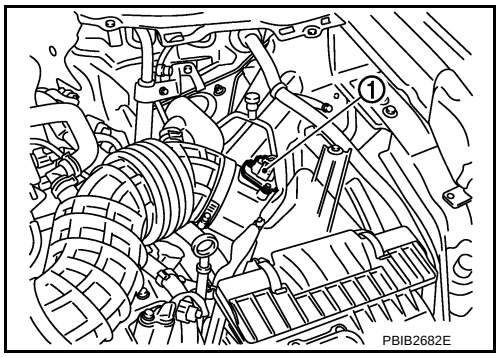
1. Body ground M70 2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

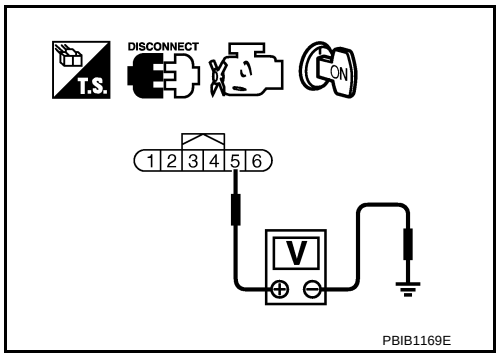
2.CHECK INTAKE AIR TEMPERATURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect mass air flow sensor (intake air temperature sensor is built-into) (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between mass air flow sensor terminal 5 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3.CHECK INTAKE AIR TEMPERATURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between mass air flow sensor terminal 6 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-884, "Component Inspection".

OK or NG

OK >> GO TO 5.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

5. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

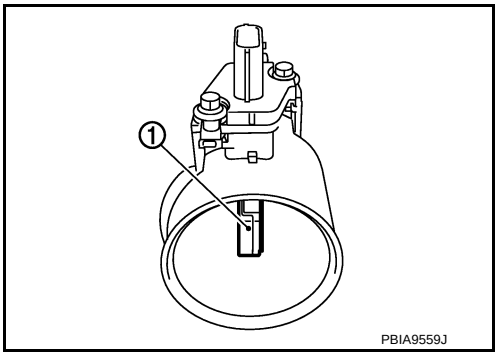
INFOID:0000000005354008

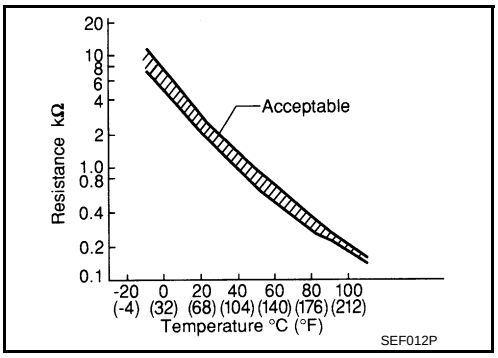
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor (1) terminals 5 and 6 under the following conditions.

Intake air temperature [°C (°F)]	Resistance (kΩ)
25 (77)	1.800 - 2.200

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

INFOID:0000000005354009

MASS AIR FLOW SENSOR

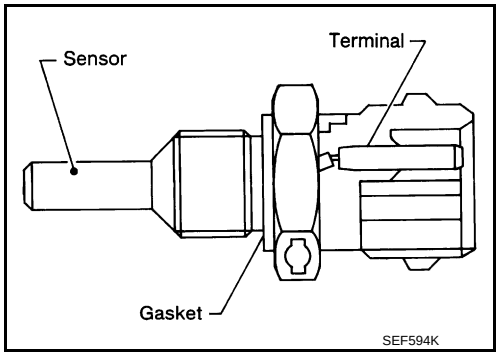
Refer to EM-172, "Component".

DTC P0116 ECT SENSOR

Component Description

INFOID:0000000005354010

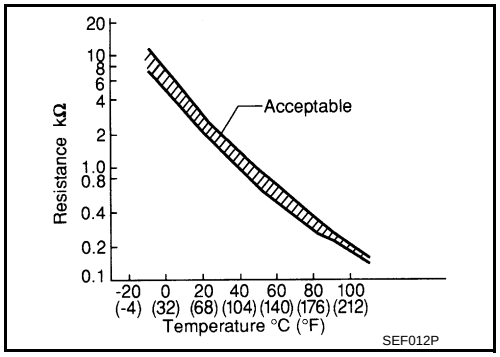
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:0000000005354011

NOTE:
If DTC P0116 is displayed with P0117 or P0118, first perform the trouble diagnosis for DTC P0117, P0118. Refer to EC-889, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0116 0116	Engine coolant temperature sensor circuit range/ performance	Engine coolant temperature signal from engine coolant temperature sensor does not fluctuate, even when some time has passed after starting the engine with pre-warming up condition.	• Harness or connectors (High or low resistance in the circuit) • Engine coolant temperature sensor

DTC Confirmation Procedure

INFOID:0000000005354012

NOTE:
If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next step.
1. Turn ignition 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.

1. Start engine and warm it up to normal operating temperature.
2. Rev engine up to 2,000 rpm for more than10 minutes.
3. Move the vehicle to a cool place, then stop engine.
4. Check resistance between “fuel level sensor and fuel pump” terminals 4 and 5.

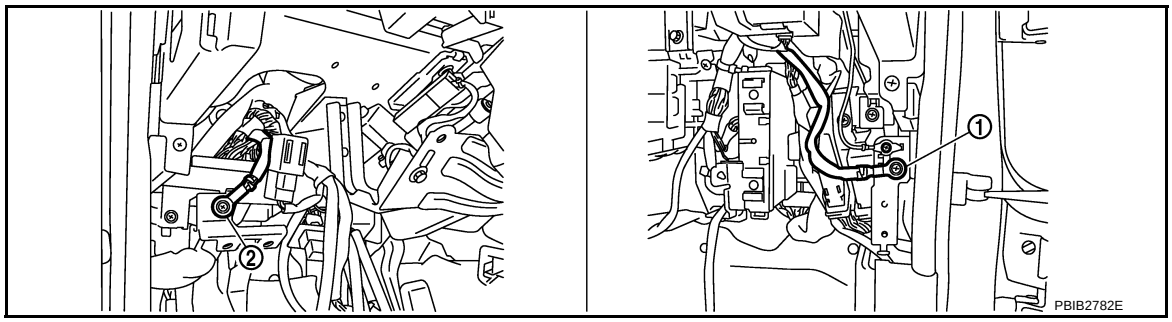
5. Soak the vehicle until the resistance between “fuel level sensor and fuel pump” terminals 4 and 5 becomes 0.5 kΩ higher than the value measured before soaking.
   CAUTION:
   Never turn ignition switch ON during soaking.
   NOTE:
   Soak time changes depending on ambient air temperature. It may take several hours.
6. Start engine and let it idle for 20 minutes.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-886, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354013

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-886, "Component Inspection".

OK or NG

OK >> GO TO 3.
NG >> Replace engine coolant temperature sensor.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

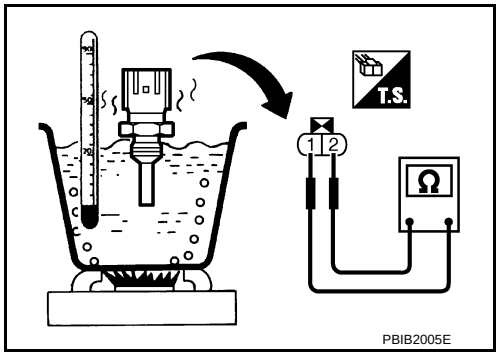
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354014

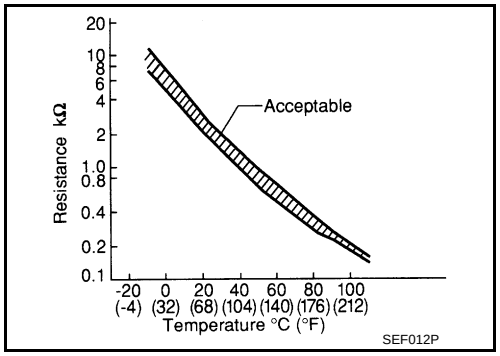
ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

INFOID:0000000005354015

ENGINE COOLANT TEMPERATURE SENSOR

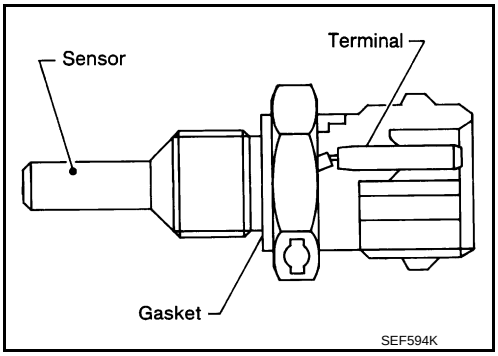
Refer to EM-228, "Component".

DTC P0117, P0118 ECT SENSOR

Component Description

INFOID:0000000005354016

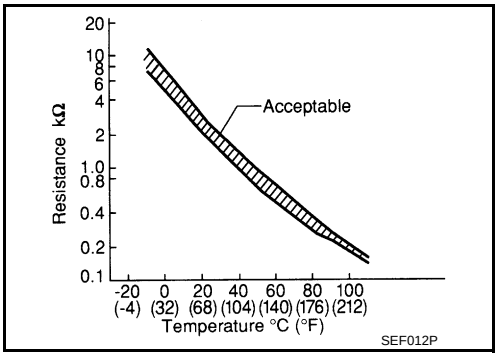
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:0000000005354017

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0117 0117	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 0118	Engine coolant temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, the ECM enters fail-safe mode and the MIL illuminates.

Detected items	Engine operating condition in fail-safe mode	
Engine coolant temperature sensor circuit	Engine coolant temperature will be determined by ECM based on the following conditions. CONSULT-III displays the engine coolant temperature decided by ECM.	
	Condition	Engine coolant temperature decided (CONSULT-III display)
	Just as ignition switch is turned ON or START	40°C (104°F)
	Approx. 4 minutes or more after engine starting	80°C (176°F)
	Except as shown above	40 - 80°C (104 - 176°F) (Depends on the time)
	When the fail-safe system for engine coolant temperature sensor is activated, the cooling fan operates while engine is running.	

DTC Confirmation Procedure

INFOID:0000000005354018

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

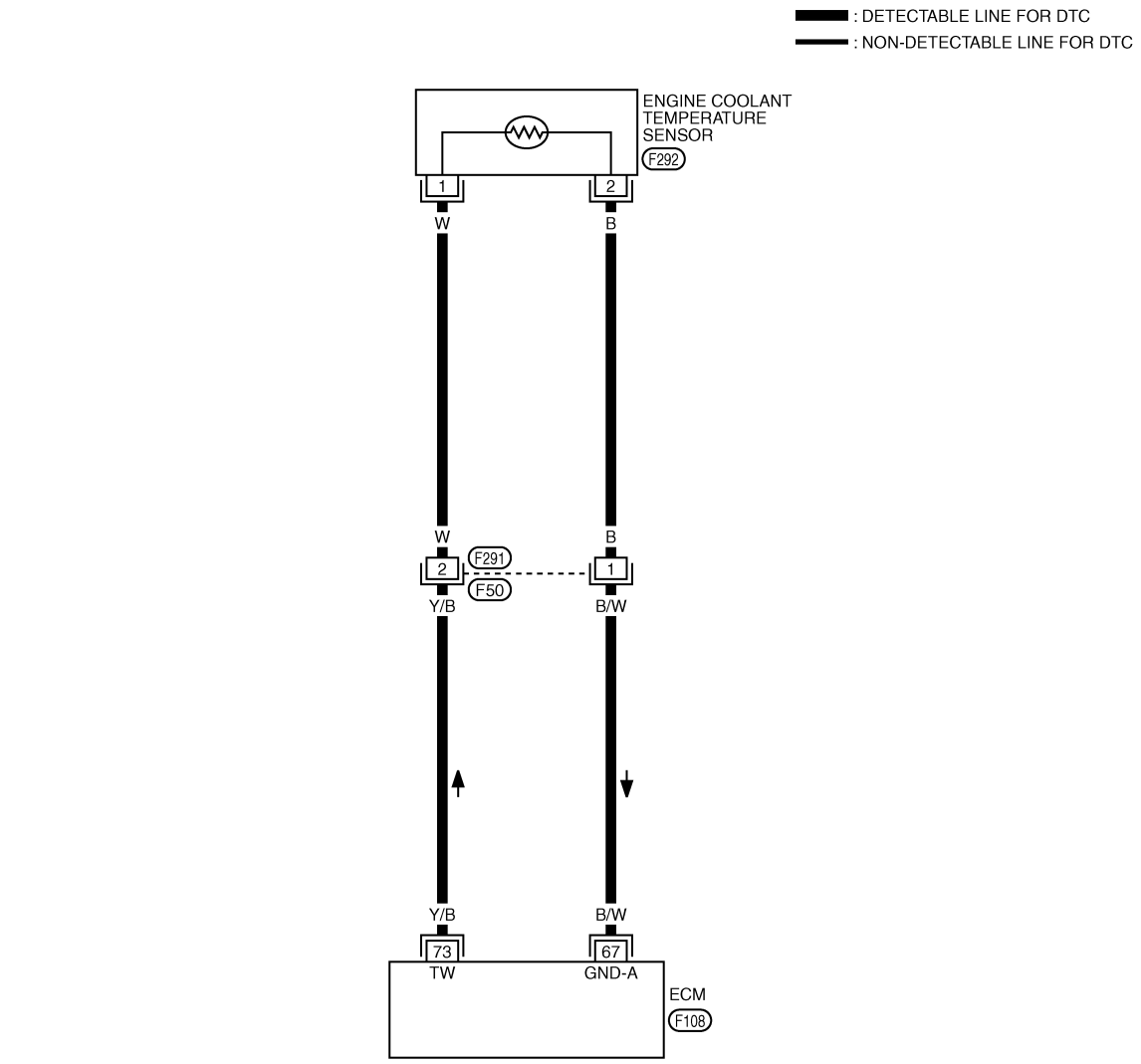
a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

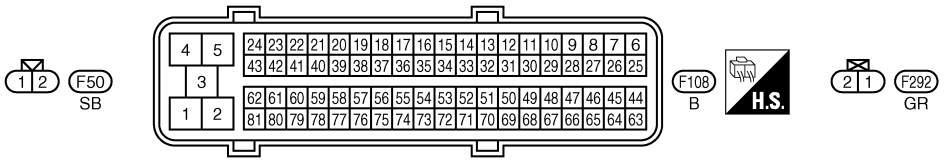
2. Turn ignition switch ON and wait at least 5 seconds.
3. Check DTC.
4. If DTC is detected, go to EC-890, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354019

EC-ECTS-01





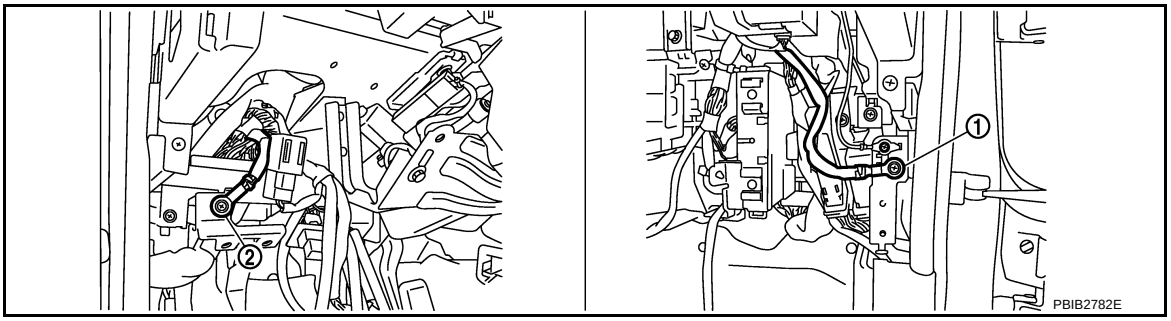
TBWT1018E

Diagnosis Procedure

INFOID:0000000005354020

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



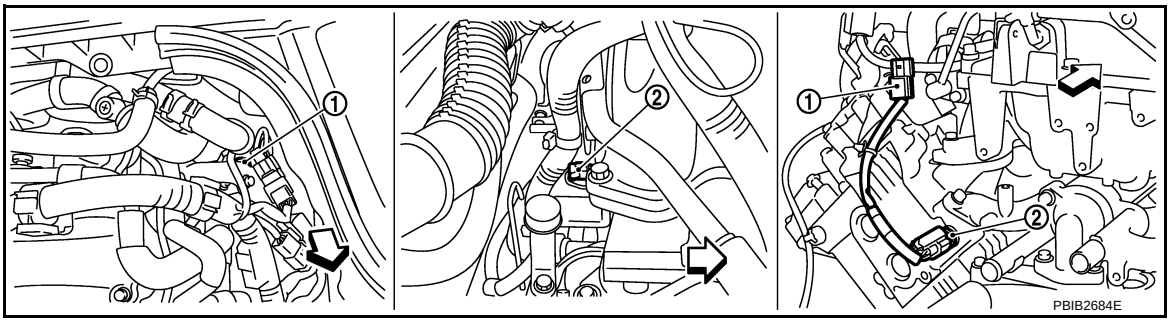
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK ECT SENSOR POWER SUPPLY CIRCUIT

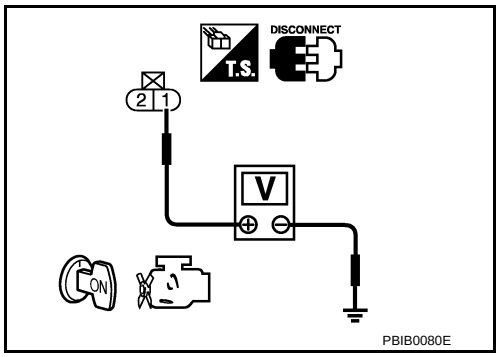
1. Disconnect engine coolant temperature (ECT) sensor harness connector.



⇦ : Vehicle front
1. Engine coolant temperature sensor sub-harness connector
2. Engine coolant temperature sensor

2. Turn ignition switch ON.
3. Check voltage between ECT sensor terminal 1 and ground with CONSULT-III or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING RART

Check the following.
- Harness connector F291, F50
- Harness for open or short between ECM and engine coolant temperature sensor

>> Repair open circuit or 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 harness continuity between ECT sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F291, F50
- Harness for open and short between ECT sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-892, "Component Inspection".

OK or NG

OK >> GO TO 7.
NG >> Replace engine coolant temperature sensor.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

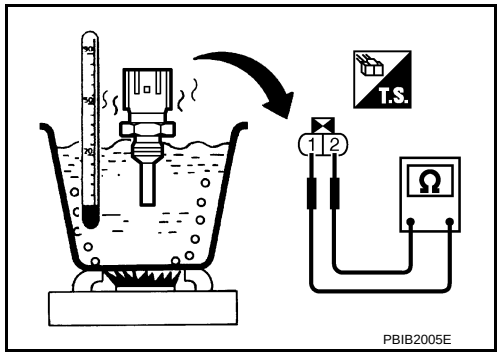
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354021

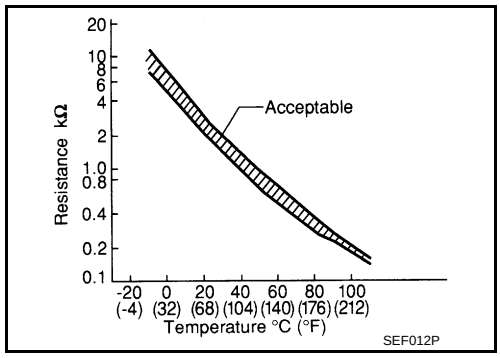
ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

INFOID:0000000005354022

ENGINE COOLANT TEMPERATURE SENSOR

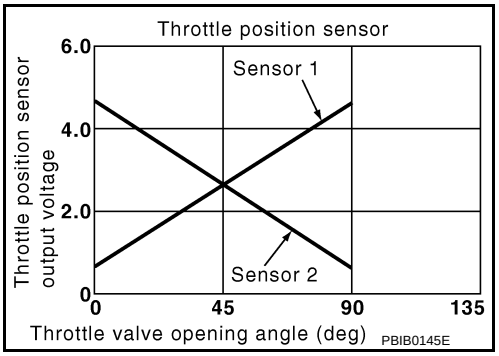
Refer to EM-228, "Component".

DTC P0122, P0123 TP SENSOR

Component Description

INFOID:0000000005354023

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 the 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 in response to driving condition via the throttle control motor.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354024

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TP SEN 1-B1 TP SEN 2-B1*	• Ignition switch: ON (Engine stopped) • Selector lever position: D	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

INFOID:0000000005354025

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0122 0122	Throttle position sensor 2 circuit low input	An excessively low voltage from the TP sensor 2 is sent to ECM.	• Harness or connectors (TP sensor 2 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) • Electric throttle control actuator (TP sensor 2) • Accelerator pedal position sensor (APP sensor 2)
P0123 0123	Throttle position sensor 2 circuit high input	An excessively high voltage from the TP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:0000000005354026

NOTE:
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.

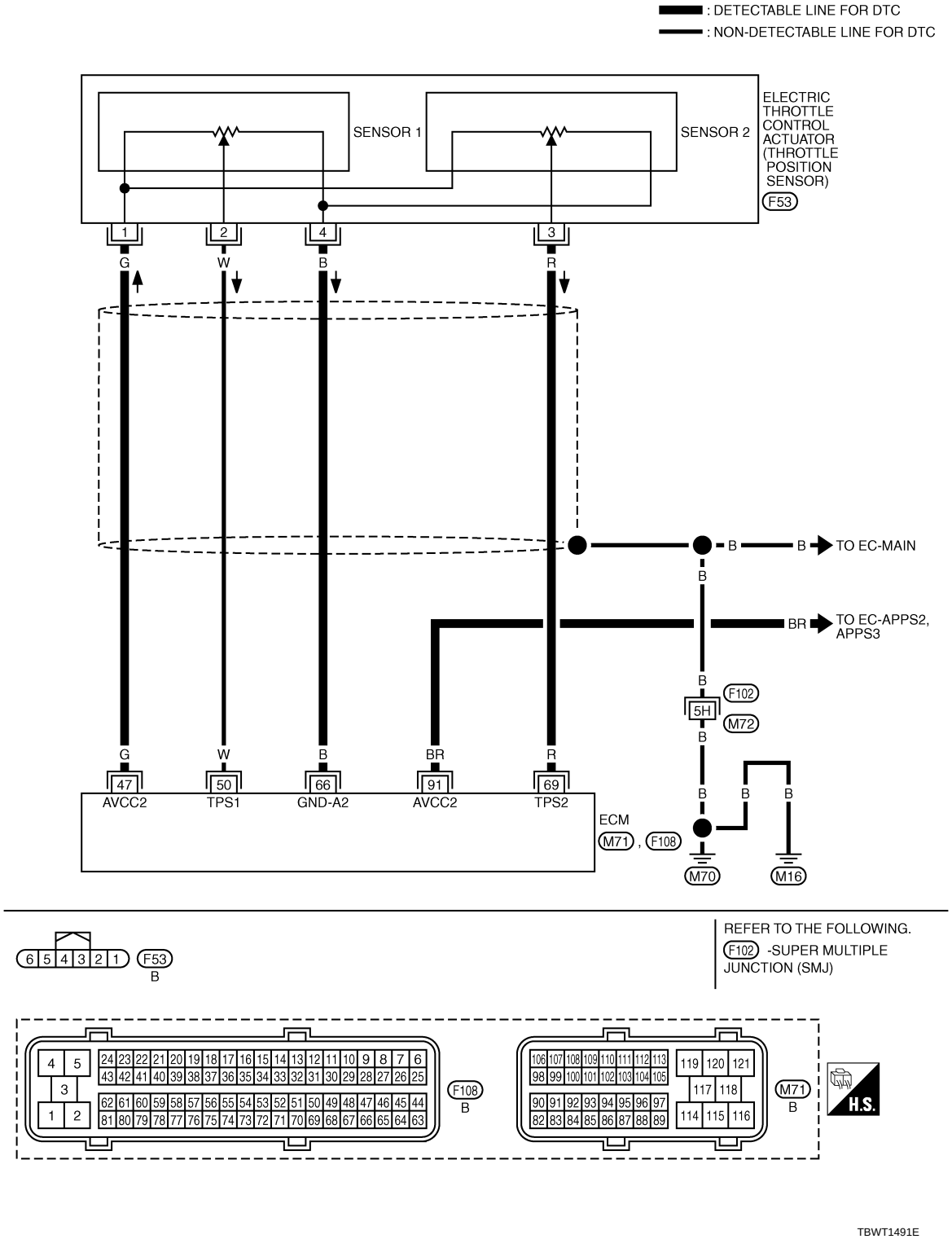
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.
1. Start engine and let it idle for 1 second.

2. Check DTC.
3. If DTC is detected, go to EC-895, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354027

EC-TPS2-01



TBWT1491E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

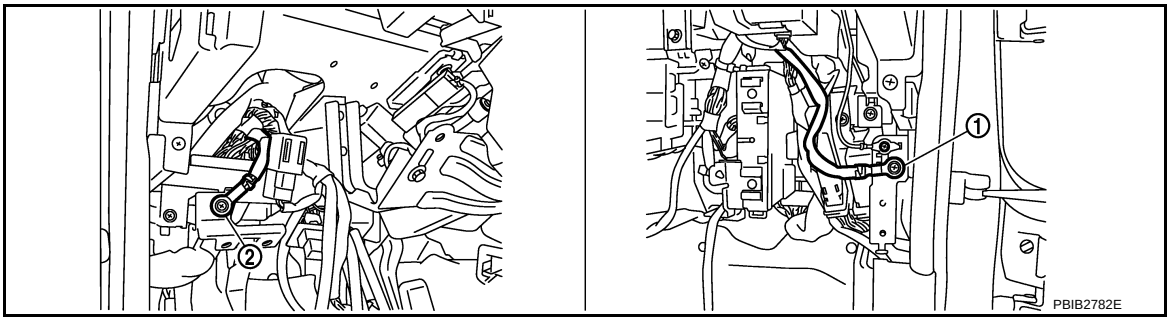
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch: ON]**	Approximately 5 V
50	W	Throttle position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully released	More than 0.36 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	Less than 4.75V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
69	R	Throttle position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully released	Less than 4.75 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	More than 0.36 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V

Diagnosis Procedure

INFOID:0000000005354028

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



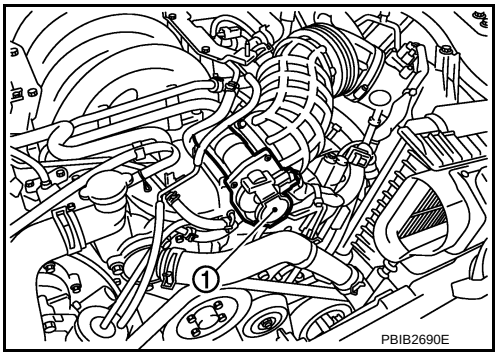
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator (1) harness connector.
- Illustration shows the view with intake air duct removed.
2. Turn ignition switch ON.

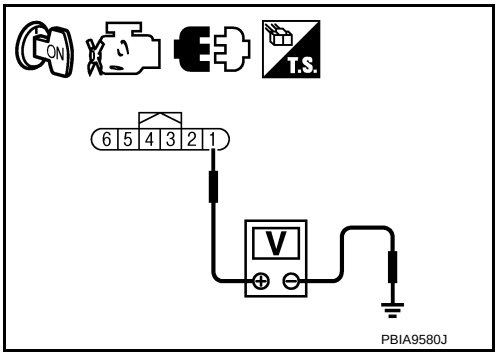


3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V

OK or NG

OK >> GO TO 7.
NG >> GO TO 3.



3. CHECK THROTTLE POSITION SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-894, "Wiring Diagram"
91	APP sensor terminal 5	EC-1254, "Wiring Diagram"

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-1258, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 69 and electric throttle control actuator terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-897, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

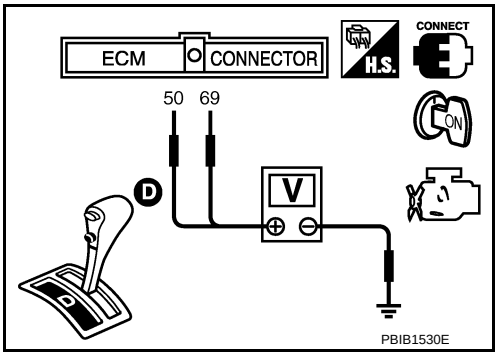
INFOID:0000000005354029

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Turn ignition switch ON.
4. Set selector lever to the D position.

5. Check voltage between ECM terminal 50 (TP sensor 1 signal) and ground, ECM terminal 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36 V
	Fully depressed	Less than 4.75 V
69 (Throttle position sensor 2)	Fully released	Less than 4.75 V
	Fully depressed	More than 0.36 V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-764, "Throttle Valve Closed Position Learning".
8. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354030

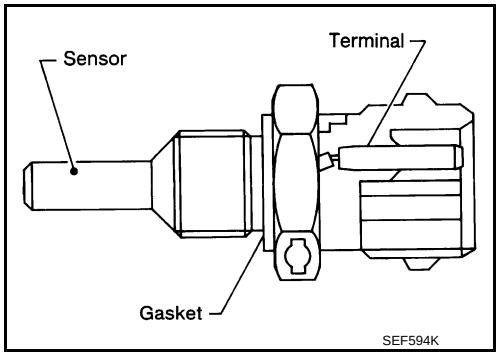
ELECTRIC THROTTLE CONTROL ACTUATOR
Refer to EM-174, "Component".

DTC P0125 ECT SENSOR

Component Description

INFOID:0000000005354031

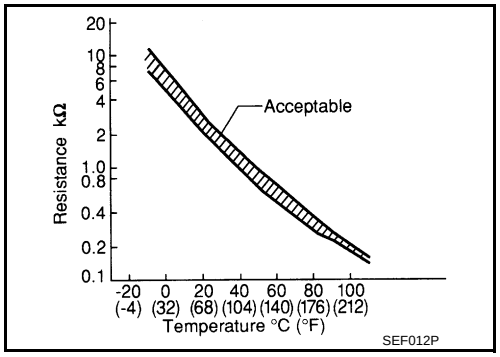
The engine coolant temperature sensor is used to detect the engine coolant temperature. The sensor modifies a voltage signal from the ECM. The modified signal returns to the ECM as the engine coolant temperature input. The sensor uses a thermistor which is sensitive to the change in temperature. The electrical resistance of the thermistor decreases as temperature increases.



<Reference data>

Engine coolant temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
–10 (14)	4.4	7.0 - 11.4
20 (68)	3.5	2.1 - 2.9
50 (122)	2.2	0.68 - 1.00
90 (194)	0.9	0.236 - 0.260

*: This data is reference value and is measured between ECM terminal 73 (Engine coolant temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:0000000005354032

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0125 0125	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

INFOID:0000000005354033

CAUTION:

Be careful not to overheat engine.

NOTE:

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-III

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-III.
3. Check that “COOLAN TEMP/S” indication is above 10°C (50°F).
   If it is above 10°C (50°F), the test result will be OK.
   If it is below 10°C (50°F), go to the following step.

4. Start engine and run it for 65 minutes at idle speed.
If “COOLAN TEMP/S” indication increases to more than 10°C (50°F) within 65 minutes, stop engine because the test result will be OK.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to EC-900, "Diagnosis Procedure".

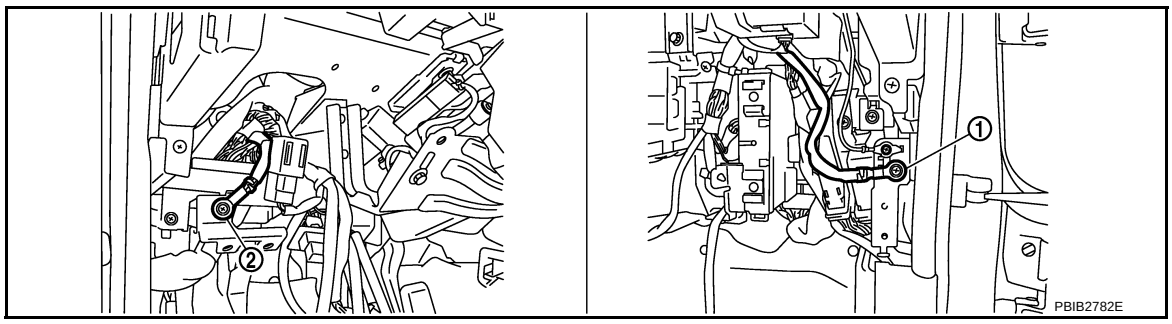
WITH GST
Follow the procedure “WITH CONSULT-III” above.

Diagnosis Procedure

INFOID:0000000005354034

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-900, "Component Inspection".

OK or NG
OK >> GO TO 3.
NG >> Replace engine coolant temperature sensor.

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.

OK or NG
OK >> GO TO 4.
NG >> Repair or replace thermostat. Refer to CO-51, "Component".

4.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".
Refer to EC-890, "Wiring Diagram".

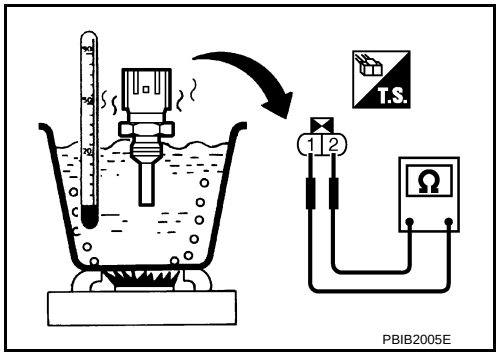
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354035

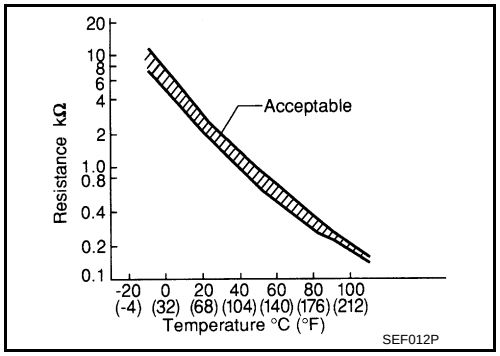
ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

INFOID:0000000005354036

ENGINE COOLANT TEMPERATURE SENSOR

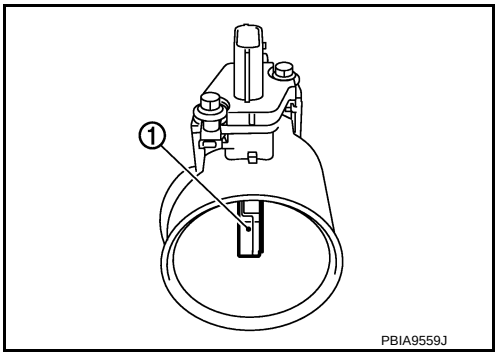
Refer to EM-228, "Component".

DTC P0127 IAT SENSOR

Component Description

INFOID:0000000005354037

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.

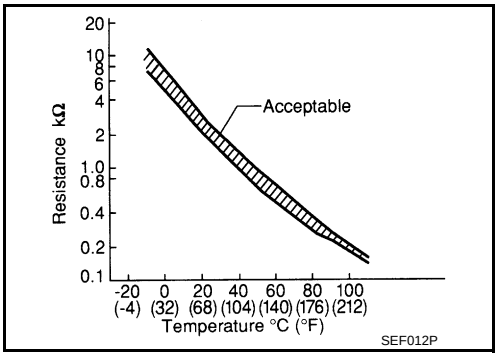


<Reference data>

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

*: This data is reference value and is measured between ECM terminal 34 (Intake air temperature sensor) and ground.

CAUTION:
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.



On Board Diagnosis Logic

INFOID:0000000005354038

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0127 0127	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

INFOID:0000000005354039

NOTE:
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.

CAUTION:
Always drive vehicle at a safe speed.
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.

WITH CONSULT-III

1. Wait until engine coolant temperature is less than 90°C (194°F)

a. Turn ignition switch ON.
b. Select “DATA MONITOR” mode with CONSULT-III.
c. Check the engine coolant temperature.

d. If the engine coolant temperature is not less than 90°C (194°F), turn ignition switch OFF and cool down engine.
   • Perform the following steps before engine coolant temperature is above 90°C (194°F).
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT-III.
4. Start engine.
5. Hold vehicle speed at more than 70 km/h (43 MPH) for 100 consecutive seconds.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to EC-903, "Diagnosis Procedure".

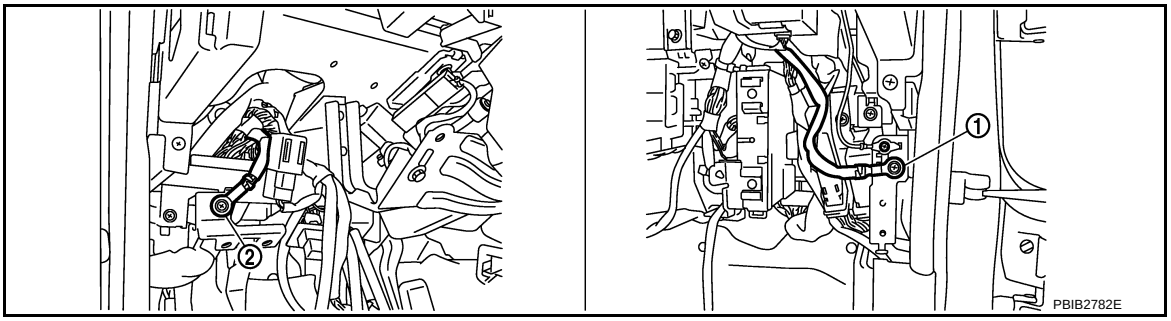
WITH GST
Follow the procedure “WITH CONSULT-III” above.

Diagnosis Procedure

INFOID:0000000005354040

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK INTAKE AIR TEMPERATURE SENSOR

Refer to EC-903, "Component Inspection".

OK or NG
OK >> GO TO 3.
NG >> Replace mass air flow sensor (with intake air temperature sensor).

3.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".
Refer to EC-882, "Wiring Diagram".

>> **INSPECTION END**

Component Inspection

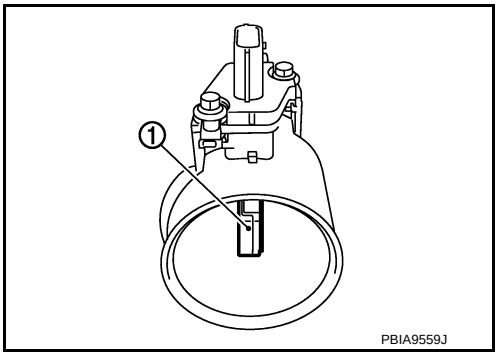
INFOID:0000000005354041

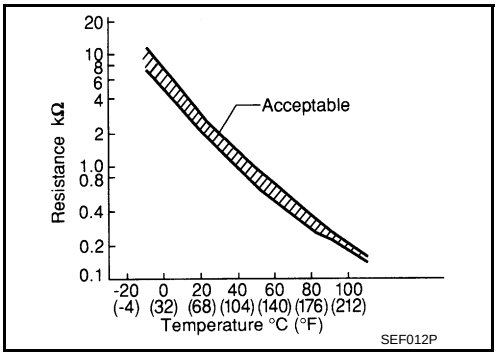
INTAKE AIR TEMPERATURE SENSOR

1. Check resistance between mass air flow sensor (1) terminals 5 and 6 under the following conditions.

Intake air temperature [°C (°F)]	Resistance (kΩ)
25 (77)	1.800 - 2.200

2. If NG, replace mass air flow sensor (with intake air temperature sensor).





Removal and Installation

INFOID:0000000005354042

MASS AIR FLOW SENSOR
Refer to EM-172, "Component".

DTC P0128 THERMOSTAT FUNCTION

On Board Diagnosis Logic

INFOID:0000000005354043

Engine coolant temperature has not risen enough to open the thermostat even though the engine has run long enough.
This is due to a leakage in the seal or the thermostat being stuck open.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0128 0128	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

INFOID:0000000005354044

NOTE:
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 best results, perform at ambient temperature of –10°C (14°F) or higher.**
- **For best results, perform at engine coolant temperature of –10°C (14°F) to 56°C (133°F).**
- **Before performing the following procedure, do not add fuel.**

WITH CONSULT-III

1. Turn A/C switch OFF.
2. Turn blower fan switch OFF.
3. Turn ignition switch ON.
4. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
5. Check that the “COOLAN TEMP/S” is above 56°C (133°F).
   If it is below 56°C (133°F), go to next step.
   If it is above 56°C (133°F), cool down the engine to less than 56°C (133°F). Then go to next steps.
6. Start engine and drive vehicle for 10 consecutive minutes under the following conditions.

VHCL SPEED SE	More than 56 km/h (35 MP)

   If “COOLAN TEMP/S” increases to more than 75°C (167°F) within 10 minutes, turn ignition switch OFF because the test result will be OK.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-905, "Diagnosis Procedure".

WITH GST

1. Follow the procedure “WITH CONSULT-III” above.

Diagnosis Procedure

INFOID:0000000005354045

1.CHECK ENGINE COOLANT TEMPERATURE SENSOR

Refer to EC-906, "Component Inspection".

OK or NG

OK >> GO TO 2.
NG >> Replace engine coolant temperature sensor.

2.CHECK THERMOSTAT

Refer to CO-51, "Component".

OK or NG

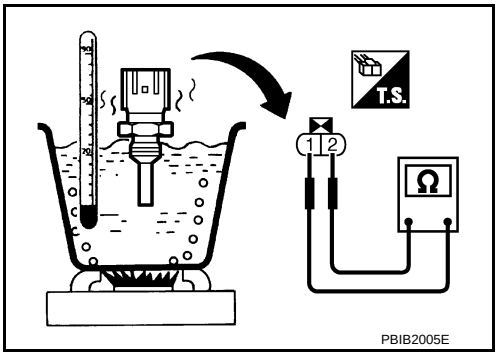
OK >> **INSPECTION END**
NG >> Replace thermostat.

Component Inspection

INFOID:0000000005354046

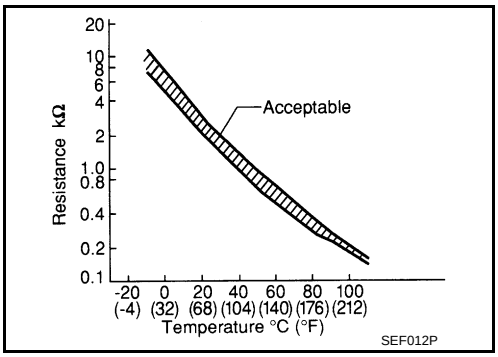
ENGINE COOLANT TEMPERATURE SENSOR

1. Check resistance between engine coolant temperature sensor terminals 1 and 2 as shown in the figure.



<Reference data>

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260



2. If NG, replace engine coolant temperature sensor.

Removal and Installation

INFOID:0000000005354047

ENGINE COOLANT TEMPERATURE SENSOR

Refer to EM-228, "Component".

DTC P0130, P0150 A/F SENSOR 1

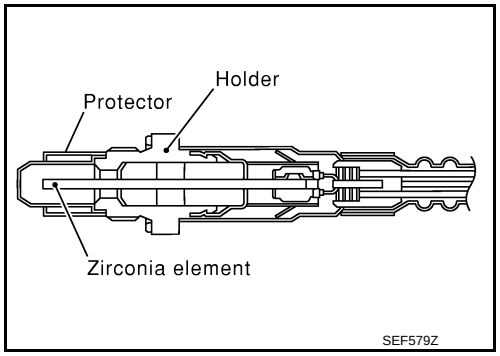
Component Description

INFOID:0000000005354048

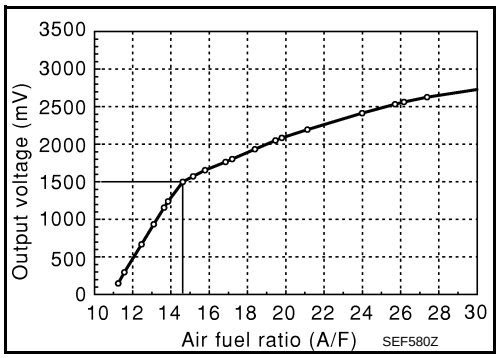
The air fuel ratio (A/F) sensor 1 is a planar dual-cell limit current sensor. The sensor element of the A/F sensor 1 is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.



An electronic circuit controls the pump current through the oxygen pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor 1 is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354049

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V

On Board Diagnosis Logic

INFOID:0000000005354050

To judge the malfunction, 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 0130 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit	A	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly in the range other than approx. 1.5 V.	• Harness or connectors (A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0150 0150 (Bank 2)		B	The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 1.5 V.	

DTC Confirmation Procedure

INFOID:0000000005354051

Perform PROCEDURE FOR MALFUNCTION A first.
If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.
NOTE:
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.

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.
4. If 1st trip DTC is detected, go to EC-912, "Diagnosis Procedure".

PROCEDURE FOR MALFUNCTION B

CAUTION:
Always drive vehicle at a safe speed.

WITH CONSULT-III

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-III.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.
   If the indication is constantly approx. 1.5 V and does not fluctuate, go to EC-912, "Diagnosis Procedure".
   If the indication fluctuates around 1.5 V, go to next step.
4. 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-III.
5. Touch “START”.
6. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III screen.

ENG SPEED	1,300 - 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.

7. Release accelerator pedal fully.
   NOTE:
   Never apply brake during releasing the accelerator pedal.
8. Check that “TESTING” changes to “COMPLETED”.
   If “TESTING” changed to “OUT OF CONDITION”, retry from step 6.
9. Check that “OK” is displayed after touching “SELF-DIAG RESULT”.
   If “NG” is displayed, go to EC-912, "Diagnosis Procedure".

Overall Function Check

INFOID:0000000005354052

Use this procedure to check the overall function of the A/F sensor 1 circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

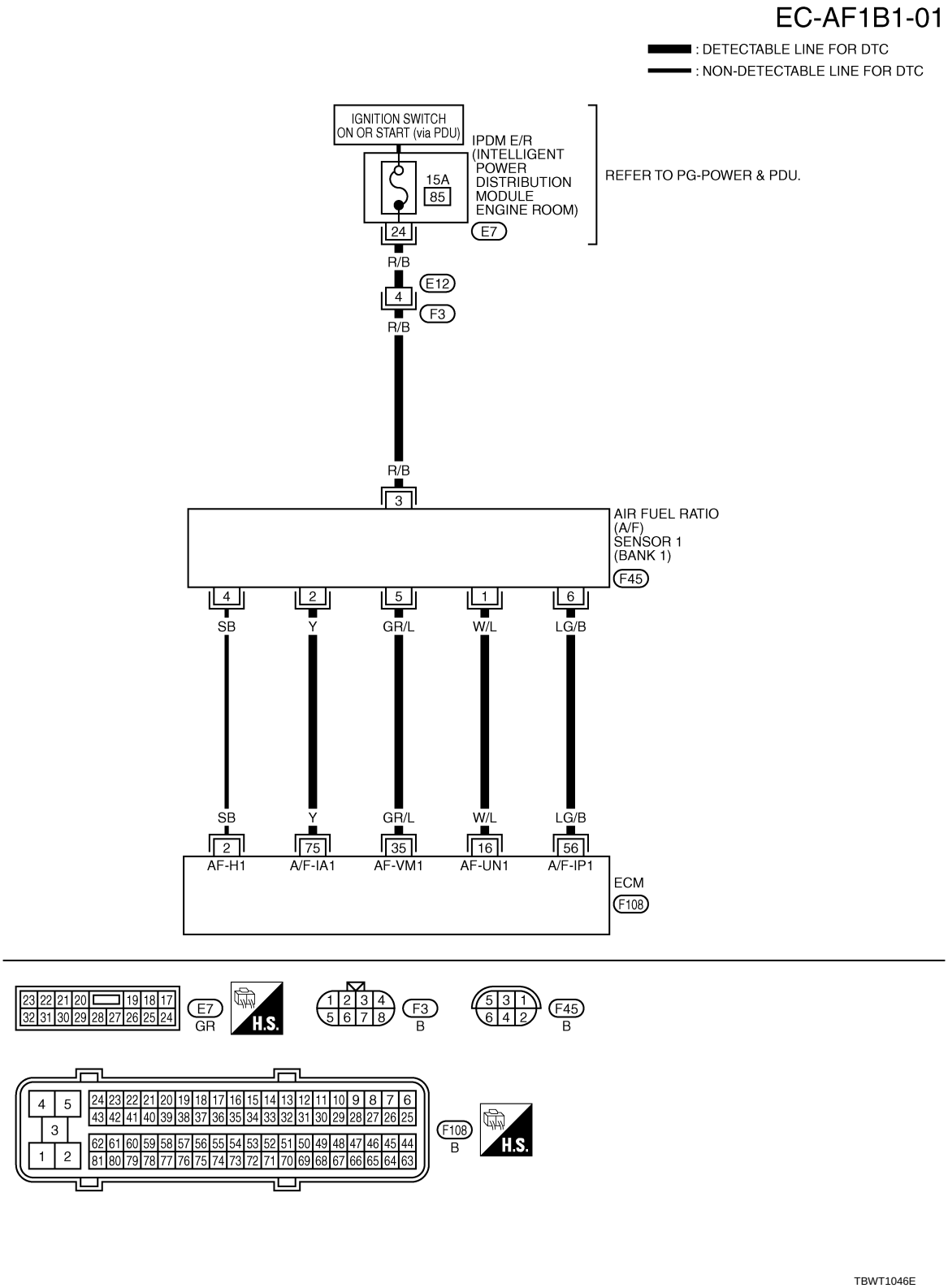
1. Start engine and warm it up to normal operating temperature.
2. Drive the vehicle at a speed of 80 km/h (50 MPH) for a few minutes in the suitable gear position.
3. Shift selector lever to the D position, then release the accelerator pedal fully until the vehicle speed decreases to 50 km/h (31 MPH).
   NOTE:
   Never apply brake during releasing the accelerator pedal.
4. Repeat steps 2 to 3 for five times.
5. Stop the vehicle and turn ignition switch OFF.
6. Wait at least 10 seconds and then turn ignition switch ON.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Restart engine.
9. Repeat steps 2 to 3 for five times.

10. Stop the vehicle and connect GST to the vehicle.
11. Check that no 1st trip DTC is displayed.
    If the 1st trip DTC is displayed, go to EC-912, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354053

BANK 1

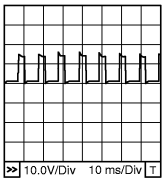


Specification data are reference values and are measured between each terminal and ground.

Pulse signal is measured by CONSULT-III.

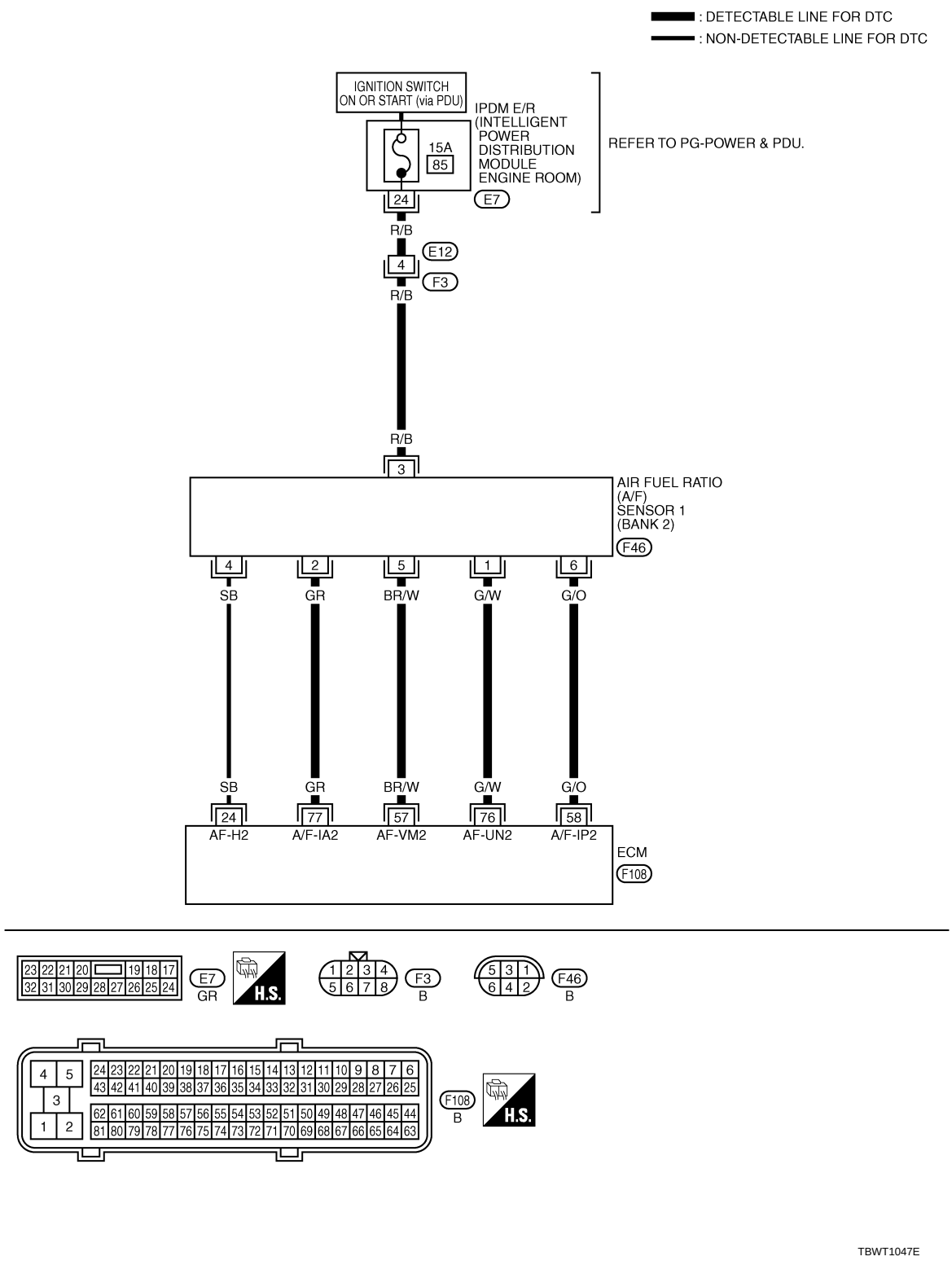
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-AF1B2-01

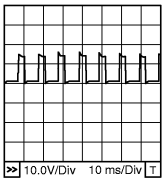


TBWT1047E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

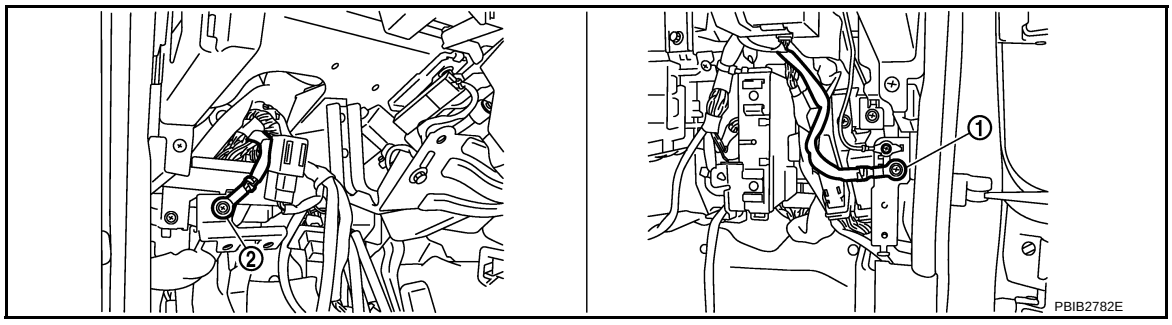
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354054

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



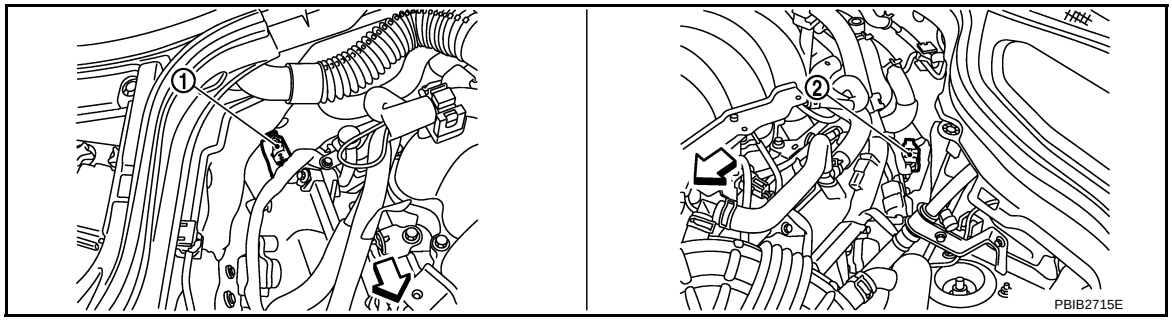
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.

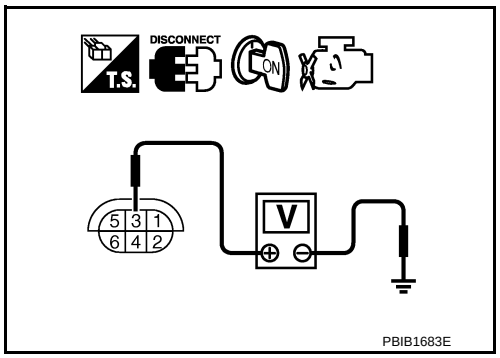


⇦ : Vehicle front

1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

2. Turn ignition switch ON.
3. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse
- 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 harness continuity between A/F sensor 1 terminal and ECM terminal as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 6.
NG >> Repair or replace malfunctioning part.

6. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

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**

Removal and Installation

INFOID:0000000005354055

AIR FUEL RATIO (A/F) SENSOR 1

Refer to EM-178, "Component".

DTC P0131, P0151 A/F SENSOR 1

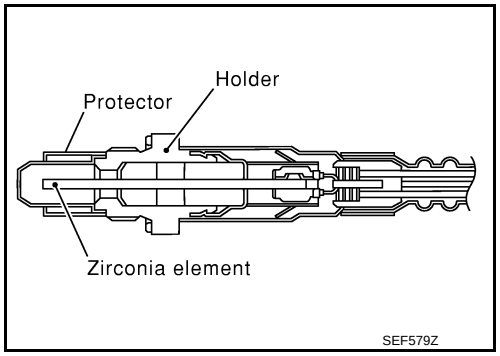
Component Description

INFOID:0000000005354056

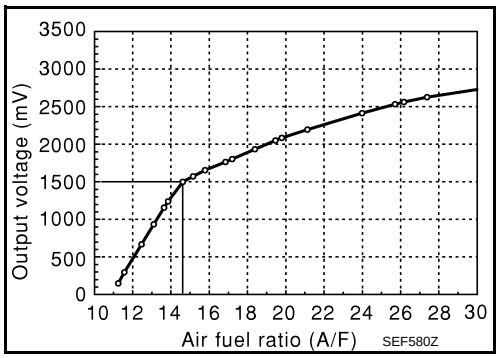
The air fuel ratio (A/F) sensor 1 is a planar dual-cell limit current sensor. The sensor element of the A/F sensor 1 is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.



An electronic circuit controls the pump current through the oxygen pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor 1 is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354057

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V

On Board Diagnosis Logic

INFOID:0000000005354058

To judge the malfunction, the diagnosis checks that the A/F signal computed by ECM from the A/F sensor 1 signal is not inordinately low.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0131 0131 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit low voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 0 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1
P0151 0151 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354059

NOTE:

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.

WITH CONSULT-III

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-III.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.
   If the indication is constantly approx. 0 V, go to EC-920, "Diagnosis Procedure".
   If the indication is not constantly approx. 0V, go to next step.
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. Restart engine.
8. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
9. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever position	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 7, return to step 4.**

10. Check 1st trip DTC.
11. If 1st trip DTC is displayed, go to EC-920, "Diagnosis Procedure".

WITH GST

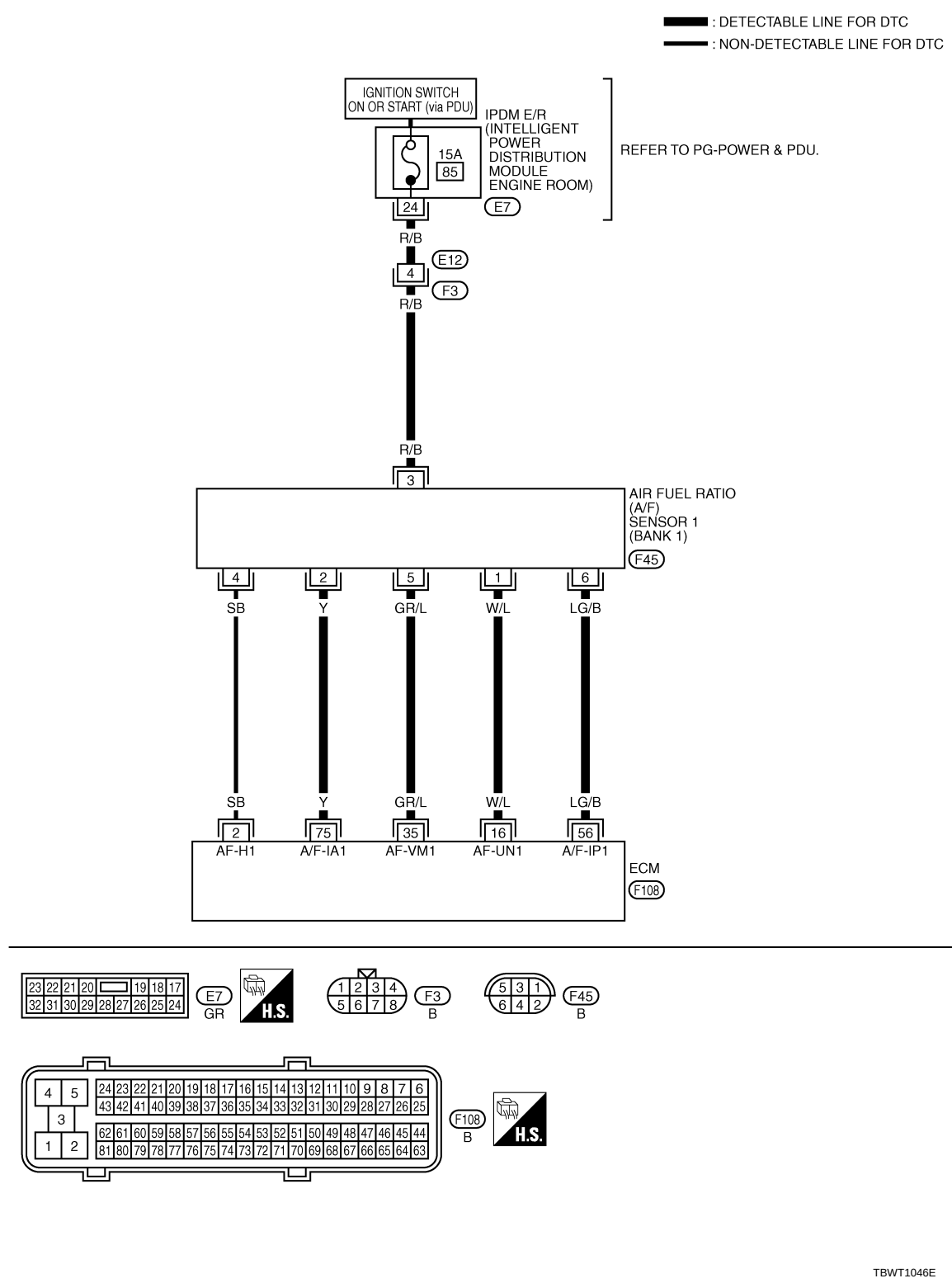
Follow the procedure “WITH CONSULT-III” above.

Wiring Diagram

INFOID:0000000005354060

BANK 1

EC-AF1B1-01

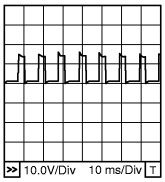


TBWT1046E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

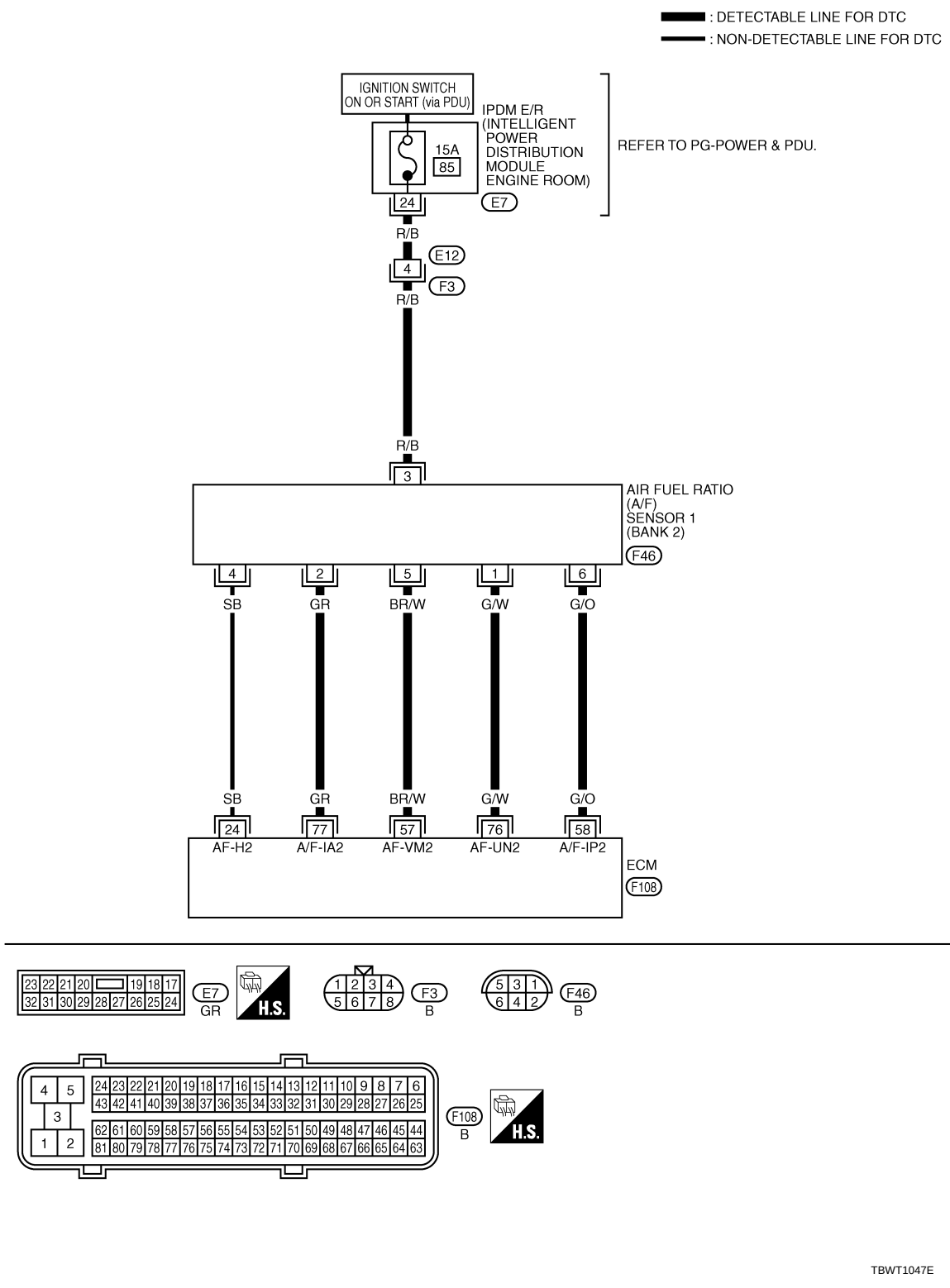
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-AF1B2-01

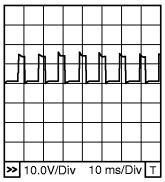


TBWT1047E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

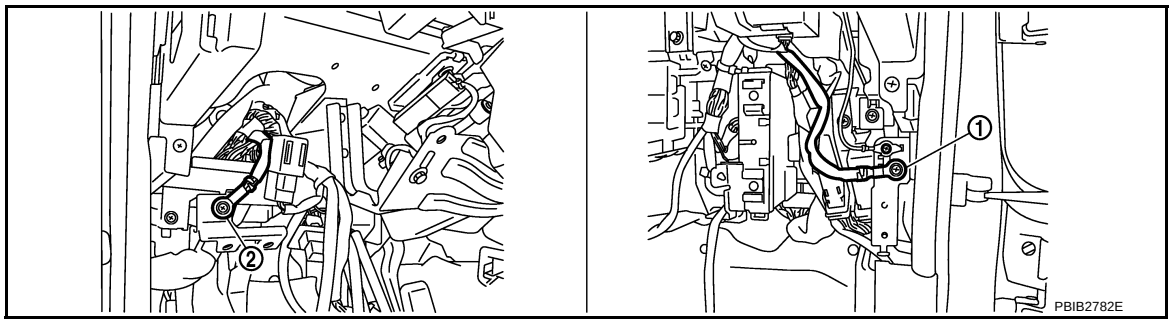
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354061

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



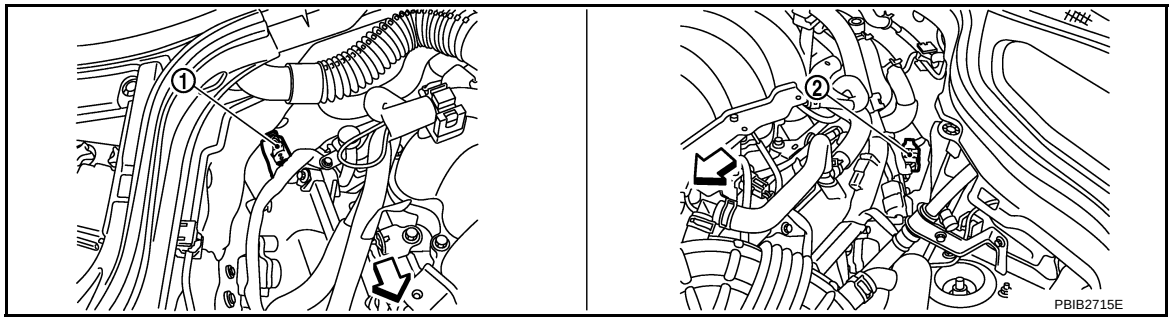
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.

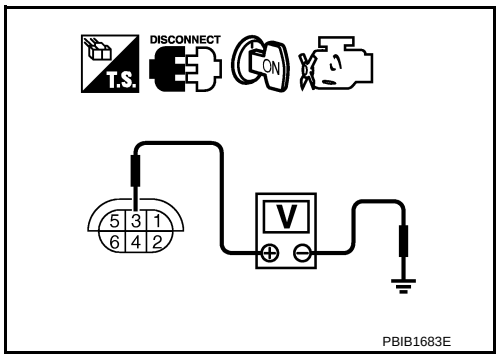


⇦ : Vehicle front

1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

2. Turn ignition switch ON.
3. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse
- 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 harness continuity between A/F sensor 1 terminal and ECM terminal as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 6.
NG >> Repair or replace malfunctioning part.

6.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

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**

Removal and Installation

INFOID:0000000005354062

AIR FUEL RATIO (A/F) SENSOR 1

Refer to EM-178, "Component".

DTC P0132, P0152 A/F SENSOR 1

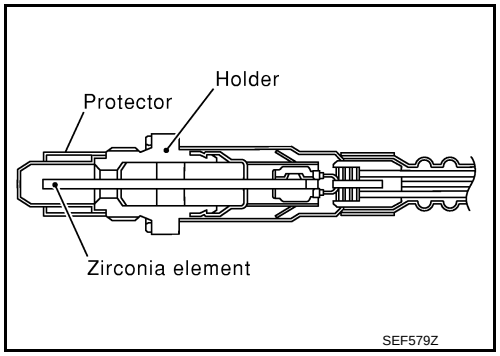
Component Description

INFOID:0000000005354063

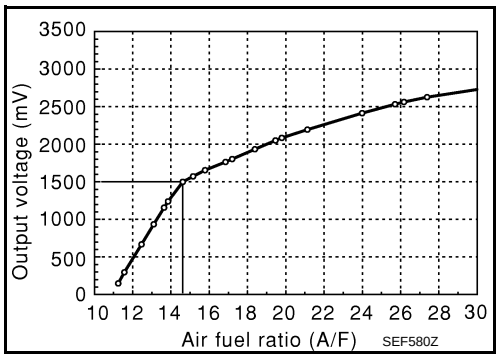
The air fuel ratio (A/F) sensor 1 is a planar dual-cell limit current sensor. The sensor element of the A/F sensor 1 is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.



An electronic circuit controls the pump current through the oxygen pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor 1 is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354064

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V

On Board Diagnosis Logic

INFOID:0000000005354065

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 0132 (Bank 1) P0152 0152 (Bank 2)	Air fuel ratio (A/F) sensor 1 circuit high voltage	• The A/F signal computed by ECM from the A/F sensor 1 signal is constantly approx. 5 V.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1

DTC Confirmation Procedure

INFOID:0000000005354066

NOTE:
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.

WITH CONSULT-III

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-III.
3. Check “A/F SEN1 (B1)” or “A/F SEN1 (B2)” indication.
   If the indication is constantly approx. 5 V, go to EC-928, "Diagnosis Procedure".
   If the indication is not constantly approx. 5 V, go to next step.
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. Restart engine.
8. Drive and accelerate vehicle to more than 40 km/h (25 MPH) within 20 seconds after restarting engine.
9. Maintain the following conditions for approximately 20 consecutive seconds.

ENG SPEED	1,000 - 3,200 rpm
VHCL SPEED SE	More than 40 km/h (25 MPH)
B/FUEL SCHDL	1.5 - 9.0 msec
Selector lever position	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 7, return to step 4.**

10. Check 1st trip DTC.
11. If 1st trip DTC is displayed, go to EC-928, "Diagnosis Procedure".

WITH GST

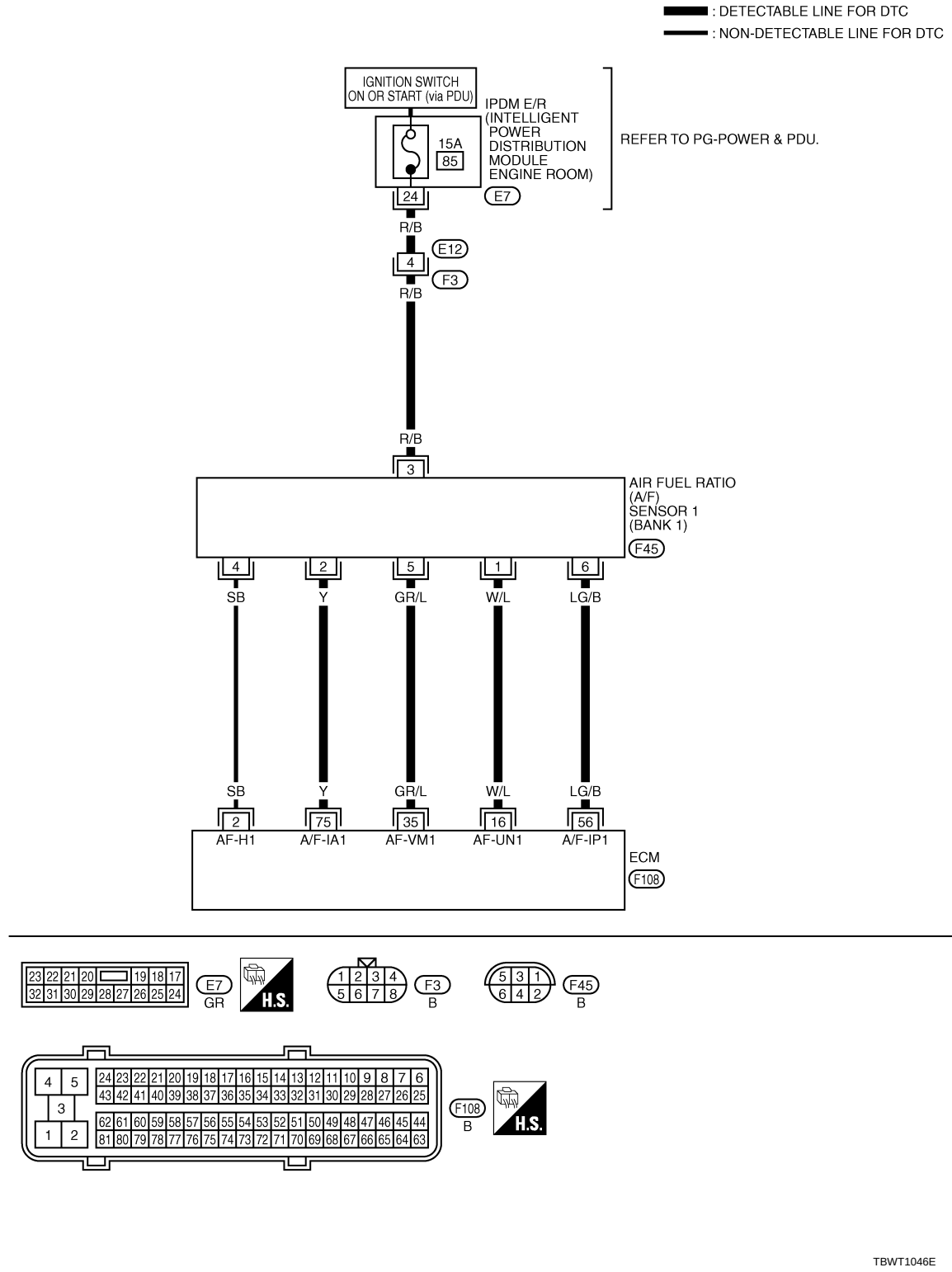
Follow the procedure “WITH CONSULT-III” above.

Wiring Diagram

INFOID:0000000005354067

BANK 1

EC-AF1B1-01

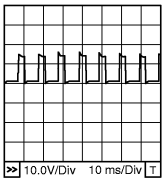


TBWT1046E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

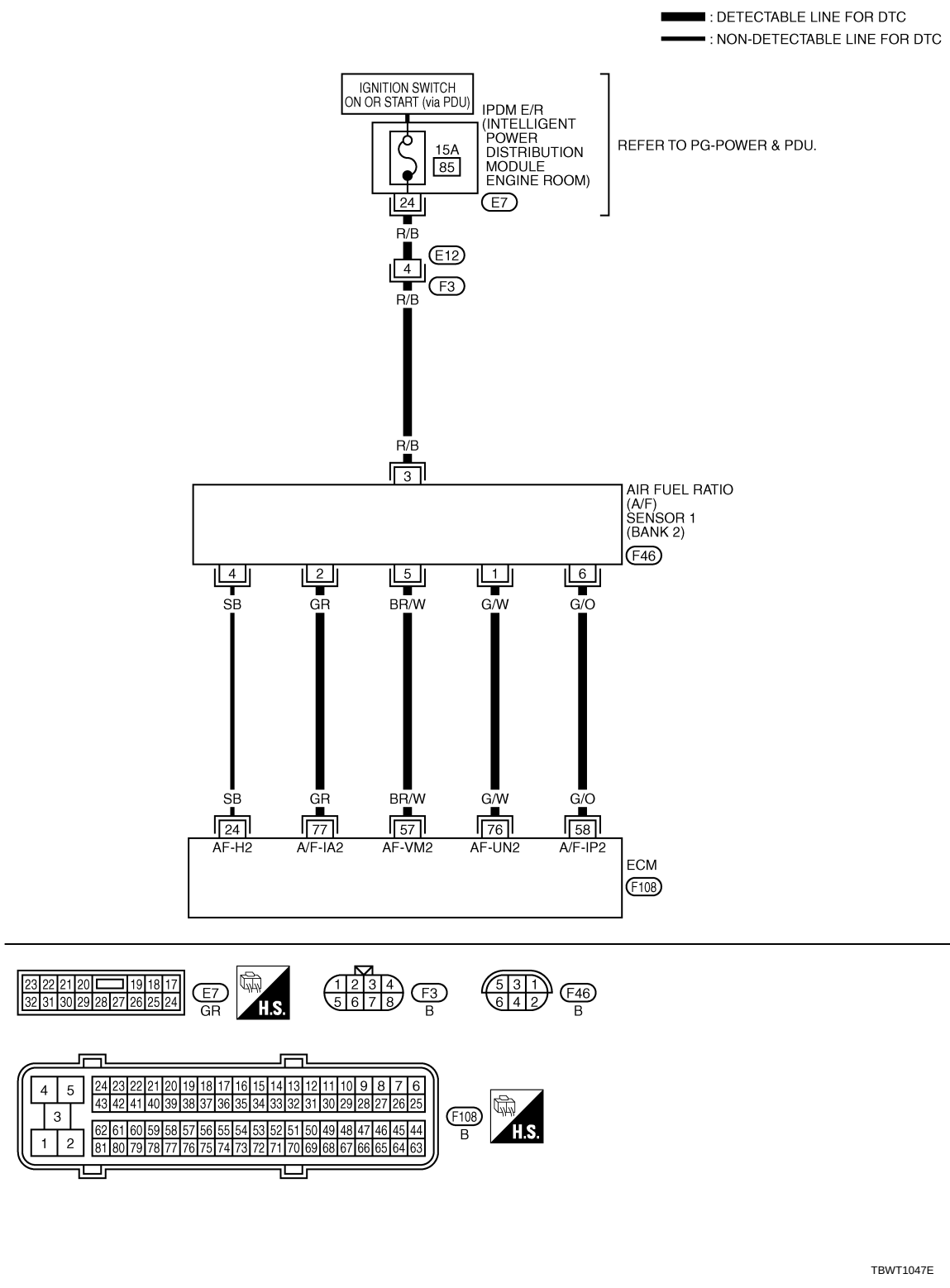
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-AF1B2-01

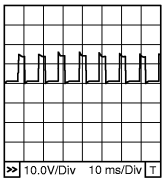


TBWT1047E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

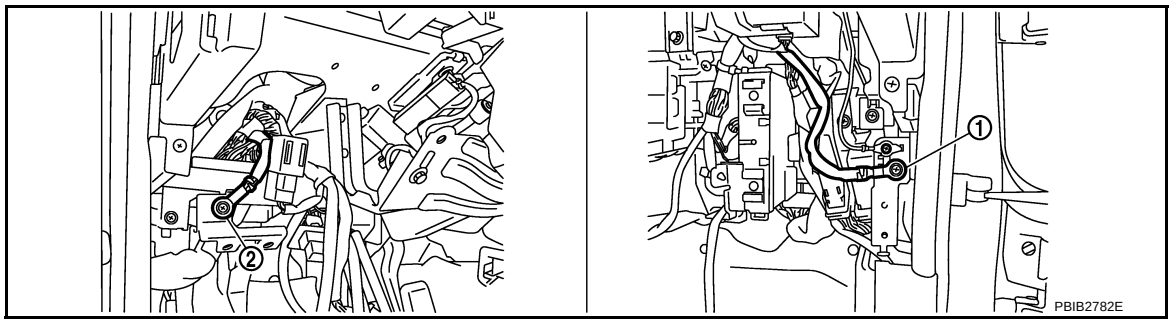
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354068

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



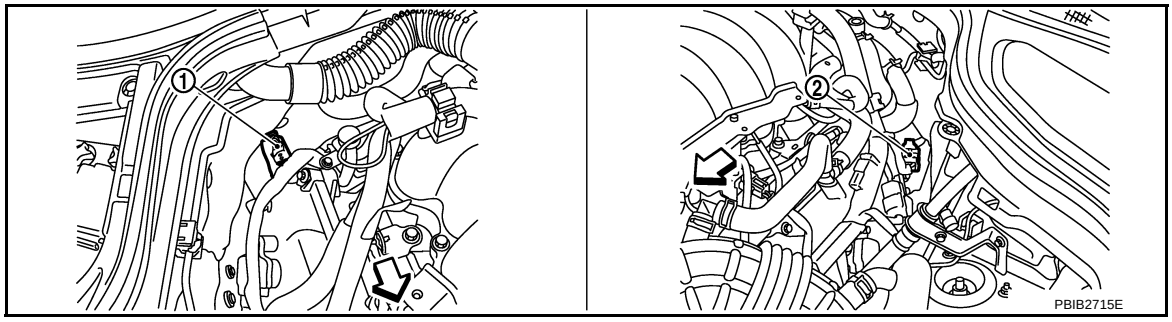
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK AIR FUEL RATIO (A/F) SENSOR 1 POWER SUPPLY CIRCUIT

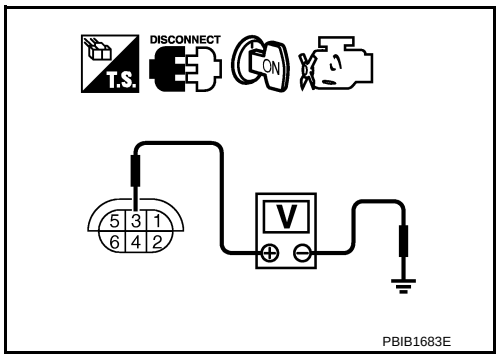
1. Disconnect air fuel ratio (A/F) sensor 1 harness connector.



⇦ : Vehicle front
1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

2. Turn ignition switch ON.
3. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse
- 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 harness continuity between A/F sensor 1 terminal and ECM terminal as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 6.
NG >> Repair or replace malfunctioning part.

6.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

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**

Removal and Installation

INFOID:0000000005354069

AIR FUEL RATIO (A/F) SENSOR 1

Refer to EM-178, "Component".

DTC P0133, P0153 A/F SENSOR 1

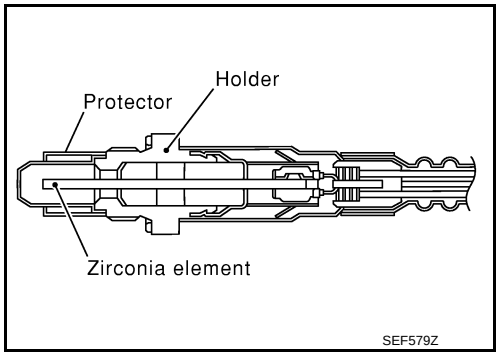
Component Description

INFOID:0000000005354070

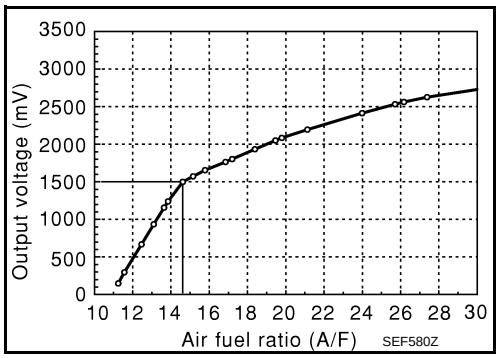
The air fuel ratio (A/F) sensor 1 is a planar dual-cell limit current sensor. The sensor element of the A/F sensor 1 is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.



An electronic circuit controls the pump current through the oxygen pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor 1 is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354071

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V

On Board Diagnosis Logic

INFOID:0000000005354072

To judge the malfunction of A/F sensor 1, this diagnosis measures response time of the A/F signal computed by ECM from the A/F sensor 1 signal. The time is compensated by engine operating (speed and load), fuel feedback control constant, and the A/F sensor 1 temperature index. Judgment is based on whether the compensated time (the A/F signal cycling time index) is inordinately long or not.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0133 0133 (Bank 1)	Air fuel ratio (A/F) sensor 1 circuit slow response	• The response of the A/F signal computed by ECM from A/F sensor 1 signal takes more than the specified time.	• Harness or connectors (The A/F sensor 1 circuit is open or shorted.) • A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leakage • Exhaust gas leakage • PCV • Mass air flow sensor
P0153 0153 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354073

NOTE:
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.

WITH CONSULT-III

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. Select “A/F SEN1(B1) P1278/P1279” (for DTC P0133) or “A/F SEN1(B2) P1288/P1289” (for DTC P0153) of “A/F SEN1” in “DTC WORK SUPPORT” mode with CONSULT-III.
8. Touch “START”.
   If “COMPLETED” appears on CONSULT-III screen, go to step 12.
   If “COMPLETED” does not appear on CONSULT-III screen, go to the following step.
9. After perform the following procedure, “TESTING” will be displayed on the CONSULT-III screen.

a. Increase the engine speed to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.

b. Fully release accelerator pedal and then let engine idle for approximately 10 seconds.
   If “TESTING” is not displayed after 10 seconds, go to EC-814, "Inspection Procedure".

10. Wait for approximately 20 seconds at idle at under the condition that “TESTING” is displayed on the CONSULT-III screen.
11. Check that “TESTING” changes to “COMPLETED”.
    If “TESTING” changed to “OUT OF CONDITION”, go to EC-814, "Inspection Procedure".
12. Check that “OK” is displayed after touching “SELF-DIAG RESULT”.
    If “NG” is displayed, go to EC-936, "Diagnosis Procedure".

WITH GST

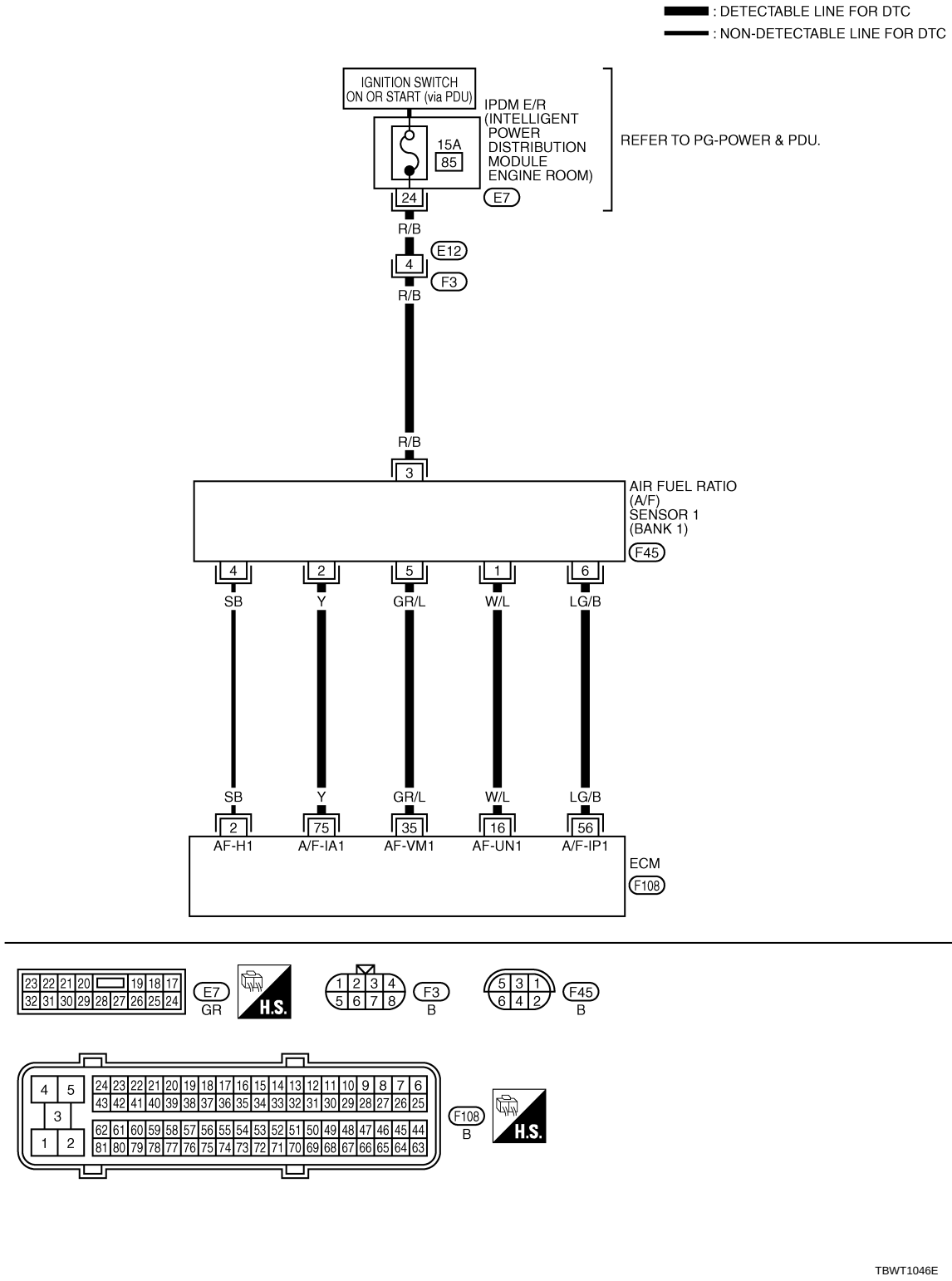
1. Start engine and warm it up to normal operating temperature.
2. Select Service $01 with GST.
3. Calculate the total value of “Short term fuel trim” and “Long term fuel trim” indications.
   Make sure that the total percentage should be within ± 15%.
   If OK, go to the following step.
   If NG, check the following.
   - Intake air leakage
   - Exhaust gas leakage
   - Incorrect fuel pressure
   - Lack of fuel
   - Fuel injector
   - Incorrect PCV hose connection
   - PCV valve
   - Mass air flow sensor
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 keep the engine speed between 3,500 and 4,000 rpm for at least 1minute under no load.
8. Let engine idle for 1 minute.
9. Increase the engine speed to between 4,000 and 5,000 rpm and maintain that speed for 10 seconds.
10. Fully release accelerator pedal and then let engine idle for approximately 1 minute.
11. Check 1st trip DTC.
12. If 1st trip DTC is displayed, go to EC-936, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354074

BANK 1

EC-AF1B1-01

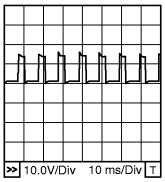


TBWT1046E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

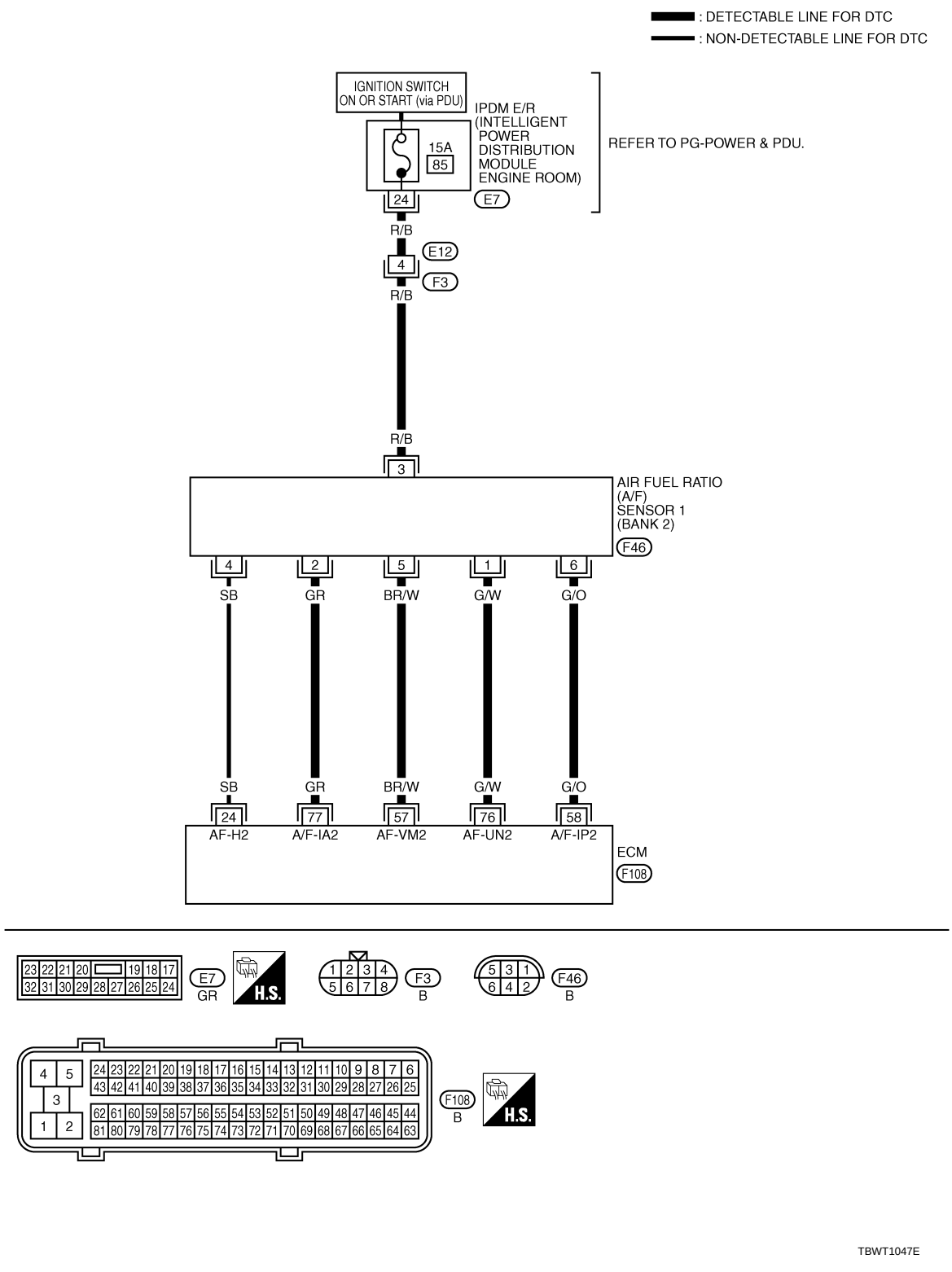
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-AF1B2-01

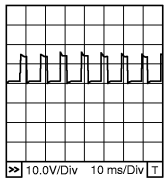


TBWT1047E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

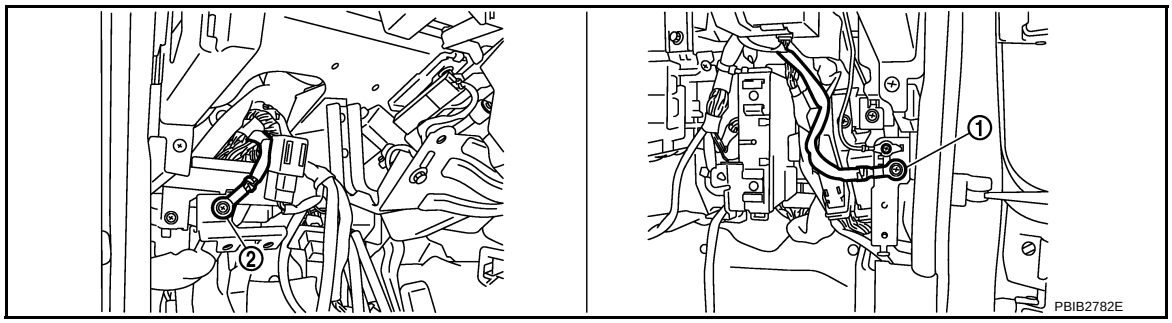
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354075

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



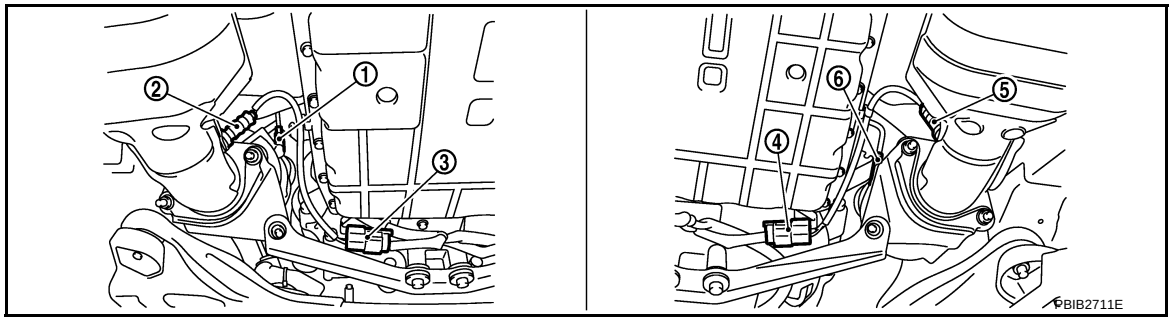
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

1. Loosen and retighten the air fuel ratio (A/F) sensor 1.



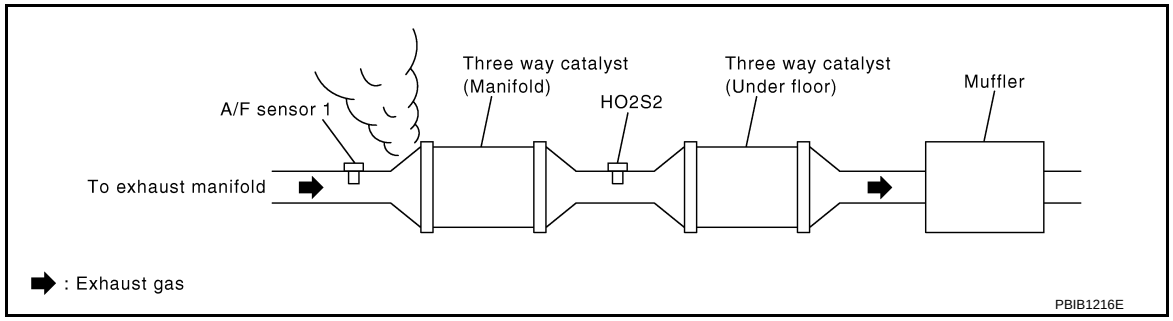
1. A/F sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. A/F sensor 1 (bank 2)

Tightening torque: 50 N-m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



OK or NG

OK >> GO TO 4.
NG >> Repair or replace malfunctioning part.

4.CHECK FOR INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace malfunctioning part.

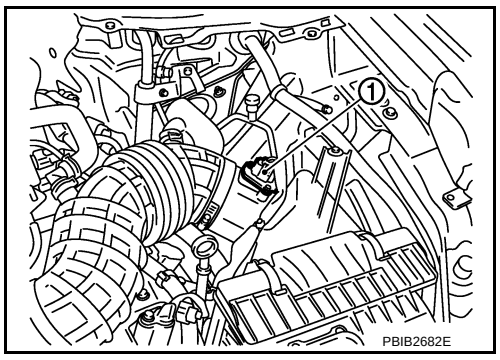
5.CLEAR THE SELF-LEARNING DATA

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P172, P0174 or P0175 detected? Is it difficult to start engine?

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC.
8. Check trhat DTC P0000 is displayed.
9. 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?

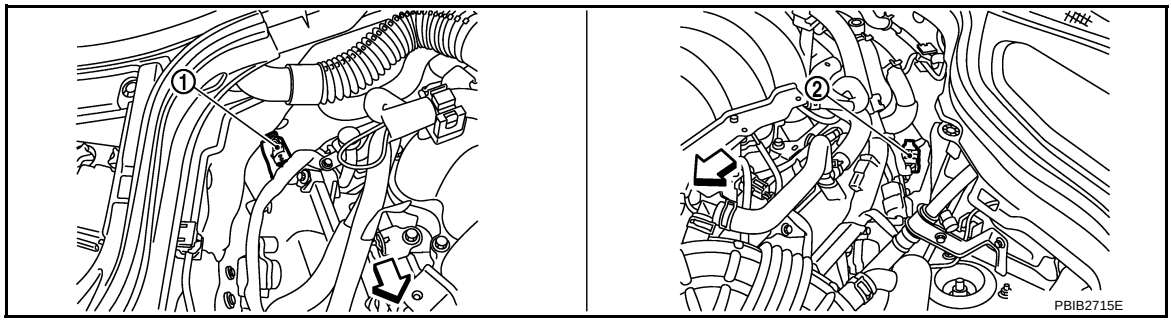


Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-975, "Diagnosis Procedure" or EC-984, "Diagnosis Procedure".
No >> GO TO 6.

6. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect A/F sensor 1 harness connector.

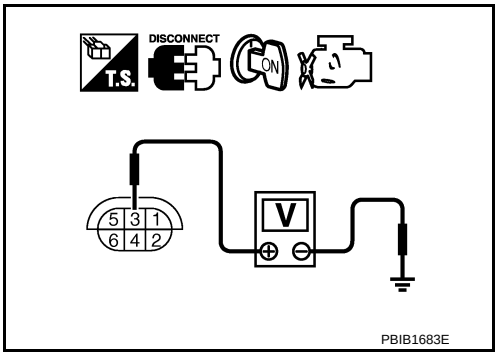


⇦ : Vehicle front

1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

2. Turn ignition switch ON.
3. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse
- 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 harness continuity between A/F sensor 1 terminal and ECM terminal as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

4. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9.CHECK AIR FUEL RATIO (A/F) SENSOR 1 HEATER

Refer to EC-851, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> GO TO 13.

10.CHECK MASS AIR FLOW SENSOR

Refer to EC-879, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> Replace mass air flow sensor.

11.CHECK PCV VALVE

Refer to EC-731, "Component Inspection".

OK or NG

OK >> GO TO 12.
NG >> Repair or replace PCV valve.

12.CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 13.
NG >> Repair or replace malfunctioning part.

13.REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

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**

Removal and Installation

INFOID:0000000005354076

AIR FUEL RATIO (A/F) SENSOR 1

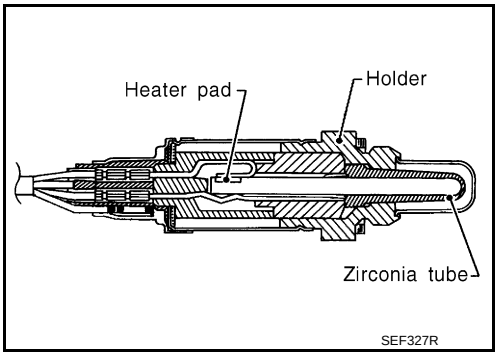
Refer to EM-178, "Component".

DTC P0137, P0157 HO2S2

Component Description

INFOID:0000000005354077

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354078

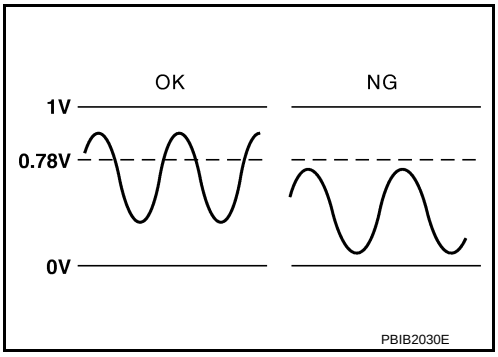
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	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 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)		LEAN ←→ RICH

On Board Diagnosis Logic

INFOID:0000000005354079

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the maximum voltage of the sensor is sufficiently high during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0137 0137 (Bank 1)	Heated oxygen sensor 2 circuit low voltage	The maximum voltage from the sensor does not reach the specified voltage.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leakage
P0157 0157 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354080

NOTE:
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-III

TESTING CONDITION:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
8. Check that “COOLAN TEMP/S” indication is more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
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-III.
11. Follow the instructions displayed.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Check that “OK” is displayed after touching “SELF-DIAG RESULTS”.
    If “NG” is displayed, go to EC-945, "Diagnosis Procedure".
    If “CAN NOT BE DIAGNOSED” is displayed, perform the following procedure.

a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
b. Return to step 1.

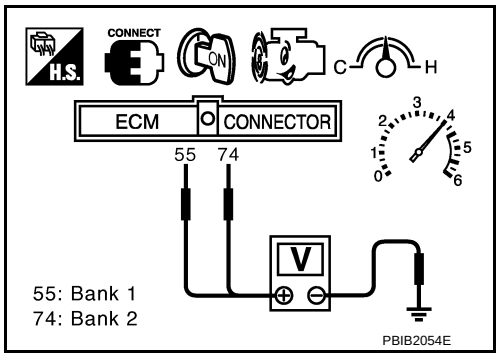
Overall Function Check

INFOID:0000000005354081

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

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. 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. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.78 V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
   The voltage should be above 0.78 V at least once during this procedure.
8. If NG, go to EC-945, "Diagnosis Procedure".

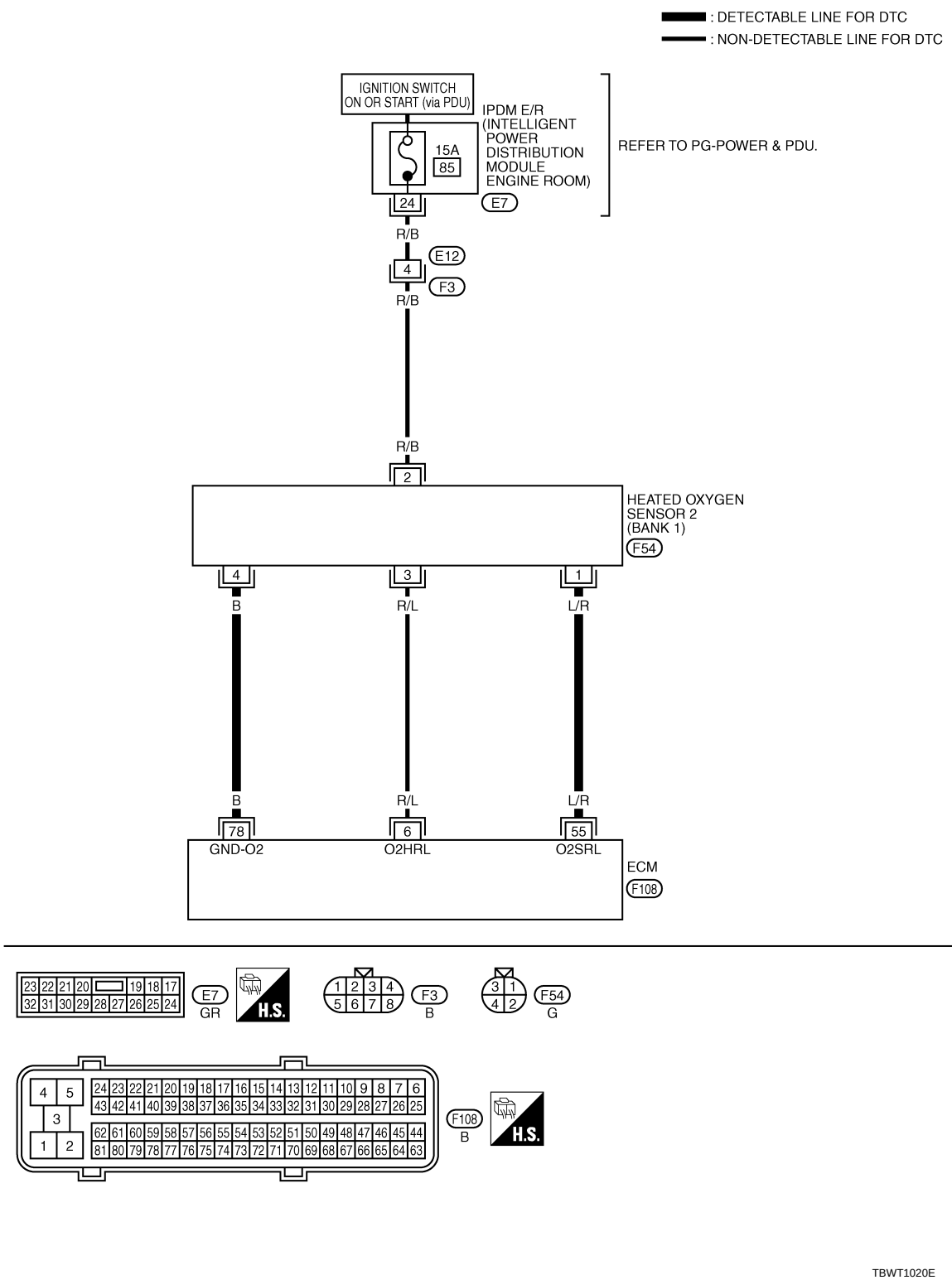


Wiring Diagram

INFOID:0000000005354082

BANK 1

EC-O2S2B1-01



TBWT1020E

Specification data are reference values and are measured between each terminal and ground.

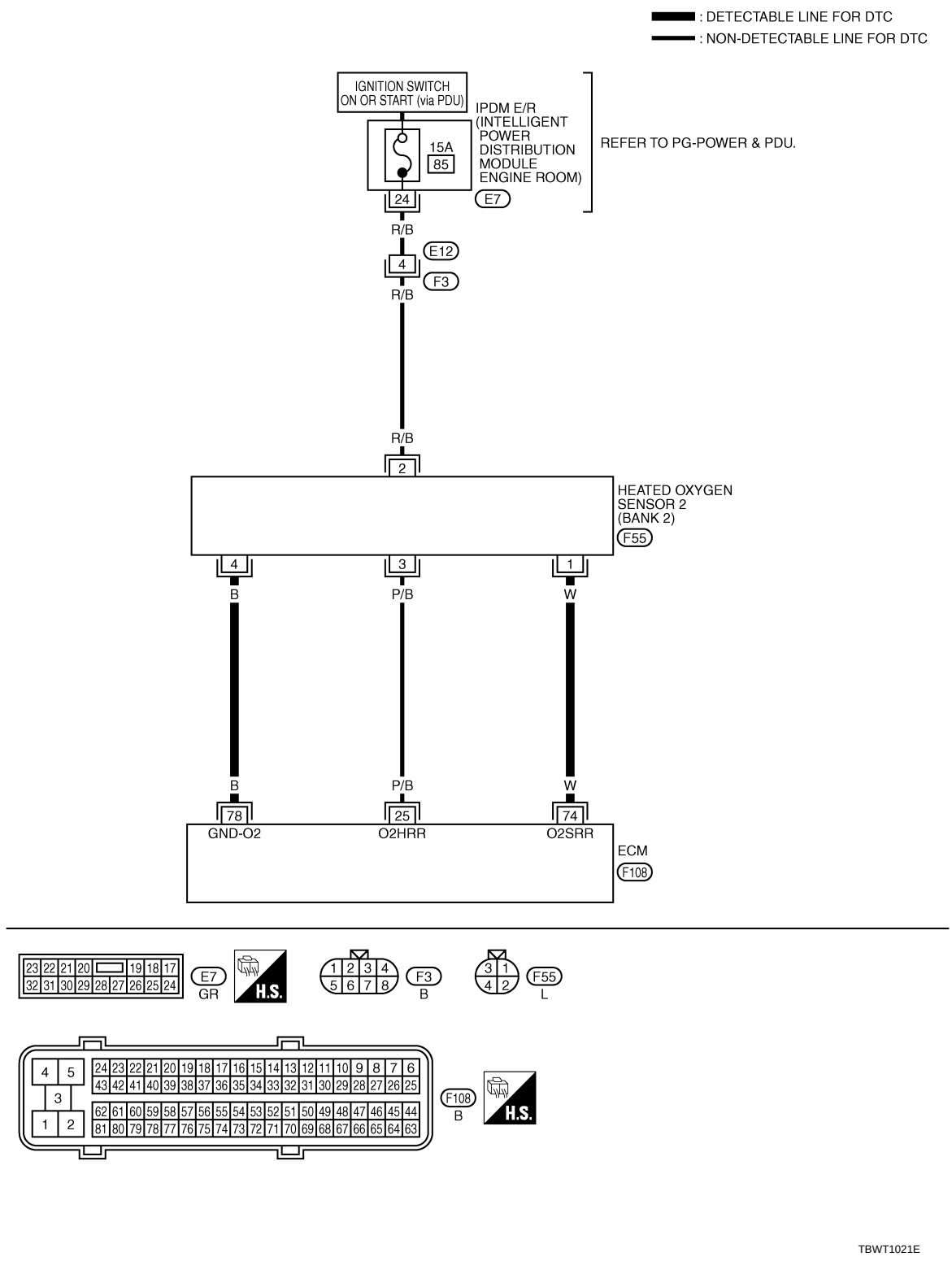
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6	R/L	Heated oxygen sensor 2 heater (bank 1)	**[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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
55	L/R	Heated oxygen sensor 2 (bank 1)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

BANK 2

EC-O2S2B2-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

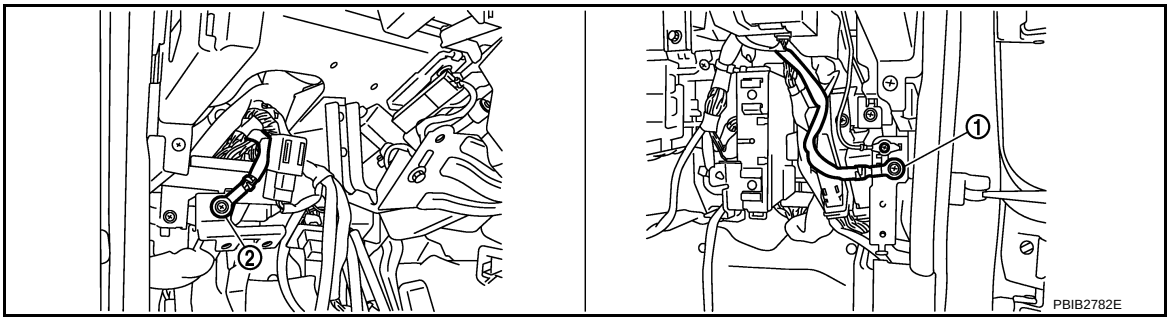
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	P/B	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
74	W	Heated oxygen sensor 2 (bank 2)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

Diagnosis Procedure

INFOID:0000000005354083

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CLEAR THE SELF-LEARNING DATA

With CONSULT-III

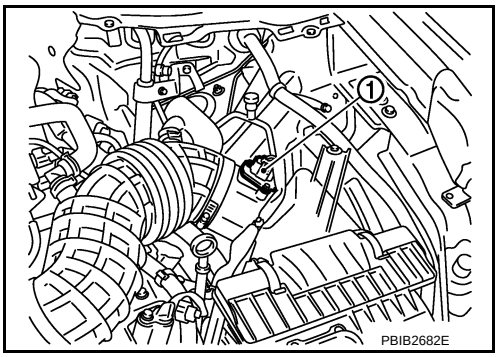
1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171 or P0174 detected?
   Is it difficult to start engine?

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.

2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Check that DTC P0102 is displayed.
6. Erase DTC.
7. Check that DTC P0000 is displayed.
8. 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?



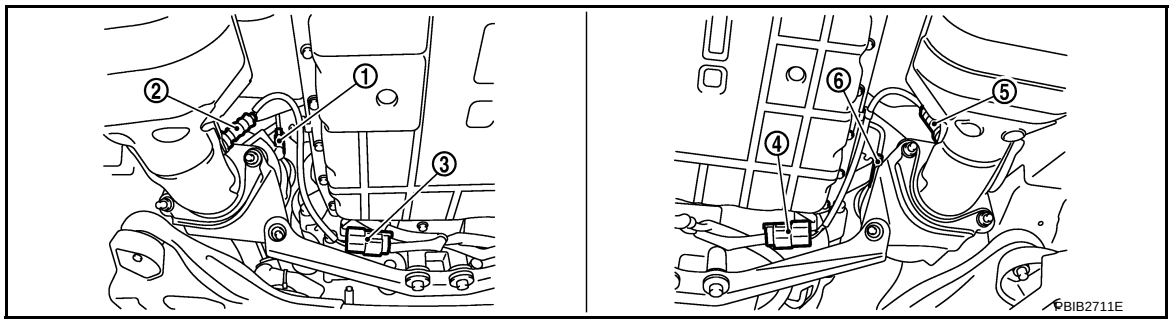
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171 or P0174. Refer to EC-975, "Diagnosis Procedure".

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.



1. Air fuel ratio (A/F) sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. Air fuel ratio (A/F) sensor 1 (bank 2)

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	55	1	1
P0157	74	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground.

Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0137	55	1	1
P0157	74	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-947, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

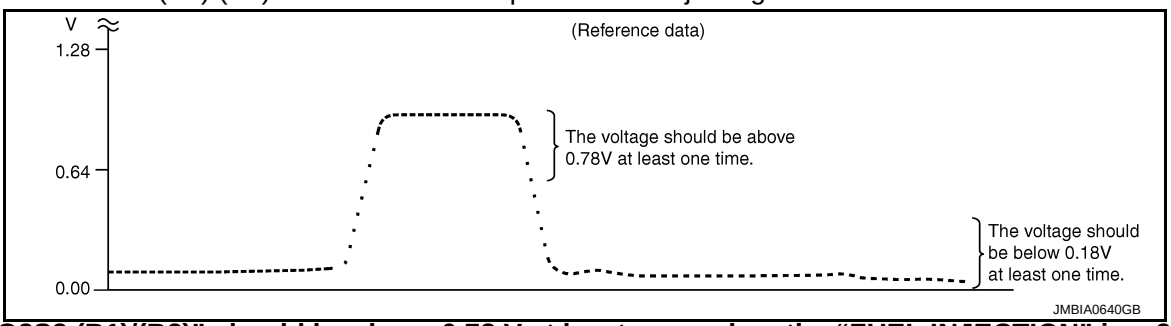
Component Inspection

INFOID:0000000005354084

HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-III.
6. Check “HO2S2 (B1)/(B2)” indication at idle speed when adjusting “FUEL INJECTION” to ± 25%.



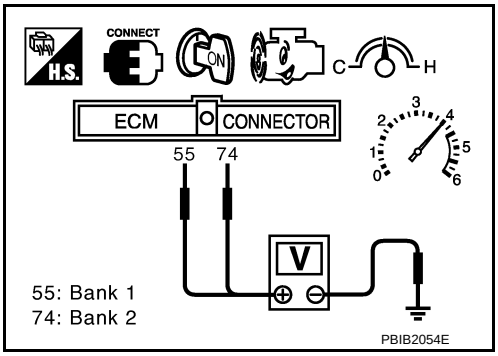
“HO2S2 (B1)/(B2)” should be above 0.78 V at least once when the “FUEL INJECTION” is + 25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is − 25%.

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).**

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.78 V at least once during this procedure.
   The voltage should be below 0.18 V at least once during this procedure.
   If the voltage can be confirmed at step 6, step 7 is not necessary.



7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
   The voltage should be above 0.78 V at least once during this procedure.
   The voltage should be below 0.18 V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

Removal and Installation

INFOID:0000000005354085

HEATED OXYGEN SENSOR 2

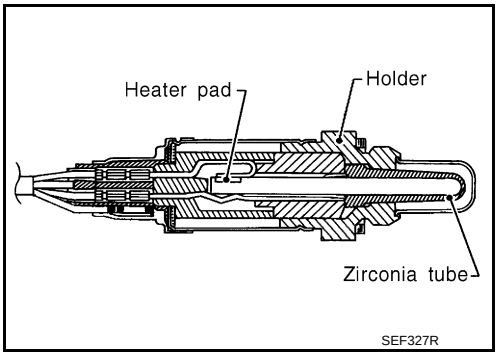
Refer to EM-178, "Component".

DTC P0138, P0158 HO2S2

Component Description

INFOID:0000000005354086

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354087

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	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 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)		LEAN ←→ RICH

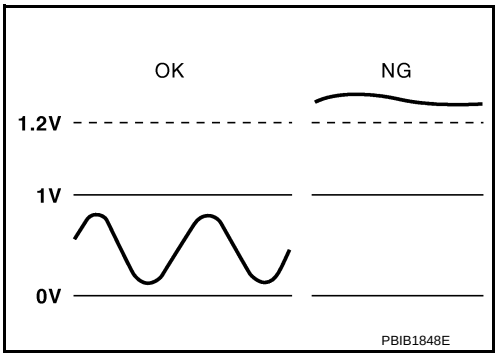
On Board Diagnosis Logic

INFOID:0000000005354088

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time.

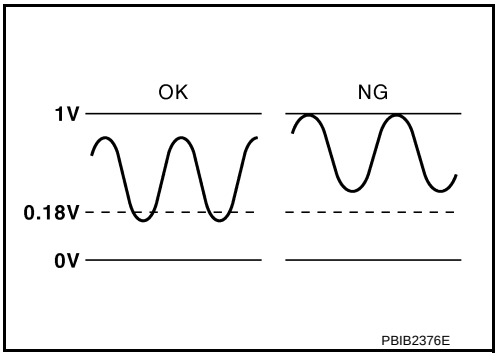
MALFUNCTION A

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the voltage is unusually high during various driving conditions such as fuel cut.



MALFUNCTION B

To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the minimum voltage of sensor is sufficiently low during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0138 0138 (Bank 1)	Heated oxygen sensor 2 circuit high voltage	A)	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2
P0158 0158 (Bank 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

INFOID:0000000005354089

Perform PROCEDURE FOR MALFUNCTION A first.
If 1st trip DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.
NOTE:
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.

PROCEDURE FOR MALFUNCTION A

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. 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.
8. If 1st trip DTC is detected, go to EC-955, "Diagnosis Procedure".

PROCEDURE FOR MALFUNCTION B

With CONSULT-III
TESTING CONDITION:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30 °C (32 to 86 °F).

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
6. Check that “COOLAN TEMP/S” indication is more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
7. Open engine hood.
8. Select “HO2S2 (B1) P1146” (for DTC P0138) or “HO2S2 (B2) P1166” (for DTC P0158) of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
9. Follow the instructions displayed.
   NOTE:
   It will take at most 10 minutes until “COMPLETED” is displayed.
10. Check that “OK” is displayed after touching “SELF-DIAG RESULTS”.
    If “NG” is displayed, go to EC-955, "Diagnosis Procedure".
    If “CAN NOT BE DIAGNOSED” is displayed, perform the following procedure.

a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
b. Return to step 1.

Overall Function Check

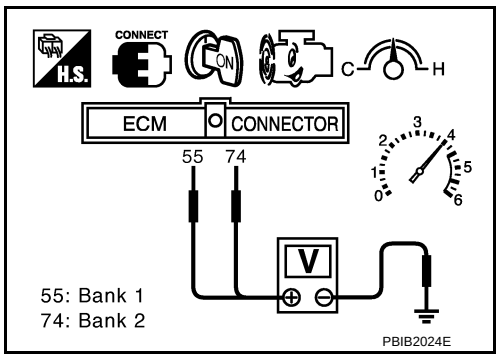
INFOID:0000000005354090

PROCEDURE FOR MALFUNCTION B

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

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. 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. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be below 0.18 V at least once during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
   The voltage should be below 0.18 V at least once during this procedure.
8. If NG, go to EC-955, "Diagnosis Procedure".

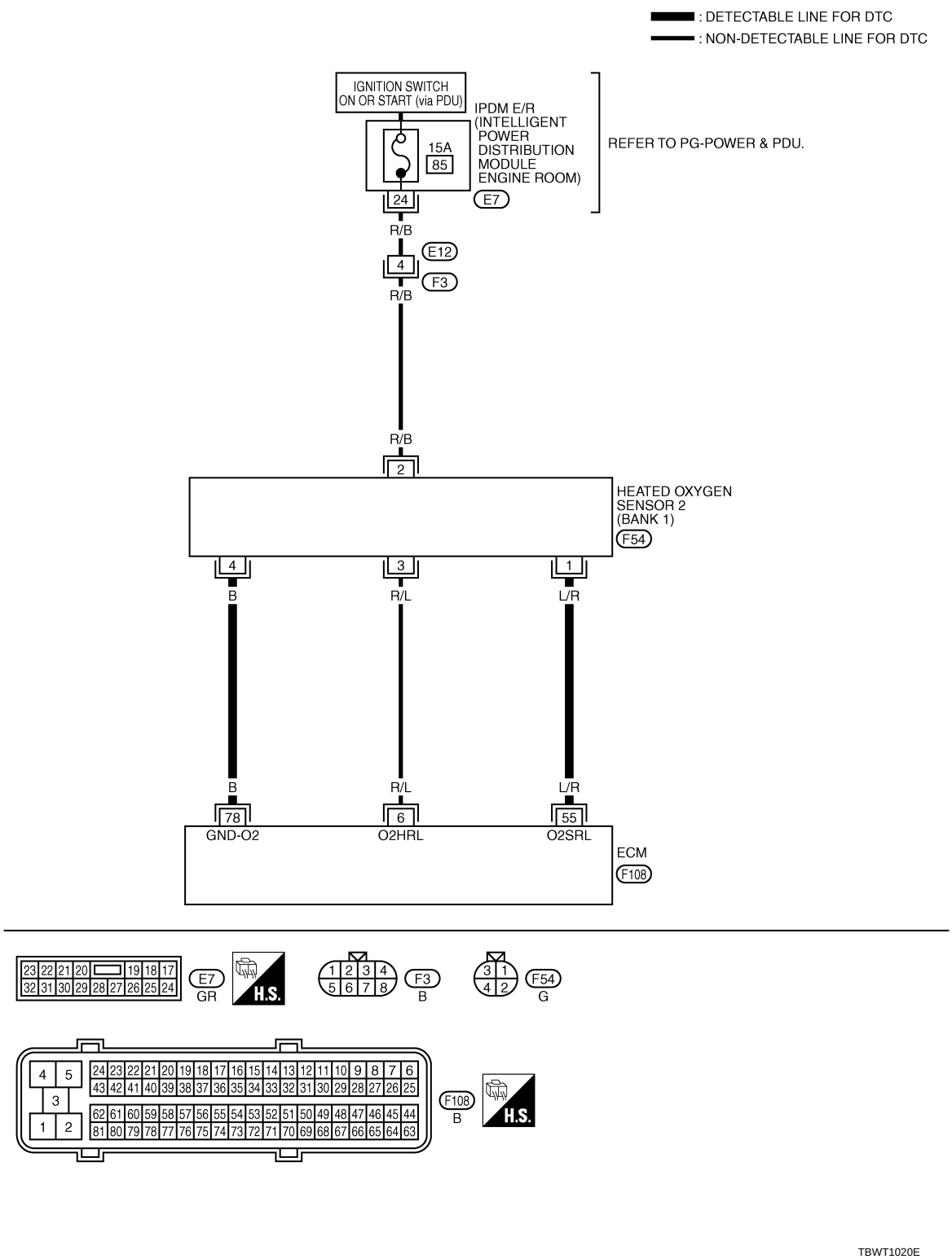


Wiring Diagram

INFOID:0000000005354091

BANK 1

EC-O2S2B1-01



TBWT1020E

Specification data are reference values and are measured between each terminal and ground.

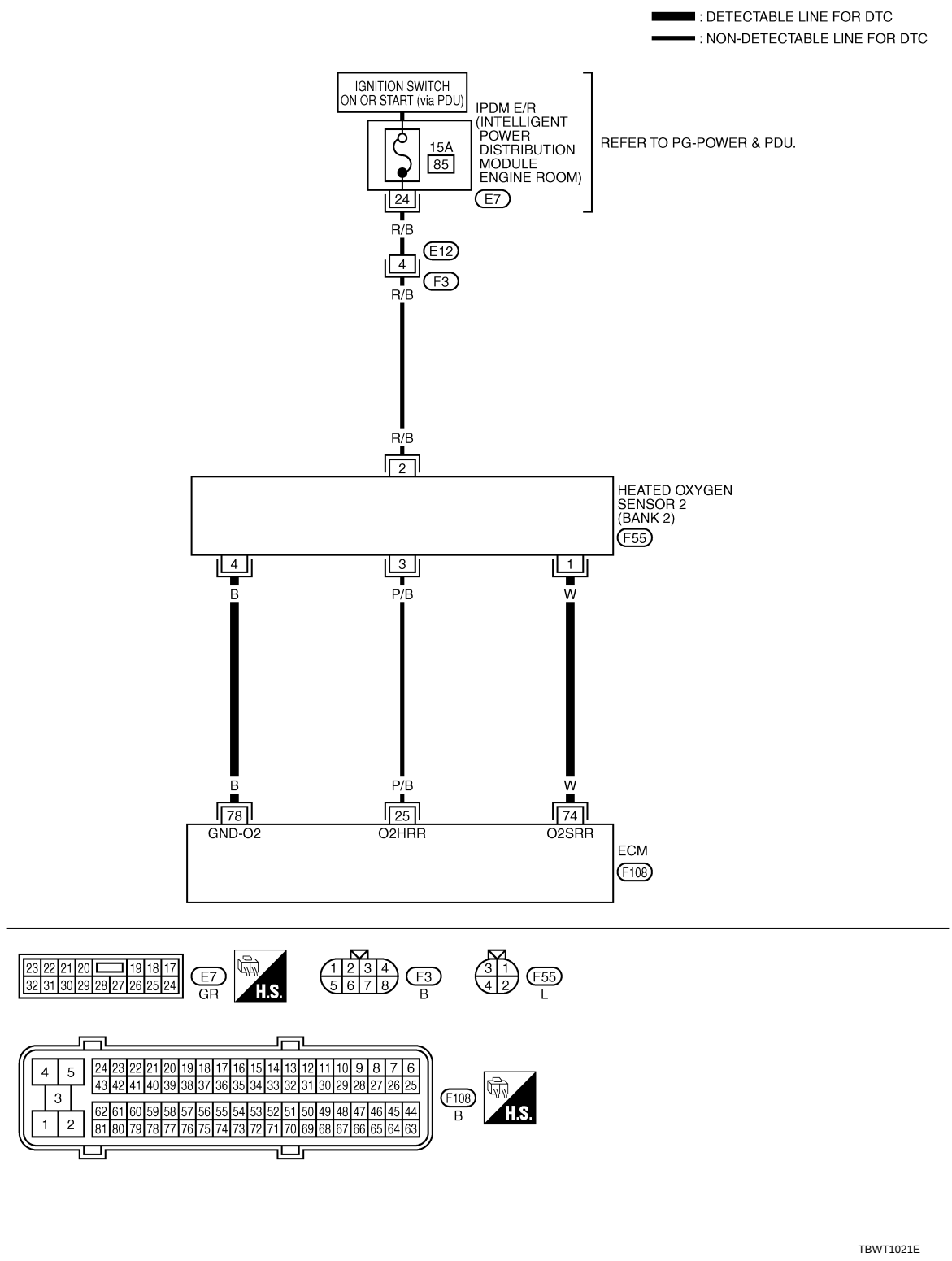
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6	R/L	Heated oxygen sensor 2 heater (bank 1)	**[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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
55	L/R	Heated oxygen sensor 2 (bank 1)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

BANK 2

EC-O2S2B2-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	P/B	Heated oxygen sensor 2 heater (bank 2)	**[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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
74	W	Heated oxygen sensor 2 (bank 2)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

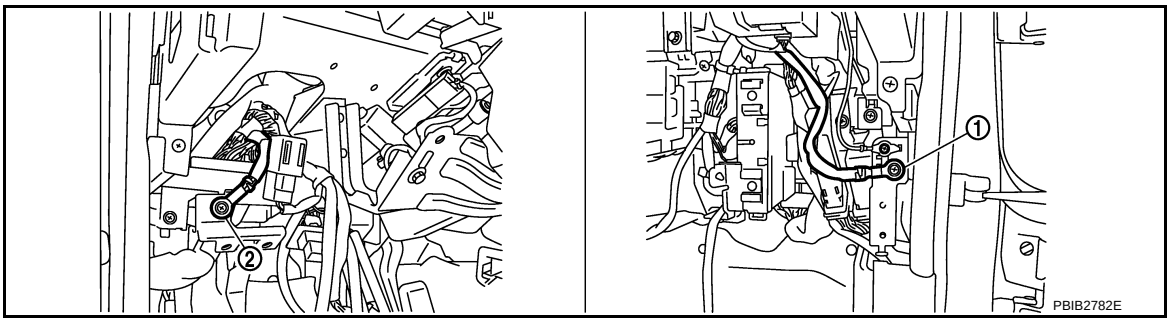
Diagnosis Procedure

INFOID:0000000005354092

PROCEDURE FOR MALFUNCTION A

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



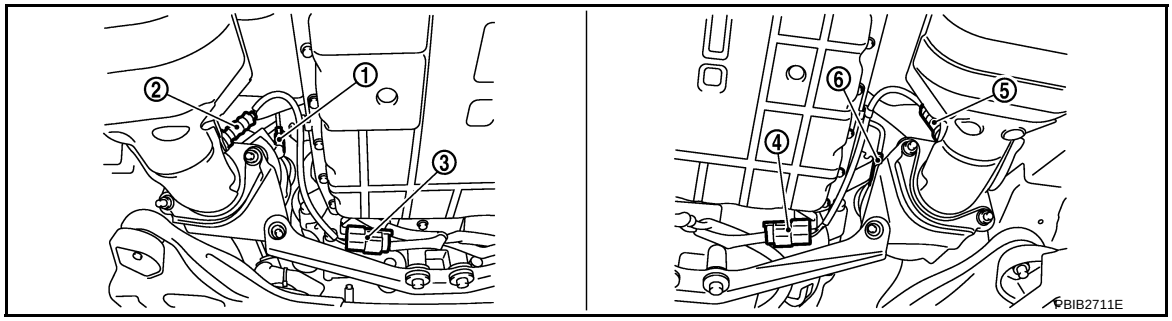
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 (HO2S2) harness connector.



1. Air fuel ratio (A/F) sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. Air fuel ratio (A/F) sensor 1 (bank 2)

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 CONNECTOR FOR WATER

Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-959, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

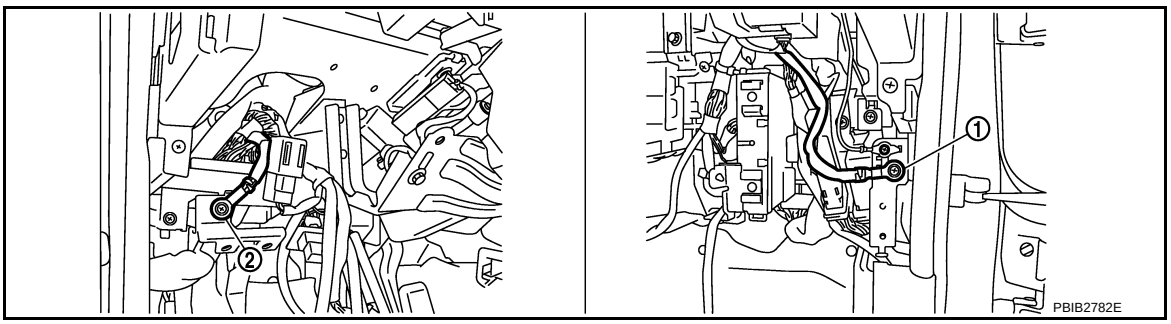
Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

PROCEDURE FOR MALFUNCTION B

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CLEAR THE SELF-LEARNING DATA

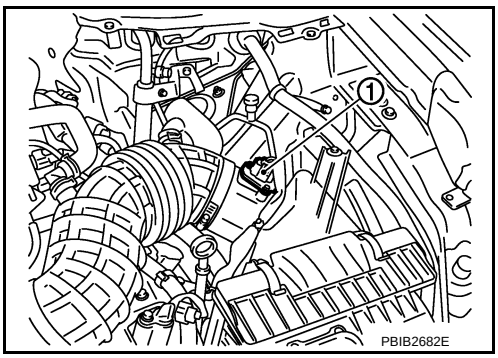
With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. 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?

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.

3. Disconnect mass air flow sensor (1) harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Check that DTC P0102 is displayed.
6. Erase the DTC.
7. Check that DTC P0000 is displayed.
8. 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?

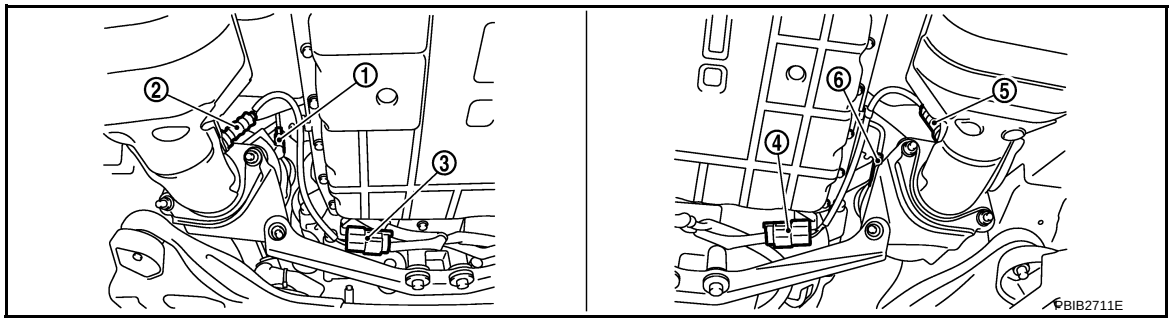


Yes or No

Yes >> Perform trouble diagnosis for DTC P0172, P0175. Refer to EC-984, "Diagnosis Procedure".
No >> GO TO 3.

3. CHECK HO2S2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect heated oxygen sensor 2 harness connector.



1. Air fuel ratio (A/F) sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. Air fuel ratio (A/F) sensor 1 (bank 2)

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0138	55	1	1
P0158	74	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-959, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

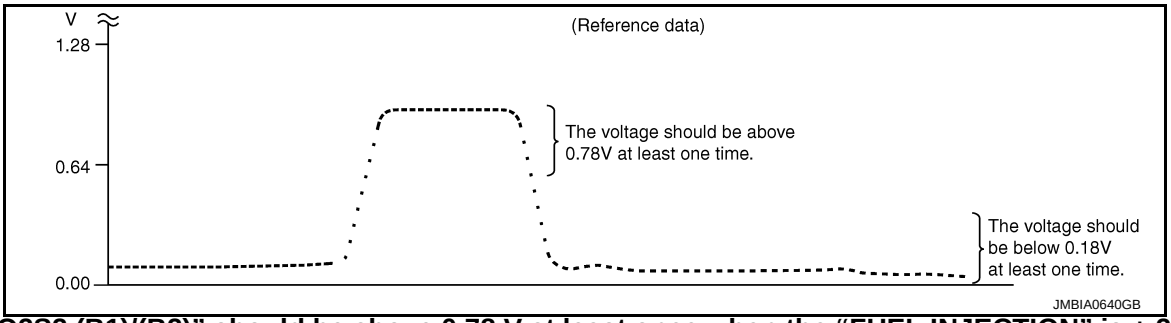
Component Inspection

INFOID:0000000005354093

HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-III.
6. Check “HO2S2 (B1)/(B2)” indication at idle speed when adjusting “FUEL INJECTION” to ± 25%.



“HO2S2 (B1)/(B2)” should be above 0.78 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%.

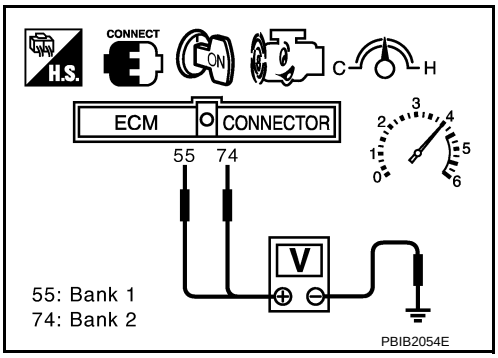
CAUTION:

- **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).**

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.

2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.78 V at least once during this procedure.
   The voltage should be below 0.18 V at least once during this procedure.
   If the voltage can be confirmed at step 6, step 7 is not necessary.



7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
   The voltage should be above 0.78 V at least once during this procedure.
   The voltage should be below 0.18 V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

Removal and Installation

INFOID:0000000005354094

HEATED OXYGEN SENSOR 2

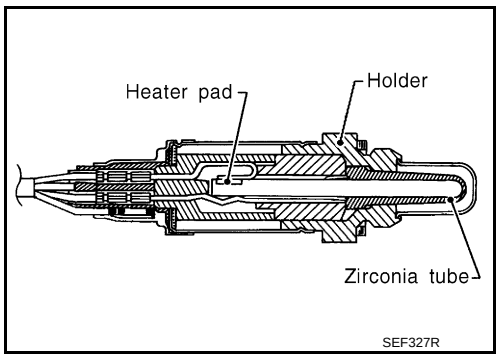
Refer to EM-178, "Component".

DTC P0139, P0159 HO2S2

Component Description

INFOID:0000000005354095

The heated oxygen sensor 2, after three way catalyst (manifold), monitors the oxygen level in the exhaust gas on each bank.
Even if switching characteristics of the air fuel ratio (A/F) sensor 1 are shifted, the air-fuel ratio is controlled to stoichiometric, by the signal from the heated oxygen sensor 2.
This sensor is made of ceramic zirconia. The zirconia generates voltage from approximately 1 V in richer conditions to 0 V in leaner conditions.
Under normal conditions the heated oxygen sensor 2 is not used for engine control operation.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354096

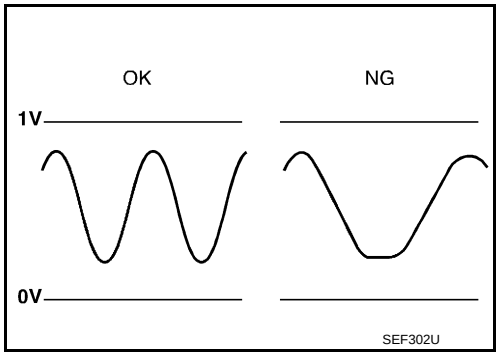
Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
HO2S2 (B1) HO2S2 (B2)	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 - 0.3 V ←→ Approx. 0.6 - 1.0 V
HO2S2 MNTR (B1) HO2S2 MNTR (B2)		LEAN ←→ RICH

On Board Diagnosis Logic

INFOID:0000000005354097

The heated oxygen sensor 2 has a much longer switching time between rich and lean than the air fuel ratio (A/F) sensor 1. The oxygen storage capacity of the three way catalyst (manifold) causes the longer switching time. To judge malfunctions of heated oxygen sensor 2, ECM monitors whether the switching response of the sensor's voltage is faster than the specified value during various driving conditions such as fuel cut.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0139 0139 (Bank 1)	Heated oxygen sensor 2 circuit slow response	It takes more time for the sensor to respond between rich and lean than the specified time.	• Harness or connectors (The sensor circuit is open or shorted) • Heated oxygen sensor 2 • Fuel pressure • Fuel injector • Intake air leakage
P0159 0159 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354098

NOTE:
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-III

TESTING CONDITION:
For better results, perform “DTC WORK SUPPORT” at a temperature of 0 to 30°C (32 to 86°F).

1. Start engine and warm it up to the normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON.
4. Turn ignition switch OFF and wait at least 10 seconds.
5. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
8. Check that “COOLAN TEMP/S” indication is more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “HO2S2 (B1) P0139” or “HO2S2 (B2) P0159” of “HO2S2” in “DTC WORK SUPPORT” mode with CONSULT-III.
11. Follow the instructions displayed.
    NOTE:
    It will take at most 10 minutes until “COMPLETED” is displayed.
12. Check that “OK” is displayed after touching “SELF-DIAG RESULTS”.
    If “NG” is displayed, go to EC-966, "Diagnosis Procedure".
    If “CAN NOT BE DIAGNOSED” is displayed, perform the following procedure.

a. Turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle).
b. Return to step 1.

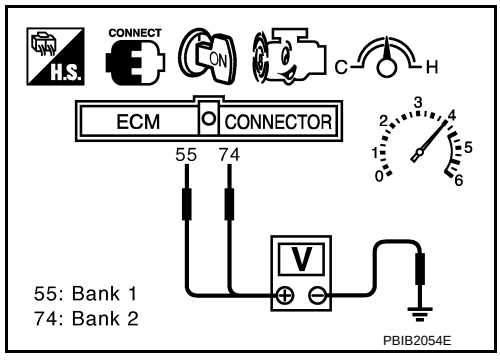
Overall Function Check

INFOID:0000000005354099

Use this procedure to check the overall function of the heated oxygen sensor 2 circuit. During this check, a 1st trip DTC might not be confirmed.

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. 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. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   A change of voltage should be more than 0.12 V for 1 second during this procedure.
   If the voltage can be confirmed in step 6, step 7 is not necessary.
7. Keep vehicle at idling for 10 minutes, then check the voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
   A change of voltage should be more than 0.12V for 1 second during this procedure.
8. If NG, go to EC-966, "Diagnosis Procedure".

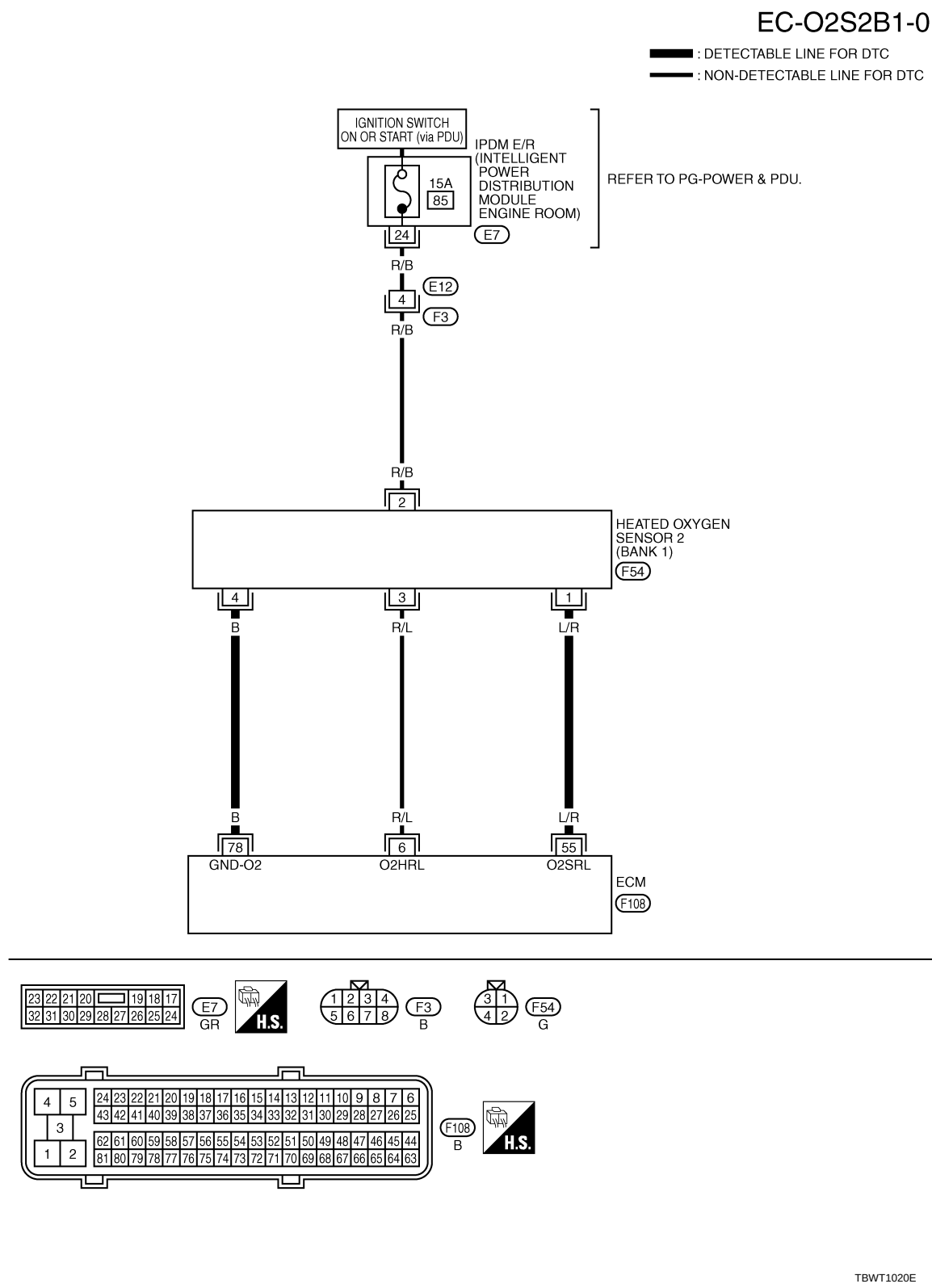


Wiring Diagram

INFOID:0000000005354100

BANK 1

EC-O2S2B1-01



TBWT1020E

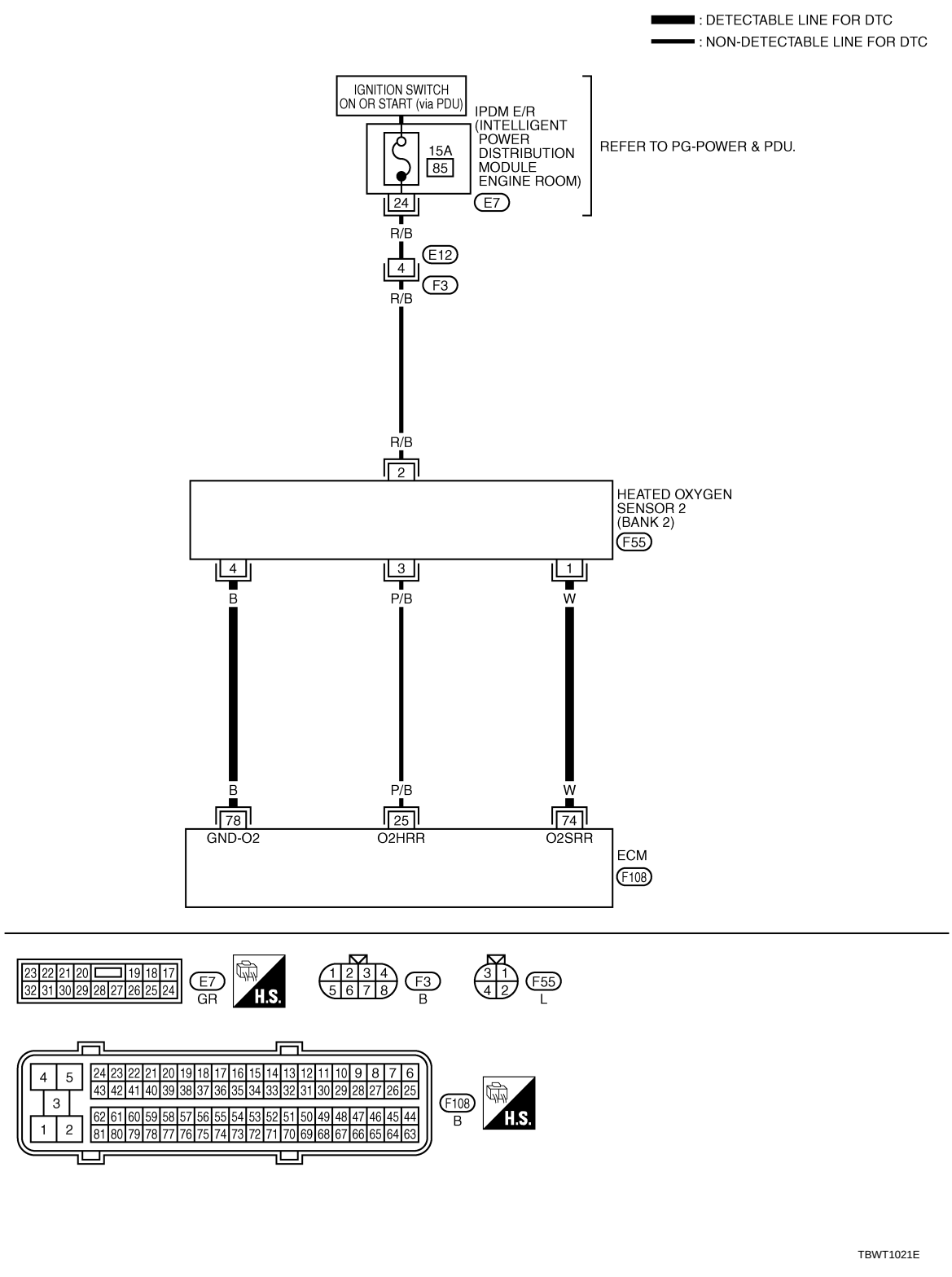
Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
6	R/L	Heated oxygen sensor 2 heater (bank 1)	**[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	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
55	L/R	Heated oxygen sensor 2 (bank 1)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

EC-O2S2B2-01



TBWT1021E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

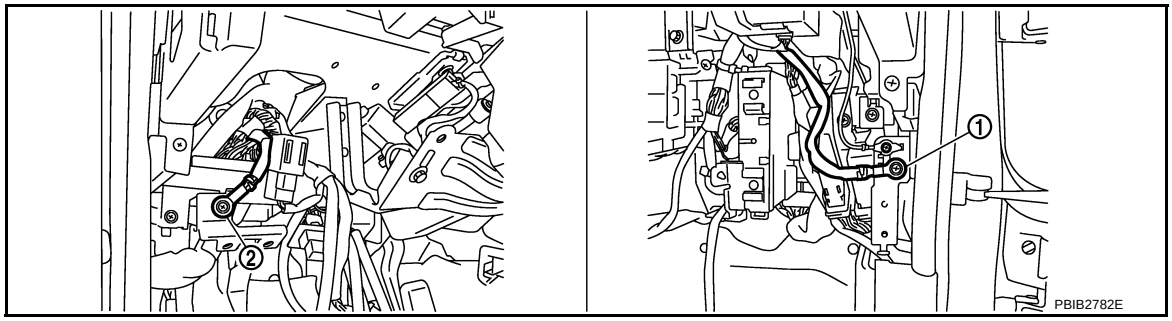
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
25	P/B	Heated oxygen sensor 2 heater (bank 2)	**[Engine is running]** • Engine speed: Below 3,600 rpm after the following conditions are met - Engine: After warming up - Keeping the engine speed between 3,500 and 4,000 rpm for 1 minute and at idle for 1 minute under no load	0 - 1.0 V
			[Ignition switch: ON] • Engine: Stopped **[Engine is running]** • Engine speed: Above 3,600 rpm	BATTERY VOLTAGE (11 - 14 V)
74	W	Heated oxygen sensor 2 (bank 2)	**[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 - Approximately 1.0 V
78	B	Sensor ground (Heated oxygen sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

Diagnosis Procedure

INFOID:0000000005354101

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CLEAR THE SELF-LEARNING DATA

With CONSULT-III

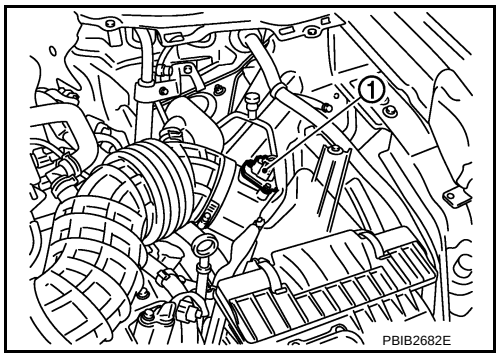
1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. Run engine for at least 10 minutes at idle speed.
   Is the 1st trip DTC P0171, P0172, P0174 or P0175 detected?
   Is it difficult to start engine?

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.

2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector, and restart and run engine for at least 5 seconds at idle speed.
4. Stop engine and reconnect mass air flow sensor harness connector.
5. Check that DTC P0102 is displayed.
6. Erase the DTC.
7. Check that DTC P0000 is displayed.
8. 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?



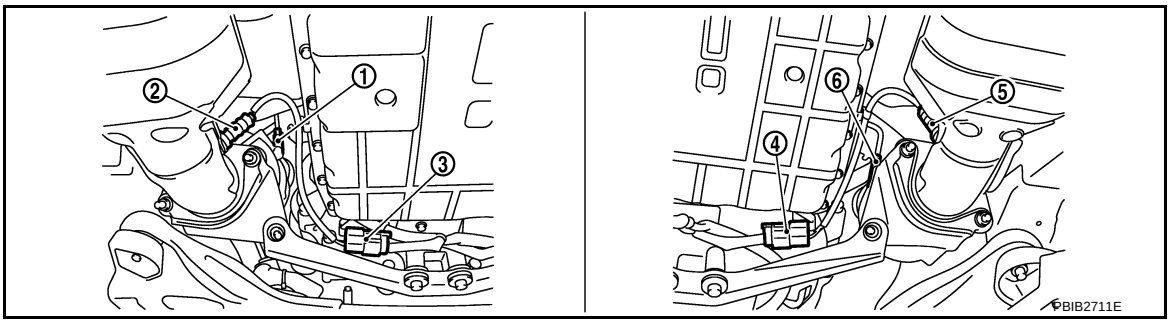
Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-975, "Diagnosis Procedure" or EC-984, "Diagnosis Procedure".

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.



1. Air fuel ratio (A/F) sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. Air fuel ratio (A/F) sensor 1 (bank 2)

3. Disconnect ECM harness connector.
4. Check harness continuity between ECM terminal 78 and HO2S2 terminal 4. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK HO2S2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal and HO2S2 terminal as per the following. Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	55	1	1
P0159	74	1	2

Continuity should exist.

2. Check harness continuity between the following terminals and ground.

Refer to Wiring Diagram.

DTC	Terminals		Bank
	ECM	Sensor	
P0139	55	1	1
P0159	74	1	2

Continuity should not exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK HEATED OXYGEN SENSOR 2

Refer to EC-968, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> Replace malfunctioning heated oxygen sensor 2.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

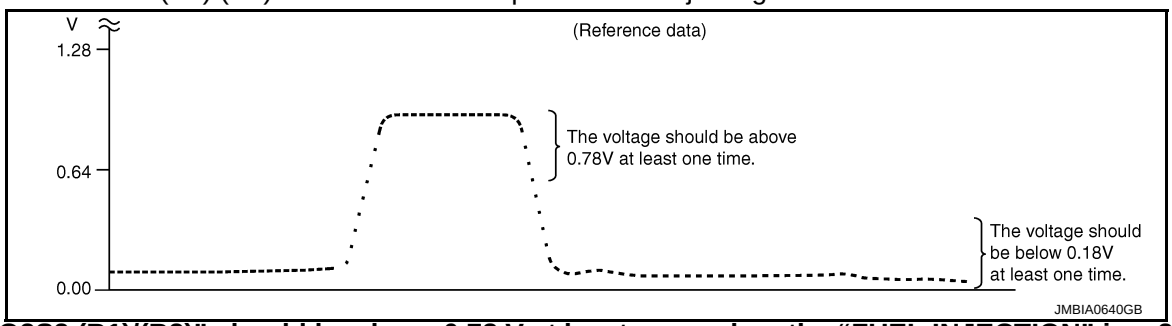
Component Inspection

INFOID:0000000005354102

HEATED OXYGEN SENSOR 2

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Select “FUEL INJECTION” in “ACTIVE TEST” mode, and select “HO2S2 (B1)/(B2)” as the monitor item with CONSULT-III.
6. Check “HO2S2 (B1)/(B2)” indication at idle speed when adjusting “FUEL INJECTION” to ± 25%.



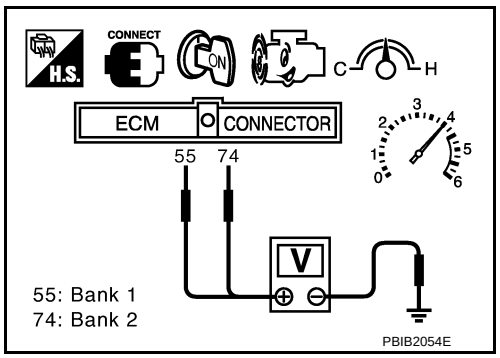
“HO2S2 (B1)/(B2)” should be above 0.78 V at least once when the “FUEL INJECTION” is + 25%.
“HO2S2 (B1)/(B2)” should be below 0.18 V at least once when the “FUEL INJECTION” is – 25%.

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).**

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and keep the engine speed between 3,500 and 4,000 rpm for at least 1 minute under no load.
4. Let engine idle for 1 minute.
5. Set voltmeter probes between ECM terminal 55 [HO2S2 (B1) signal] and ground, or 74 [HO2S2 (B2) signal] and ground.
6. Check the voltage when revving up to 4,000 rpm under no load at least 10 times.
   (Depress and release accelerator pedal as soon as possible.)
   The voltage should be above 0.78 V at least once during this procedure.
   The voltage should be below 0.18 V at least once during this procedure.
   If the voltage can be confirmed at step 6, step 7 is not necessary.



7. Keep vehicle at idling for 10 minutes, then check voltage. Or check the voltage when coasting from 80 km/h (50 MPH) in the D position.
   The voltage should be above 0.78 V at least once during this procedure.
   The voltage should be below 0.18 V at least once during this procedure.
8. If NG, replace heated oxygen sensor 2.

CAUTION:
- **Discard any heated oxygen sensor which has been dropped from a height of more than 0.5 m (19.7 in) onto a hard surface such as a concrete floor; use a new one.**
- **Before installing new oxygen sensor, clean exhaust system threads using Oxygen Sensor Thread Cleaner [commercial service tool (J-43897-18 or J-43897-12)] and approved Anti-seize Lubricant (commercial service tool).**

Removal and Installation

INFOID:0000000005354103

HEATED OXYGEN SENSOR 2

Refer to EM-178, "Component".

DTC P0171, P0174 FUEL INJECTION SYSTEM FUNCTION

On Board Diagnosis Logic

INFOID:0000000005354104

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 0171 (Bank 1) P0174 0174 (Bank 2)	Fuel injection system too lean	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too lean.)	• Intake air leakage • A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Lack of fuel • Mass air flow sensor • Incorrect PCV hose connection

DTC Confirmation Procedure

INFOID:0000000005354105

NOTE:
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-III

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 and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
6. Clear the self-learning control coefficient by touching “CLEAR”.
7. Start engine.
   If it is difficult to start engine, the fuel injection system has a malfunction.
   Performing the following procedure is advised.

a. 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.

b. If engine starts, go to EC-975, "Diagnosis Procedure".
   If engine does not start, check exhaust and intake air leakage visually.

8. Keep engine at idle for at least 5 minutes.
9. Check 1st trip DTC.
10. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to EC-975, "Diagnosis Procedure".
    NOTE:
    If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Start engine.
c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

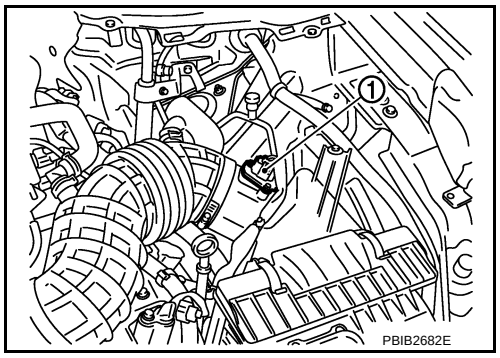
VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

d. Check 1st trip DTC.
e. If 1st rip DTC is detected, go to EC-975, "Diagnosis 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. Disconnect mass air flow sensor (1) harness connector.
6. Restart engine and let it idle for at least 5 seconds.
7. Stop engine and reconnect mass air flow sensor harness connector.
8. Select Service $03 with GST and check that DTC P0102 is detected.
9. Select Service $04 with GST and erase the DTC P0102.
10. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction.
Performing the following procedure is advised.



a. 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.
b. If engine starts, go to EC-975, "Diagnosis Procedure".
If engine does not start, check exhaust and intake air leakage visually.

11. Keep engine at idle for at least 5 minutes.
12. Check 1st trip DTC.
13. The 1st trip DTC P0171 or P0174 should be detected at this stage, if a malfunction exists. If so, go to EC-975, "Diagnosis Procedure".
NOTE:
If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Start engine.
c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

Vehicle speed	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

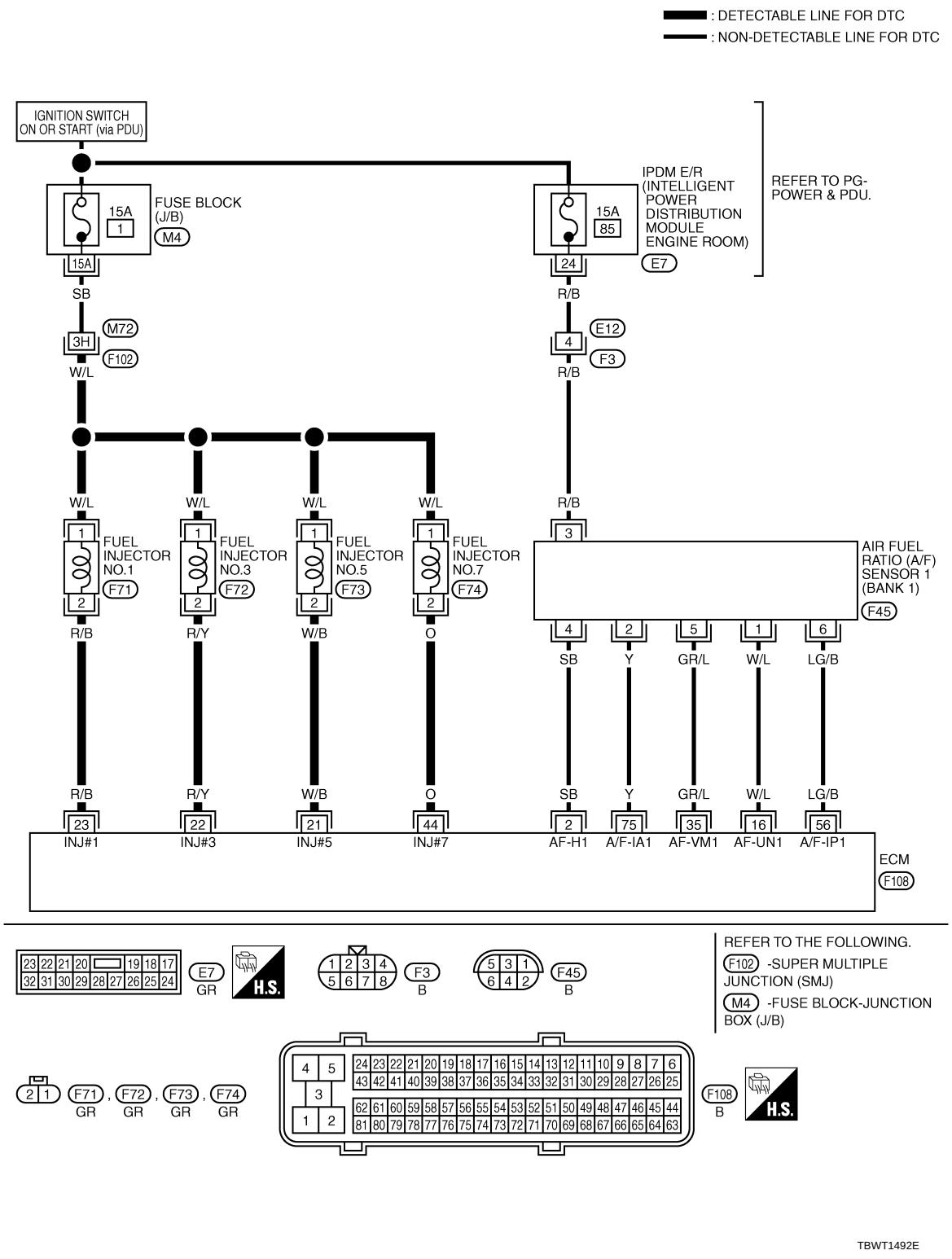
d. Check 1st trip DTC.
e. If 1st rip DTC is detected, go to EC-975, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354106

BANK 1

EC-FUELB1-01

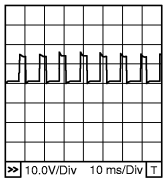
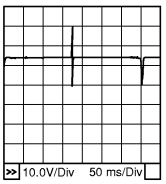
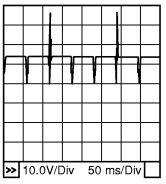


TBWT1492E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

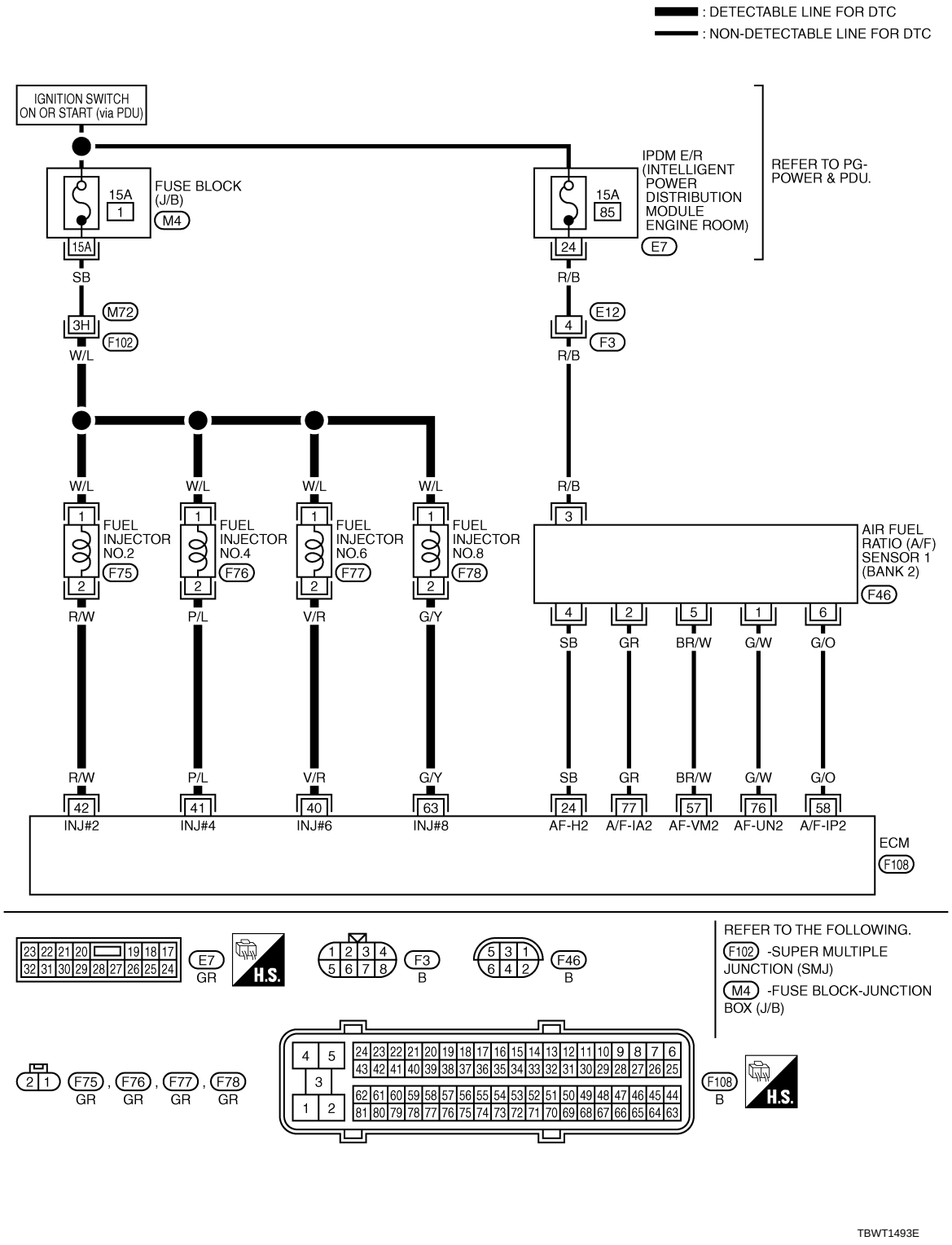
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V
21 22 23 44	W/B R/Y R/B O	Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1 Fuel injector No. 7	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  PBIB0042E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  PBIB0043E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-FUELB2-01

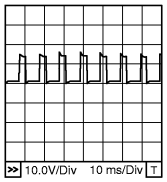
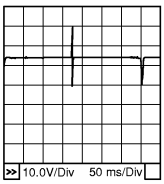
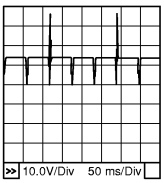


TBWT1493E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
40 41 42 63	V/R P/L R/W G/Y	Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2 Fuel injector No. 8	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  PBIB0042E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  PBIB0043E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

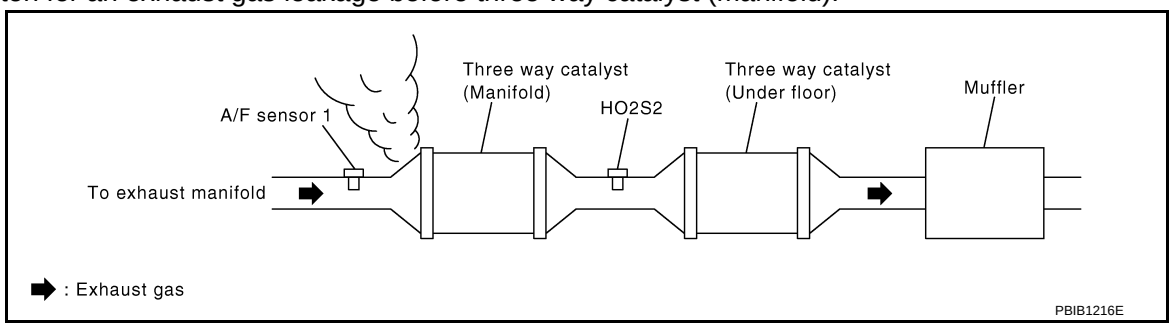
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354107

1.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



PBIB1216E

OK or NG

OK >> GO TO 2.
NG >> Repair or replace malfunctioning part.

2.CHECK FOR INTAKE AIR LEAKAGE

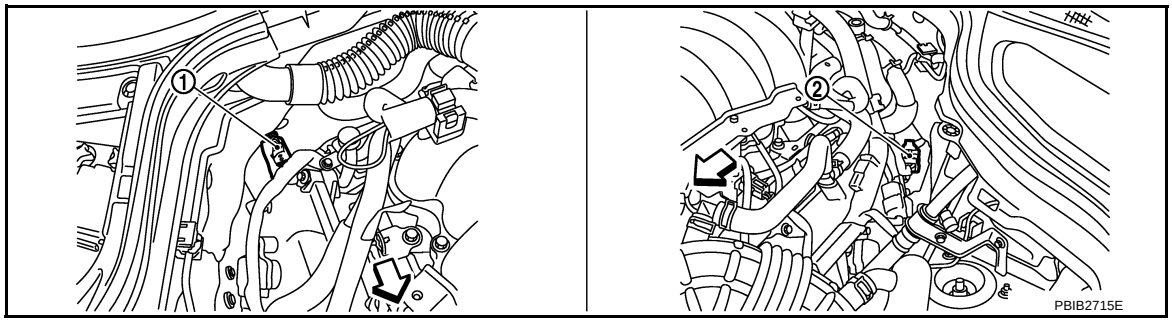
1. Listen for an intake air leakage after mass air flow sensor.
2. Check PCV hose connection.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding air fuel ratio (A/F) sensor 1 harness connector.



⇦ : Vehicle front
1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.
Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

5. Check harness continuity between the following terminals and ground.
Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.

NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-766, "Fuel Pressure Check".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-766, "Fuel Pressure Check".

At idling: Approximately 350 kPa (3.57 kg/cm^2, 51 psi)

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Fuel pump and circuit (Refer to EC-1298, "Diagnosis Procedure".)
- Fuel pressure regulator (Refer to EC-766, "Fuel Pressure Check".)
- Fuel lines
- Fuel filter for clogging

>> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-III
1. Install all removed parts.
2. Start engine and warm it up to normal operating temperature.
3. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

With GST
1. Install all removed parts.
2. Start engine and warm it up to normal operating temperature.
3. Check mass air flow sensor signal in Service $01 with GST.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

OK or NG

OK (With CONSULT-III)>>GO TO 7.
OK (Without CONSULT-III)>>GO TO 8.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-870, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT-III
1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
2. Check that each circuit produces a momentary engine speed drop.

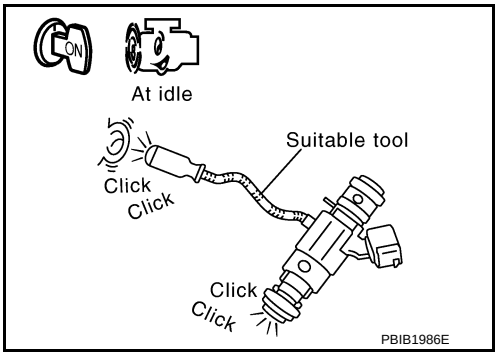
OK or NG

OK >> GO TO 9.
NG >> Perform trouble diagnosis for fuel injector, refer to EC-1293, "Diagnosis Procedure".

8. CHECK FUNCTION OF FUEL INJECTOR

Without CONSULT-III

Listen to each fuel injector operating sound.



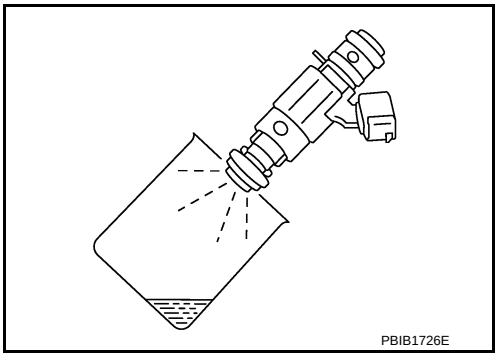
Operating sound should exist.

OK or NG

OK >> GO TO 9.
NG >> Perform trouble diagnosis for fuel injector, refer to EC-1293, "Diagnosis Procedure".

9. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Check 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-189, "Component".
   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.

OK or NG

OK >> GO TO 10.
NG >> Replace fuel injectors from which fuel does not spray out. Always replace O-ring with new ones.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

DTC P0172, P0175 FUEL INJECTION SYSTEM FUNCTION

On Board Diagnosis Logic

INFOID:0000000005354108

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 0172 (Bank 1) P0175 0175 (Bank 2)	Fuel injection system too rich	• Fuel injection system does not operate properly. • The amount of mixture ratio compensation is too large. (The mixture ratio is too rich.)	• A/F sensor 1 • Fuel injector • Exhaust gas leakage • Incorrect fuel pressure • Mass air flow sensor

DTC Confirmation Procedure

INFOID:0000000005354109

NOTE:
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-III

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 and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
6. Clear the self-learning control coefficient by touching “CLEAR”.
7. Start engine.
   If it is difficult to start engine, the fuel injection system has a malfunction.
   Performing the following procedure is advised.

a. 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.

b. If engine starts, go to EC-984, "Diagnosis Procedure".
   If engine does not start, remove spark plugs and check for fouling, etc.

8. Keep engine at idle for at least 5 minutes.
9. Check 1st trip DTC.
10. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to EC-984, "Diagnosis Procedure".
    NOTE:
    If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Start engine.

c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

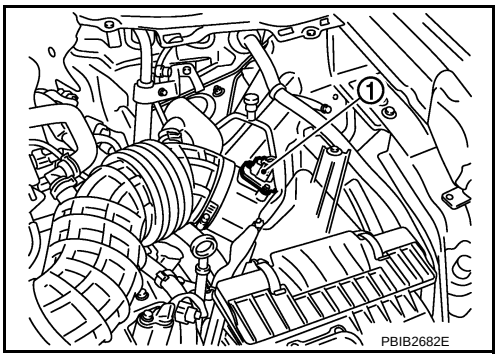
VHCL SPEED SE	50 - 120 km/h (31 - 75 MPH)

CAUTION:
Always drive vehicle at a safe speed.

d. Check 1st trip DTC.
e. If 1st rip DTC is detected, go to EC-984, "Diagnosis 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. Disconnect mass air flow sensor (1) harness connector.
6. Restart engine and let it idle for at least 5 seconds.
7. Stop engine and reconnect mass air flow sensor harness connector.
8. Select Service $03 with GST and check that DTC P0102 is detected.
9. Select Service $04 with GST and erase the DTC P0102.
10. Start engine.
If it is difficult to start engine, the fuel injection system has a malfunction.
Performing the following procedure is advised.



a. 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.
b. If engine starts, go to EC-984, "Diagnosis Procedure".
If engine does not start, remove spark plugs and check for fouling, etc.

11. Keep engine at idle for at least 5 minutes.
12. Check 1st trip DTC.
13. The 1st trip DTC P0172 or P0175 should be detected at this stage, if a malfunction exists. If so, go to EC-984, "Diagnosis Procedure".
NOTE:
If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Start engine.
c. Maintain the following conditions for at least 10 consecutive minutes.
Hold the accelerator pedal as steady as possible.

Vehicle speed	50 - 120 km/h (31 - 75 MPH)

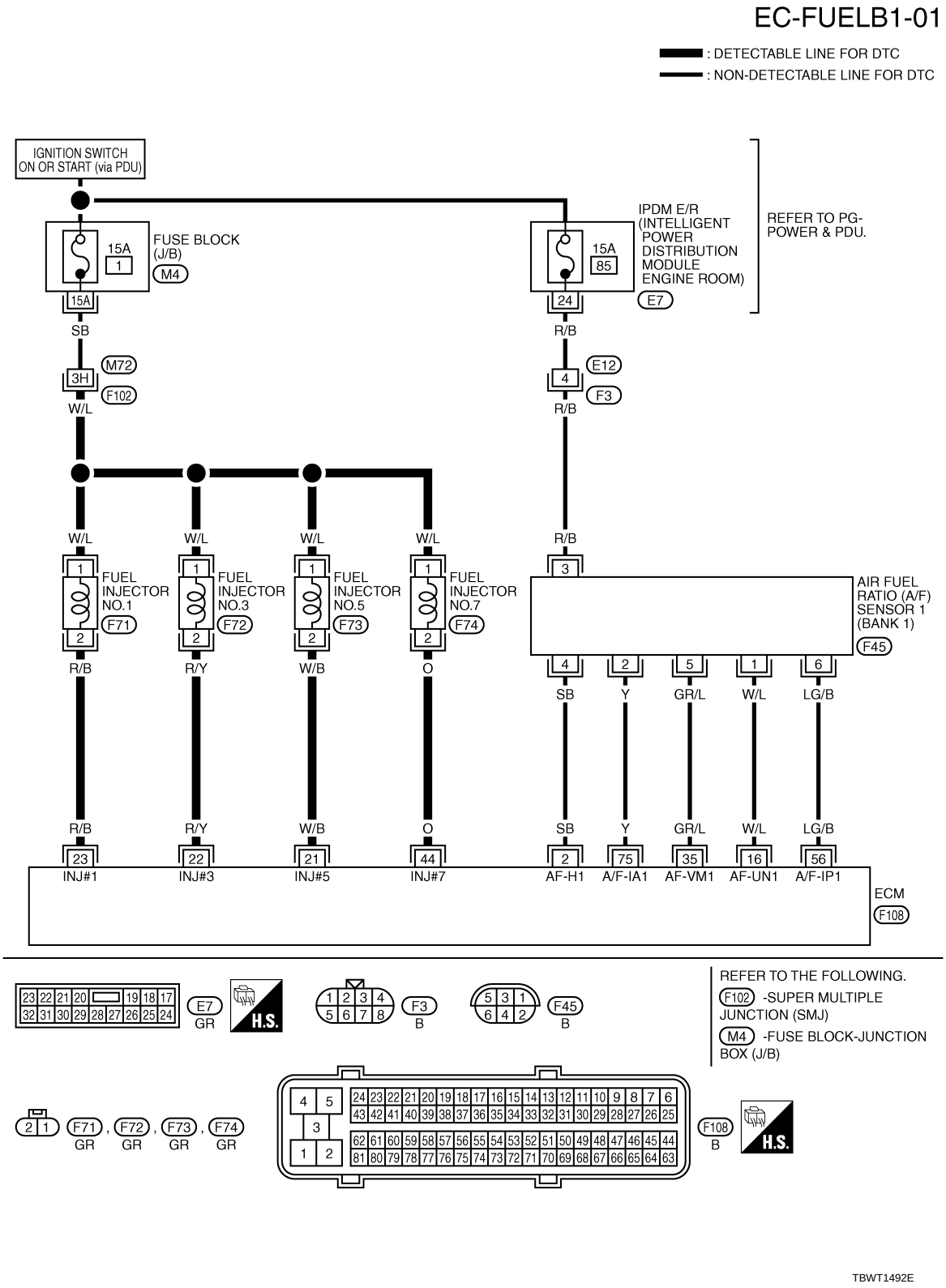
CAUTION:
Always drive vehicle at a safe speed.

d. Check 1st trip DTC.
e. If 1st rip DTC is detected, go to EC-984, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354110

BANK 1

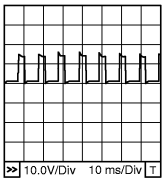
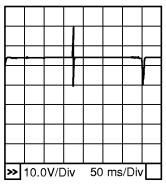
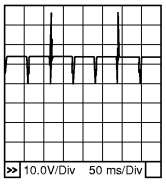


TBWT1492E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

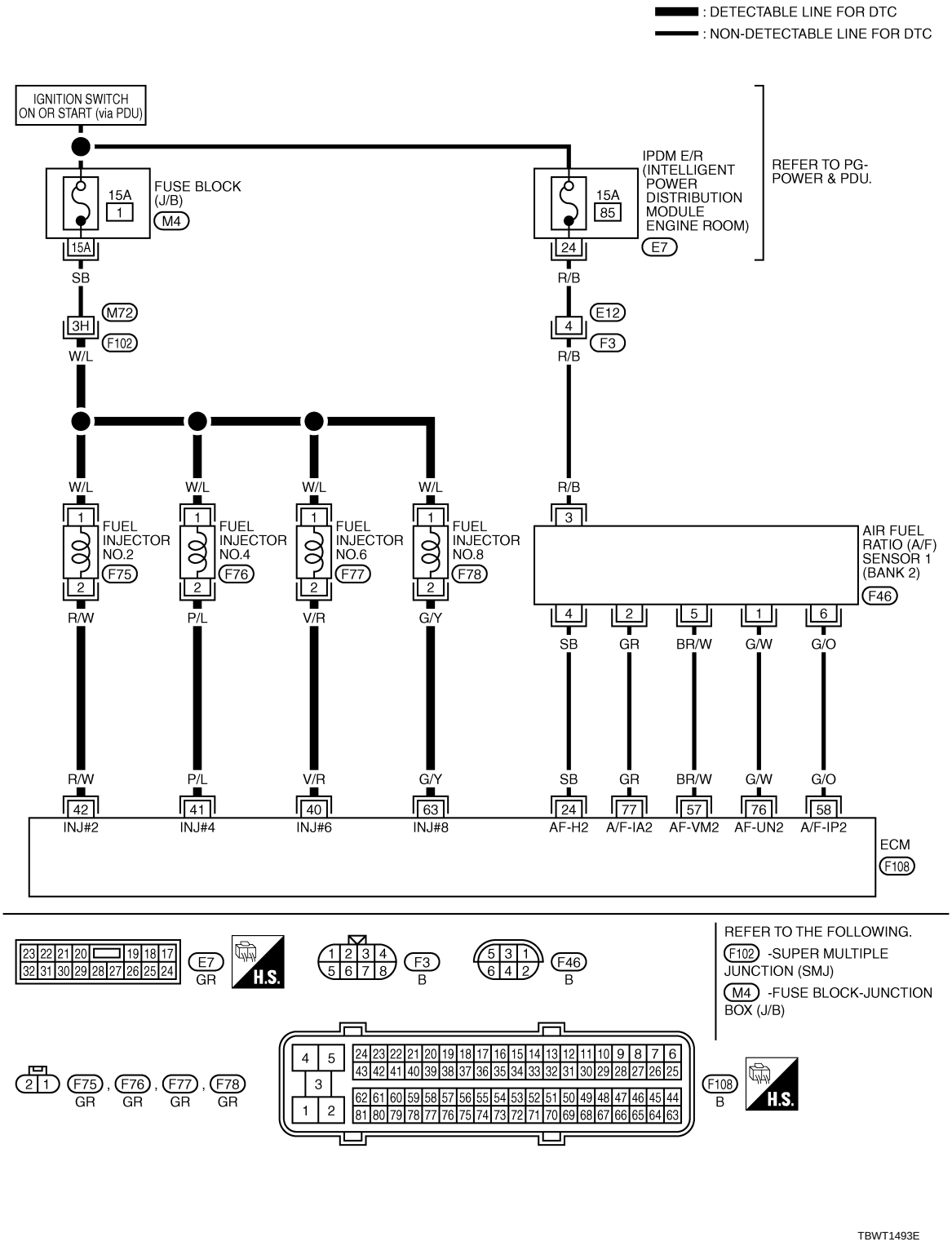
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V
21 22 23 44	W/B R/Y R/B O	Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1 Fuel injector No. 7	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  PBIB0042E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  PBIB0043E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-FUELB2-01

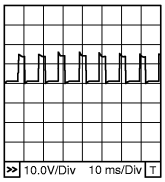
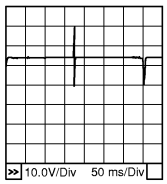
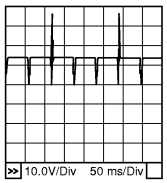


TBWT1493E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
40 41 42 63	V/R P/L R/W G/Y	Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2 Fuel injector No. 8	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  PBIB0042E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  PBIB0043E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

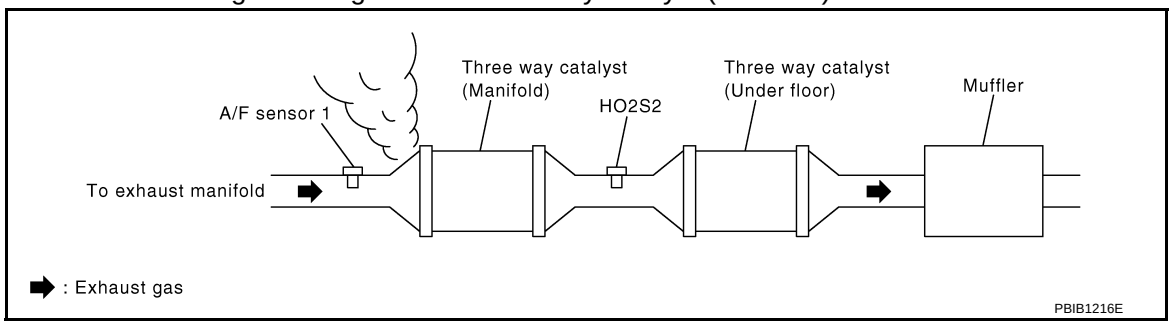
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354111

1.CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before three way catalyst (manifold).



PBIB1216E

OK or NG

OK >> GO TO 2.
NG >> Repair or replace malfunctioning part.

2.CHECK FOR INTAKE AIR LEAKAGE

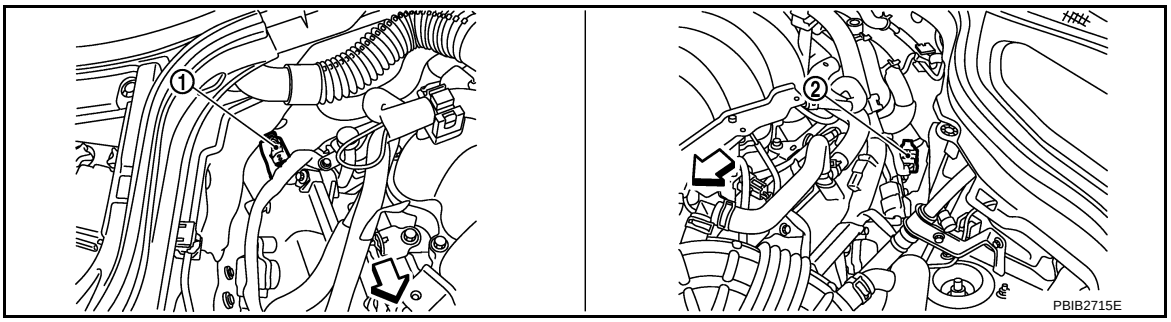
Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding air fuel ratio (A/F) sensor 1 harness connector.



⇦ : Vehicle front

1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals.
   Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

5. Check harness continuity between the following terminals and ground.
   Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUEL PRESSURE

1. Release fuel pressure to zero. Refer to EC-766, "Fuel Pressure Check".
2. Install fuel pressure gauge and check fuel pressure. Refer to EC-766, "Fuel Pressure Check".

At idling: Approximately 350 kPa (3.57 kg/cm^2, 51 psi)

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Fuel pump and circuit (Refer to EC-1298, "Diagnosis Procedure".)
- Fuel pressure regulator (Refer to EC-766, "Fuel Pressure Check".)

>> Repair or replace malfunctioning part.

6. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

1. Install all removed parts.
2. Start engine and warm it up to normal operating temperature.
3. Check “MASS AIR FLOW” in “DATA MONITOR” mode with CONSULT-III.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

With GST

1. Install all removed parts.
2. Start engine and warm it up to normal operating temperature.
3. Check mass air flow sensor signal in Service $01 with GST.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

OK or NG

OK (With CONSULT-III)>>GO TO 7.
OK (Without CONSULT-III)>>GO TO 8.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or grounds. Refer to EC-870, "Diagnosis Procedure".

7. CHECK FUNCTION OF FUEL INJECTOR

With CONSULT-III

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
2. Check that each circuit produces a momentary engine speed drop.

OK or NG

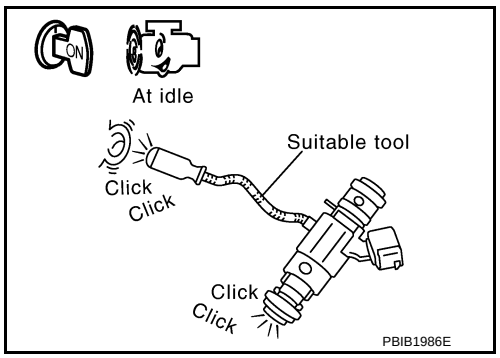
OK >> GO TO 9.
NG >> Perform trouble diagnosis for fuel injector, refer to EC-1293, "Diagnosis Procedure".

8. CHECK FUNCTION OF FUEL INJECTOR

Without CONSULT-III

Listen to fuel injector operating sound.

Operating sound should exist.



OK or NG

OK >> GO TO 9.
NG >> Perform trouble diagnosis for fuel injector, refer to EC-1293, "Diagnosis Procedure".

9. CHECK FUEL INJECTOR

1. Remove fuel tube assembly. Refer to EM-189, "Component".
   Keep fuel hose and all fuel injectors connected to fuel tube.
2. Check 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 approximately 3 seconds.
   Check that fuel does not drip from fuel injector.

OK or NG

OK (Does not drip.)>>GO TO 10.
NG (Drips.)>>Replace the fuel injectors from which fuel is dripping. Always replace O-ring with new one.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

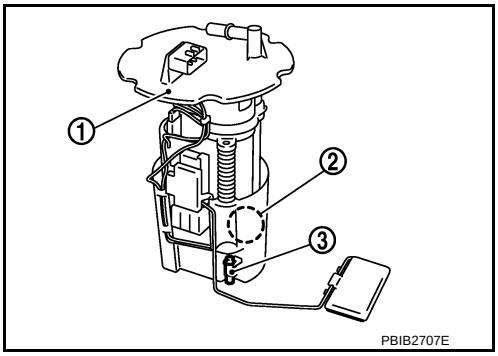
DTC P0181 FTT SENSOR

Component Description

INFOID:0000000005354112

The fuel tank temperature sensor (3) 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.

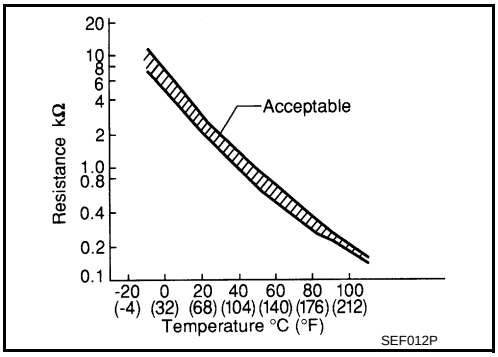
- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)



<Reference data>

Fuel temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: This data is reference value and is measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:0000000005354113

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0181 0181	Fuel tank temperature sensor circuit range/performance	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 sensor circuit is open or shorted) • Fuel tank temperature sensor

DTC Confirmation Procedure

INFOID:0000000005354114

NOTE:

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-III

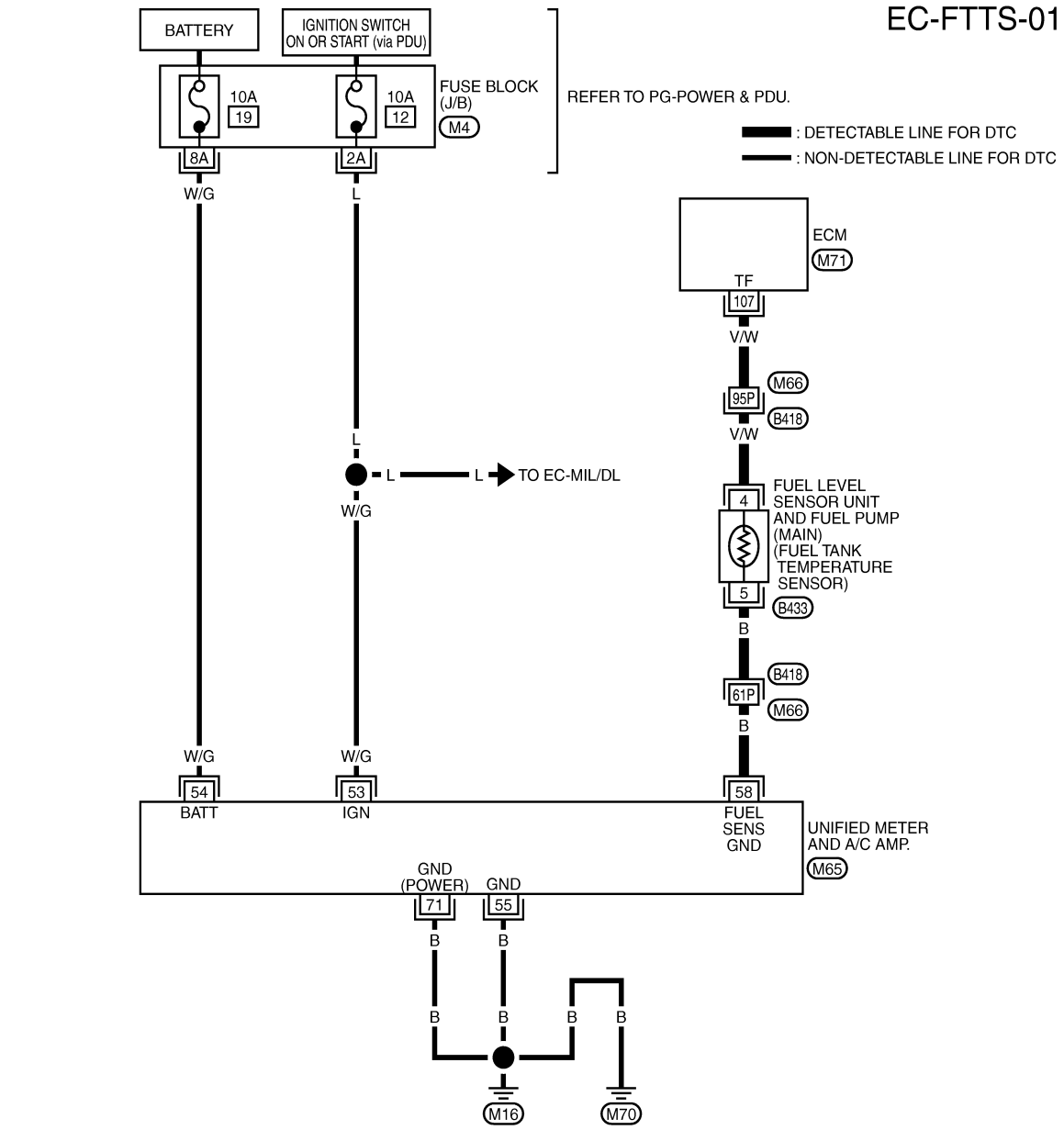
1. Turn ignition switch ON and wait at least 10 seconds..
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-990, "Diagnosis Procedure".
   If 1st trip DTC is not detected, go to the following step.
4. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
5. Check “COOLAN TEMP/S” indication.
   If “COOLAN TEMP/S” indication is less than 60°C (140°F), the result will be OK.
   If “COOLAN TEMP/S” indication is above 60°C (140°F), go to the following step.
6. Cool engine down until “COOLAN TEMP/S” indication is less than 60°C (140°F).

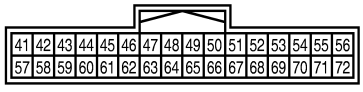
7. Wait at least 10 seconds.
8. Check 1st trip DTC.
9. If 1st trip DTC is detected, go to EC-990, "Diagnosis Procedure".

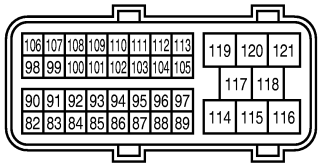
WITH GST
Follow the procedure “WITH CONSULT-III” above.

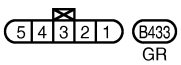
Wiring Diagram

INFOID:0000000005354115









REFER TO THE FOLLOWING.
B418 - SUPER MULTIPLE JUNCTION (SMJ)
M4 - FUSE BLOCK - JUNCTION BOX (J/B)

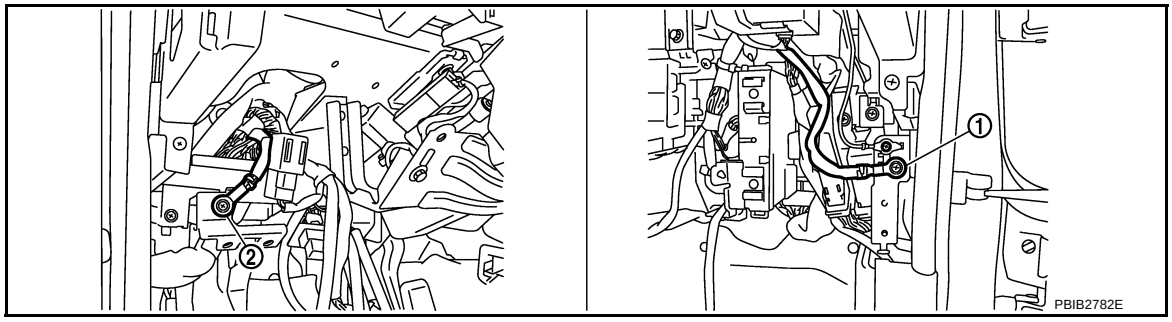
TBWT1989E

Diagnosis Procedure

INFOID:0000000005354116

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

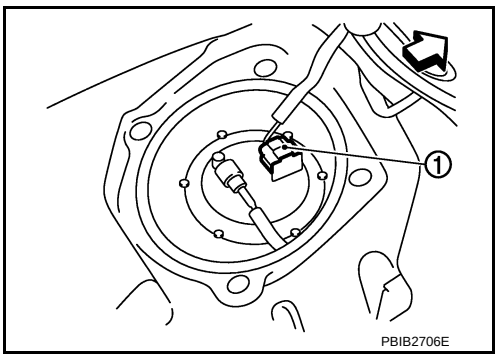
OK >> GO TO 3.
NG >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

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 (1).

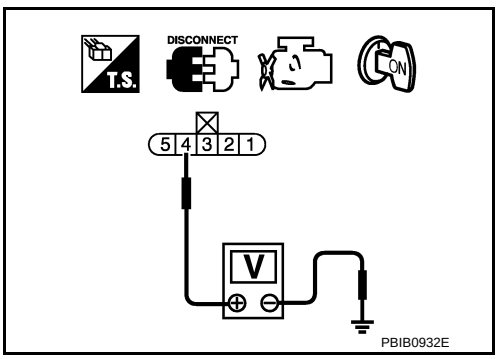
- Illustration shows the view with rear seat cushion and inspection hole cover (RH) removed.
- ⇦: Vehicle front

3. Turn ignition switch ON.



4. Check voltage between “fuel level sensor unit and fuel pump” terminal 4 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M66, B418

- Harness for open or short between ECM and “fuel level sensor unit and fuel pump”

>> Repair open circuit or 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 harness continuity between “fuel level sensor unit and fuel pump” terminal 5 and “unified meter and A/C amp.” terminal 58.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M66, B418
- Harness for open or short between “fuel level sensor unit and fuel pump” and “unified meter and A/C amp.”

>> Repair open circuit or short to ground or short to power in harness or connector.

7. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-991, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace “fuel level sensor unit and fuel pump”.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

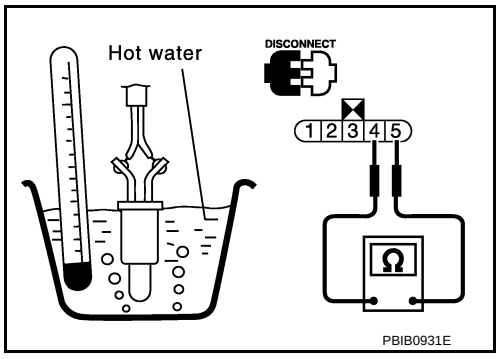
Component Inspection

INFOID:0000000005354117

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between “fuel level sensor unit and fuel pump” terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



Removal and Installation

INFOID:0000000005354118

FUEL TANK TEMPERATURE SENSOR

Refer to FL-4, "Component".

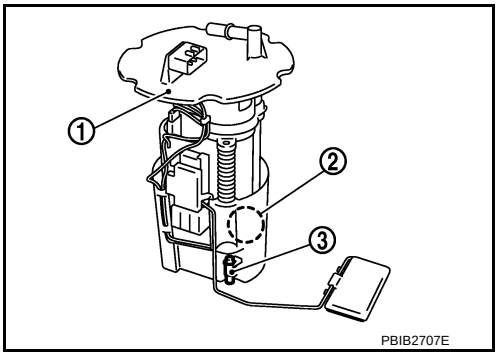
DTC P0182, P0183 FTT SENSOR

Component Description

INFOID:0000000005354119

The fuel tank temperature sensor (3) 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.

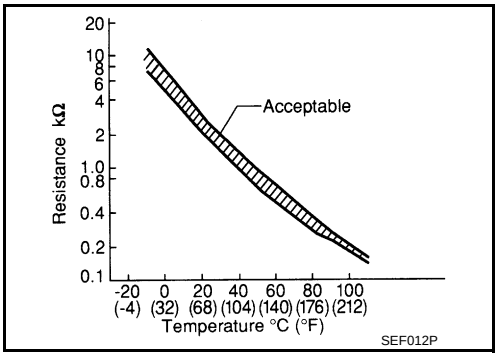
- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)



<Reference data>

Fuel temperature [°C (°F)]	Voltage* (V)	Resistance (kΩ)
20 (68)	3.5	2.3 - 2.7
50 (122)	2.2	0.79 - 0.90

*: This data is reference value and is measured between ECM terminal 107 (Fuel tank temperature sensor) and ground.



CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

On Board Diagnosis Logic

INFOID:0000000005354120

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0182 0182	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 0183	Fuel tank temperature sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:0000000005354121

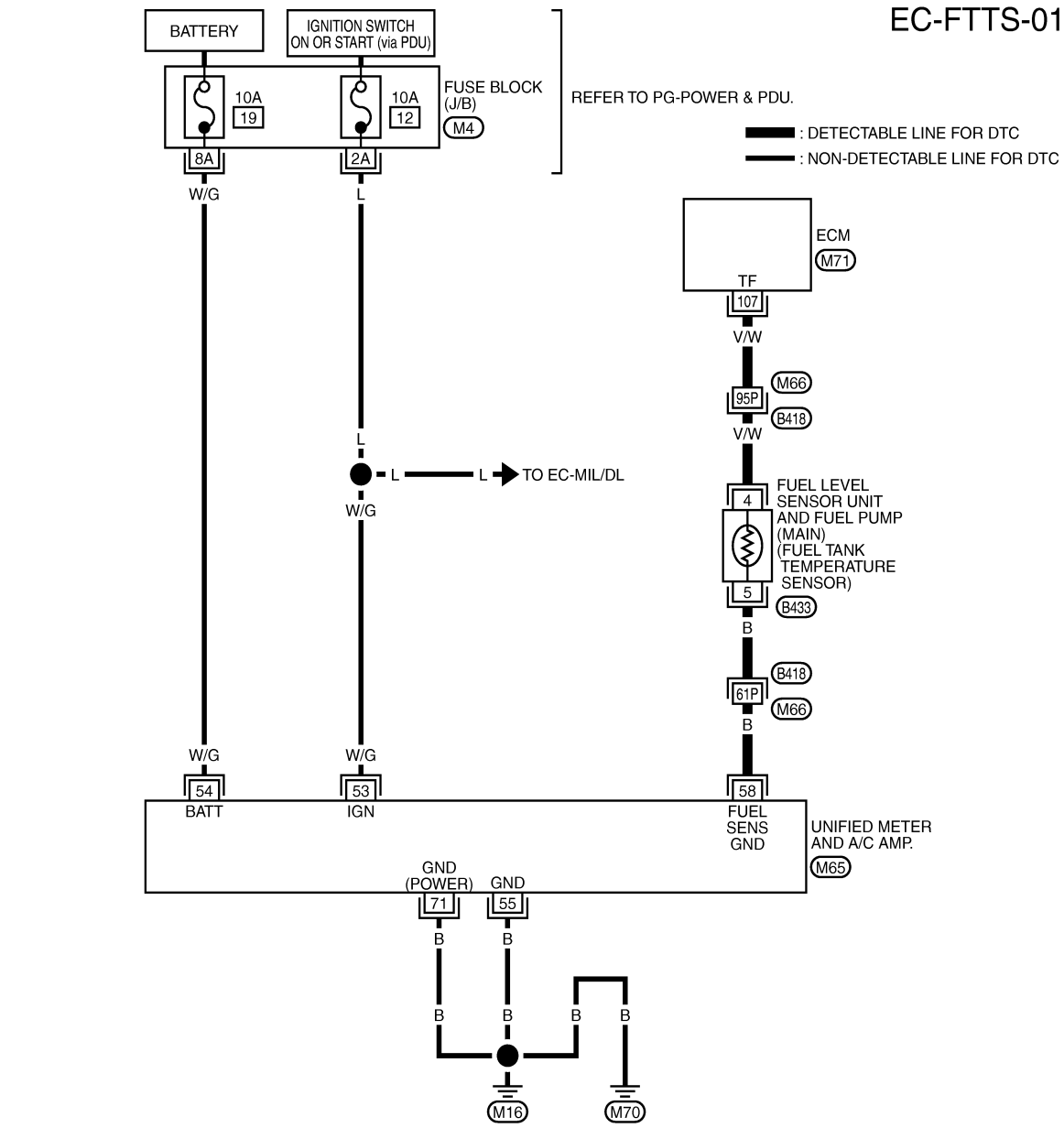
1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

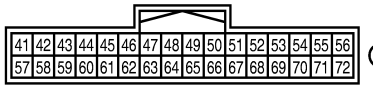
a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

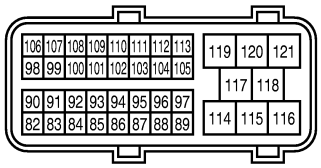
2. Turn ignition switch ON and wait at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-993, "Diagnosis Procedure".

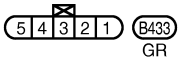
Wiring Diagram

INFOID:0000000005354122









REFER TO THE FOLLOWING.
B418 - SUPER MULTIPLE JUNCTION (SMJ)
M4 - FUSE BLOCK - JUNCTION BOX (J/B)

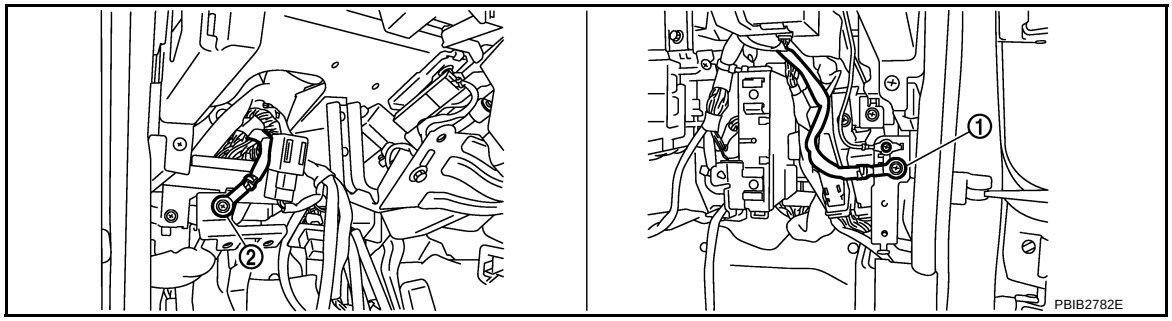
TBWT1989E

Diagnosis Procedure

INFOID:0000000005354123

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70 2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

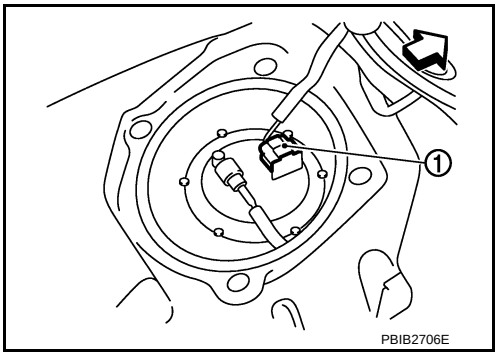
OK >> GO TO 3.
NG >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

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 (1).

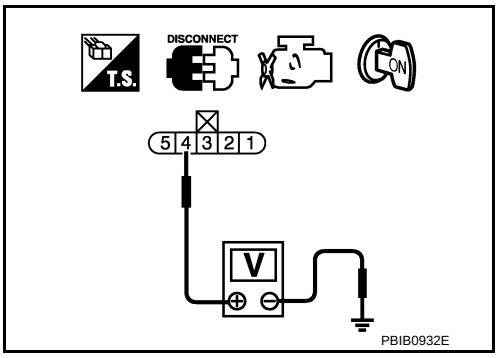
- Illustration shows the view with rear seat cushion and inspection hole cover (RH) removed.
- ⇦: Vehicle front

3. Turn ignition switch ON.



4. Check voltage between “fuel level sensor unit and fuel pump” terminal 4 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M66, B418
- Harness for open or short between ECM and “fuel level sensor unit and fuel pump”

>> Repair open circuit or 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 harness continuity between “fuel level sensor unit and fuel pump” terminal 5 and “unified meter and A/C amp.” terminal 58.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M66, B418
- Harness for open or short between “fuel level sensor unit and fuel pump” and “unified meter and A/C amp.”

>> Repair open circuit or short to ground or short to power in harness or connector.

7. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-995, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace “fuel level sensor unit and fuel pump”.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

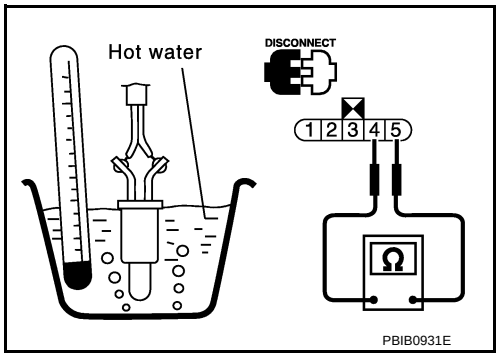
Component Inspection

INFOID:0000000005354124

FUEL TANK TEMPERATURE SENSOR

1. Remove fuel level sensor unit.
2. Check resistance between “fuel level sensor unit and fuel pump” terminals 4 and 5 by heating with hot water or heat gun as shown in the figure.

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90



Removal and Installation

INFOID:0000000005354125

FUEL TANK TEMPERATURE SENSOR

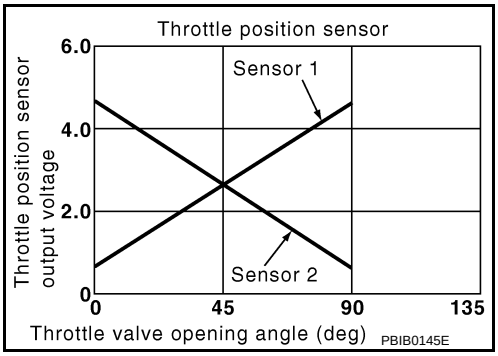
Refer to FL-4, "Component".

DTC P0222, P0223 TP SENSOR

Component Description

INFOID:0000000005354126

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 the 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 in response to driving condition via the throttle control motor.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354127

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TP SEN 1-B1 TP SEN 2-B1*	• Ignition switch: ON (Engine stopped) • Selector lever position: D	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

INFOID:0000000005354128

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0222 0222	Throttle position sensor 1 circuit low input	An excessively low voltage from the TP sensor 1 is sent to ECM.	• Harness or connectors (TP sensor 1 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) • Electric throttle control actuator (TP sensor 1) • Accelerator pedal position sensor (APP sensor 2)
P0223 0223	Throttle position sensor 1 circuit high input	An excessively high voltage from the TP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:0000000005354129

NOTE:
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.

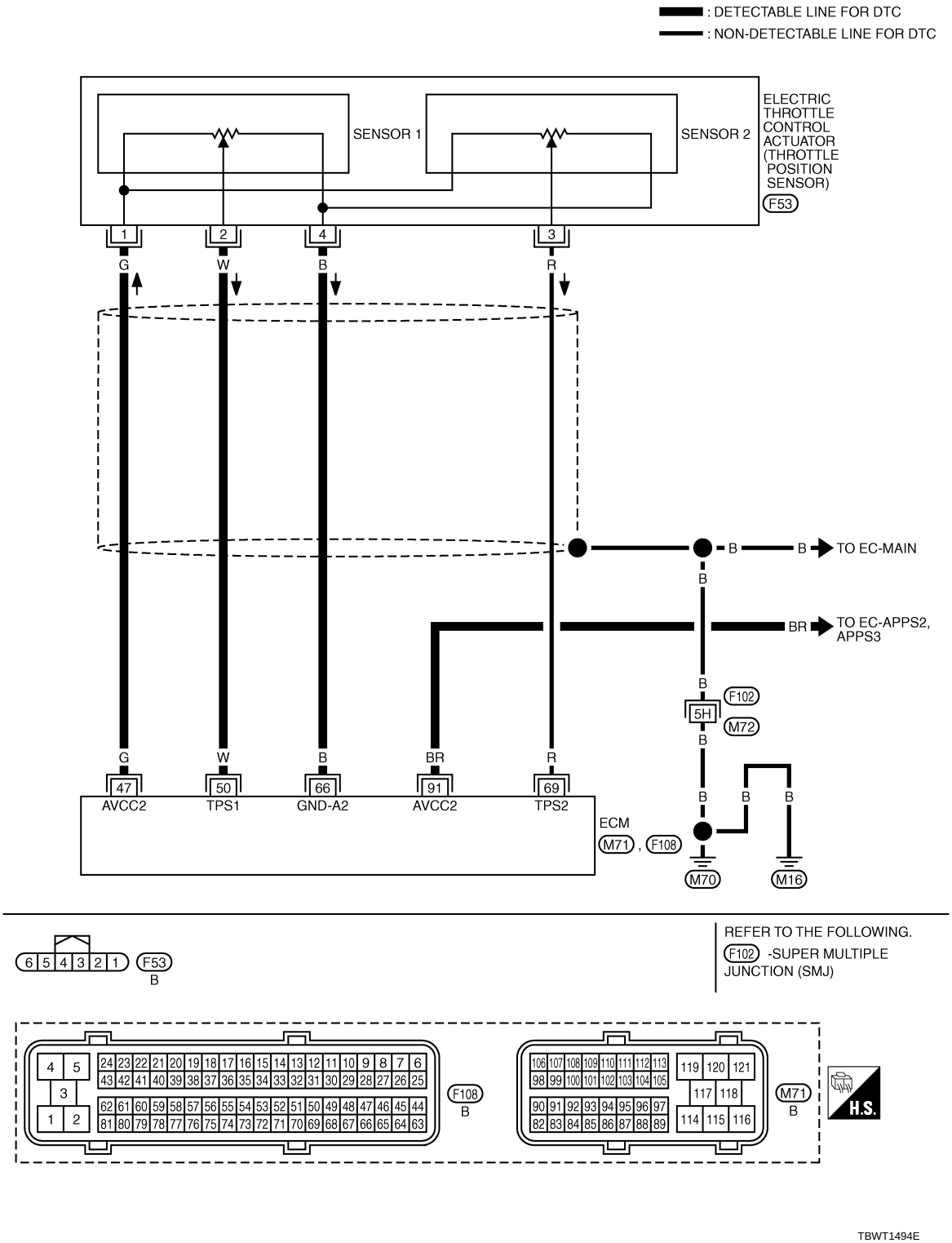
1. Start engine and let it idle for 1 second.
2. Check DTC.

3. If DTC is detected, go to EC-998, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354130

EC-TPS1-01



TBWT1494E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

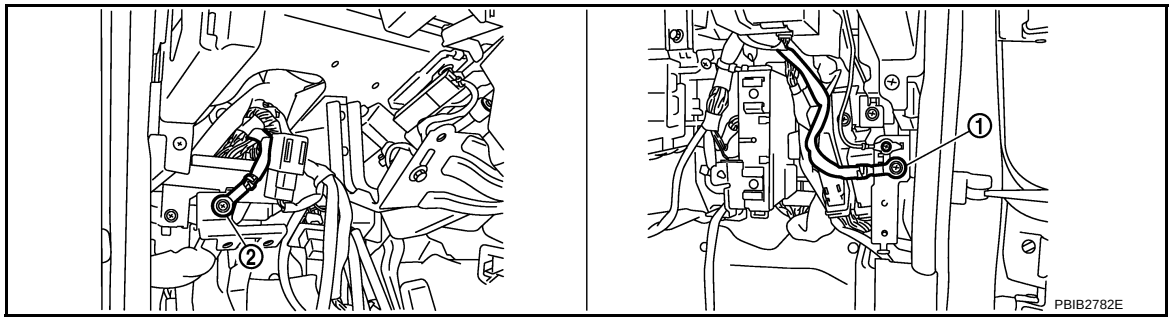
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch: ON]**	Approximately 5 V
50	W	Throttle position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully released	More than 0.36 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	Less than 4.75 V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
69	R	Throttle position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully released	Less than 4.75 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	More than 0.36 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V

Diagnosis Procedure

INFOID:0000000005354131

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



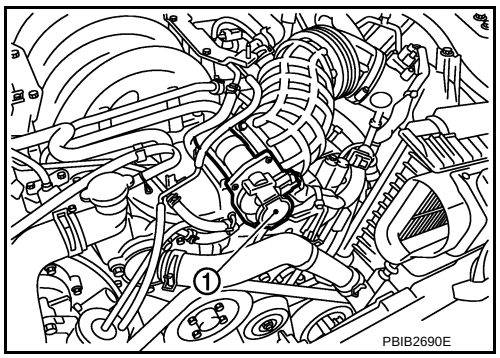
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

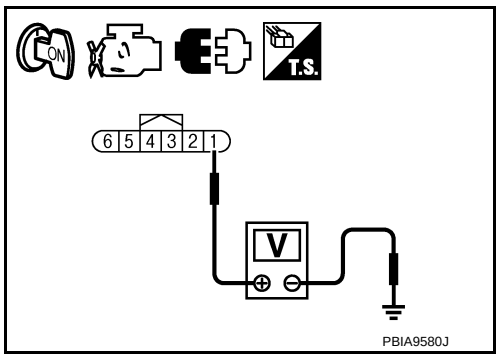
2.CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator (1) harness connector.
- Illustration shows the view with intake air duct removed.
2. Turn ignition switch ON.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR 1 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-997, "Wiring Diagram"
91	APP sensor terminal 5	EC-1254, "Wiring Diagram"

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-1258, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

7.CHECK THROTTLE POSITION SENSOR 1 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8.CHECK THROTTLE POSITION SENSOR 1 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9.CHECK THROTTLE POSITION SENSOR

Refer to EC-1000, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

11.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

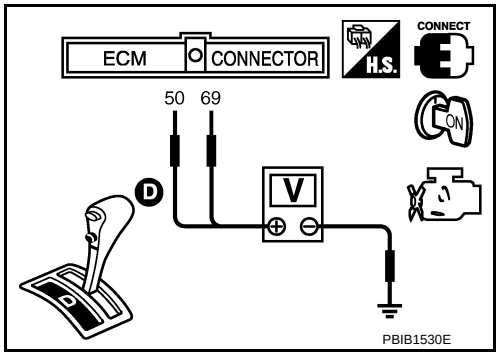
INFOID:0000000005354132

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Turn ignition switch ON.
4. Set selector lever to the D position.

5. Check voltage between ECM terminal 50 (TP sensor 1 signal) and ground, ECM terminal 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36 V
	Fully depressed	Less than 4.75 V
69 (Throttle position sensor 2)	Fully released	Less than 4.75 V
	Fully depressed	More than 0.36 V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-764, "Throttle Valve Closed Position Learning".
8. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354133

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-174, "Component".

DTC P0300 - P0308 MULTIPLE CYLINDER MISFIRE, NO. 1 - 8 CYLINDER MISFIRE

On Board Diagnosis Logic

INFOID:0000000005354134

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 on.
   If another misfire condition occurs that can damage the TWC, the MIL will begin to blink again.
2. Two Trip Detection Logic (Exhaust quality deterioration)
   For misfire conditions that will not damage the TWC (but will affect vehicle emissions), the MIL will only 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 0300	Multiple cylinder misfires detected	Multiple cylinder misfire.	• Improper spark plug • Insufficient compression • Incorrect fuel pressure • The fuel injector circuit is open or shorted • Fuel injector • Intake air leakage • The ignition signal circuit is open or shorted • Lack of fuel • Signal plate • A/F sensor 1 • Incorrect PCV hose connection
P0301 0301	No.1 cylinder misfire detected	No. 1 cylinder misfires.	
P0302 0302	No. 2 cylinder misfire detected	No. 2 cylinder misfires.	
P0303 0303	No. 3 cylinder misfire detected	No. 3 cylinder misfires.	
P0304 0304	No. 4 cylinder misfire detected	No. 4 cylinder misfires.	
P0305 0305	No. 5 cylinder misfire detected	No. 5 cylinder misfires.	
P0306 0306	No. 6 cylinder misfire detected	No. 6 cylinder misfires.	
P0307 0307	No. 7 cylinder misfire detected	No. 7 cylinder misfires.	
P0308 0308	No. 8 cylinder misfire detected	No. 8 cylinder misfires.	

DTC Confirmation Procedure

INFOID:0000000005354135

CAUTION:
Always drive vehicle in safe manner according to traffic conditions and obey all traffic laws when driving.

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.

b. Turn ignition switch ON.

c. Turn ignition switch OFF and wait at least 10 seconds.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Restart engine and let it idle for approximately 15 minutes.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1003, "Diagnosis Procedure".

NOTE:
If 1st trip DTC is not detected during above procedure, performing the following procedure is advised.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.
d. 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 means that the following conditions should be satisfied at the same time.

Engine speed	Engine speed in the freeze frame data ± 400 rpm
Vehicle speed	Vehicle speed in the freeze frame data ± 10 km/h (6 MPH)
Engine coolant temperature (T) condition	When the freeze frame data shows lower than 70°C (158°F), T should be lower than 70°C (158°F).
	When the freeze frame data shows higher than or equal to 70°C (158°F), T should be higher than or equal to 70°C (158°F).

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

Diagnosis Procedure

INFOID:0000000005354136

1. CHECK FOR INTAKE AIR LEAKAGE AND PCV HOSE

1. Start engine and run it at idle speed.
2. Listen for the sound of the intake air leakage.
3. Check PCV hose connection.

OK or NG

OK >> GO TO 2.
NG >> Discover air leakage location and repair.

2. CHECK FOR EXHAUST SYSTEM CLOGGING

Stop engine and visually check exhaust tube, three way catalyst and muffler for dents.

OK or NG

OK (With CONSULT-III)>>GO TO 3.
OK (Without CONSULT-III>>GO TO 4.
NG >> Repair or replace malfunctioning part.

3. PERFORM POWER BALANCE TEST

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Is there any cylinder which does not produces a momentary engine speed drop?

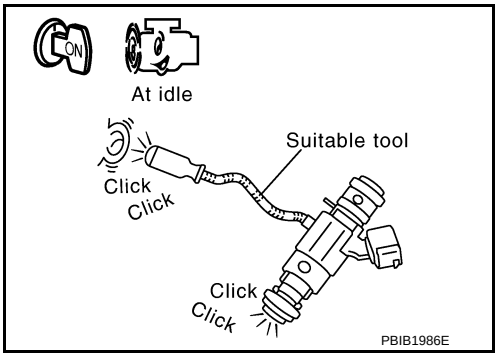
Yes or No

Yes >> GO TO 4.
No >> GO TO 9.

4. CHECK FUNCTION OF FUEL INJECTOR

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Listen to fuel injector operating sound.



Operating sound should exist.

OK or NG

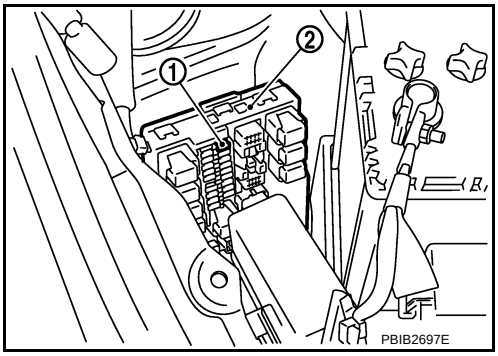
OK >> GO TO 5.
NG >> Perform trouble diagnosis for fuel injector, refer to EC-1293, "Diagnosis Procedure".

5. CHECK FUNCTION OF IGNITION COIL-I

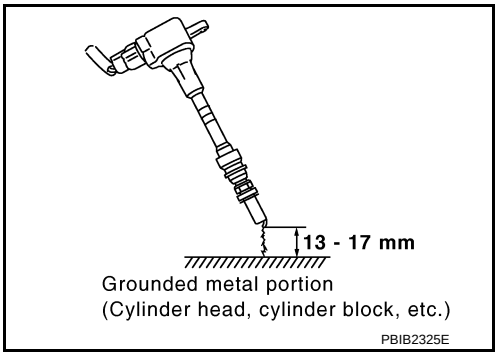
CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.



   NOTE:
   Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm between the edge of the spark plug and grounded metal portion as shown in the figure.



11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

CAUTION:

- **Never place the spark plug and the ignition coil within 50 cm 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 is made.**

NOTE:

When the gap is less than 13 mm, spark might be generated even if the coil is malfunctioning.

OK or NG

OK >> GO TO 9.

NG >> GO TO 6.

6. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

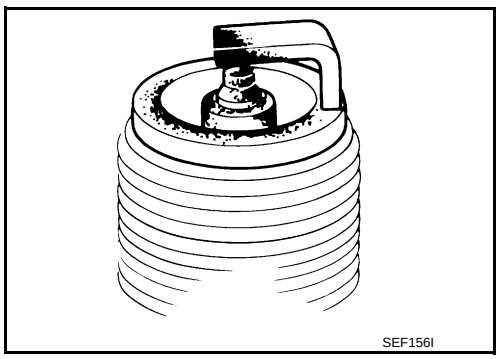
Spark should be generated.

OK or NG

OK >> GO TO 7.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1313, "Diagnosis Procedure".

7. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.



OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-272, "Standard and Limit".
NG >> 1. Repair or clean spark plug.
2. GO TO 8.

8. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

OK or NG

OK >> **INSPECTION END**
NG >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-272, "Standard and Limit".

9. CHECK COMPRESSION PRESSURE

Check compression pressure. Refer to EM-227, "On-Vehicle Service".

OK or NG

OK >> GO TO 10.
NG >> 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-766, "Fuel Pressure Check".
3. Install fuel pressure gauge and check fuel pressure. Refer to EC-766, "Fuel Pressure Check".

At idling: Approximately 350 kPa (3.57 kg/cm^2, 51 psi)

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Fuel pump and circuit (Refer to EC-1298, "Diagnosis Procedure".)
- Fuel pressure regulator (Refer to EC-766, "Fuel Pressure Check".)

- Fuel lines
- Fuel filter for clogging

>> Repair or replace malfunctioning part.

12. CHECK IGNITION TIMING

Check the following items. Refer to EC-760, "Basic Inspection".

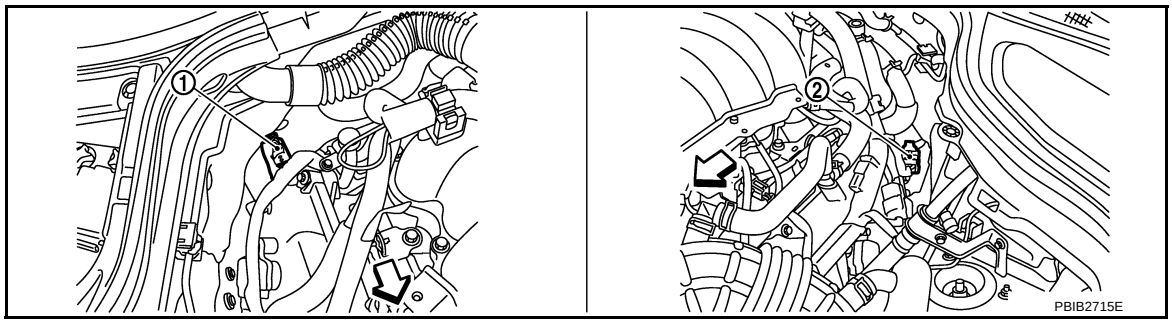
Items	Specifications
Target idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	12 ± 5°BTDC (in P or N position)

OK or NG

OK >> GO TO 13.
NG >> Follow the EC-760, "Basic Inspection".

13. CHECK AIR FUEL RATIO (A/F) SENSOR 1 INPUT SIGNAL CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect corresponding air fuel ratio (A/F) sensor 1 harness connector.



⇦ : Vehicle front

1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank 1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

5. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76

Bank 1		Bank 2	
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

6. Also check harness for short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK A/F SENSOR 1 HEATER

Refer to EC-851, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning A/F sensor 1.

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**

16. CHECK MASS AIR FLOW SENSOR

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Check “MASS AIRFLOW” in “DATA MONITOR” mode with CONSULT-III.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

With GST

1. Start engine and warm it up to normal operating temperature.
2. Check mass air flow sensor signal in Service $01 with GST.

2.0 - 6.0 g·m/sec: at idling
7.0 - 20.0 g·m/sec: at 2,500 rpm

OK or NG

OK >> GO TO 17.
NG >> Check connectors for rusted terminals or loose connections in the mass air flow sensor circuit or ground. Refer to EC-870, "Diagnosis Procedure".

17. CHECK SYMPTOM MATRIX CHART

Check items on the rough idle symptom in EC-775, "Symptom Matrix Chart".

OK or NG

OK >> GO TO 18.
NG >> Repair or replace malfunctioning part.

18. ERASE THE 1ST TRIP DTC

Some tests may cause a 1st trip DTC to be set.

Erase the 1st trip DTC from the ECM memory after performing the tests.

>> GO TO 19.

19. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

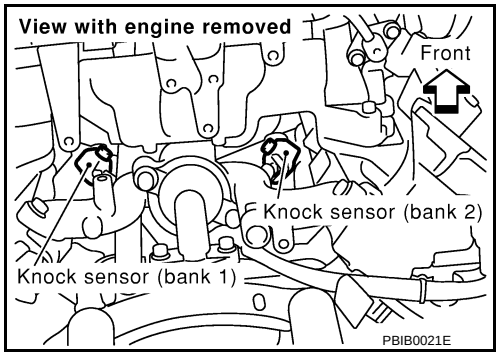
>> **INSPECTION END**

DTC P0327, P0328, P0332, P0333 KS

Component Description

INFOID:0000000005354137

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.



On Board Diagnosis Logic

INFOID:0000000005354138

The MIL will not illuminate for these diagnoses.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0327 0327 (Bank 1)	Knock sensor circuit low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • Knock sensor
P0332 0332 (Bank 2)			
P0328 0328 (Bank 1)	Knock sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	
P0333 0333 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354139

NOTE:
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.

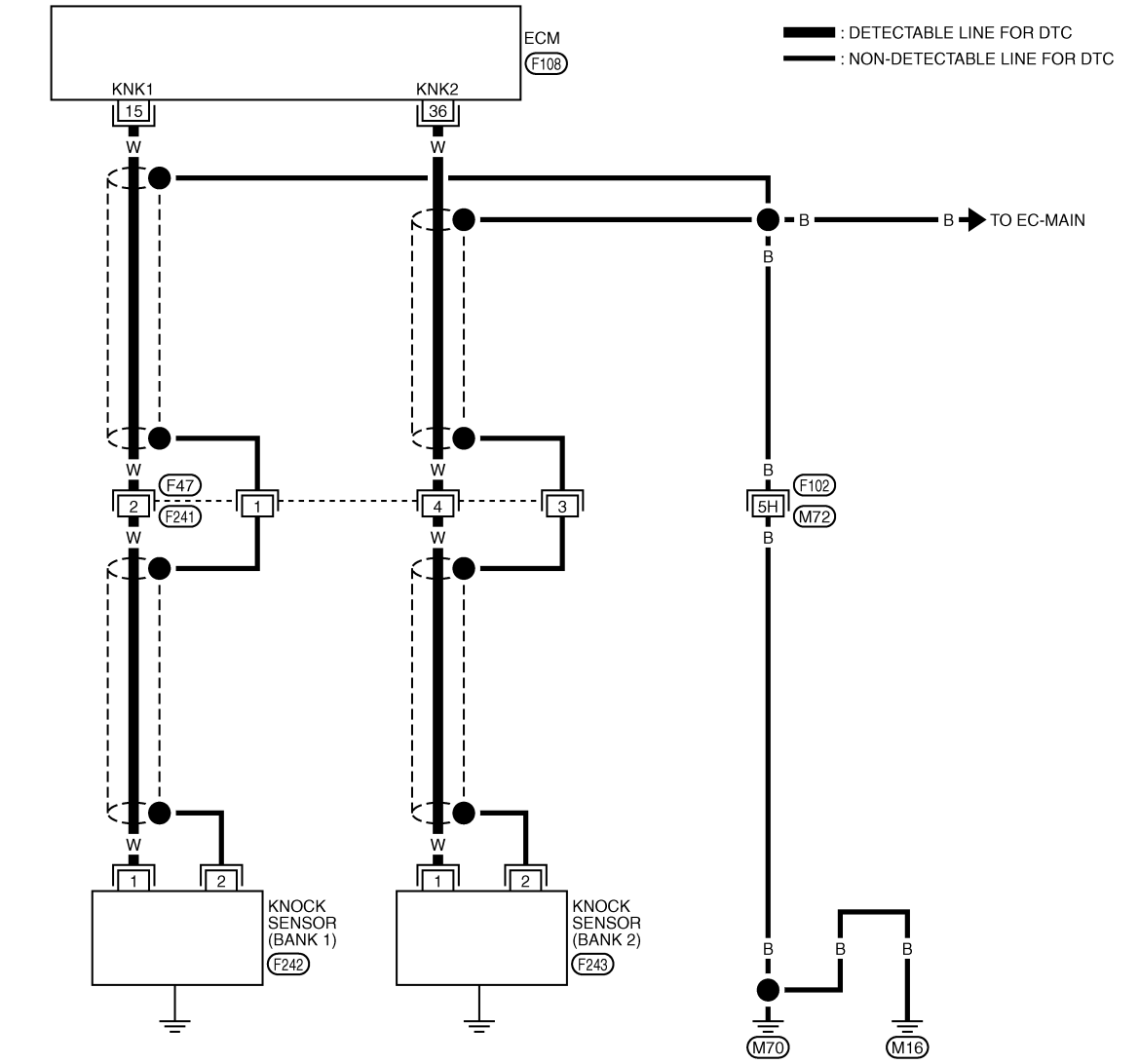
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

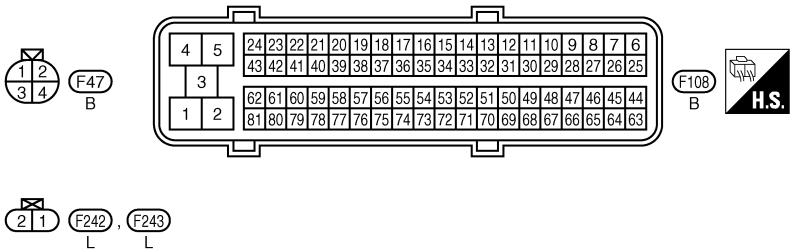
1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1011, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354140

EC-KS-01





REFER TO THE FOLLOWING.
F102 -SUPER MULTIPLE JUNCTION (SMJ)

TBWT1026E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
15 36	W W	Knock sensor (bank 1) Knock sensor (bank 2)	**[Engine is running]** • Idle speed	Approximately 2.5 V

Diagnosis Procedure

INFOID:0000000005354141

1. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check resistance between ECM terminals 15, 36 and ground.
   Refer to Wiring Diagram.
   NOTE:
   It is necessary to use an ohmmeter which can measure more than 10 MΩ.

   Resistance: Approximately 532 - 588 kΩ [at 20°C (68°F)]

4. Also check harness for short to ground and short to power.

OK or NG

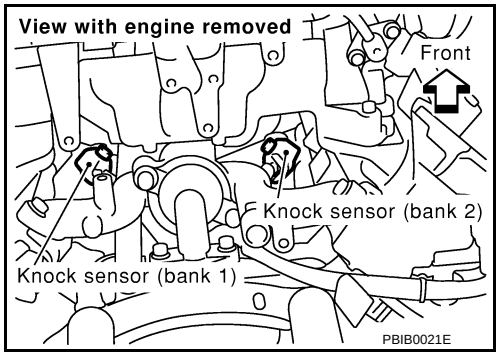
OK >> GO TO 5.
NG >> GO TO 2.

2. CHECK KNOCK SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect knock sensor harness connector.
2. Check harness continuity between the following;
   ECM terminal 15 and knock sensor (bank1) terminal 1,
   ECM terminal 36 and knock sensor (bank 2) terminal 1.
   Refer to Wiring Diagram.

   Continuity should exist.

3. Also check harness for short to ground and short to power.



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F47, F241
- Harness for open or short between ECM and knock sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK KNOCK SENSOR

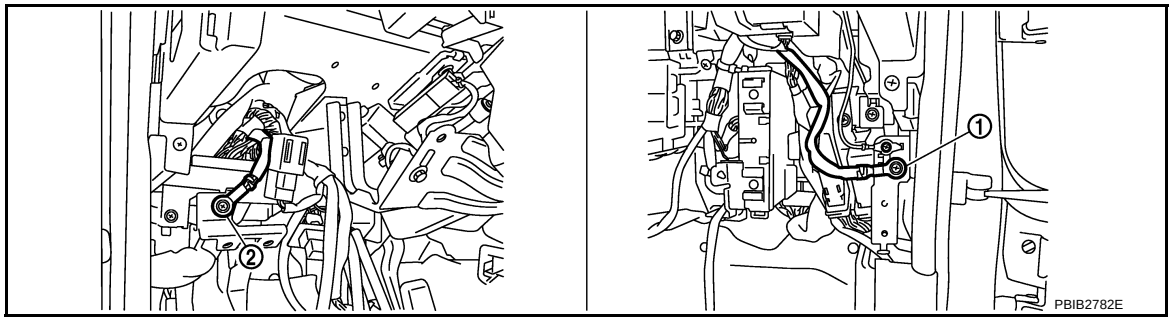
Refer to EC-1012, "Component Inspection".

OK or NG

OK >> GO TO 5.
NG >> Replace knock sensor.

5. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70 2. Body ground M16

OK or NG

OK >> GO TO 6.
NG >> Repair or replace ground connections.

6. CHECK KNOCK SENSOR SHIELD CIRCUIT FOR OPEN AND SHORT

1. Disconnect knock sensor harness connector.
2. Check harness continuity between knock sensor terminal 2 and ground.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F47, F241
- Harness connectors F102, M72
- Harness for open or short between knock sensor terminal 2 and ground

>> Repair open circuit or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354142

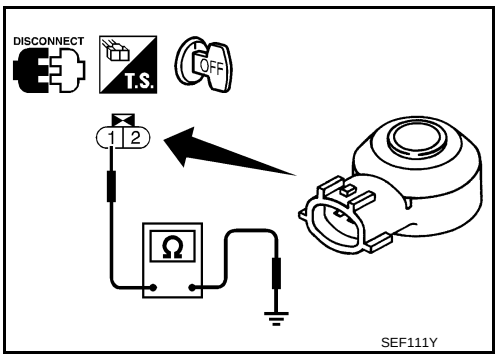
KNOCK SENSOR

Check resistance between knock sensor terminal 1 and ground.

NOTE:
It is necessary to use an ohmmeter which can measure more than 10 MΩ.

Resistance: Approximately 532 - 588 kΩ [at 20°C (68°F)]

CAUTION:
Never use any knock sensors that have been dropped or physically damaged. Use only new ones.



Removal and Installation

INFOID:0000000005354143

KNOCK SENSOR

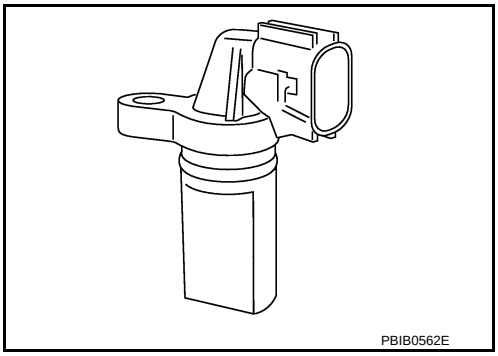
Refer to EM-246, "Component".

DTC P0335 CKP SENSOR (POS)

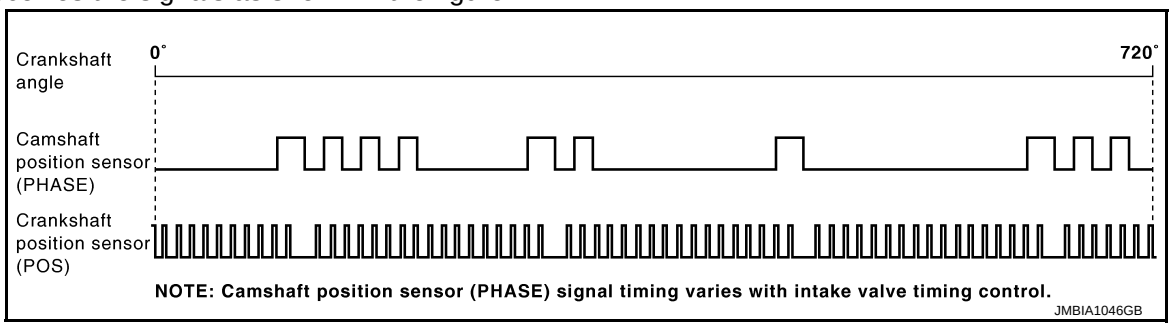
Component Description

INFOID:0000000005354144

The crankshaft position sensor (POS) is located on the A/T converter housing 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.


PBIB0562E

ECM receives the signals as shown in the figure.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354145

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
ENG SPEED	• Run engine and compare CONSULT-III value with the tachometer indication.	Almost the same speed as the tachometer indication.

On Board Diagnosis Logic

INFOID:0000000005354146

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0335 0335	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 (The sensor circuit is open or shorted) • Crankshaft position sensor (POS) • Signal plate

DTC Confirmation Procedure

INFOID:0000000005354147

NOTE:
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.

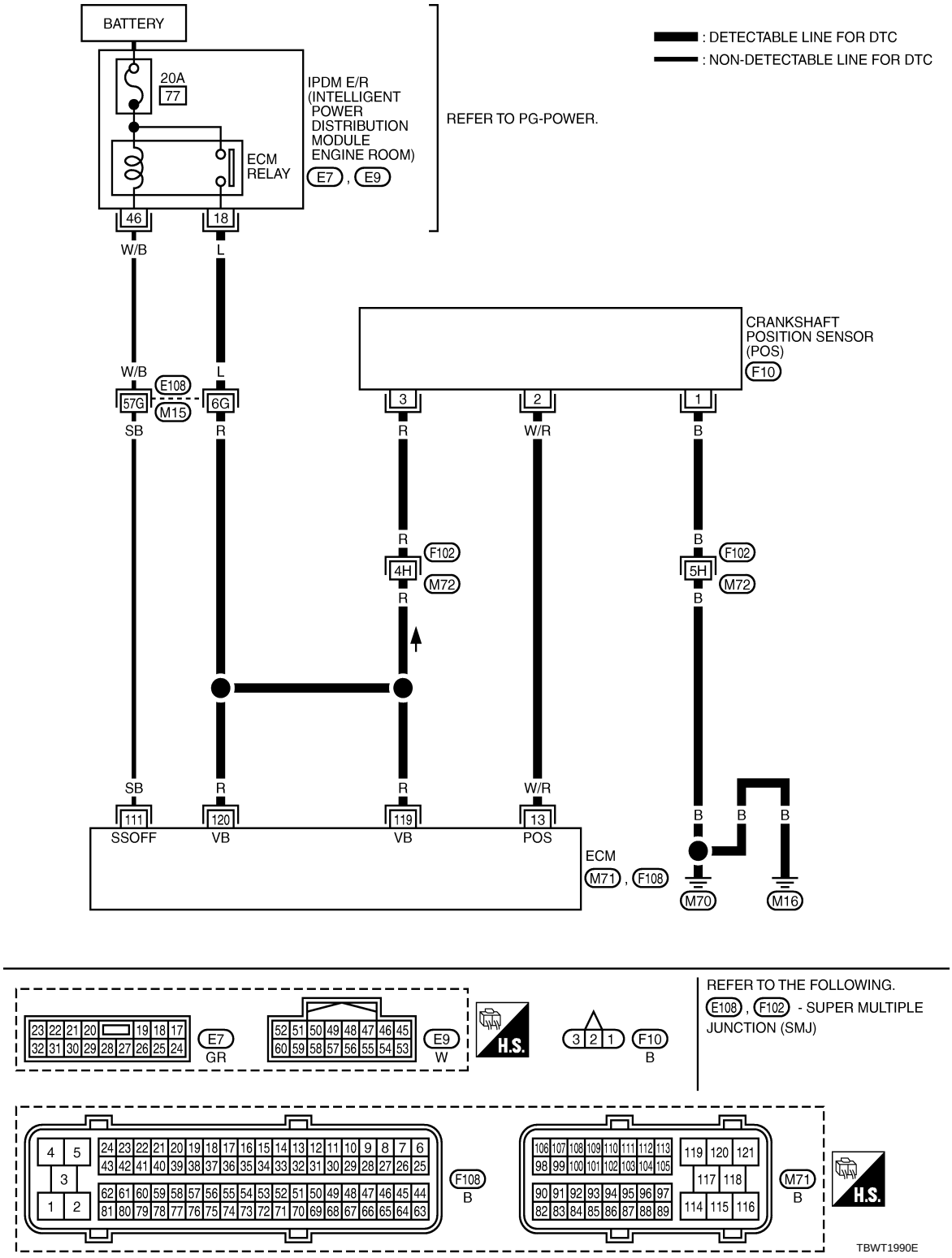
1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.

2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1016, "Diagnosis Procedure".

Wiring Diagram

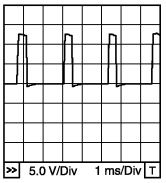
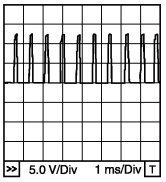
INFOID:0000000005354148

EC-POS-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
13	W/R	Crankshaft position sensor (POS)	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	1.0 - 2.0 V★  PBIB1041E
			[Engine is running] • Engine speed: 2,000 rpm	1.0 - 2.0 V★  PBIB1042E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

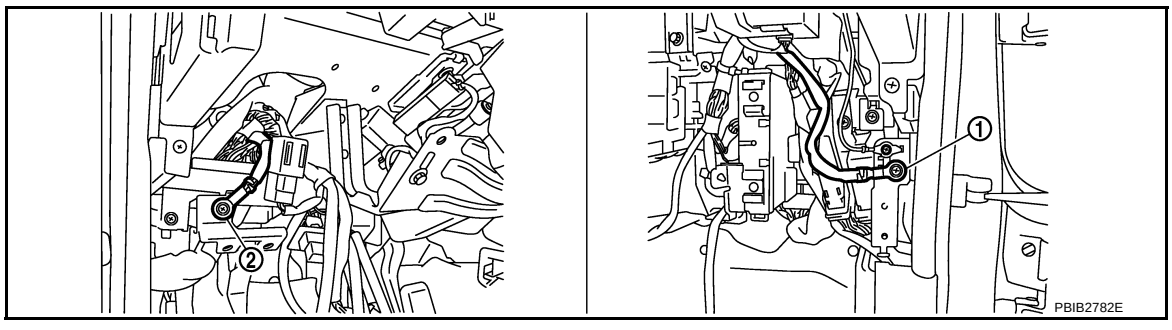
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354149

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



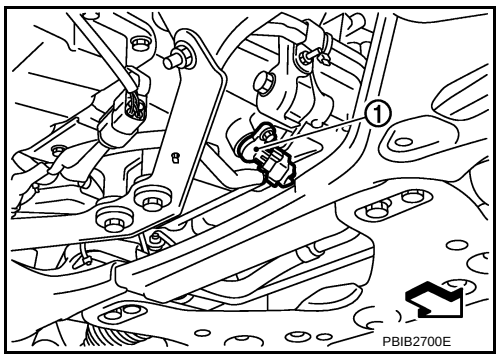
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

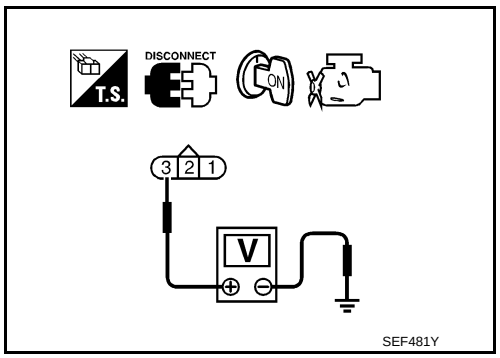
2. CHECK CRANKSHAFT POSITION (CKP) SENSOR (POS) POWER SUPPLY CIRCUIT

1. Disconnect crankshaft position (CKP) sensor (POS) (1) harness connector.
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
2. Turn ignition switch ON.



3. Check voltage between CKP sensor (POS) terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors F102, M72
- Harness for open or short between crankshaft position sensor (POS) and ECM
- Harness for open or short between crankshaft position sensor (POS) and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK CKP SENSOR (POS) GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between CKP sensor (POS) terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F102, M72
- Harness for open or short between crankshaft position sensor (POS) and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK CKP SENSOR (POS) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 13 and CKP sensor (POS) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1018, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace crankshaft position sensor (POS).

8.CHECK GEAR TOOTH

Visually check for chipping signal plate gear tooth.

OK or NG

OK >> GO TO 9.
NG >> Replace the signal plate.

9.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

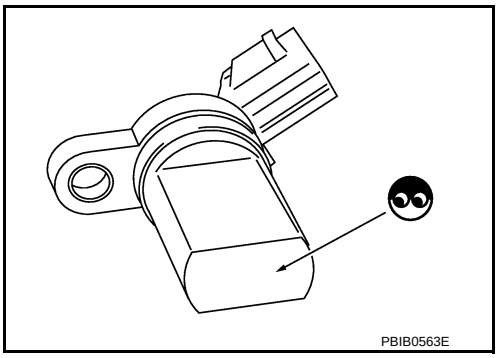
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354150

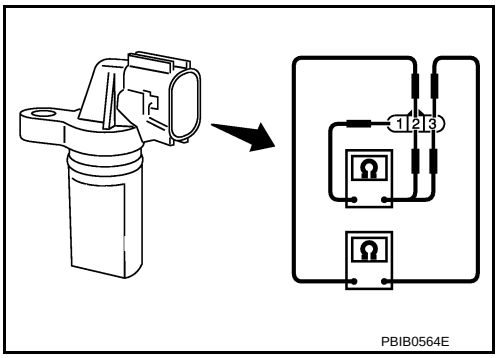
CRANKSHAFT POSITION SENSOR (POS)

1. Loosen the fixing bolt of the sensor.
2. Disconnect crankshaft position sensor (POS) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
1 (+) - 2 (-)	Except 0 or ∞ Ω
1 (+) - 3 (-)	
2 (+) - 3 (-)	



Removal and Installation

INFOID:0000000005354151

CRANKSHAFT POSITION SENSOR (POS)

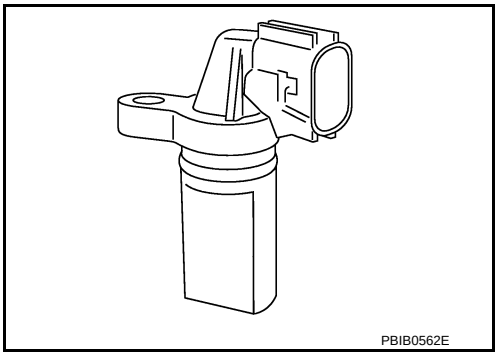
Refer to EM-182, "Component".

DTC P0340 CAMSHAFT POSITION (CMP) SENSOR (PHASE)

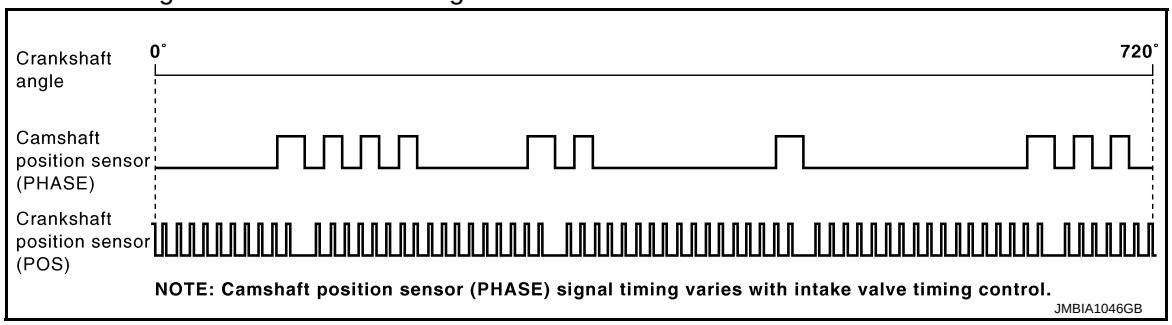
Component Description

INFOID:0000000005354152

The camshaft position sensor (PHASE) senses the protrusion of exhaust valve cam sprocket 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.


PBIB0562E

Due to the changing magnetic field, the voltage from the sensor changes.
ECM receives the signals as shown in the figure.



On Board Diagnosis Logic

INFOID:0000000005354153

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0340 0340	Camshaft position sensor (PHASE) circuit	• The cylinder No. signal is not sent to ECM for the first few seconds during engine cranking. • The cylinder No. signal is not sent to ECM during engine running. • The cylinder No. signal is not in the normal pattern during engine running.	• Harness or connectors (The sensor circuit is open or shorted) • Camshaft position sensor (PHASE) • Camshaft sprocket (EXH) • Starter motor (Refer to SC-8.) • Starting system circuit (Refer to SC-8.) • Dead (Weak) battery

DTC Confirmation Procedure

INFOID:0000000005354154

NOTE:
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.

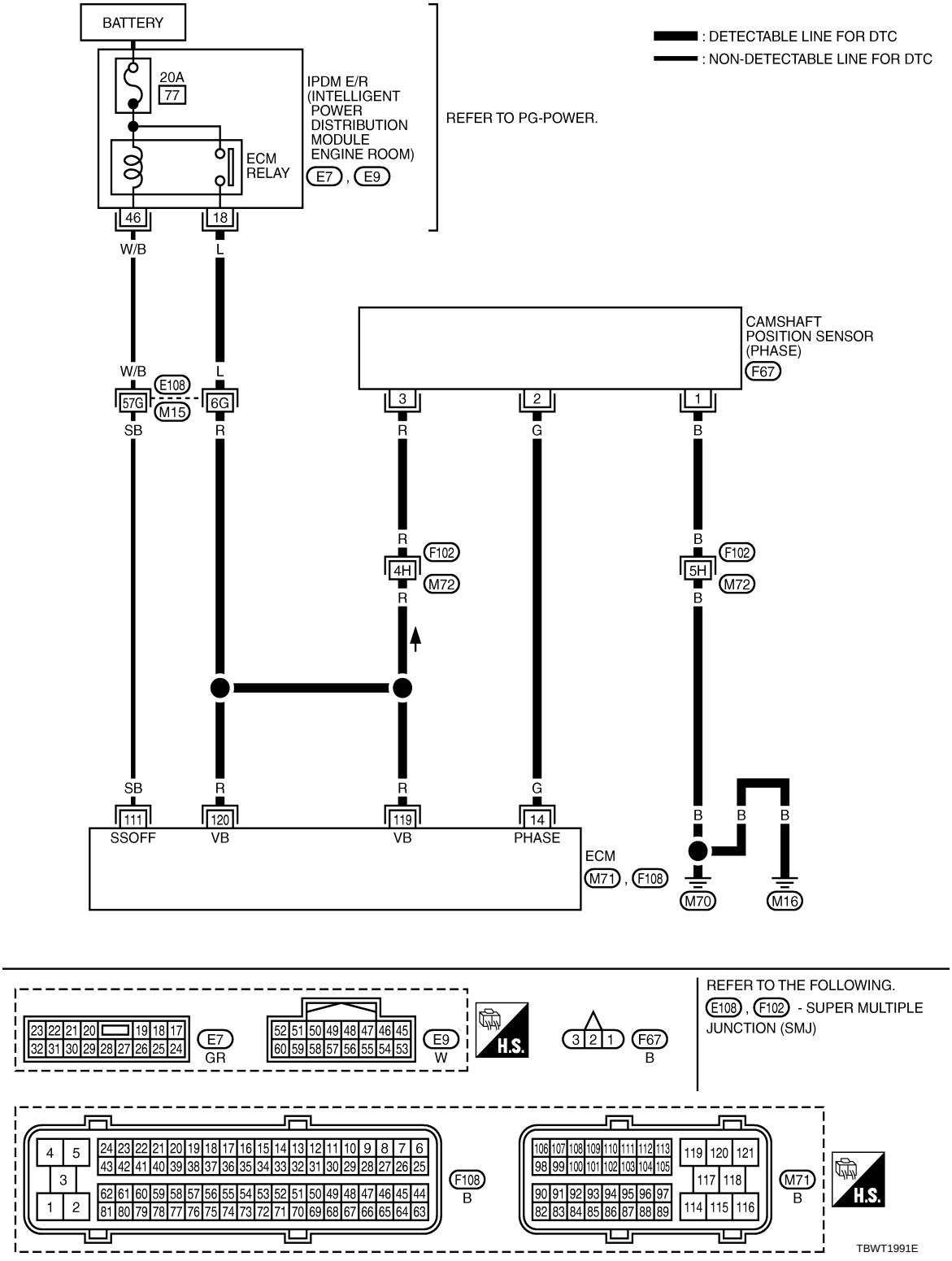
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V with ignition switch ON.

1. Crank engine for at least 2 seconds and run it for at least 5 seconds at idle speed.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1022, "Diagnosis Procedure".
   If 1st trip DTC is not detected, go to next step.
4. Maintain engine speed at more than 800 rpm for at least 5 seconds.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to EC-1022, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354155

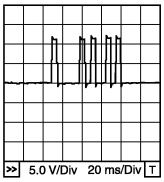
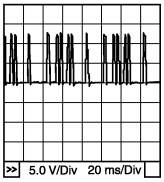
EC-PHASE-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
14	G	Camshaft position sensor (PHASE)	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	1.0 - 4.0 V★  PBIB1039E
			[Engine is running] • Engine speed: 2,000 rpm	1.0 - 4.0 V★  PBIB1040E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354156

1.CHECK STARTING SYSTEM

Turn ignition switch to the START position.

Does the engine turn over?

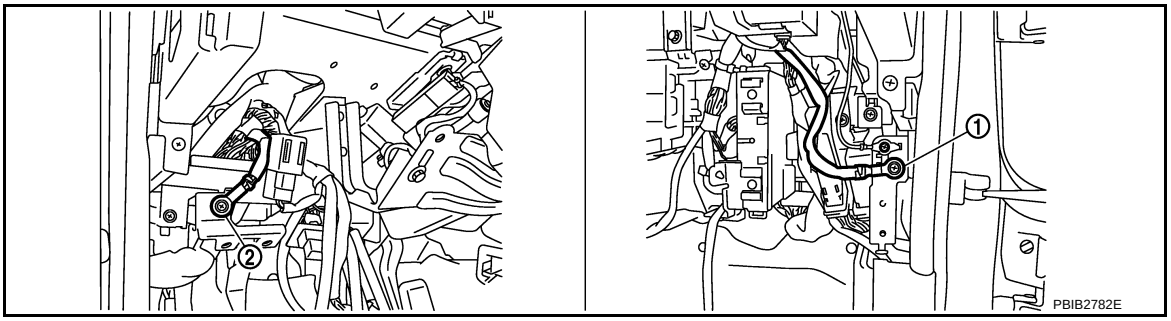
Does the starter motor operate?

Yes or No

Yes >> GO TO 2.
No >> Check starting system. (Refer to SC-8, "System Description".)

2.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



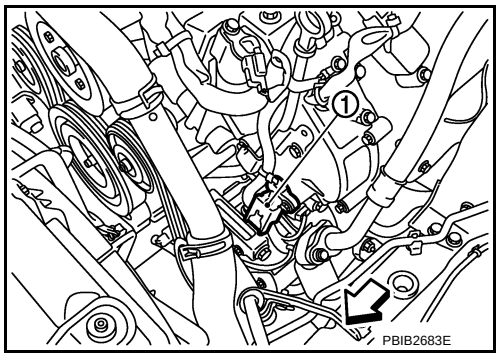
1. Body ground M70 2. Body ground M16

OK or NG

OK >> GO TO 3.
NG >> Repair or replace ground connections.

3. CHECK CAMSHAFT POSITION (CMP) SENSOR (PHASE) POWER SUPPLY CIRCUIT

1. Disconnect camshaft position (CMP) sensor (PHASE) (1) harness connector.
- Illustration shows the view with intake air duct removed.
- ⇦: Vehicle front
2. Turn ignition switch ON.

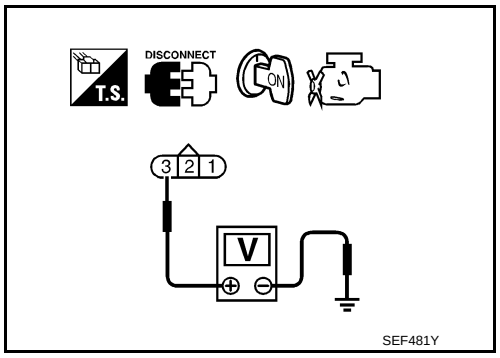


3. Check voltage between CMP sensor (PHASE) terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.



4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors F102, M72
- Harness for open or short between camshaft position sensor (PHASE) and ECM
- Harness for open or short between camshaft position sensor (PHASE) and IPDM E/R

>> Repair open circuit or 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. Check harness continuity between CMP sensor (PHASE) terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F102, M72
- Harness for open or short between CMP sensor (PHASE) and ground

>> Repair open circuit or short to power in harness or connectors.

7. CHECK CMP SENSOR (PHASE) INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 14 and CMP sensor (PHASE) terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1024, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace camshaft position sensor (PHASE).

9. CHECK CAMSHAFT SPROCKET (EXH)

Visually check camshaft sprocket (EXH) for chipping.

OK or NG

OK >> GO TO 10.
NG >> Replace camshaft sprocket (exhaust).

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

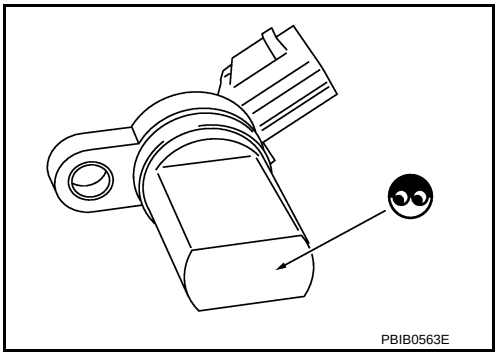
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354157

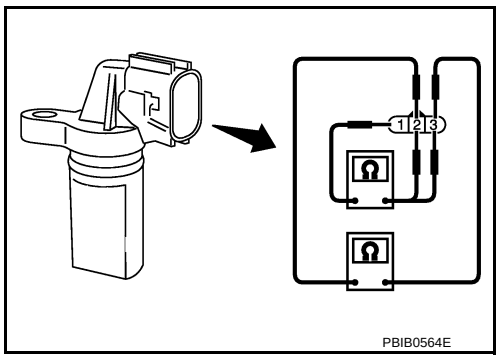
CAMSHAFT POSITION SENSOR (PHASE)

1. Loosen the fixing bolt of the sensor.
2. Disconnect camshaft position sensor (PHASE) harness connector.
3. Remove the sensor.
4. Visually check the sensor for chipping.



5. Check resistance as shown in the figure.

Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
3(+) - 1 (-)	Except 0 or ∞ Ω
2 (+) - 1 (-)	
3 (+) - 2 (-)	



Removal and Installation

INFOID:0000000005354158

CAMSHAFT POSITION SENSOR (PHASE)

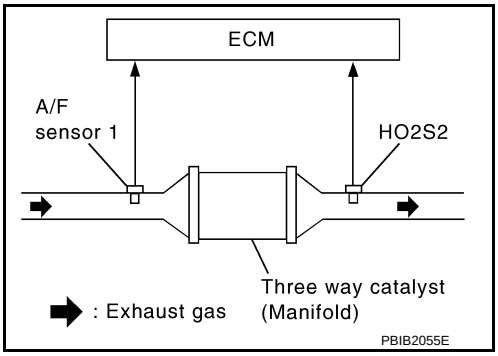
Refer to EM-211, "Component".

DTC P0420, P0430 THREE WAY CATALYST FUNCTION

On Board Diagnosis Logic

INFOID:0000000005354159

The ECM monitors the switching frequency ratio of air fuel ratio (A/F) sensor 1 and heated oxygen sensor 2.
A three way catalyst (manifold) with high oxygen storage capacity will indicate a low switching frequency of heated oxygen sensor 2. As oxygen storage capacity decreases, the heated oxygen sensor 2 switching frequency will increase.
When the frequency ratio of A/F sensor 1 and heated oxygen sensor 2 approaches a specified limit value, the three way catalyst (manifold) malfunction is diagnosed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0420 0420 (Bank 1)	Catalyst system efficiency below threshold	• Three way catalyst (manifold) does not operate properly. • Three way catalyst (manifold) does not have enough oxygen storage capacity.	• Three way catalyst (manifold) • Exhaust tube • Intake air leakage • Fuel injector • Fuel injector leakage • Spark plug • Improper ignition timing
P0430 0430 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354160

NOTE:
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-III

TESTING CONDITION:
Do not hold engine speed for more than the specified minutes below.

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 1 minute under no load.
6. Let engine idle for 1 minute.
7. Select “COOLAN TEMP/S” in “DATA MONITOR” mode with CONSULT-III.
8. Check that “COOLAN TEMP/S” indication is more than 70°C (158°F).
   If not, warm up engine and go to next step when “COOLAN TEMP/S” indication reaches 70°C (158°F).
9. Open engine hood.
10. Select “DTC & SRT CONFIRMATION” then “SRT WORK SUPPORT” mode with CONSULT-III.
11. Rev engine between 2,000 and 3,000 rpm and maintain that speed for 3 consecutive minutes, then release the accelerator pedal completely.
    If “INCMP” of “CATALYST” changed to “CMPLT”, go to step 14.
12. Wait 5 seconds at idle.
13. Rev engine between 2,000 and 3,000 rpm and maintain that speed until “INCMP” of “CATALYST” changes to “CMPLT” (It will take approximately 5 minutes).
    If not “CMPLT”, stop engine and cool it down to less than 70°C (158°F), and then retest from step 1.
14. Check 1st trip DTC.

15. If 1st trip DTC is detected, go to EC-1027, "Diagnosis Procedure".

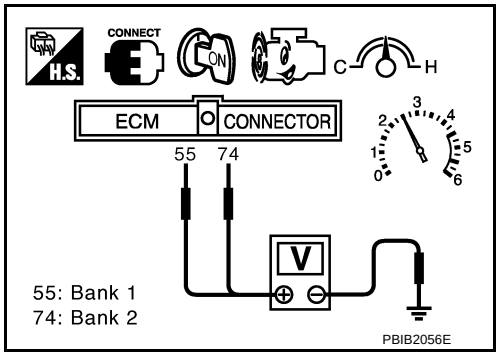
Overall Function Check

INFOID:0000000005354161

Use this procedure to check the overall function of the three way catalyst (manifold). During this check, a 1st trip DTC might not be confirmed.

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. 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. Set voltmeter probe between ECM terminal 55 [HO2S2 (bank 1) signal] and ground, ECM terminal 74 [HO2S2 (bank 2) signal] and ground.
7. Keep engine speed at 2,500 rpm constant under no load.
8. Check that the voltage does not vary for more than 5 seconds. If the voltage fluctuation cycle takes less than 5 seconds, go to EC-1027, "Diagnosis Procedure".
   - 1 cycle: 0.6 - 1.0 → 0 - 0.3 → 0.6 - 1.0



Diagnosis Procedure

INFOID:0000000005354162

1. CHECK EXHAUST SYSTEM

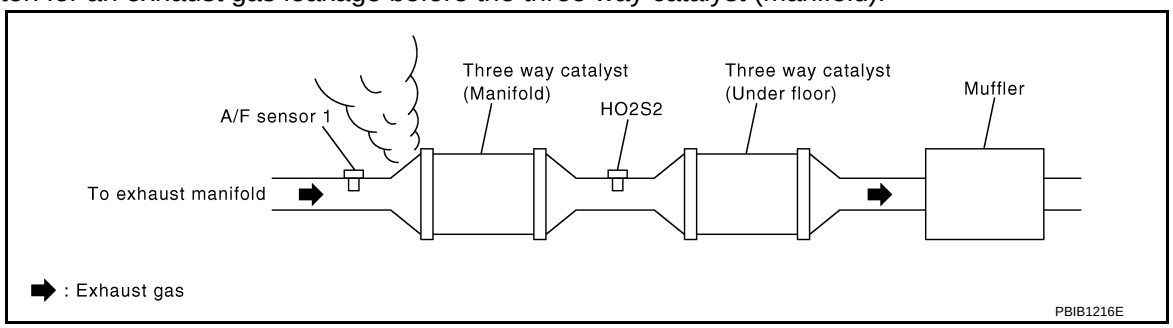
Visually check exhaust tubes and muffler for dents.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace.

2. CHECK EXHAUST GAS LEAKAGE

1. Start engine and run it at idle.
2. Listen for an exhaust gas leakage before the three way catalyst (manifold).



OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK INTAKE AIR LEAKAGE

Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace malfunctioning part.

4. CHECK IGNITION TIMING

Check the following items. Refer to EC-760, "Basic Inspection".

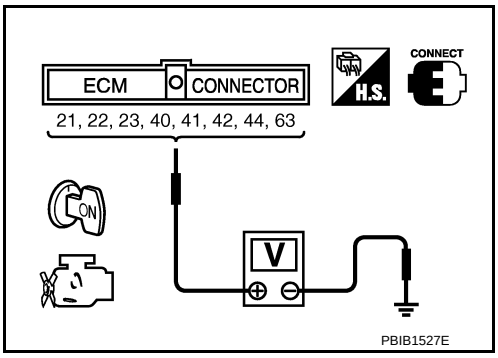
Items	Specifications
Target idle speed	650 ± 50 rpm (in P or N position)
Ignition timing	12 ± 5°BTDC (in P or N position)

OK or NG

OK >> GO TO 5.
NG >> Follow the instructions on EC-760, "Basic Inspection".

5. CHECK FUEL INJECTORS

1. Stop engine and then turn ignition switch ON.
2. Check voltage between ECM terminals 21, 22, 23, 40, 41, 42, 44, 63 and ground with CONSULT-III or tester.
   Refer to Wiring Diagram for fuel injectors, EC-1292, "Wiring Diagram".



Battery voltage should exist.

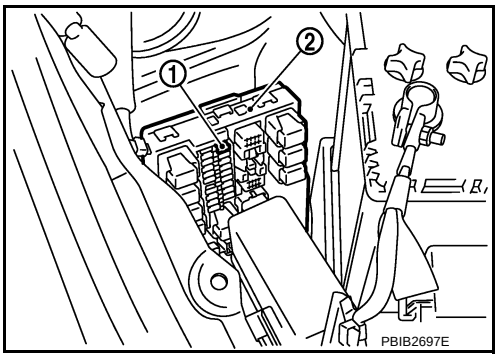
OK or NG

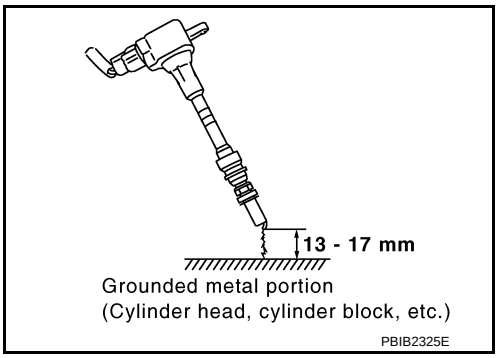
OK >> GO TO 6.
NG >> Perform EC-1293, "Diagnosis Procedure".

6. CHECK FUNCTION OF IGNITION COIL-I

CAUTION:
Perform the following procedure in a place with no combustible objects and good ventilation.

1. Turn ignition switch OFF.
2. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
3. Start engine.
4. After engine stalls, crank it two or three times to release all fuel pressure.
5. Turn ignition switch OFF.
6. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
7. Remove ignition coil and spark plug of the cylinder to be checked.
8. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
9. Connect spark plug and harness connector to ignition coil.
10. Fix ignition coil using a rope etc. with gap of 13 - 17 mm between the edge of the spark plug and grounded metal portion as shown in the figure.
11. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.





Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm 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 is made.**

NOTE:
When the gap is less than 13 mm, spark might be generated even if the coil is malfunctioning.

OK or NG

OK >> GO TO 10.
NG >> GO TO 7.

7. CHECK FUNCTION OF IGNITION COIL-II

1. Turn ignition switch OFF.
2. Disconnect spark plug and connect a non-malfunctioning spark plug.
3. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded metal portion.

Spark should be generated.

OK or NG

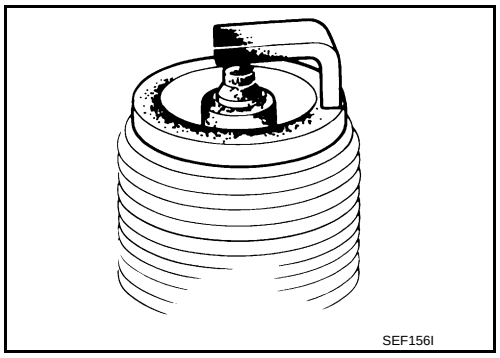
OK >> GO TO 8.
NG >> Check ignition coil, power transistor and their circuits. Refer to EC-1313, "Diagnosis Procedure".

8. CHECK SPARK PLUG

Check the initial spark plug for fouling, etc.

OK or NG

OK >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-272, "Standard and Limit".
NG >> 1. Repair or clean spark plug.
2. GO TO 9.



9. CHECK FUNCTION OF IGNITION COIL-III

1. Reconnect the initial spark plugs.
2. Crank engine for approximately 3 seconds, and recheck whether spark is generated between the spark plug and the grounded portion.

Spark should be generated.

OK or NG

OK >> **INSPECTION END**
NG >> Replace spark plug(s) with standard type one(s). For spark plug type, refer to EM-272, "Standard and Limit".

10. CHECK FUEL INJECTOR

1. Turn ignition switch OFF.
2. Remove fuel tube assembly.
   Refer to EM-189, "Component".
   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.
   Check that fuel does not drip from fuel injector.

OK or NG

OK (Does not drip.)>>GO TO 11.
NG (Drips.)>>Replace the fuel injector(s) from which fuel is dripping.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

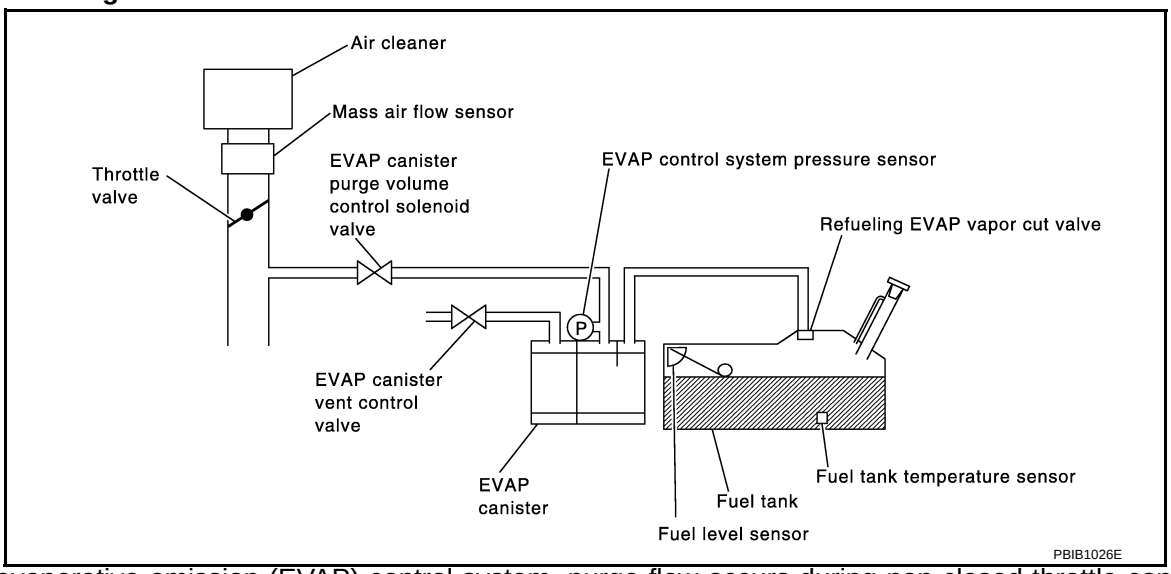
Trouble is fixed.>>**INSPECTION END**
Trouble is not fixed.>>Replace malfunctioning three way catalyst assembly.

DTC P0441 EVAP CONTROL SYSTEM

System Description

INFOID:0000000005354163

NOTE:
If DTC P0441 is displayed with other DTC such as P2122, P2123, P2127, P2128 or P2138, first perform the 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.

On Board Diagnosis Logic

INFOID:0000000005354164

Under normal conditions (non-closed throttle), sensor output voltage indicates if pressure drop and purge flow are adequate. If not, a malfunction is determined.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0441 0441	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

INFOID:0000000005354165

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
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.

WITH CONSULT-III

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-III.
7. Touch “START”.
   If “COMPLETED” is displayed, go to step 9.
8. When the following conditions are met, “TESTING” will be displayed on the CONSULT-III screen. Maintain the conditions continuously until “TESTING” changes to “COMPLETED”. (It will take 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	1.0 - 10.0 msec
COOLAN TEMP/S	70 - 100°C (158 - 212°F)

If “TESTING” does not change for a long time, retry from step 2.

9. Check that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, go to EC-1031, "Diagnosis Procedure".

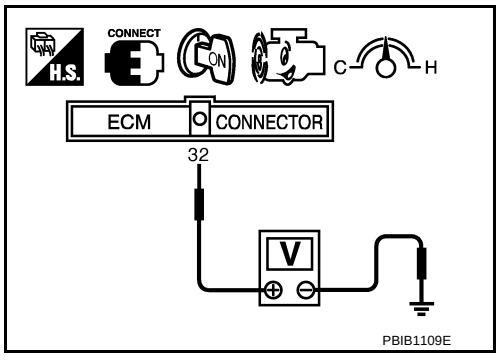
Overall Function Check

INFOID:0000000005354166

Use this procedure to check the overall function of the EVAP control system purge flow monitoring. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine (VDC switch OFF) and warm it up to normal operating temperature.
3. Turn ignition switch OFF, wait at least 10 seconds.
4. Start engine and wait at least 70 seconds.
5. Set voltmeter probes to ECM terminals 32 (EVAP control system pressure sensor signal) and ground.
6. Check EVAP control system pressure sensor value at idle speed and note it.
7. Establish and maintain the following conditions for at least 1 minute.



Air conditioner switch	ON
Headlamp switch	ON
Rear window defogger switch	ON
Engine speed	Approx. 3,000 rpm
Selector lever position	Any position other than P, N or R

8. Check that EVAP control system pressure sensor value stays 0.1V less than the value at idle speed (measured at step 6) for at least 1 second.
9. If NG, go to EC-1031, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354167

1. CHECK EVAP CANISTER

1. Turn ignition switch OFF.

2. Check EVAP canister for cracks.

OK or NG

OK (With CONSULT-III)>>GO TO 2.
OK (Without CONSULT-III)>>GO TO 3.
NG >> Replace EVAP canister.

2.CHECK PURGE FLOW

With CONSULT-III

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port. For the location of EVAP service port, refer to EC-720, "Description".
2. Install vacuum gauge between the vacuum hose and EVAP service port.
3. Start engine and let it idle.
4. Select “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III.
5. Rev engine up to 2,000 rpm.
6. Touch “Qd” and “Qu” on CONSULT-III screen to adjust “PURG VOL C/V” indication and check vacuum existence.

PURG VOL C/V	Vacuum
100%	Should exist.
0%	Should not exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

3.CHECK PURGE FLOW

Without CONSULT-III

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 and EVAP service port. For the location of EVAP service port, refer to EC-720, "Description".
4. Install vacuum gauge between the vacuum hose and EVAP service port.
5. Start engine and let it idle.
   Do not depress accelerator pedal even slightly.
6. Check vacuum gauge indication before 60 seconds pass after starting engine.

   Vacuum should not exist.

7. Rev engine up to 2,000rpm after 100 seconds pass after starting engine.

   Vacuum should exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 4.

4.CHECK EVAP PURGE LINE

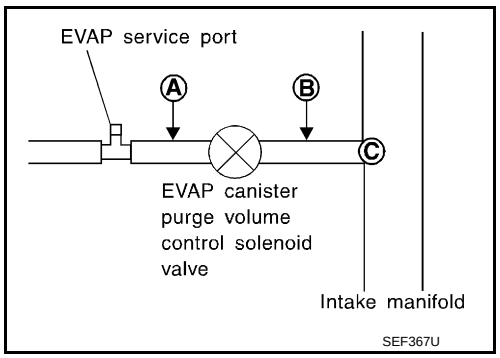
1. Turn ignition switch OFF.
2. Check EVAP purge line for improper connection or disconnection.
   Refer to EC-720, "Description".

OK or NG

OK >> GO TO 5.
NG >> Repair malfunctioning part.

5.CHECK EVAP PURGE HOSE AND PURGE PORT

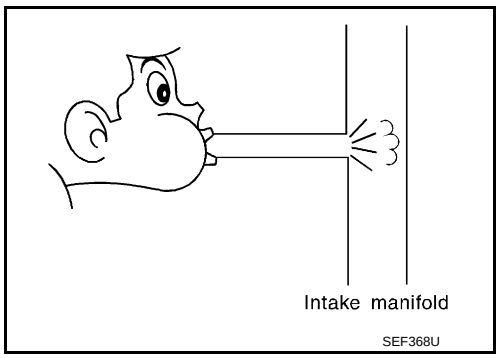
1. Disconnect purge hoses connected to EVAP service port (A) and EVAP canister purge volume control solenoid valve (B).
2. Blow air into each hose and EVAP purge port (C).



3. Check that air flows freely.

OK or NG

OK (With CONSULT-III)>>GO TO 6.
OK (Without CONSULT-III)>>GO TO 7.
NG >> Repair or clean hoses and/or purge port.



6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1055, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

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.

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP control system pressure sensor.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR FUNCTION

Refer to EC-1070, "DTC Confirmation Procedure" for DTC P0452, EC-1076, "DTC Confirmation Procedure" for DTC P0453.

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.

2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 11.
NG >> Clean the rubber tube using an air blower.

11. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1060, "Component Inspection".

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP canister vent control valve.

12. CHECK EVAP PURGE LINE

Inspect EVAP purge line (pipe and rubber tube). Check for evidence of leaks.
Refer to EC-720, "Description".

OK or NG

OK >> GO TO 13.
NG >> Replace malfunctioning part.

13. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 14.

14. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

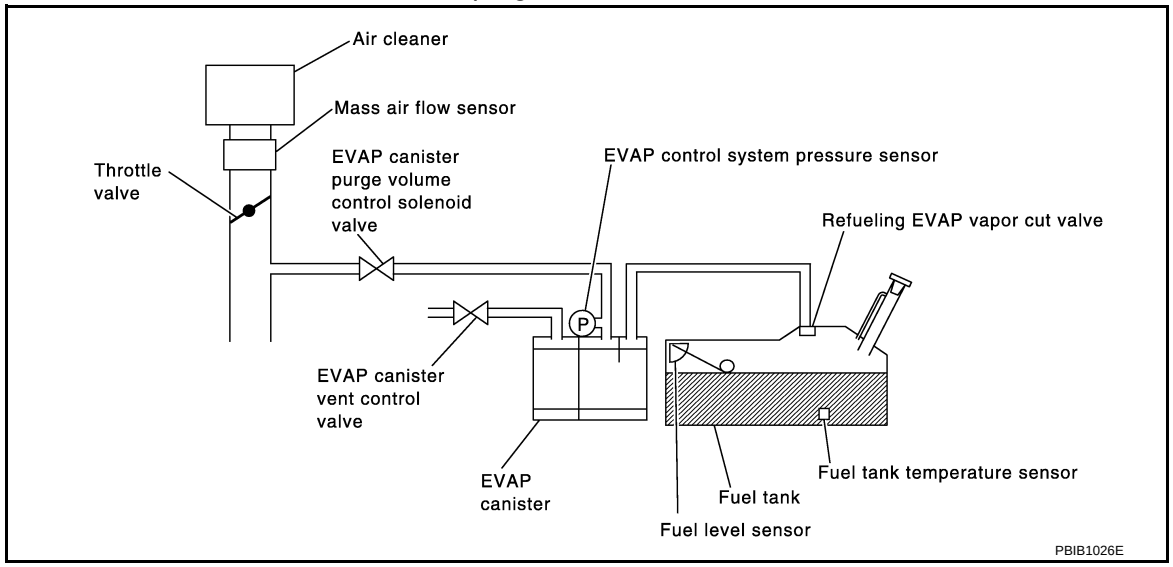
>> **INSPECTION END**

DTC P0442 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:0000000005354168

This diagnosis detects leakage in the EVAP purge line using engine intake manifold vacuum.
If pressure does not increase, the ECM will check for leakage in the line between the fuel tank and EVAP canister purge volume control solenoid valve, under the following “Vacuum test” conditions.
The EVAP canister vent control valve is closed to shut the EVAP purge line off. The EVAP canister purge volume control solenoid valve will then be opened to depressurize the EVAP purge line using intake manifold vacuum. After this occurs, the EVAP canister purge volume control solenoid valve will be closed.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0442 0442	EVAP control system small leak detected (negative pressure)	EVAP control system has a leak, EVAP control system does not operate properly.	• Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Fuel filler cap remains open or does not close. • Foreign matter caught in fuel filler cap. • Leak is in line between intake manifold and EVAP canister purge volume control solenoid valve. • Foreign matter caught in EVAP canister vent control valve. • EVAP canister or fuel tank leakage • EVAP purge line (pipe and rubber tube) leakage • 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 • Fuel level sensor and the circuit • Refueling EVAP vapor cut valve • ORVR system leakage

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

INFOID:0000000005354169

NOTE:

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:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.**
- **Always perform test at a temperature of 0 to 30°C (32 to 86°F).**

WITH CONSULT-III

1. Turn ignition switch ON.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
4. Check that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 30°C (32 - 86°F)
5. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
   Follow the instructions displayed.
   NOTE:
   If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-760, "Basic Inspection".
6. Check that “OK” is displayed.
   If “NG” is displayed, refer to EC-1036, "Diagnosis Procedure".
   NOTE:
   Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.

WITH GST

NOTE:
Be sure to read the explanation of “Driving Pattern” in EC-735, "Emission-Related Diagnostic Information" before driving vehicle.

1. Start engine.
2. Drive vehicle according to “Driving Pattern” in EC-735, "Emission-Related Diagnostic Information".
3. Stop vehicle.
4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
5. Select Service $07 with GST.
   - If P0442 is displayed on the screen, go to EC-1036, "Diagnosis Procedure".
   - If P0441 is displayed on the screen, go to EC-1031, "Diagnosis Procedure".

Diagnosis Procedure

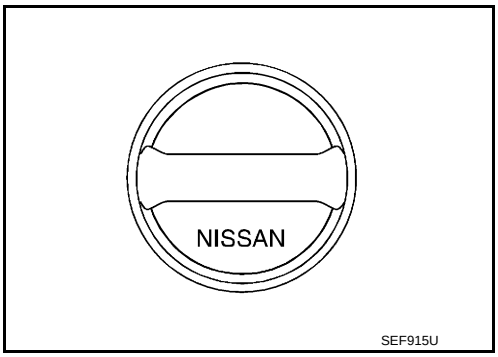
INFOID:0000000005354170

1.CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-722, "Component Inspection".

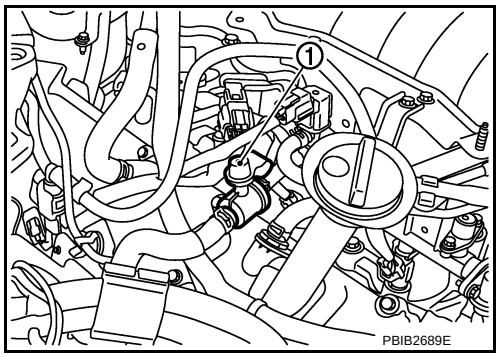
OK or NG

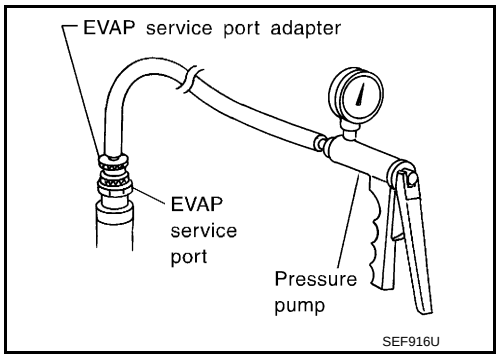
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leak, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port (1) securely.

NOTE:
Improper installation of the EVAP service port adapter (commercial service tool) to the EVAP service port may cause leaking.





With CONSULT-III>>GO TO 6.
Without CONSULT-III>>GO TO 7.

6. CHECK FOR EVAP LEAK

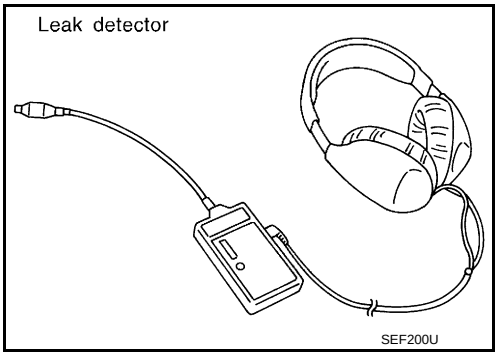
With CONSULT-III

1. Turn ignition switch ON.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-III.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.
Refer to EC-720, "Description".



OK or NG

OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.

7. CHECK FOR EVAP LEAK

Without CONSULT-III

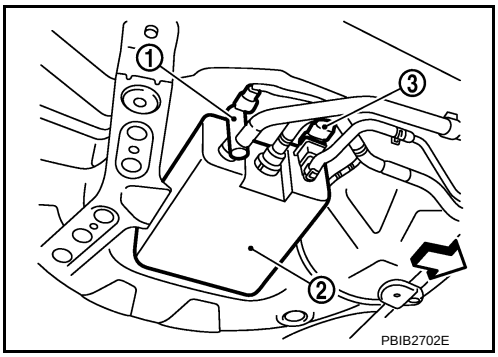
1. Turn ignition switch OFF.
2. Apply 12 volts DC to EVAP canister vent control valve (1). The valve will close. (Continue to apply 12 volts until the end of test.)

- Illustration shows the view from under the vehicle
- ⇦: Vehicle front
- EVAP canister (2)
- EVAP control system pressure sensor (3)

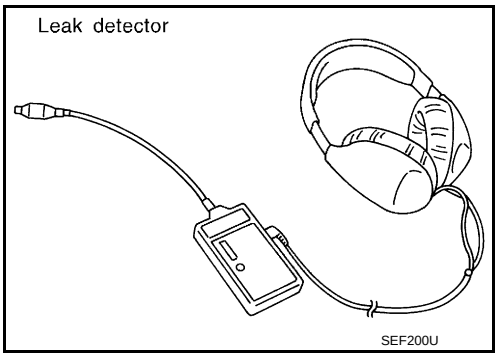
3. Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi), then remove pump and EVAP service port adapter (commercial service tool).

CAUTION:

- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**



4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details. Refer to EC-720, "Description".



OK or NG

OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
  Refer to EC-724, "Removal and Installation".
- EVAP canister vent control valve.
  Refer to EC-1060, "Component Inspection".

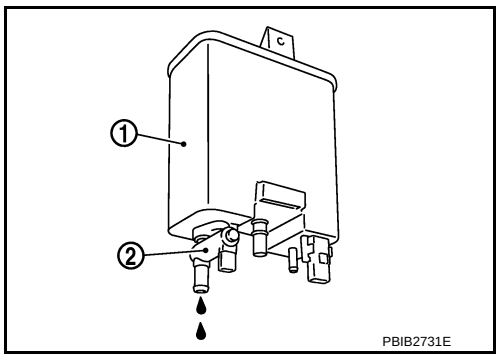
OK or NG

OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring.

9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Does water drain from the EVAP canister (1)?
- EVAP canister vent control valve (2)



Yes or No

Yes >> GO TO 10.
No (With CONSULT-III)>>GO TO 12.
No (Without CONSULT-III)>>GO TO 13.

10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

OK (With CONSULT-III)>>GO TO 12.
OK (Without CONSULT-III)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-III screen to increase “PURG VOL C/V” indication to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-III

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 and EVAP service port 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.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-788, "Vacuum Hose Drawing".

OK or NG

OK >> GO TO 15.

NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1055, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-995, "Component Inspection".

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-720, "Description".

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. 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-720, "Description".

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hose, tube or filler neck tube.

22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-728, "Component Inspection".

OK or NG

OK >> GO TO 23.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-24, "Electrical Component Inspection".

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

DTC P0443 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000005354171

SYSTEM DESCRIPTION

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		
Unified meter and A/C amp.	Vehicle speed*2		

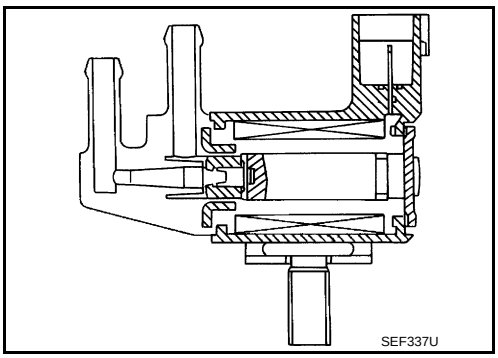
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354172

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
		2,000 rpm	—

On Board Diagnosis Logic

INFOID:0000000005502522

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0443 0443	EVAP canister purge volume control solenoid valve	A)	The canister purge flow is detected during the vehicle is stopped while the engine is running, even when EVAP canister purge volume control solenoid valve is completely closed.	• EVAP control system pressure sensor • EVAP canister purge volume control solenoid valve (EVAP canister purge volume control solenoid valve is stuck open.) • EVAP canister vent control valve • EVAP canister • Hoses (Hoses are connected incorrectly or clogged.)
		B)	The canister purge flow is detected during the specified driving conditions, even when EVAP canister purge volume control solenoid valve is completely closed.	

DTC Confirmation Procedure

INFOID:0000000005502523

Perform PROCEDURE FOR MALFUNCTION A first.
If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B.
NOTE:
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.

PROCEDURE FOR MALFUNCTION A

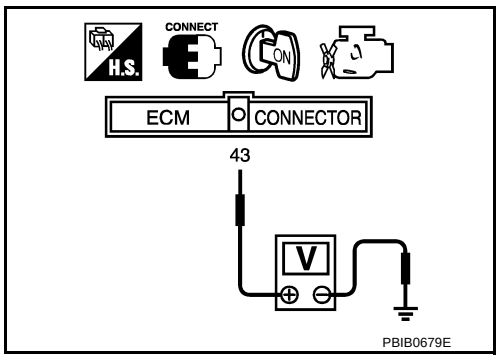
TESTING CONDITION:
- Perform "DTC Confirmation Procedure" when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.
- Always perform test at a temperature of 5 to 60°C (41 to 140°F).
- Cool the vehicle so that engine coolant temperature becomes same level as ambient temperature.

With CONSULT-III

1. Turn ignition switch ON and select "DATA MONITOR" mode with CONSULT-III.
2. Check that the following condition are met.
   FUEL T/TMP SE: 0 – 35°C (32 – 95°F)
3. Start engine and wait at least 60 seconds.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to EC-1046, "Diagnosis Procedure".

With GST

1. Turn ignition switch ON.
2. Set voltmeter probes to ECM terminal 43 (FTT sensor signal) and ground.
3. Check that the voltage is 3.1 – 4.2 V.
4. Start engine and wait at least 60 seconds.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to EC-1046, "Diagnosis Procedure".



PROCEDURE FOR MALFUNCTION B

NOTE:
If DTC Confirmation Procedure has been previously conducted, always turn ignition switch OFF and wait at least 10 seconds before conducting the next test.
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

With CONSULT-III

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. Select “PURG VOL CN/V P1444” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
5. Touch “START”.
6. Start engine and let it idle until “TESTING” on CONSULT-III changes to “COMPLETED”. (It will take approximately 10 seconds.)
   If “TESTING” is not displayed after 5 minutes, retry from step 2.
7. Make sure that “OK” is displayed after touching “SELF-DIAG RESULTS”. If “NG” is displayed, refer to EC-1046, "Diagnosis Procedure".

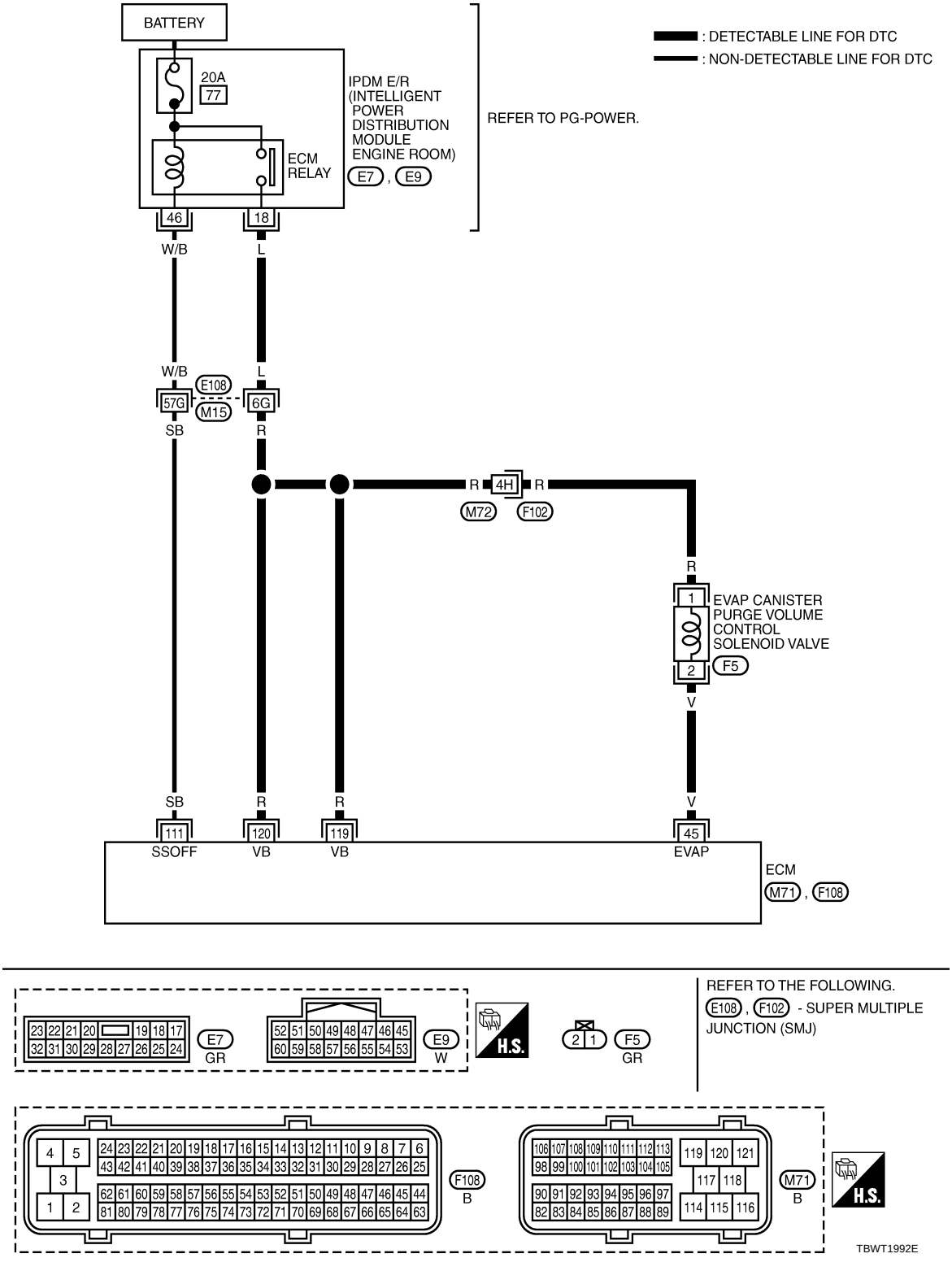
With GST

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Start engine and let it idle for at least 20 seconds.
4. Select Service $07 with GST.
5. If 1st trip DTC is detected, go to EC-1046, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354175

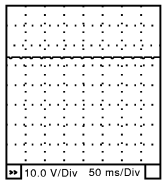
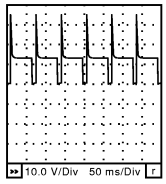
EC-PGC/V-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	V	EVAP canister purge volume control solenoid valve	**[Engine is running]** • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)★  SEC990C
			[Engine is running] • Engine speed: Approx. 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★  SEC991C
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

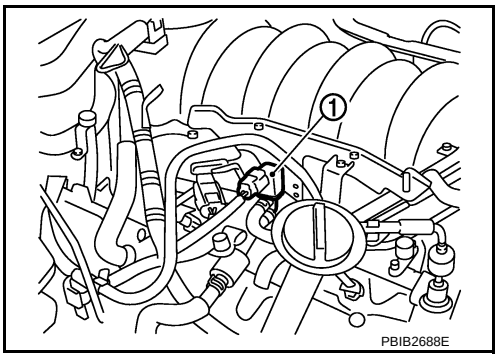
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354176

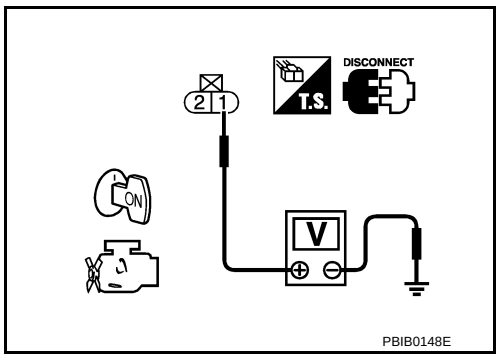
1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve (1) harness connector.
3. Turn ignition switch ON.



PBIB2688E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors M72, F102
- IPDM E/R harness connector E7
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR

1. Disconnect EVAP control system pressure sensor harness connector.
2. Check connectors for water.

Water should not exist.

OK or NG

OK >> GO TO 5.
NG >> Replace EVAP control system pressure sensor.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK (With CONSULT-III)>>GO TO 6.
OK (Without CONSULT-III)>>GO TO 7.
NG >> Replace EVAP control system pressure sensor.

6. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

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-III. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1049, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP canister purge volume control solenoid valve.

8. CHECK RUBBER TUBE FOR CLOGGING

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging.

OK or NG

OK >> GO TO 9.
NG >> Clean the rubber tube using an air blower.

9. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1060, "Component Inspection".

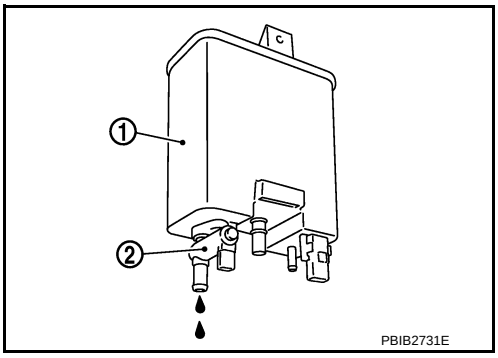
OK or NG

OK >> GO TO 10.
NG >> Replace EVAP canister vent control valve.

10. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Does water drain from the EVAP canister (1)?

- EVAP canister vent control valve (2)



Yes or No

Yes >> GO TO 11.
No >> GO TO 13.

11. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

OK >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.

- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

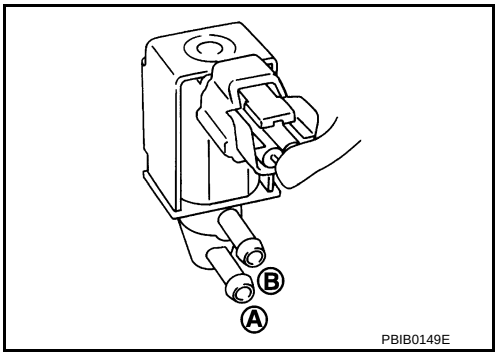
INFOID:0000000005354177

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

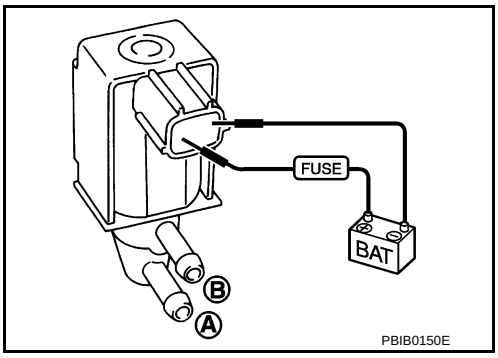
Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Yes
0%	No



Without CONSULT-III

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

INFOID:0000000005354178

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EM-174, "Component".

DTC P0444, P0445 EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Description

INFOID:0000000005354179

SYSTEM DESCRIPTION

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		
Unified meter and A/C amp.	Vehicle speed*2		

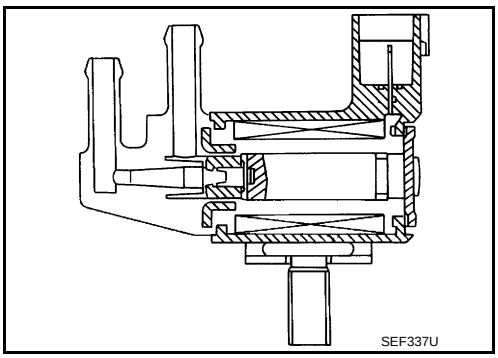
*1: ECM determines the start signal status by the signals of engine speed and battery voltage.

*2: This signal is sent to the ECM via the CAN communication line.

This system controls flow rate of fuel vapor from the EVAP canister. The opening of the vapor by-pass passage in the EVAP canister purge volume control solenoid valve changes to control the flow rate. The EVAP canister purge volume control solenoid valve repeats ON/OFF operation according to the signal sent from the ECM. The opening of the valve varies for optimum engine control. The optimum value stored in the ECM is determined by considering various engine conditions. When the engine is operating, the flow rate of fuel vapor from the EVAP canister is regulated as the air flow changes.

COMPONENT DESCRIPTION

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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354180

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PURG VOL C/V	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle (Accelerator pedal: Not depressed even slightly, after engine starting.)	0%
		2,000 rpm	—

On Board Diagnosis Logic

INFOID:0000000005354181

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0444 0444	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 0445	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

INFOID:0000000005354182

NOTE:
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.

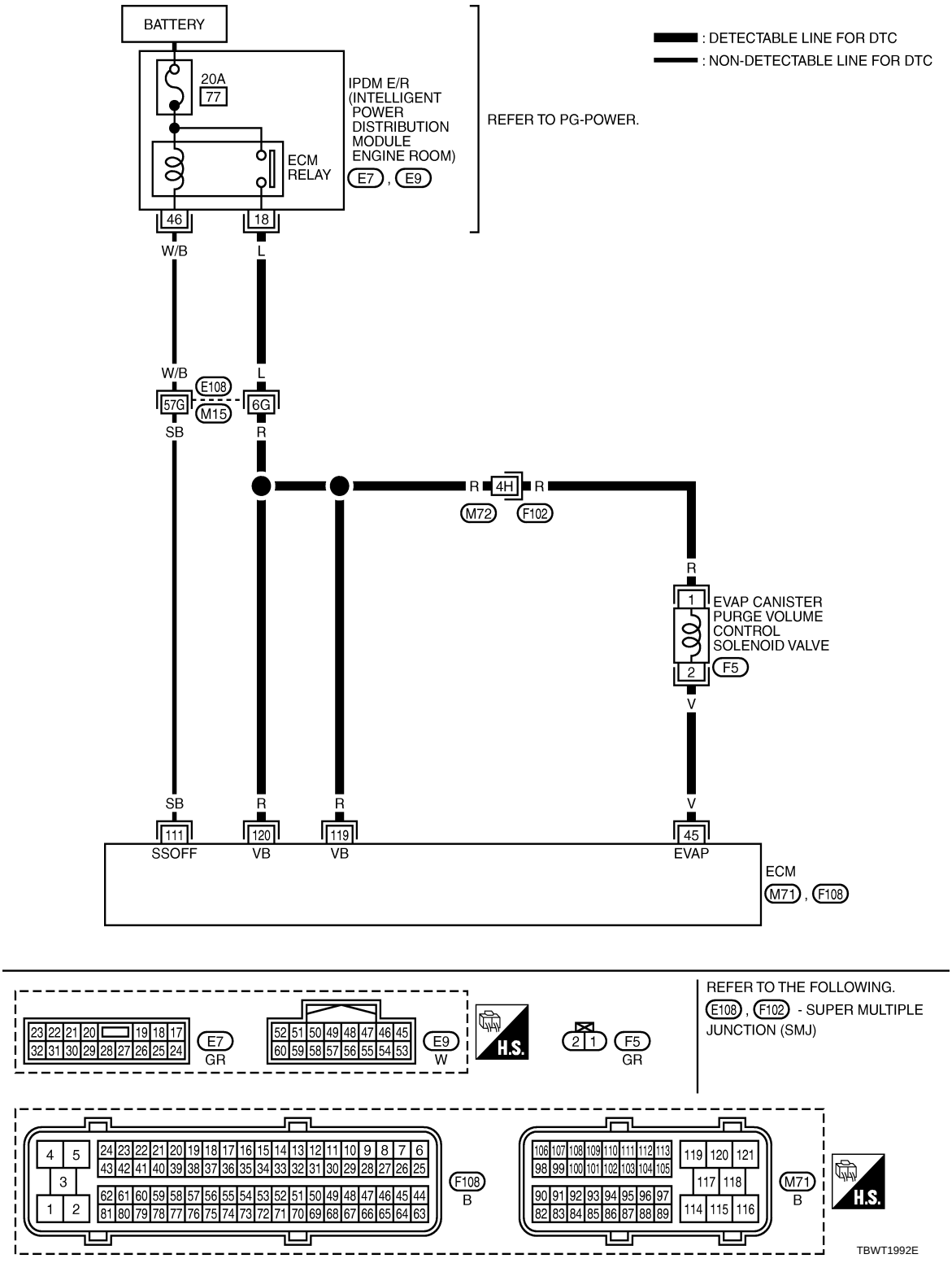
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

1. Start engine and let it idle for at least 13 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1053, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354183

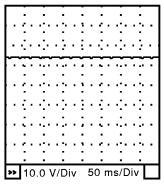
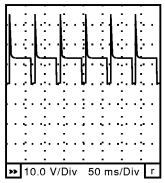
EC-PGC/V-01



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
45	V	EVAP canister purge volume control solenoid valve	**[Engine is running]** • Idle speed • Accelerator pedal: Not depressed even slightly, after engine starting	BATTERY VOLTAGE (11 - 14 V)★  SEC990C
			[Engine is running] • Engine speed: Approx. 2,000 rpm (More than 100 seconds after starting engine)	BATTERY VOLTAGE (11 - 14 V)★  SEC991C
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

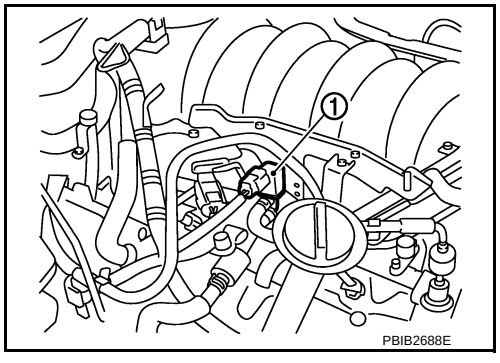
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354184

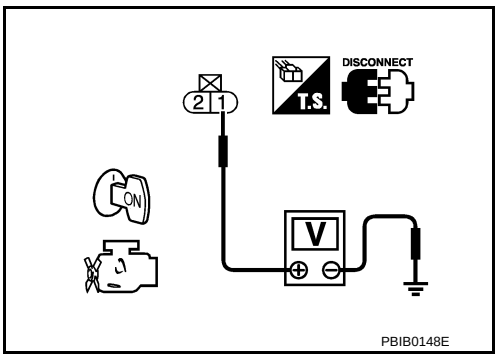
1. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister purge volume control solenoid valve (1) harness connector.
3. Turn ignition switch ON.



PBIB2688E

4. Check voltage between EVAP canister purge volume control solenoid valve terminal 1 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors M72, F102
- IPDM E/R harness connector E7
- Harness for open or short between EVAP canister purge volume control solenoid valve and IPDM E/R
- Harness for open or short between EVAP canister purge volume control solenoid valve and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

3. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 45 and EVAP canister purge volume control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK (With CONSULT-III)>>GO TO 4.
OK (Without CONSULT-III)>>GO TO 5.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

1. Reconnect all harness connectors disconnected.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1055, "Component Inspection".

OK or NG

OK >> GO TO 6.
NG >> Replace EVAP canister purge volume control solenoid valve.

6. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

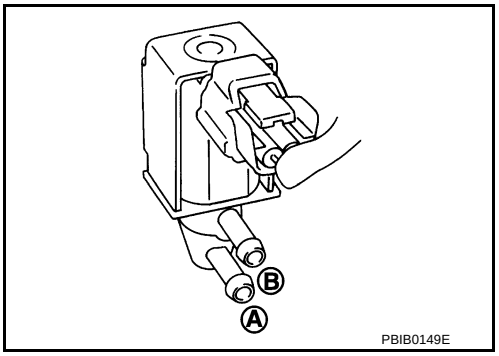
INFOID:0000000005354185

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

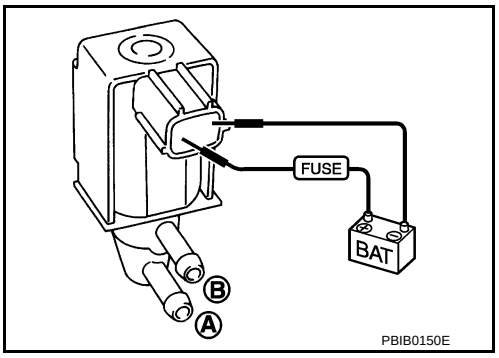
Condition (PURG VOL C/V value)	Air passage continuity between (A) and (B)
100%	Yes
0%	No



Without CONSULT-III

Check air passage continuity of EVAP canister purge volume control solenoid valve under the following conditions.

Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals 1 and 2	Yes
No supply	No



Removal and Installation

INFOID:0000000005354186

EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

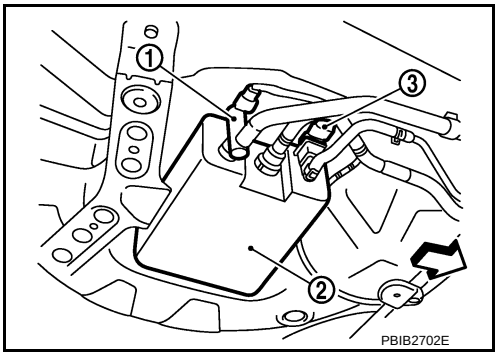
Refer to EM-174, "Component".

DTC P0447 EVAP CANISTER VENT CONTROL VALVE

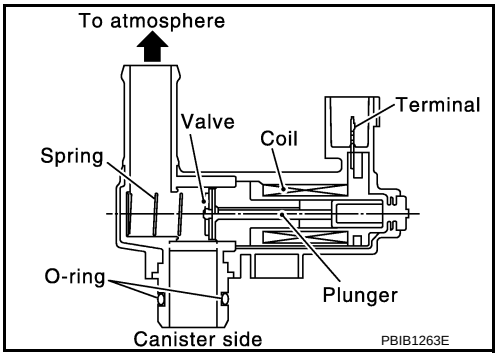
Component Description

INFOID:0000000005354187

The EVAP canister vent control valve (1) is located on the EVAP canister (2) and is used to seal the canister vent.
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP control system pressure sensor (3)



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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354188

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	• Ignition switch: ON	OFF

On Board Diagnosis Logic

INFOID:0000000005354189

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0447 0447	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

INFOID:0000000005354190

NOTE:
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.

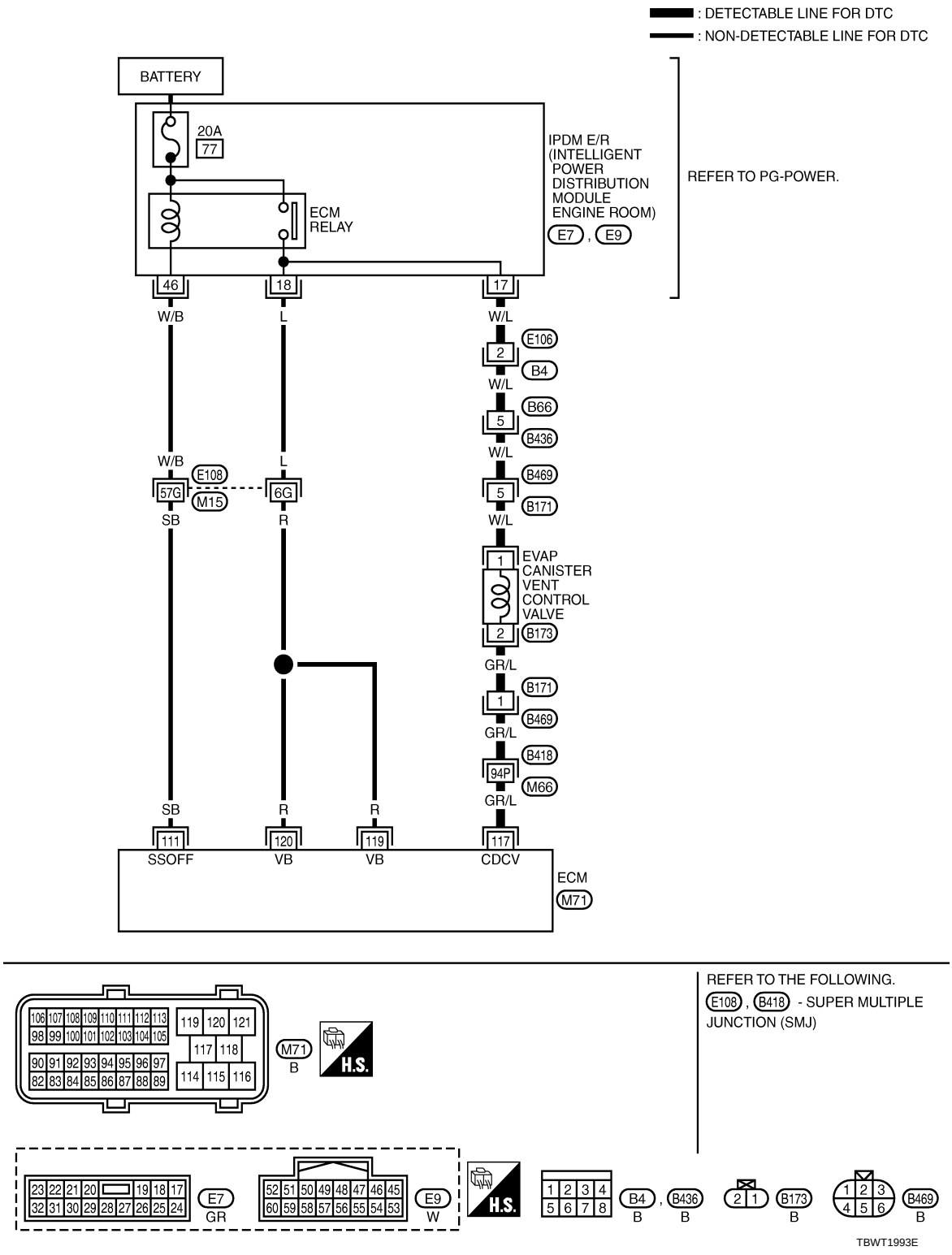
TESTING CONDITION:
Before performing the following procedure, confirm battery voltage is more than 11 V at idle.

1. Start engine and wait at least 8 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1058, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354191

EC-VENT/V-01



TBWT1993E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
117	GR/L	EVAP canister vent control valve	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354192

1.INSPECTION START

Do you have CONSULT-III?

Yes or No

Yes >> GO TO 2.
No >> GO TO 3.

2.CHECK EVAP CANISTER VENT CONTROL VALVE CIRCUIT

With CONSULT-III

1. Turn ignition switch OFF and then turn ON.
2. Select “VENT CONTROL/V” in “ACTIVE TEST” mode with CONSULT-III.
3. Touch “ON/OFF” on CONSULT-III screen.
4. Check for operating sound of the valve.

Clicking noise should be heard.

OK or NG

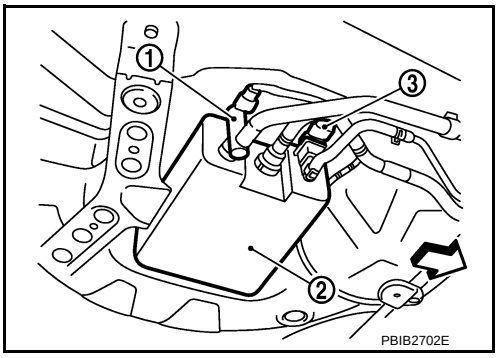
OK >> GO TO 7.
NG >> GO TO 3.

3.CHECK EVAP CANISTER VENT CONTROL VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect EVAP canister vent control valve (1) harness connector.

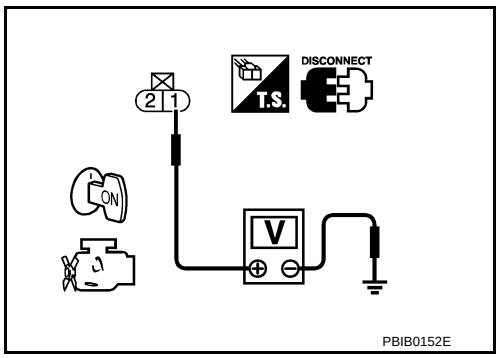
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister (2)
- EVAP control system pressure sensor (3)

3. Turn ignition switch ON.



4. Check voltage between EVAP canister vent control valve terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E106, B4
- Harness connectors B66, B436
- Harness connectors B469, B171
- IPDM E/R harness connector E7
- Harness for open or short between EVAP canister vent control valve and IPDM E/R

>> Repair open circuit or 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 harness continuity between ECM terminal 117 and EVAP canister vent control valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness for open or short between EVAP canister vent control valve and ECM

>> Repair open circuit or 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.

OK or NG

OK >> GO TO 8.
NG >> Clean the rubber tube using an air blower.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1060, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace EVAP canister vent control valve.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

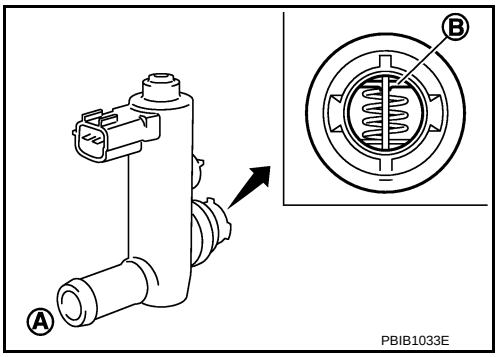
Component Inspection

INFOID:0000000005354193

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-III

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion (B) of EVAP canister vent control valve for rust.
   If NG, replace EVAP canister vent control valve.
   If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch ON.
5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.
   Check that new O-ring is installed properly.



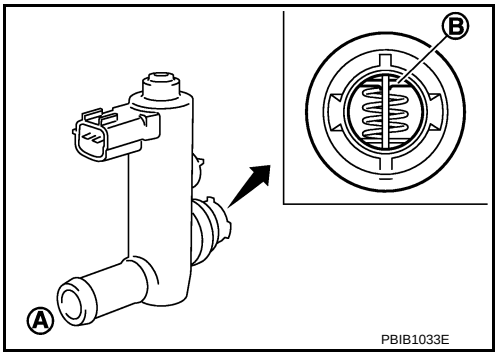
VENT CONT/V indication	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

Operation takes less than 1 second.
If NG, go to next step.

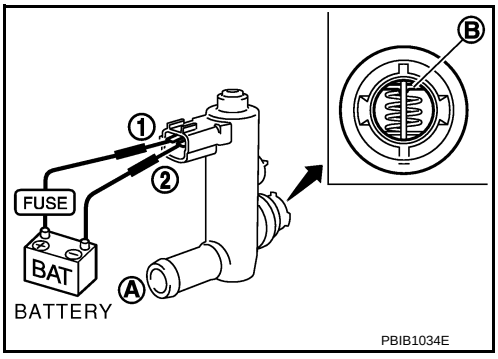
7. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
8. Perform step 6 again.
   If NG, replace EVAP canister vent control valve.

Without CONSULT-III

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion (B) of EVAP canister vent control valve for rust.



3. Check air passage continuity and operation delay time under the following conditions.
   Check that new O-ring is installed properly.



Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals (1) and (2)	No
OFF	Yes

Operation takes less than 1 second.
If NG, go to next step.

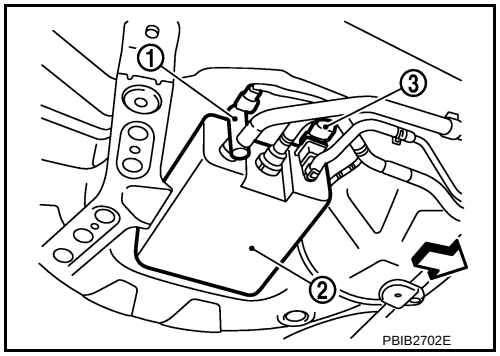
4. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.
   If NG, replace EVAP canister vent control valve.

DTC P0448 EVAP CANISTER VENT CONTROL VALVE

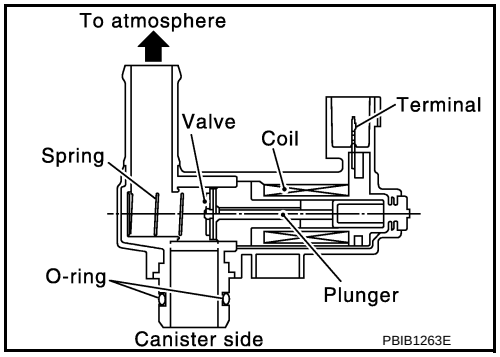
Component Description

INFOID:0000000005354194

The EVAP canister vent control valve (1) is located on the EVAP canister (2) and is used to seal the canister vent.
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP control system pressure sensor (3)



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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354195

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VENT CONT/V	• Ignition switch: ON	OFF

On Board Diagnosis Logic

INFOID:0000000005354196

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0448 0448	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

INFOID:0000000005354197

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON and wait at least 5 seconds.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and let it idle for at least 1 minute.
5. Repeat next procedures 3 times.

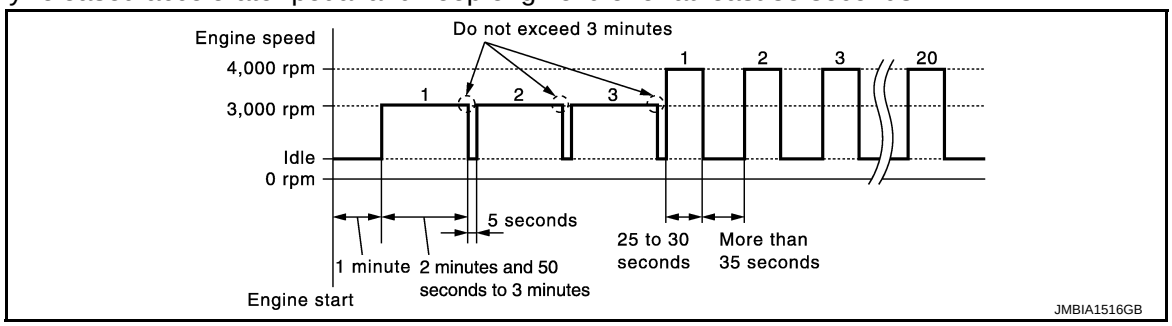
a. Rev engine between 3,000 and 3,500 rpm, then maintain that speed for 2 minutes and 50 seconds to 3 minutes.
Do not exceed 3 minutes.

b. Fully released accelerator pedal and keep engine idle for approximately 5 seconds.

6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to EC-1064, "Diagnosis Procedure".
If 1st trip DTC is not detected, go to the next step.
8. Repeat next procedure 20 times.

a. Quickly rev engine between 4,000 and 4,500 rpm or more, then maintain that speed for 25 to 30 seconds.

b. Fully released accelerator pedal and keep engine idle for at least 35 seconds.

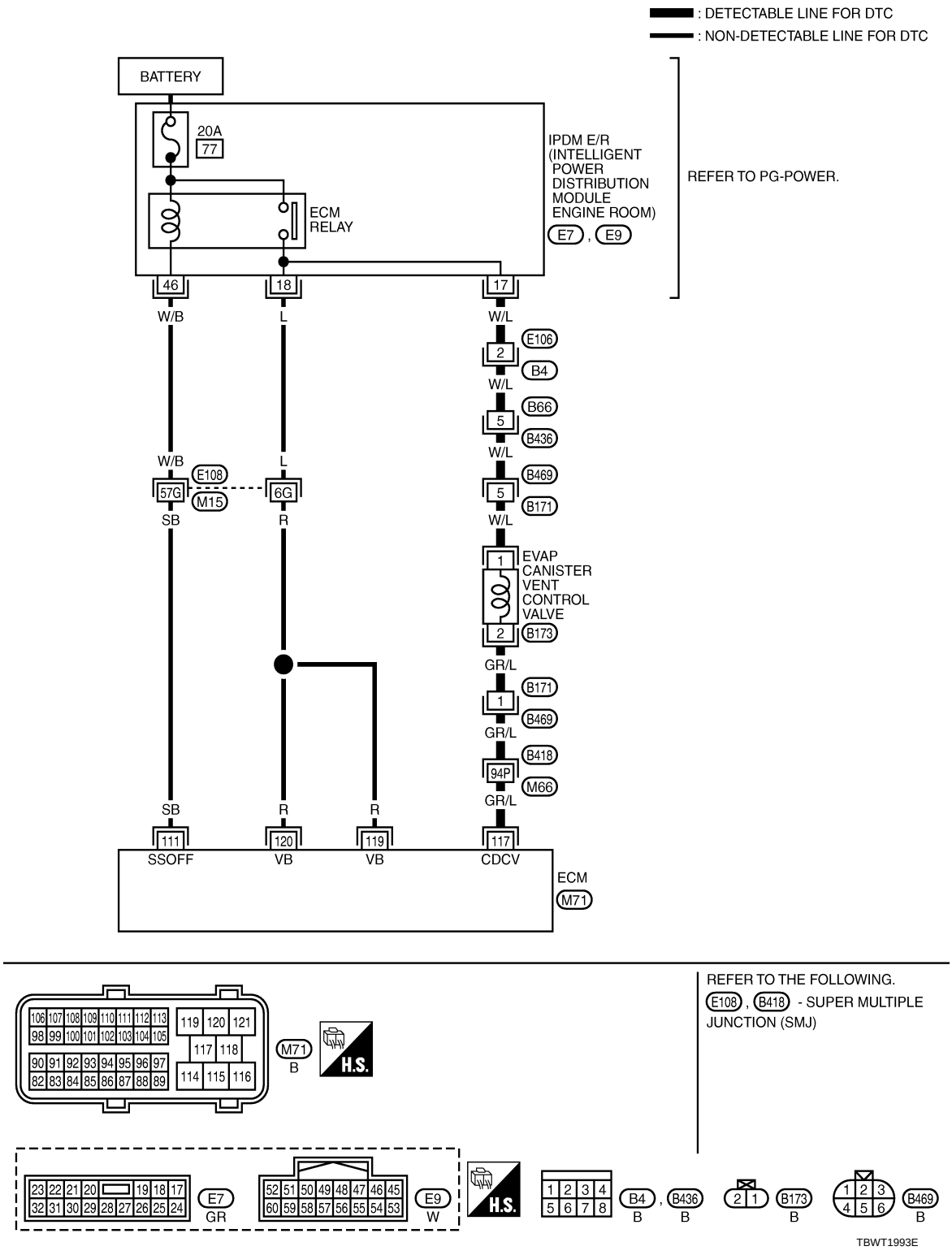


9. Check 1st trip DTC.
10. If 1st trip DTC is detected, go to EC-1064, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354198

EC-VENT/V-01



TBWT1993E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
117	GR/L	EVAP canister vent control valve	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

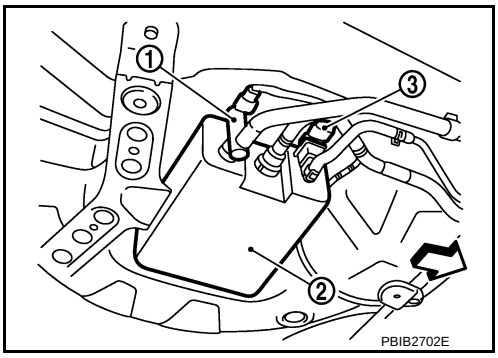
INFOID:0000000005354199

1.CHECK RUBBER TUBE

1. Turn ignition switch OFF.
2. Disconnect rubber tube connected to EVAP canister vent control valve (1).

- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister (2)
- EVAP control system pressure sensor (3)

3. Check the rubber tube for clogging.



OK or NG

OK >> GO TO 2.
NG >> Clean rubber tube using an air blower.

2.CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1065, "Component Inspection".

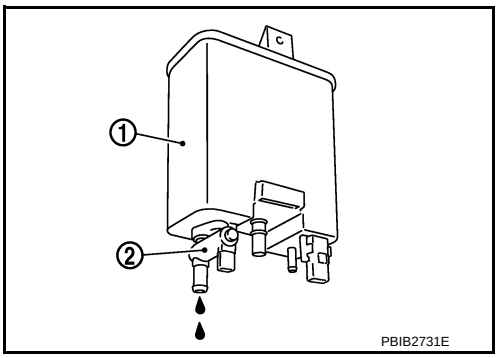
OK or NG

OK >> GO TO 3.
NG >> Replace EVAP canister vent control valve.

3.CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister (1).

- EVAP canister vent control valve (2)



Yes or No

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 2.0 kg (4.4 lb).

OK or NG

OK >> GO TO 6.
NG >> 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.

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.

OK or NG

OK >> GO TO 7.
NG >> Replace EVAP control system pressure sensor.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace EVAP control system pressure sensor.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

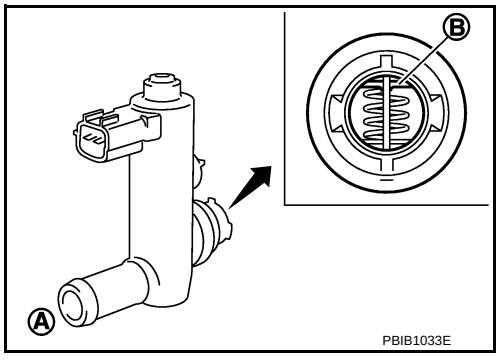
Component Inspection

INFOID:0000000005354200

EVAP CANISTER VENT CONTROL VALVE

With CONSULT-III

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion (B) of EVAP canister vent control valve for rust.
   If NG, replace EVAP canister vent control valve.
   If OK, go to next step.
3. Reconnect harness connectors disconnected.
4. Turn ignition switch ON.
5. Perform “VENT CONTROL/V” in “ACTIVE TEST” mode.
6. Check air passage continuity and operation delay time.
   Check that new O-ring is installed properly.



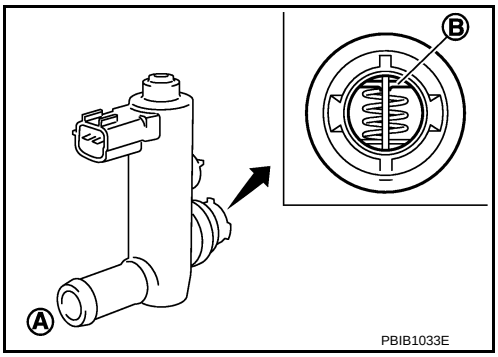
VENT CONT/V indication	Air passage continuity between (A) and (B)
ON	No
OFF	Yes

Operation takes less than 1 second.
If NG, go to next step.

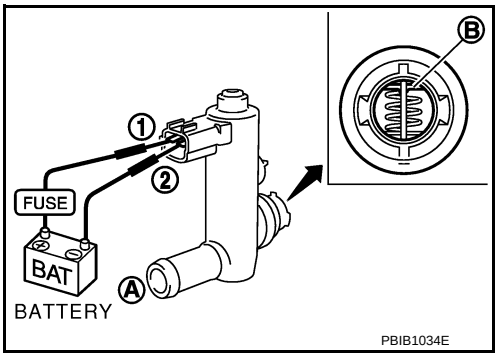
7. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
8. Perform step 6 again.
   If NG, replace EVAP canister vent control valve.

Without CONSULT-III

1. Remove EVAP canister vent control valve from EVAP canister.
2. Check portion (B) of EVAP canister vent control valve for rust.



3. Check air passage continuity and operation delay time under the following conditions.
   Check that new O-ring is installed properly.



Condition	Air passage continuity between (A) and (B)
12 V direct current supply between terminals (1) and (2)	No
OFF	Yes

Operation takes less than 1 second.
If NG, go to next step.

4. Clean the air passage [portion (A) to (B)] of EVAP canister vent control valve using an air blower.
5. Perform step 3 again.
   If NG, replace EVAP canister vent control valve.

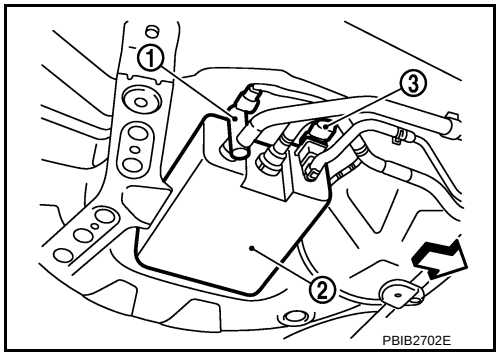
DTC P0451 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:0000000005354201

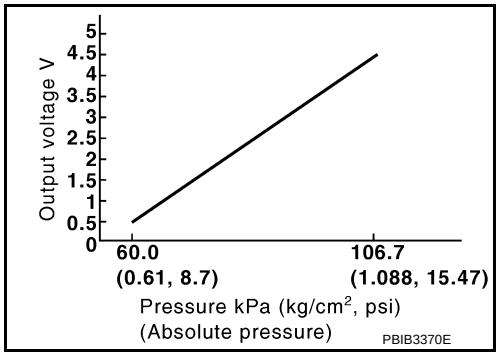
The EVAP control system pressure sensor (3) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister vent control valve (1)
- EVAP canister (2)



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354202



Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	• Ignition switch: ON	Approx. 1.8 - 4.8 V

On Board Diagnosis Logic

INFOID:0000000005354203

NOTE:
If DTC P0451 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0451 0451	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

DTC Confirmation Procedure

INFOID:0000000005354204

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

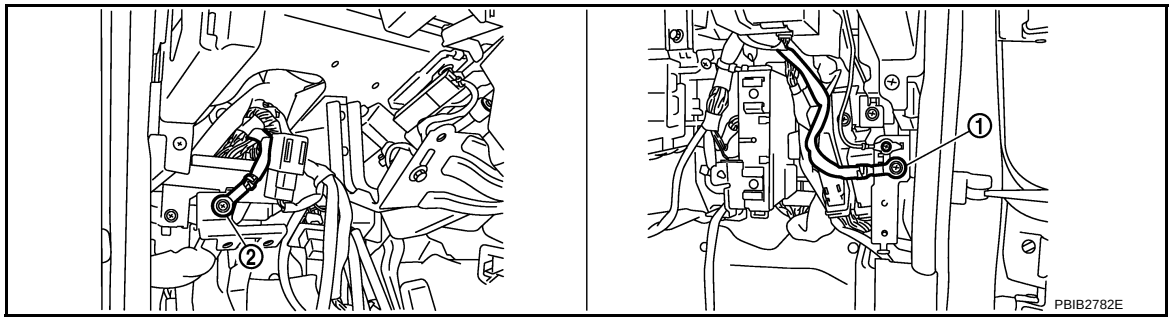
2. Start engine and wait at least 40 seconds.
   NOTE:
   Do not depress accelerator pedal even slightly.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-1068, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354205

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



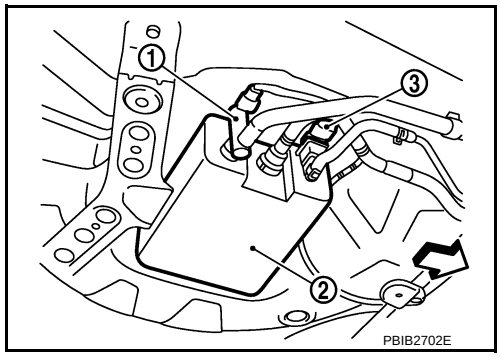
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR CONNECTOR FOR WATER

1. Disconnect EVAP control system pressure sensor (3) harness connector.
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister vent control valve (1)
- EVAP canister (2)
2. Check sensor harness connector for water.



Water should not exist.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK >> GO TO 4.
NG >> Replace EVAP control system pressure sensor.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".
For Wiring Diagram, refer to EC-1072, "Wiring Diagram".

>> **INSPECTION END**

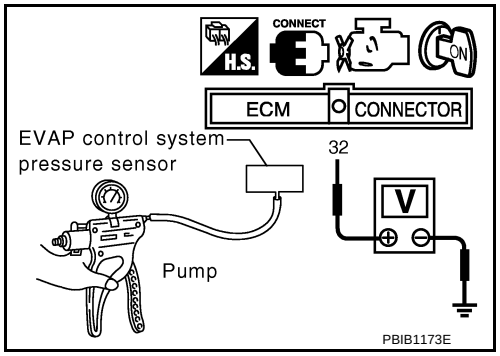
Component Inspection

INFOID:0000000005354206

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.

3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.



Applied vacuum [kPa (kg/cm^2, psi)]	Voltage
Not applied	1.8 - 4.8 V
-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum 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).**

4. If NG, replace EVAP control system pressure sensor.

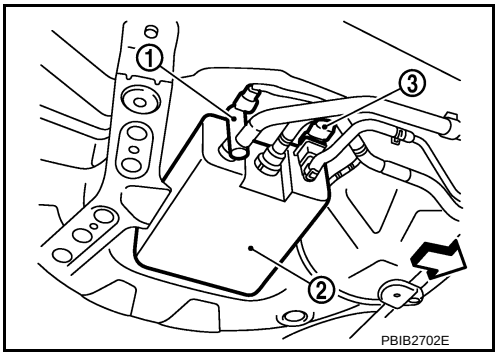
DTC P0452 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:0000000005354207

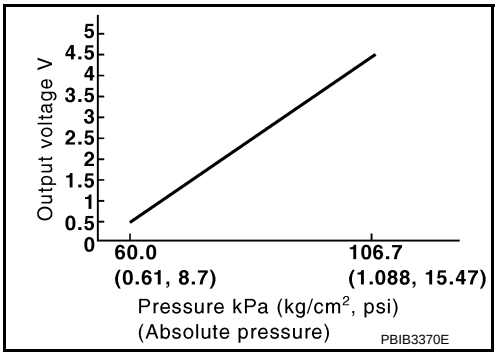
The EVAP control system pressure sensor (3) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister vent control valve (1)
- EVAP canister (2)



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354208



Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	• Ignition switch: ON	Approx. 1.8 - 4.8 V

On Board Diagnosis Logic

INFOID:0000000005354209

NOTE:
If DTC P0452 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0452 0452	EVAP control system pressure sensor low input	An excessively low voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor

DTC Confirmation Procedure

INFOID:0000000005354210

NOTE:
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.

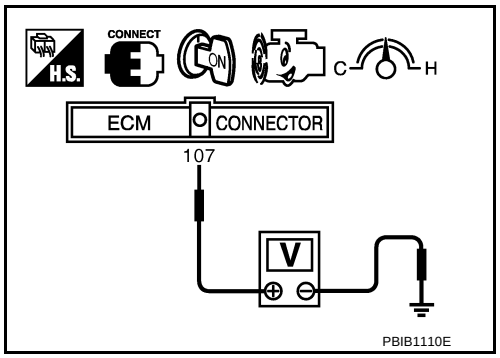
WITH CONSULT-III

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. Select “DATA MONITOR” mode with CONSULT-III.
5. Check that “FUEL T/TMP SE” indication is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1073, "Diagnosis Procedure".

WITH GST

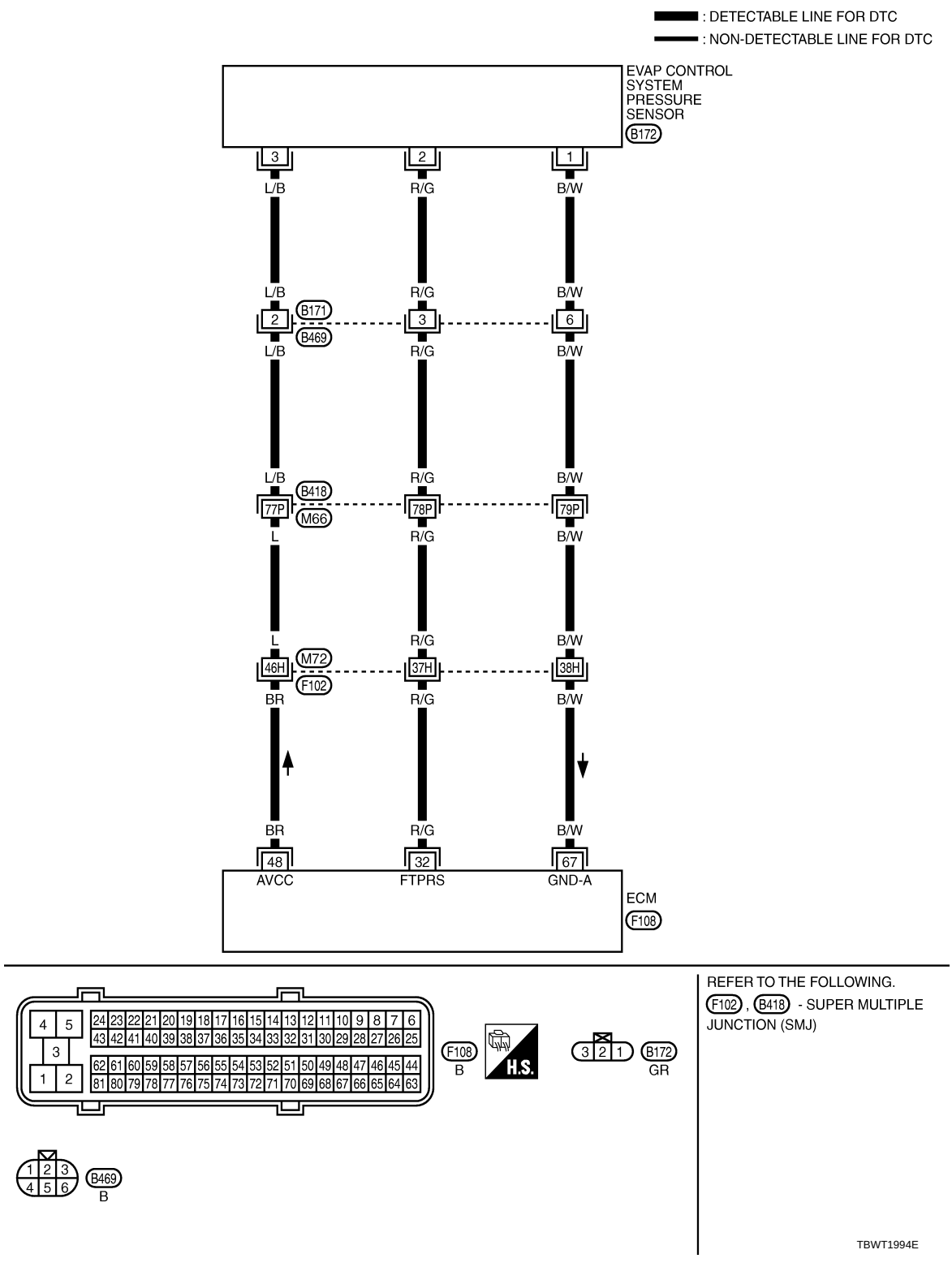
1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2 V.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to EC-1073, "Diagnosis Procedure".



Wiring Diagram

INFOID:0000000005354211

EC-PRE/SE-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

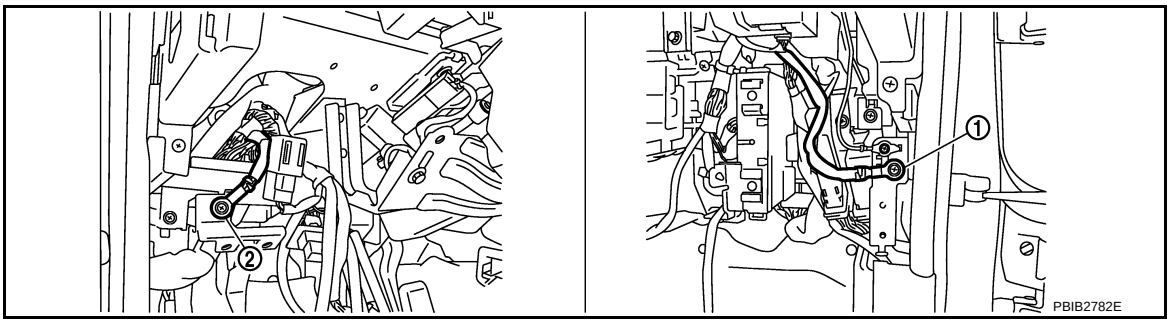
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	R/G	EVAP control system pressure sensor	**[Ignition switch: ON]**	Approximately 1.8 - 4.8 V
48	BR	Sensor power supply (EVAP control system pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (EVAP control system pressure sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

Diagnosis Procedure

INFOID:0000000005354212

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to EC-828, "Ground Inspection".



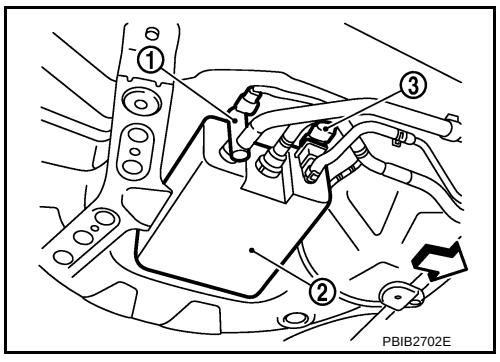
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor (3) harness connector.
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister vent control valve (1)
- EVAP canister (2)
2. Check sensor harness connector for water.



Water should not exist.

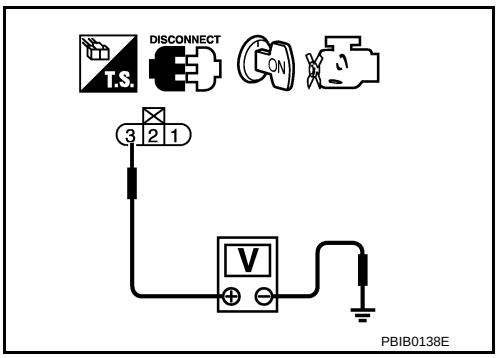
OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-III or tester.



Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness connectors M72, F102
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 67.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness connectors M72, F102
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness connectors M72, F102
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1075, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> Replace EVAP control system pressure sensor.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

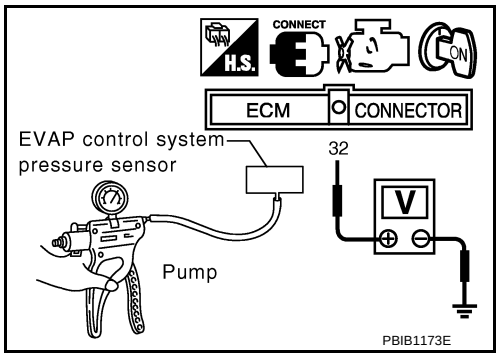
Component Inspection

INFOID:0000000005354213

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.
3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.

Applied vacuum [kPa (kg/cm^2, psi)]	Voltage
Not applied	1.8 - 4.8 V
-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value



CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum 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).**

4. If NG, replace EVAP control system pressure sensor.

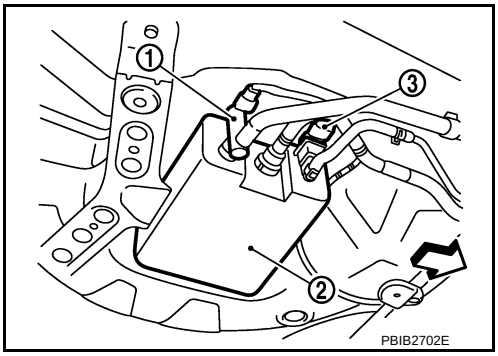
DTC P0453 EVAP CONTROL SYSTEM PRESSURE SENSOR

Component Description

INFOID:0000000005354214

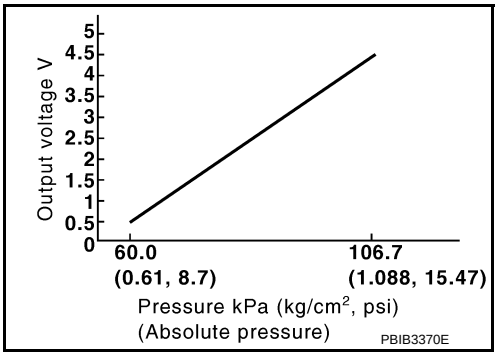
The EVAP control system pressure sensor (3) detects pressure in the purge line. The sensor output voltage to the ECM increases as pressure increases.

- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister vent control valve (1)
- EVAP canister (2)



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354215



Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
EVAP SYS PRES	• Ignition switch: ON	Approx. 1.8 - 4.8 V

On Board Diagnosis Logic

INFOID:0000000005354216

NOTE:
If DTC P0453 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0453 0453	EVAP control system pressure sensor high input	An excessively high voltage from the sensor is sent to ECM.	• Harness or connectors (The sensor circuit is open or shorted.) • EVAP control system pressure sensor • EVAP canister vent control valve • EVAP canister • Rubber hose from EVAP canister vent control valve to vehicle frame

DTC Confirmation Procedure

INFOID:0000000005354217

NOTE:
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.

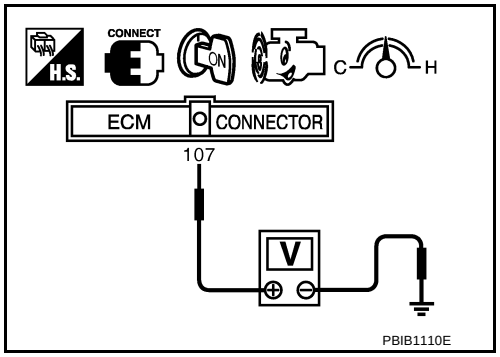
TESTING CONDITION:
Always perform test at a temperature of 5°C (41°F) or more.

WITH CONSULT-III

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. Select “DATA MONITOR” mode with CONSULT-III.
5. Check that “FUEL T/TMP SE” indication is more than 0°C (32°F).
6. Start engine and wait at least 20 seconds.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1079, "Diagnosis Procedure".

WITH GST

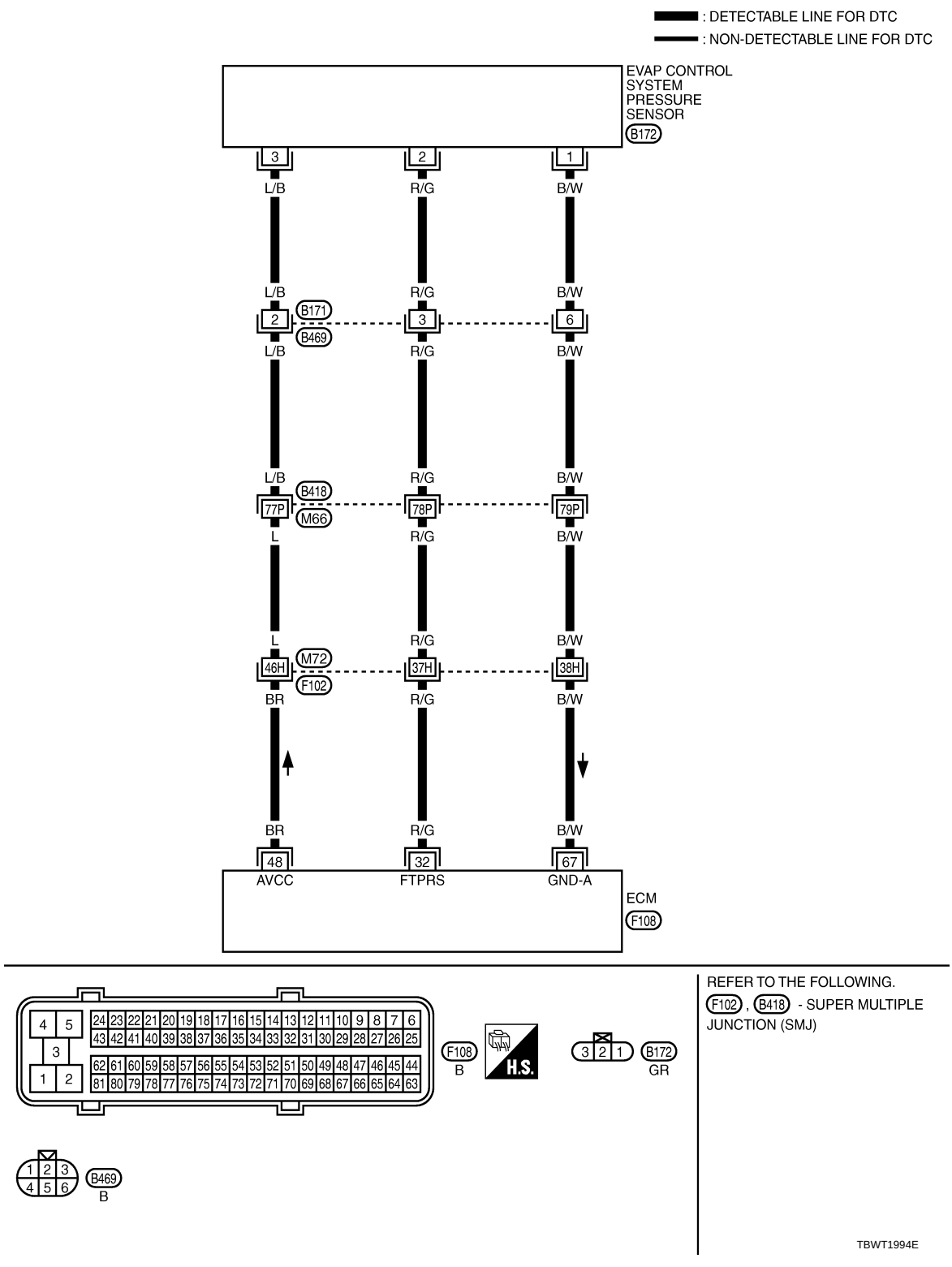
1. Start engine and warm it up to normal operating temperature.
2. Check that voltage between ECM terminal 107 (Fuel tank temperature sensor signal) and ground is less than 4.2 V.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Start engine and wait at least 20 seconds.
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to EC-1079, "Diagnosis Procedure".



Wiring Diagram

INFOID:0000000005354218

EC-PRE/SE-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

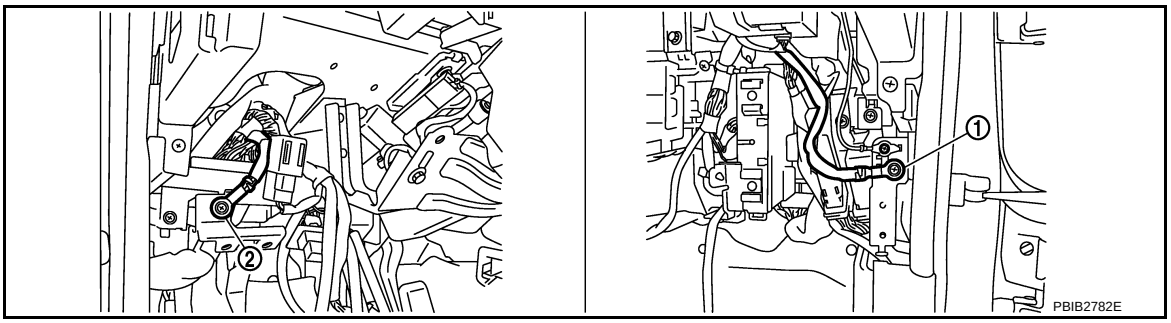
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
32	R/G	EVAP control system pressure sensor	**[Ignition switch: ON]**	Approximately 1.8 - 4.8 V
48	BR	Sensor power supply (EVAP control system pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (EVAP control system pressure sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V

Diagnosis Procedure

INFOID:0000000005354219

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to EC-828, "Ground Inspection".



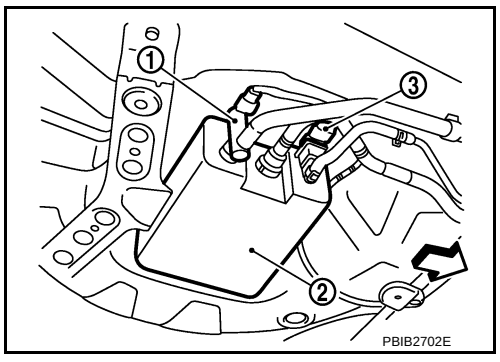
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK CONNECTOR

1. Disconnect EVAP control system pressure sensor (3) harness connector.
- Illustration shows the view from under the vehicle.
- ⇦: Vehicle front
- EVAP canister vent control valve (1)
- EVAP canister (2)
2. Check sensor harness connector for water.



Water should not exist.

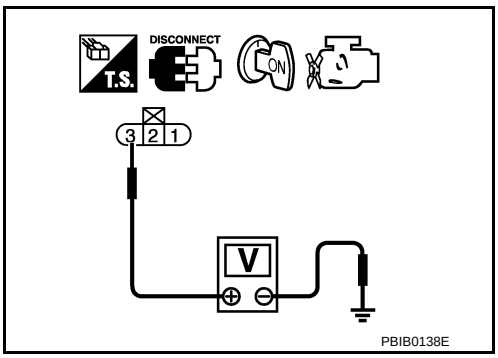
OK or NG

OK >> GO TO 3.
NG >> Repair or replace harness connector.

3.CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.

2. Check voltage between EVAP control system pressure sensor terminal 3 and ground with CONSULT-III or tester.



Voltage: Approximately 5V

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness connectors M72, F102
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between EVAP control system pressure sensor terminal 1 and ECM terminal 67.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness connectors M72, F102
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 32 and EVAP control system pressure sensor terminal 2.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors B171, B469
- Harness connectors B418, M66
- Harness connectors M72, F102
- Harness for open or short between EVAP control system pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK RUBBER TUBE

1. Disconnect rubber tube connected to EVAP canister vent control valve.
2. Check the rubber tube for clogging, vent or kinked.

OK or NG

OK >> GO TO 10.
NG >> Clean the rubber tube using an air blower, repair or replace rubber tube.

10. CHECK EVAP CANISTER VENT CONTROL VALVE

Refer to EC-1060, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> Replace EVAP canister vent control valve.

11. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1082, "Component Inspection".

OK or NG

OK >> GO TO 12.
NG >> Replace EVAP control system pressure sensor.

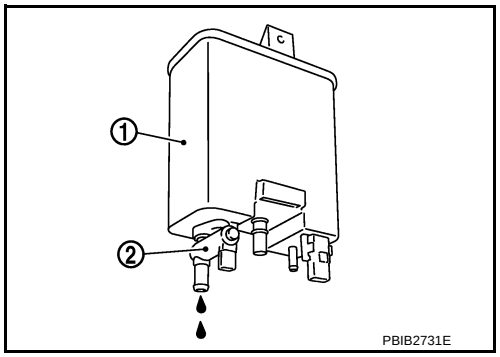
12. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.
2. Check if water will drain from the EVAP canister (1).

- EVAP canister vent control valve (2)

Yes or No

Yes >> GO TO 13.
No >> GO TO 15.



13. 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 2.0 kg (4.4 lb).

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. 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.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

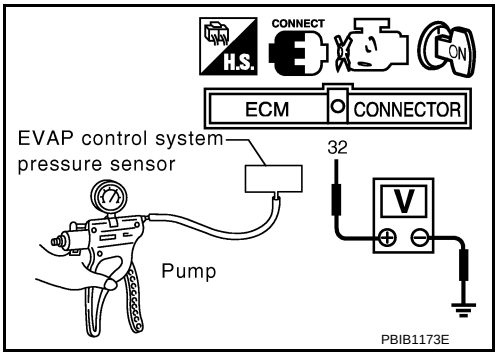
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354220

EVAP CONTROL SYSTEM PRESSURE SENSOR

1. Remove EVAP control system pressure sensor with its harness connector.
   Always replace O-ring with a new one.
2. Install a vacuum pump to EVAP control system pressure sensor.
3. Turn ignition switch ON and check output voltage between ECM terminal 32 and ground under the following conditions.



Applied vacuum [kPa (kg/cm^2, psi)]	Voltage
Not applied	1.8 - 4.8 V
-26.7 (-0.272, -3.87)	2.1 to 2.5 V lower than above value

CAUTION:

- **Always calibrate the vacuum pump gauge when using it.**
- **Do not apply vacuum 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).**

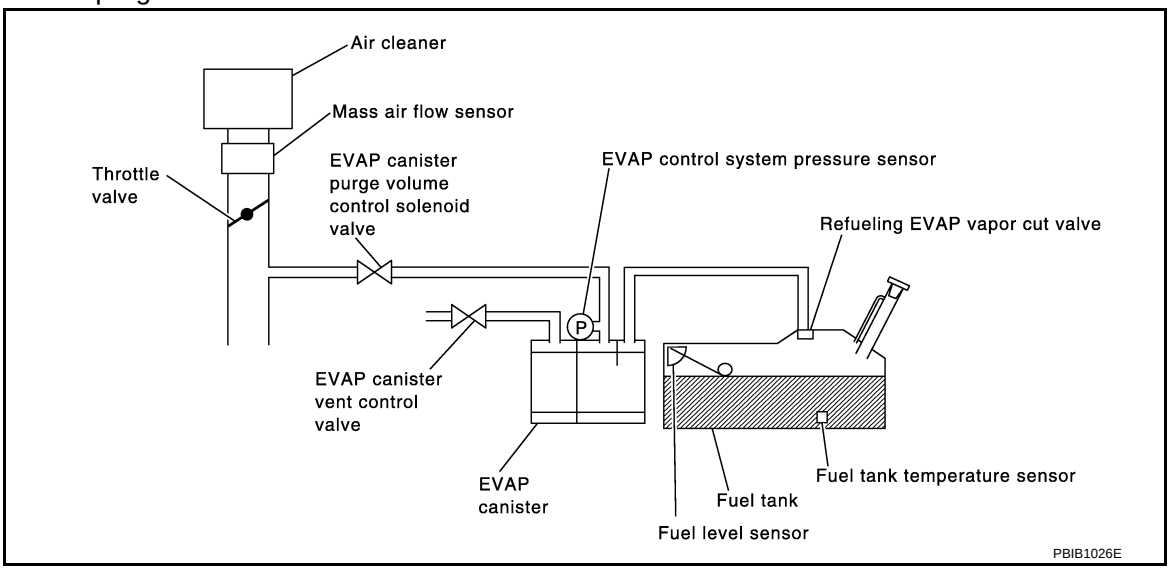
4. If NG, replace EVAP control system pressure sensor.

DTC P0455 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:0000000005354221

This diagnosis detects a very large leak (fuel filler cap fell off etc.) in EVAP system between the fuel tank and EVAP canister purge volume control solenoid valve.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0455 0455	EVAP control system gross leak detected	EVAP control system has a very large leak such as fuel filler cap fell off, EVAP control system does not operate properly.	• Fuel filler cap remains open or does not close. • Incorrect fuel tank vacuum relief valve • Incorrect fuel filler cap used • Foreign matter caught in fuel filler cap • Leakage 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 leakage • EVAP purge line (pipe and rubber tube) leakage • 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 control system pressure sensor • Refueling EVAP vapor cut valve • ORVR system leakage

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

INFOID:0000000005354222

CAUTION:
Never remove fuel filler cap during the DTC Confirmation Procedure.
NOTE:

- **Make sure that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**
- 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:

- **Perform “DTC WORK SUPPORT” when the fuel level is between 1/4 and 3/4 full, and vehicle is placed on flat level surface.**
- **Open engine hood before conducting the following procedure.**

WITH CONSULT-III

1. Tighten fuel filler cap securely until ratcheting sound is heard.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
5. Check that the following conditions are met.
   COOLAN TEMP/S: 0 - 70°C (32 - 158°F)
   INT/A TEMP SE: 0 - 60°C (32 - 140°F)
6. Select “EVAP SML LEAK P0442/P1442” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
   Follow the instructions displayed.
   NOTE:
   If the engine speed cannot be maintained within the range displayed on the CONSULT-III screen, go to EC-760, "Basic Inspection".
7. Check that “OK” is displayed.
   If “NG” is displayed, select “SELF-DIAG RESULTS” mode and check that “EVAP GROSS LEAK [P0455]” is displayed. If it is displayed, go to EC-1084, "Diagnosis Procedure".
   If P0442 is displayed, perform Diagnostic Procedure for DTC P0442, refer to EC-1036, "Diagnosis Procedure".

WITH GST

NOTE:
Be sure to read the explanation on “Driving Pattern” in EC-735, "Emission-Related Diagnostic Information" before driving vehicle.

1. Start engine.
2. Drive vehicle according to “Driving Pattern” in EC-735, "Emission-Related Diagnostic Information".
3. Stop vehicle.
4. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
5. Check 1st trip DTC.
6. If P0455 is displayed, go to EC-1084, "Diagnosis Procedure".
   If P0442 is displayed, go to EC-1036, "Diagnosis Procedure".
   If P0441 is displayed, go to EC-1031, "Diagnosis Procedure".

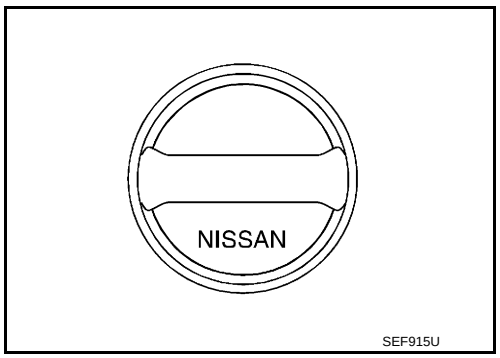
Diagnosis Procedure

INFOID:0000000005354223

1.CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.

2. Check for genuine NISSAN fuel filler cap design.



OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.

2.CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3.CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4.CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-722, "Component Inspection".

OK or NG

OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5.CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks, improper connection or disconnection.
Refer to EC-720, "Description".

OK or NG

OK >> GO TO 6.
NG >> Repair or reconnect the hose.

6.CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 7.

7.CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.
- EVAP canister vent control valve is installed properly.
  Refer to EC-724, "Removal and Installation".
- EVAP canister vent control valve.
  Refer to EC-1060, "Component Inspection".

OK or NG

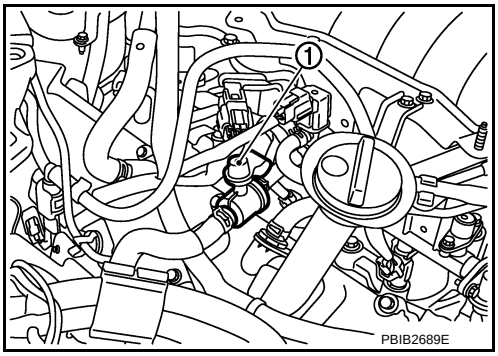
OK >> GO TO 8.
NG >> Repair or replace EVAP canister vent control valve and O-ring.

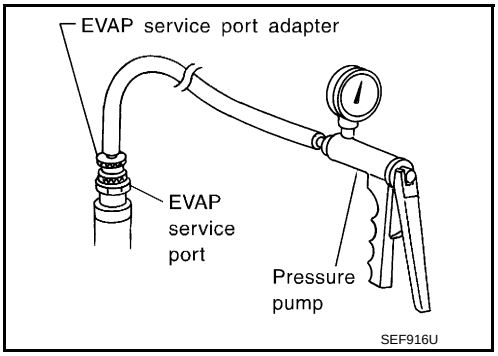
8.INSTALL THE PRESSURE PUMP

To locate the EVAP leakage, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port (1) securely.

NOTE:

Improper installation of the EVAP service port adapter (commercial service tool) to the EVAP service port may cause leaking.



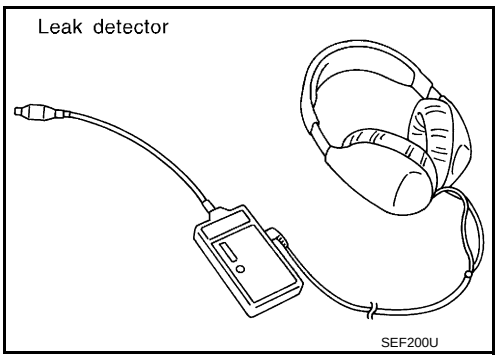


With CONSULT-III>>GO TO 9.
Without CONSULT-III>>GO TO 10.

9. CHECK FOR EVAP LEAK

With CONSULT-III

1. Turn ignition switch ON.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-III.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.
   CAUTION:
   - **Never use compressed air or a high pressure pump.**
   - **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**
4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.
   Refer to EC-720, "Description".



OK or NG

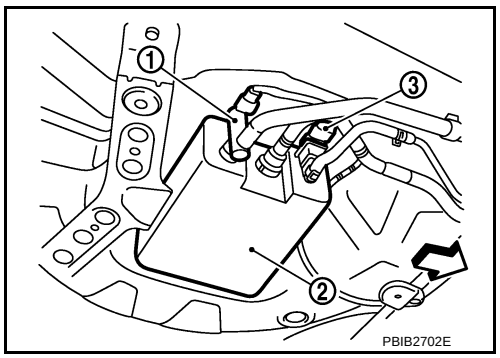
OK >> GO TO 11.
NG >> Repair or replace malfunctioning part.

10. CHECK FOR EVAP LEAK

Without CONSULT-III

1. Turn ignition switch OFF.

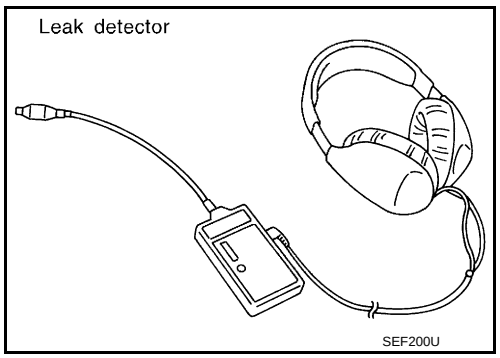
2. Apply 12 V DC to EVAP canister vent control valve (1). The valve will close. (Continue to apply 12 V until the end of test.)
- Illustration shows the view from under the vehicle
- ⇦: Vehicle front
- EVAP canister (2)
- EVAP control system pressure sensor (3)



3. Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi), then remove pump and EVAP service port adapter (commercial service tool).

CAUTION:
- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details. Refer to EC-720, "Description".



OK or NG

OK >> GO TO 12.
NG >> Repair or replace malfunctioning part.

11. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-III screen to increase “PURG VOL C/V” indication to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-III

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 and EVAP service port 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.

OK or NG

OK >> GO TO 15.
NG >> GO TO 13.

13. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-788, "Vacuum Hose Drawing".

OK or NG

OK (With CONSULT-III)>>GO TO 14.
OK (Without CONSULT-III)>>GO TO 15.
NG >> Repair or reconnect the hose.

14. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

With CONSULT-III

1. Start engine.
2. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode with CONSULT-III. Check that engine speed varies according to the valve opening.

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1055, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-995, "Component Inspection".

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

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-720, "Description".

OK or NG

OK >> GO TO 19.
NG >> 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.

OK or NG

OK >> GO TO 20.
NG >> Repair or replace hose, tube or filler neck tube.

20. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-728, "Component Inspection".

OK or NG

OK >> GO TO 21.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

21. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

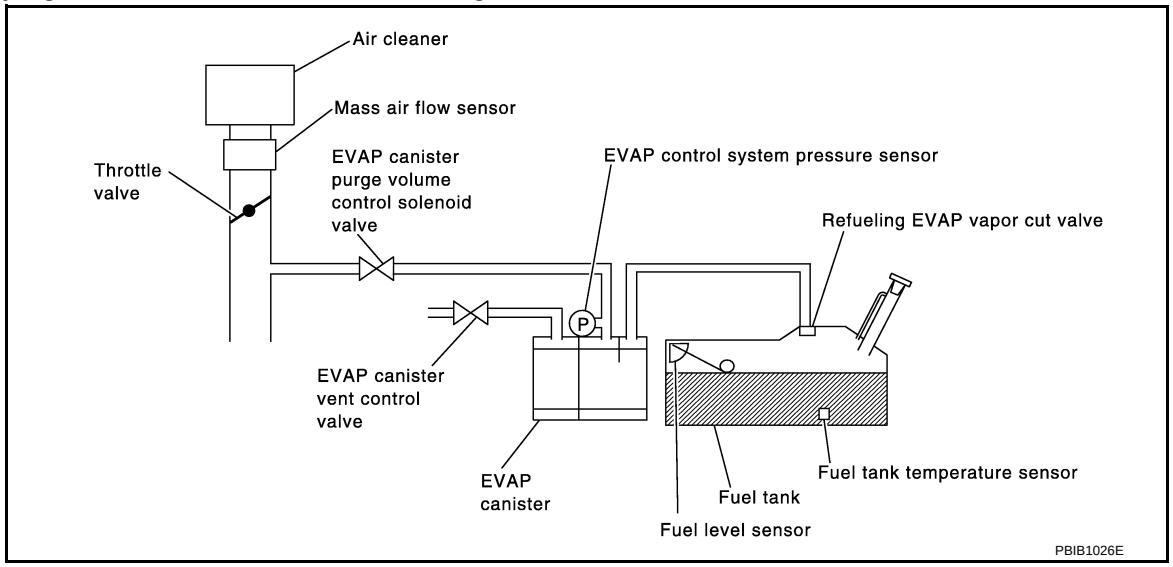
>> **INSPECTION END**

DTC P0456 EVAP CONTROL SYSTEM

On Board Diagnosis Logic

INFOID:0000000005354224

This diagnosis detects very small leaks in the EVAP line between fuel tank and EVAP canister purge volume control solenoid valve, using the intake manifold vacuum in the same way as conventional EVAP small leak diagnosis.
If ECM judges that a leak which corresponds to a very small leak, the very small leak P0456 will be detected.
If ECM judges that a leak equivalent to a small leak, EVAP small leak P0442 will be detected.
If ECM judges that there are no leaks, the diagnosis will be OK.



DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0456 0456	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 does not close. • Foreign matter caught in fuel filler cap. • Leakage 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 leakage • EVAP purge line (pipe and rubber tube) leakage • 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 leakage • 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

INFOID:0000000005354225

NOTE:
- **If DTC P0456 is displayed with P0442, first perform the trouble diagnosis for DTC P0456.**
- **After repair, check that the hoses and clips are installed properly.**
- 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:
- **Open engine hood before conducting the following procedure.**
- **If any of the following conditions are met just before the DTC confirmation procedure, leave the vehicle for more than 1 hour.**
  - **Fuel filler cap is removed.**
  - **Fuel is refilled or drained.**
  - **EVAP component part/parts is/are removed.**
- **Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.**

WITH CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Check that the following conditions are met.
   FUEL LEVEL SE: 0.25 - 1.4 V
   COOLAN TEMP/S: 0 - 32°C (32 - 90°F)
   FUEL T/TMP SE: 0 - 35°C (32 - 95°F)
   INT/A TEMP SE: More than 0°C (32°F)
   If NG, turn ignition switch OFF and leave the vehicle in a cool place (soak the vehicle), or refill/drain fuel until the output voltage of the “FUEL LEVEL SE” meets within the range above and leave the vehicle for more than 1 hour. Then start from step 1.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Select “EVAP V/S LEAK P0456/P1456” of “EVAPORATIVE SYSTEM” in “DTC WORK SUPPORT” mode with CONSULT-III.
   Follow the instructions displayed.
6. Check that “OK” is displayed.
   If “NG” is displayed, go to EC-1091, "Diagnosis Procedure".
   NOTE:
   - **If the engine speed cannot be maintained within the range displayed on CONSULT-III screen, go to EC-760, "Basic Inspection".**
   - **Check that EVAP hoses are connected to EVAP canister purge volume control solenoid valve properly.**

Overall Function Check

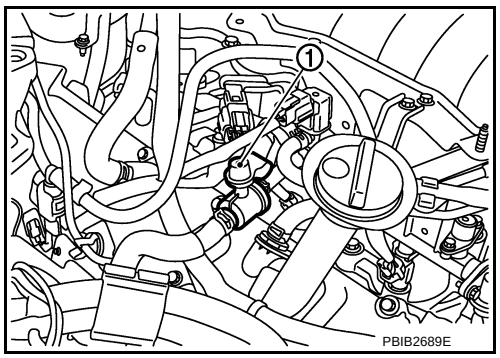
INFOID:0000000005354226

WITH GST

Use this procedure to check the overall function of the EVAP very small leak function. During this check, a 1st trip DTC might not be confirmed.

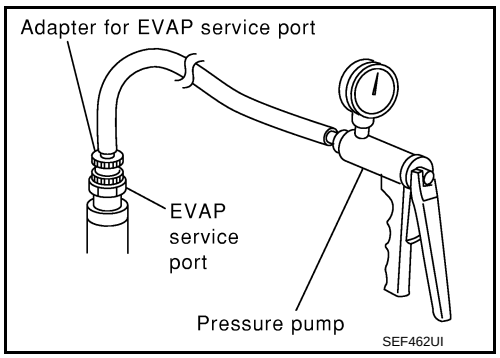
CAUTION:
- **Never use compressed air, doing so may damage the EVAP system.**
- **Never start engine.**
- **Never exceeded 4.12 kPa (0.042 kg/cm^2, 0.6 psi).**

1. Attach the EVAP service port adapter (commercial service tool) securely to the EVAP service port (1).



2. Set the pressure pump and a hose.
3. Also set a vacuum gauge via 3-way connector and a hose.
4. Turn ignition switch ON.
5. Connect GST and select Service $08.
6. Using Service $08 control the EVAP canister vent control valve (close).
7. Apply pressure and make sure the following conditions are satisfied.

   Pressure to be applied: 2.7 kPa (0.028 kg/cm^2, 0.39 psi)
   Time to be waited after the pressure drawn in to the EVAP system and the pressure to be dropped: 60 seconds and the pressure should not be dropped more than 0.4 kPa (0.004 kg/cm^2, 0.06 psi).
   If NG, go to EC-1091, "Diagnosis Procedure".
   If OK, go to next step.
8. Disconnect GST.
9. Start engine and warm it up to normal operating temperature.
10. Turn ignition switch OFF and wait at least 10 seconds.
11. Restart engine and let it idle for 90 seconds.
12. Keep engine speed at 2,000 rpm for 30 seconds.
13. Turn ignition switch OFF.
    NOTE:
    For more information, refer to GST instruction manual.



Diagnosis Procedure

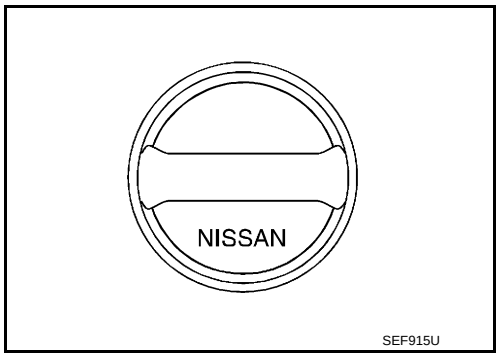
INFOID:0000000005354227

1. CHECK FUEL FILLER CAP DESIGN

1. Turn ignition switch OFF.
2. Check for genuine NISSAN fuel filler cap design.

OK or NG

OK >> GO TO 2.
NG >> Replace with genuine NISSAN fuel filler cap.



2. CHECK FUEL FILLER CAP INSTALLATION

Check that the cap is tightened properly by rotating the cap clockwise.

OK or NG

OK >> GO TO 3.
NG >> 1. Open fuel filler cap, then clean cap and fuel filler neck threads using air blower.
2. Retighten until ratcheting sound is heard.

3. CHECK FUEL FILLER CAP FUNCTION

Check for air releasing sound while opening the fuel filler cap.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. CHECK FUEL TANK VACUUM RELIEF VALVE

Refer to EC-722, "Component Inspection".

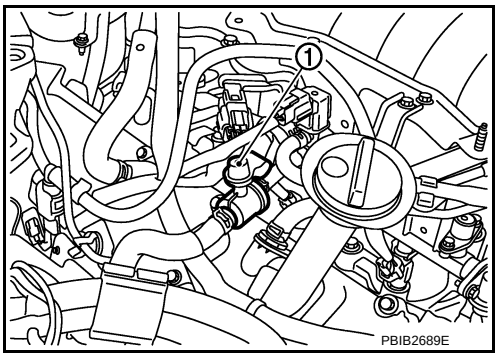
OK or NG

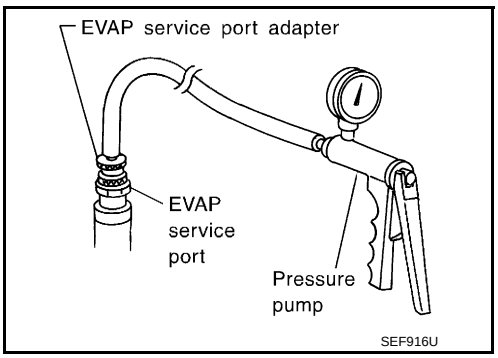
OK >> GO TO 5.
NG >> Replace fuel filler cap with a genuine one.

5. INSTALL THE PRESSURE PUMP

To locate the EVAP leakage, install EVAP service port adapter (commercial service tool) and pressure pump to EVAP service port (1) securely.

NOTE:
Improper installation of the EVAP service port adapter (commercial service tool) to the EVAP service port may cause leaking.





With CONSULT-III>>GO TO 6.
Without CONSULT-III>>GO TO 7.

6. CHECK FOR EVAP LEAK

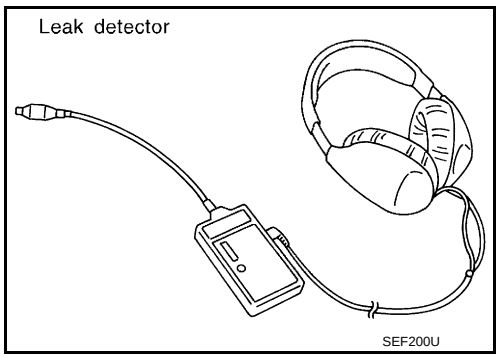
With CONSULT-III

1. Turn ignition switch ON.
2. Select “EVAP SYSTEM CLOSE” of “WORK SUPPORT” mode with CONSULT-III.
3. Touch “START” and apply pressure into the EVAP line until the pressure indicator reaches the middle of the bar graph.

CAUTION:

- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.
Refer to EC-720, "Description".



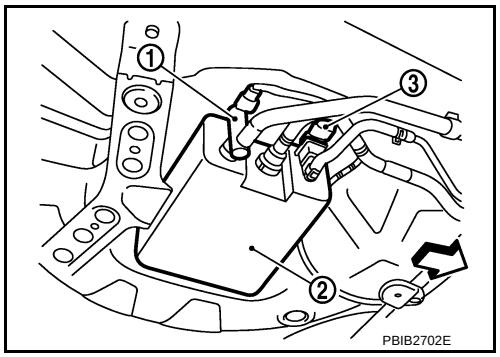
OK or NG

OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.

7. CHECK FOR EVAP LEAK

Without CONSULT-III

1. Turn ignition switch OFF.
2. Apply 12 V DC to EVAP canister vent control valve (1). The valve will close. (Continue to apply 12 V until the end of test.)
- Illustration shows the view from under the vehicle
- ⇦: Vehicle front
- EVAP canister (2)
- EVAP control system pressure sensor (3)

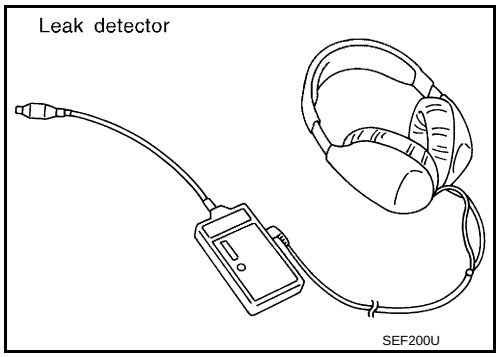


3. Pressurize the EVAP line using pressure pump with 1.38 to 2.76 kPa (0.014 to 0.028 kg/cm^2, 0.2 to 0.4 psi), then remove pump and EVAP service port adapter (commercial service tool).

CAUTION:

- **Never use compressed air or a high pressure pump.**
- **Never exceed 4.12 kPa (0.042 kg/cm^2, 0.6 psi) of pressure in the system.**

4. Using EVAP leak detector (commercial service tool), locate the EVAP leak. For the leak detector (commercial service tool), refer to the instruction manual for more details.
Refer to EC-720, "Description".



OK or NG

OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.

8. CHECK EVAP CANISTER VENT CONTROL VALVE

Check the following.

- EVAP canister vent control valve is installed properly.
Refer to EC-724, "Removal and Installation".
- EVAP canister vent control valve.
Refer to EC-1060, "Component Inspection".

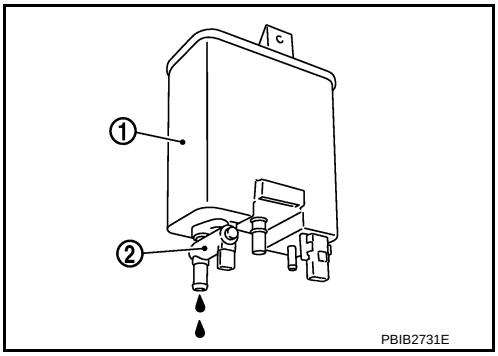
OK or NG

OK >> GO TO 9.
NG >> Repair or replace EVAP canister vent control valve and O-ring.

9. CHECK IF EVAP CANISTER IS SATURATED WITH WATER

1. Remove EVAP canister with EVAP canister vent control valve and EVAP control system pressure sensor attached.

2. Does water drain from the EVAP canister?
- EVAP canister (1)
- EVAP canister vent control valve (2)



Yes or No

Yes >> GO TO 10.
No (With CONSULT-III)>>GO TO 12.
No (Without CONSULT-III)>>GO TO 13.

10. CHECK EVAP CANISTER

Weigh the EVAP canister with the EVAP canister vent control valve and EVAP control system pressure sensor attached.

The weight should be less than 2.0 kg (4.4 lb).

OK or NG

OK (With CONSULT-III)>>GO TO 12.
OK (Without CONSULT-III)>>GO TO 13.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- EVAP canister for damage
- EVAP hose between EVAP canister and vehicle frame for clogging or poor connection

>> Repair hose or replace EVAP canister.

12. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

With CONSULT-III

1. Disconnect vacuum hose connected to EVAP canister purge volume control solenoid valve and EVAP service port from EVAP service port.
2. Start engine.
3. Perform “PURG VOL CONT/V” in “ACTIVE TEST” mode.
4. Touch “Qu” on CONSULT-III screen to increase “PURG VOL CONT/V” indication to 100%.
5. Check vacuum hose for vacuum when revving engine up to 2,000 rpm.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

13. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE OPERATION

Without CONSULT-III

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 and EVAP service port 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.

OK or NG

OK >> GO TO 15.
NG >> GO TO 14.

14. CHECK VACUUM HOSE

Check vacuum hoses for clogging or disconnection. Refer to EC-788, "Vacuum Hose Drawing".

OK or NG

OK >> GO TO 15.

NG >> Repair or reconnect the hose.

15. CHECK EVAP CANISTER PURGE VOLUME CONTROL SOLENOID VALVE

Refer to EC-1055, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> Replace EVAP canister purge volume control solenoid valve.

16. CHECK FUEL TANK TEMPERATURE SENSOR

Refer to EC-995, "Component Inspection".

OK or NG

OK >> GO TO 17.
NG >> Replace fuel level sensor unit.

17. CHECK EVAP CONTROL SYSTEM PRESSURE SENSOR

Refer to EC-1068, "Component Inspection".

OK or NG

OK >> GO TO 18.
NG >> Replace EVAP control system pressure sensor.

18. CHECK EVAP PURGE LINE

Check EVAP purge line (pipe, rubber tube, fuel tank and EVAP canister) for cracks or improper connection.
Refer to EC-720, "Description".

OK or NG

OK >> GO TO 19.
NG >> Repair or reconnect the hose.

19. CLEAN EVAP PURGE LINE

Clean EVAP purge line (pipe and rubber tube) using air blower.

>> GO TO 20.

20. 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-720, "Description".

OK or NG

OK >> GO TO 21.
NG >> Repair or replace hoses and tubes.

21. CHECK RECIRCULATION LINE

Check recirculation line between filler neck tube and fuel tank for clogging, kinks, cracks, looseness and improper connection.

OK or NG

OK >> GO TO 22.
NG >> Repair or replace hose, tube or filler neck tube.

22. CHECK REFUELING EVAP VAPOR CUT VALVE

Refer to EC-728, "Component Inspection".

OK or NG

OK >> GO TO 23.
NG >> Replace refueling EVAP vapor cut valve with fuel tank.

23. CHECK FUEL LEVEL SENSOR

Refer to DI-22, "Fuel Level Sensor Signal Inspection".

OK or NG

OK >> GO TO 24.
NG >> Replace fuel level sensor unit.

24. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

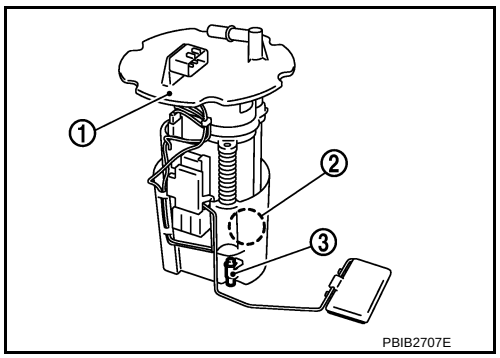
DTC P0460 FUEL LEVEL SENSOR

Component Description

INFOID:0000000005354228

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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (3)



On Board Diagnosis Logic

INFOID:0000000005354229

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-1120, "DTC Confirmation Procedure".**

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 0460	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

INFOID:0000000005354230

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

2. Start engine and wait maximum of 2 consecutive minutes.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-1097, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354231

1. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

OK >> GO TO 2.
NG >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

2. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Removal and Installation

INFOID:0000000005354232

FUEL LEVEL SENSOR
Refer to FL-4, "Component".

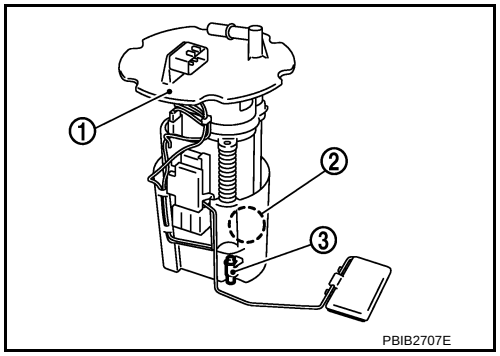
DTC P0461 FUEL LEVEL SENSOR

Component Description

INFOID:0000000005354233

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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (3)



On Board Diagnosis Logic

INFOID:0000000005354234

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-1120, "DTC Confirmation Procedure".**

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 0461	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

Overall Function Check

INFOID:0000000005354235

Use this procedure to check the overall function of the fuel level sensor. During this check, a 1st trip DTC might not be confirmed.

WARNING:
When performing the following procedure, always observe the handling of the fuel. Refer to FL-3, "General Precaution".
TESTING CONDITION:
Before starting overall function check, preparation of draining fuel and refilling fuel is required.

WITH CONSULT-III

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-766, "Fuel Pressure Check".
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch OFF and wait at least 10 seconds then turn ON.
6. Select “FUEL LEVEL SE” in “DATA MONITOR” mode with CONSULT-III.
7. Check “FUEL LEVEL SE” output voltage and note it.
8. Select “FUEL PUMP RELAY” in “ACTIVE TEST” mode with CONSULT-III.
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.
If NG, go to EC-1100, "Diagnosis Procedure".

WITH GST

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-766, "Fuel Pressure Check".
3. Remove the fuel feed hose on the fuel level sensor unit.
4. Connect a spare fuel hose where the fuel feed hose was removed.
5. Turn ignition switch ON.
6. Drain fuel by 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal) from the fuel tank using proper equipment.
7. Confirm that the fuel gauge indication varies.
8. Fill fuel into the fuel tank for 30 ℓ (7-7/8 US gal, 6-5/8 Imp gal).
9. Confirm that the fuel gauge indication varies.
10. If NG, go to EC-1100, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354236

1.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

OK >> GO TO 2.
NG >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

2.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Removal and Installation

INFOID:0000000005354237

FUEL LEVEL SENSOR

Refer to FL-4, "Component".

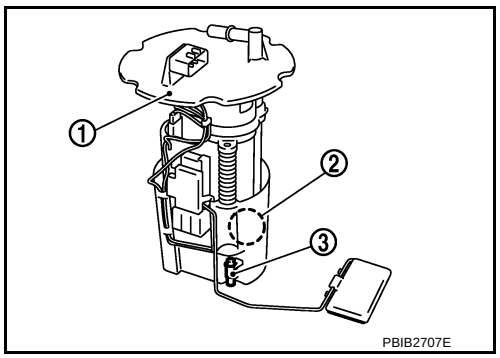
DTC P0462, P0463 FUEL LEVEL SENSOR CIRCUIT

Component Description

INFOID:0000000005354238

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.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (3)



On Board Diagnosis Logic

INFOID:0000000005354239

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-1120, "DTC Confirmation Procedure".**

This diagnosis detects open or short circuit malfunction.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0462 0462	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 0463	Fuel level sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:0000000005354240

NOTE:

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.

1. Turn ignition switch ON and wait at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1101, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354241

1. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

OK >> GO TO 2.
NG >> Go to DI-22, "Fuel Level Sensor Signal Inspection".

2. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Removal and Installation

INFOID:0000000005354242

FUEL LEVEL SENSOR

Refer to FL-4, "Component".

DTC P0500 VSS

Description

INFOID:0000000005354243

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-1120, "DTC Confirmation Procedure".**

The vehicle speed signal is sent to the “unified meter and A/C amp.” from the “ABS actuator and electric unit (control unit)” via the CAN communication line. The “unified meter and A/C amp.” then sends a signal to the ECM via the CAN communication line.

On Board Diagnosis Logic

INFOID:0000000005354244

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0500 0500	Vehicle speed sensor	The vehicle speed signal sent to ECM is almost 0 km/h (0 MPH) even when vehicle is being driven.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (The vehicle speed signal circuit is open or shorted) • Wheel sensor • Unified meter and A/C amp. • ABS actuator and electric unit (control unit)

DTC Confirmation Procedure

INFOID:0000000005354245

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
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:
Steps 1 and 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

WITH CONSULT-III

1. Start engine (VDC switch OFF).
2. Read “VHCL SPEED SE” in “DATA MONITOR” mode with CONSULT-III. The vehicle speed on CONSULT-III should exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
   If NG, go to EC-1104, "Diagnosis Procedure".
   If OK, go to following step.
3. Select “DATA MONITOR” mode with CONSULT-III.
4. Warm engine up to normal operating temperature.
5. Maintain the following conditions for at least 50 consecutive seconds.

ENG SPEED	More than 1,550 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	5.4 - 31.8 msec
Selector lever position	Except P or N
PW/ST SIGNAL	OFF

6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to EC-1104, "Diagnosis Procedure".

Overall Function Check

INFOID:0000000005354246

Use this procedure to check the overall function of the vehicle speed signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Lift up drive wheels.
2. Start engine.
3. Read vehicle speed signal in Service $01 with GST.
   The vehicle speed signal on GST should be able to exceed 10 km/h (6 MPH) when rotating wheels with suitable gear position.
4. If NG, go to EC-1104, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354247

1.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-30, "CONSULT-III Function (ABS)".

OK or NG

OK >> GO TO 2.
NG >> Repair or replace malfunctioning part.

2.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

>> **INSPECTION END**

DTC P0506 ISC SYSTEM

Description

INFOID:0000000005354248

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.
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.).

On Board Diagnosis Logic

INFOID:0000000005354249

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0506 0506	Idle speed control system RPM lower than expected	The idle speed is less than the target idle speed by 100 rpm or more.	• Electric throttle control actuator • Intake air leakage

DTC Confirmation Procedure

INFOID:0000000005354250

NOTE:
- **If idle speed is out of the specified value, perform EC-765, "Idle Air Volume Learning", before conducting DTC Confirmation Procedure. For idle speed, refer to the EC-1337, "Idle Speed and Ignition Timing".**
- 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.**
- **Always perform the test at a temperature above −10°C (14°F).**

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and run it for at least 1 minute at idle speed.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1105, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354251

1. CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 2.
NG >> Discover air leakage location and repair.

2. REPLACE ECM

1. Stop engine.
2. Replace ECM.

3. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
4. Perform EC-764, "VIN Registration".
5. Perform EC-764, "Accelerator Pedal Released Position Learning".
6. Perform EC-764, "Throttle Valve Closed Position Learning".
7. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

DTC P0507 ISC SYSTEM

Description

INFOID:0000000005354252

NOTE:
If DTC P0506 is displayed with other DTC, first perform the trouble diagnosis for the other DTC.
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.).

On Board Diagnosis Logic

INFOID:0000000005354253

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0507 0507	Idle speed control system RPM higher than expected	The idle speed is more than the target idle speed by 200 rpm or more.	• Electric throttle control actuator • Intake air leakage • PCV system

DTC Confirmation Procedure

INFOID:0000000005354254

NOTE:
- **If idle speed is out of the specified value, perform EC-765, "Idle Air Volume Learning", before conducting DTC Confirmation Procedure. For idle speed, refer to the EC-1337, "Idle Speed and Ignition Timing".**
- 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.**
- **Always perform the test at a temperature above −10°C (14°F).**

1. Open engine hood.
2. Start engine and warm it up to normal operating temperature.
3. Turn ignition switch OFF and wait at least 10 seconds.
4. Turn ignition switch ON.
5. Turn ignition switch OFF and wait at least 10 seconds.
6. Start engine and run it for at least 1 minute at idle speed.
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1107, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354255

1. CHECK PCV HOSE CONNECTION

Confirm that PCV hose is connected correctly.

OK or NG

OK >> GO TO 2.
NG >> Repair or replace malfunctioning part.

2. CHECK INTAKE AIR LEAKAGE

1. Start engine and let it idle.
2. Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 3.
NG >> Discover air leakage location and repair.

3. REPLACE ECM

1. Stop engine.
2. Replace ECM.
3. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
4. Perform EC-764, "VIN Registration".
5. Perform EC-764, "Accelerator Pedal Released Position Learning".
6. Perform EC-764, "Throttle Valve Closed Position Learning".
7. Perform EC-765, "Idle Air Volume Learning".

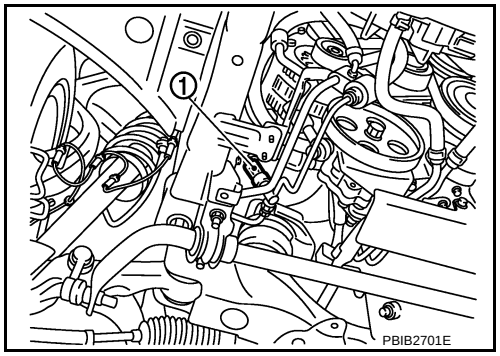
>> **INSPECTION END**

DTC P0550 PSP SENSOR

Component Description

INFOID:0000000005354256

Power steering pressure (PSP) sensor (1) 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.
• Illustration shows the view from under the vehicle.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354257

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
PW/ST SIGNAL	• Engine: After warming up, idle the engine	Steering wheel: Not being turned	OFF
		Steering wheel: Being turned	ON

On Board Diagnosis Logic

INFOID:0000000005354258

The MIL will not illuminate for this diagnosis.
NOTE:
If DTC P0550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0550 0550	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

INFOID:0000000005354259

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

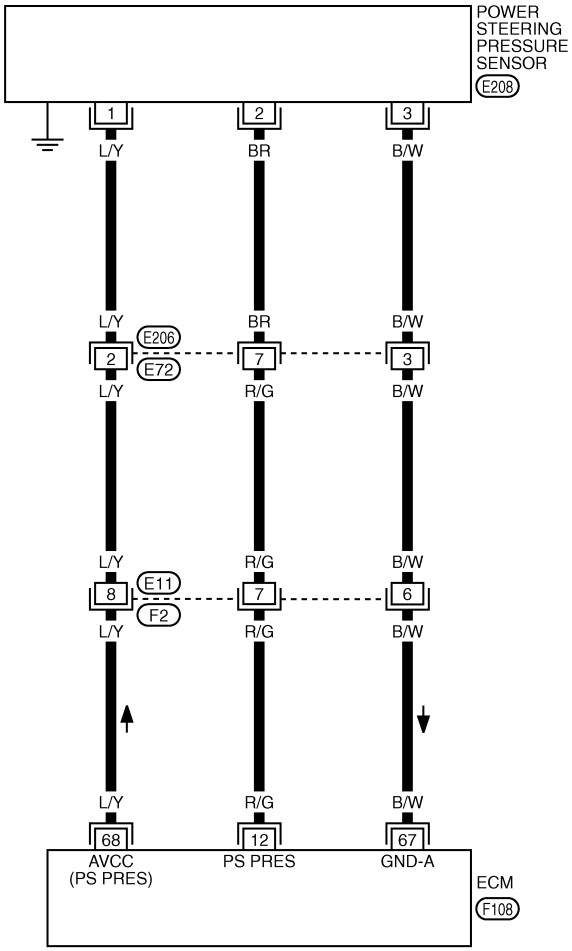
2. Start engine and let it idle for at least 5 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-1111, "Diagnosis Procedure".

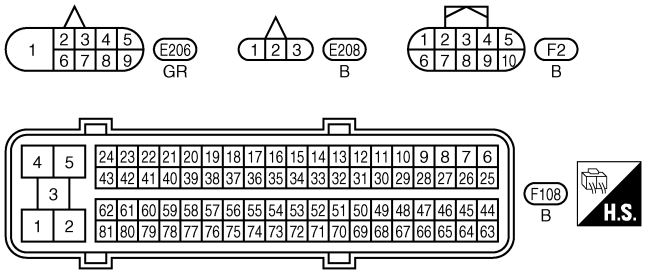
Wiring Diagram

INFOID:0000000005354260

EC-PS/SEN-01

: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC





TBWT1032E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

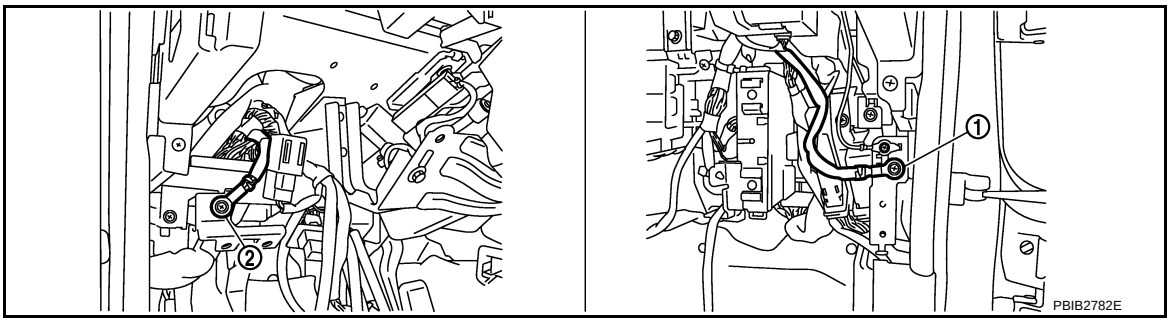
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
12	R/G	Power steering pressure sensor	**[Engine is running]** • Steering wheel: Being turned	0.5 - 4.5 V
			[Engine is running] • Steering wheel: Not being turned	0.4 - 0.8 V
67	B/W	Sensor ground (Power steering pressure sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
68	L/Y	Sensor power supply (Power steering pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V

Diagnosis Procedure

INFOID:0000000005354261

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



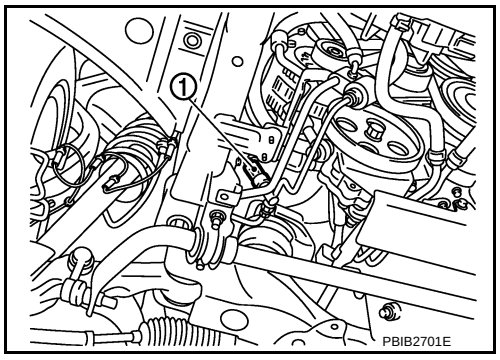
1. Body ground M70
2. Body ground M16

OK or NG

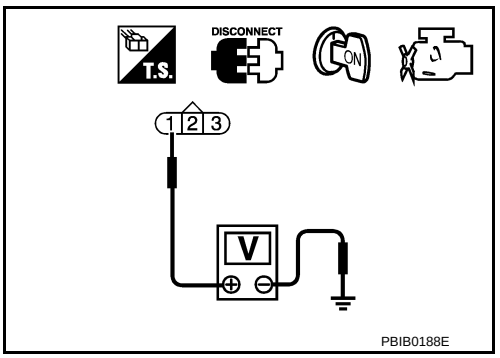
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK PSP SENSOR POWER SUPPLY CIRCUIT

1. Disconnect PSP sensor (1) harness connector.
- Illustration shows the view from under the vehicle.
2. Turn ignition switch ON.



3. Check voltage between PSP sensor terminal 1 and ground with CONSULT-III or tester.



Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E206, E72
- Harness connectors E11, F2
- Harness for open or short between power steering pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK PSP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between PSP sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E206, E72
- Harness connectors E11, F2
- Harness for open or short between power steering pressure sensor and ECM

>> Repair open circuit or short to ground short to power in harness or connectors.

6. CHECK PSP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 12 and PSP sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E206, E72
- Harness connectors E11, F2
- Harness for open or short between power steering pressure sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK PSP SENSOR

Refer to EC-1113, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace PSP sensor.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

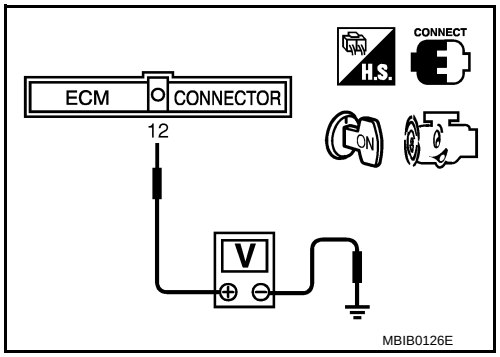
Component Inspection

INFOID:0000000005354262

POWER STEERING PRESSURE SENSOR

1. Reconnect all harness connectors disconnected.
2. Start engine and let it idle.
3. Check voltage between ECM terminal 12 and ground under the following conditions.

Condition	Voltage
Steering wheel: Being turned.	0.5 - 4.5 V
Steering wheel: Not being turned.	0.4 - 4.5 V



Removal and Installation

INFOID:0000000005354263

POWER STEERING PRESSURE SENSOR

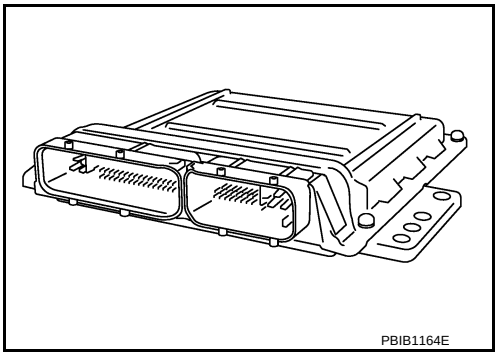
Refer to PS-36, "Removal and Installation".

DTC P0603 ECM POWER SUPPLY

Component Description

INFOID:0000000005354264

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.


PBIB1164E

On Board Diagnosis Logic

INFOID:0000000005354265

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0603 0603	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

INFOID:0000000005354266

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

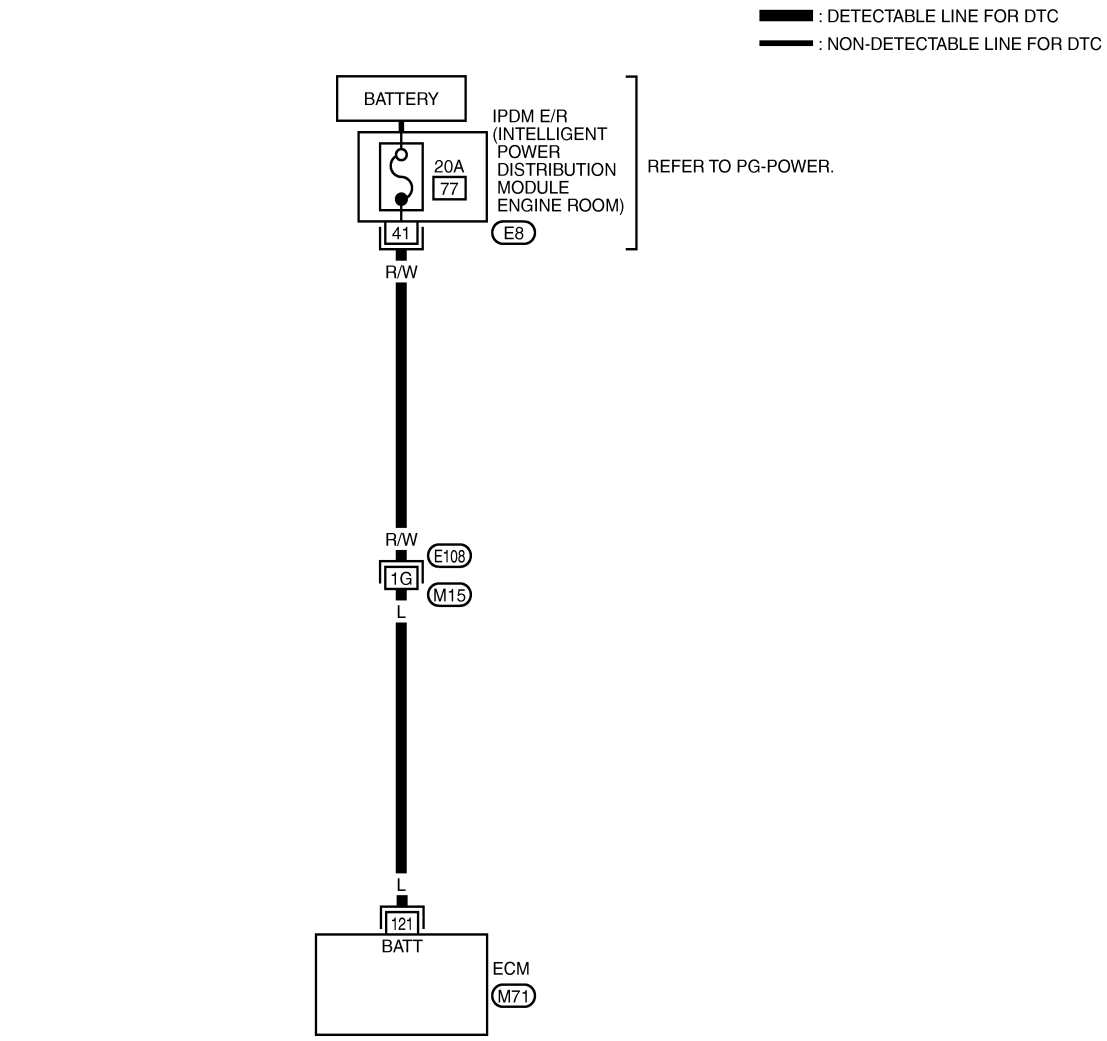
a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

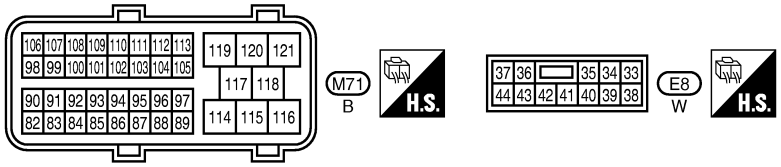
2. Turn ignition switch ON and wait at least 10 seconds.
3. Turn ignition switch OFF, wait at least 5 minutes.
4. Turn ignition switch ON and wait at least 10 seconds.
5. Repeat steps 2 and 3 for five times.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to EC-1116, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354267

EC-ECM/PW-01





REFER TO THE FOLLOWING.
E108 - SUPER MULTIPLE JUNCTION (SMJ)

TBWT1995E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
121	L	Power supply for ECM (Back up)	**[Ignition switch: OFF]**	BATTERY VOLTAGE (11 - 14 V)

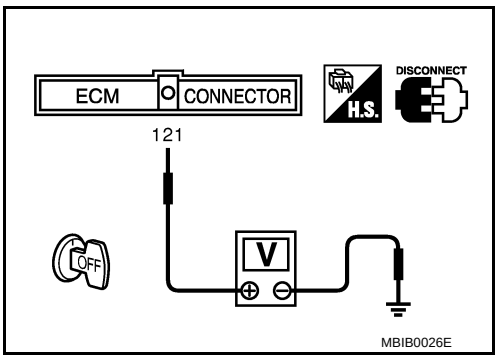
Diagnosis Procedure

INFOID:0000000005354268

1.CHECK ECM POWER SUPPLY

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check voltage between ECM terminal 121 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 3.
NG >> GO TO 2.

2.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- 20 A fuse
- IPDM E/R harness connector E8
- Harness for open or short between ECM and battery

>> Repair or replace harness or connectors.

3.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 4.
NG >> 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-1114, "DTC Confirmation Procedure".
4. Is the 1st trip DTC P0603 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5.REPLACE ECM

1. Replace ECM.
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
3. Perform EC-764, "VIN Registration".
4. Perform EC-764, "Accelerator Pedal Released Position Learning".
5. Perform EC-764, "Throttle Valve Closed Position Learning".
6. Perform EC-765, "Idle Air Volume Learning".

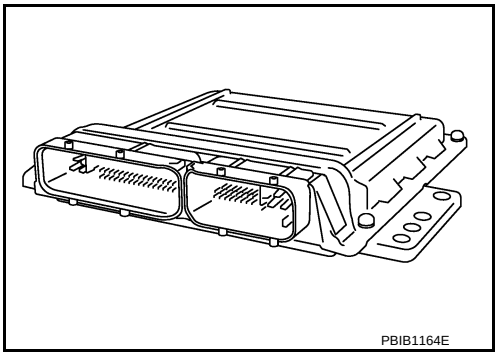
>> **INSPECTION END**

DTC P0605 ECM

Component Description

INFOID:0000000005354269

The ECM consists of a microcomputer and connectors for signal input and output and for power supply. The ECM controls the engine.


PBIB1164E

On Board Diagnosis Logic

INFOID:0000000005354270

This self-diagnosis has one or two trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P0605 0605	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.	

FAIL-SAFE MODE

ECM enters fail-safe mode when the malfunction A is detected.

Detected items	Engine operation condition in fail-safe mode
Malfunction A	• 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.

DTC Confirmation Procedure

INFOID:0000000005354271

Perform PROCEDURE FOR MALFUNCTION A first. If the 1st trip DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION B. If there is no malfunction on PROCEDURE FOR MALFUNCTION B, perform PROCEDURE FOR MALFUNCTION C.

NOTE:

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.

PROCEDURE FOR MALFUNCTION A

1. Turn ignition switch ON.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1119, "Diagnosis Procedure".

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.
4. If 1st trip DTC is detected, go to EC-1119, "Diagnosis Procedure".

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 3 for 32 times.
4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to EC-1119, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354272

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-1118, "DTC Confirmation Procedure".
4. Is the 1st trip DTC P0605 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2.REPLACE ECM

1. Replace ECM.
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
3. Perform EC-764, "VIN Registration".
4. Perform EC-764, "Accelerator Pedal Released Position Learning".
5. Perform EC-764, "Throttle Valve Closed Position Learning".
6. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

DTC P0607 ECM

Description

INFOID:0000000005354273

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.

On Board Diagnosis Logic

INFOID:0000000005354274

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0607 0607	CAN communication bus	When detecting error during the initial diagnosis of CAN controller of ECM.	• ECM

DTC Confirmation Procedure

INFOID:0000000005354275

1. Turn ignition switch ON.
2. Check DTC.
3. If DTC is detected, go to EC-1120, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354276

1.INSPECTION START

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-1120, "DTC Confirmation Procedure".
4. Check DTC.
5. Is DTC P0607 displayed again?

Yes or No

Yes >> GO TO 2.
No >> **INSPECTION END**

2.REPLACE ECM

1. Replace ECM.
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs. Refer to BL-224, "ECM Re-Communicating Function".
3. Perform EC-764, "VIN Registration".
4. Perform EC-764, "Accelerator Pedal Released Position Learning".
5. Perform EC-764, "Throttle Valve Closed Position Learning".
6. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

DTC P0643 SENSOR POWER SUPPLY

On Board Diagnosis Logic

INFOID:0000000005354277

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0643 0643	Sensor power supply circuit short	ECM detects the voltage of power source for sensor is excessively low or high.	• Harness or connectors (APP sensor 1 circuit is shorted.) (EVAP control system pressure sensor is shorted.) (Refrigerant pressure sensor circuit is shorted.) (PSP sensor circuit is shorted.) (Battery current sensor circuit is shorted.) • Accelerator pedal position sensor • EVAP control system pressure sensor • Refrigerant pressure sensor • Power steering pressure sensor • Battery current sensor

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operation condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:0000000005354278

NOTE:
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.

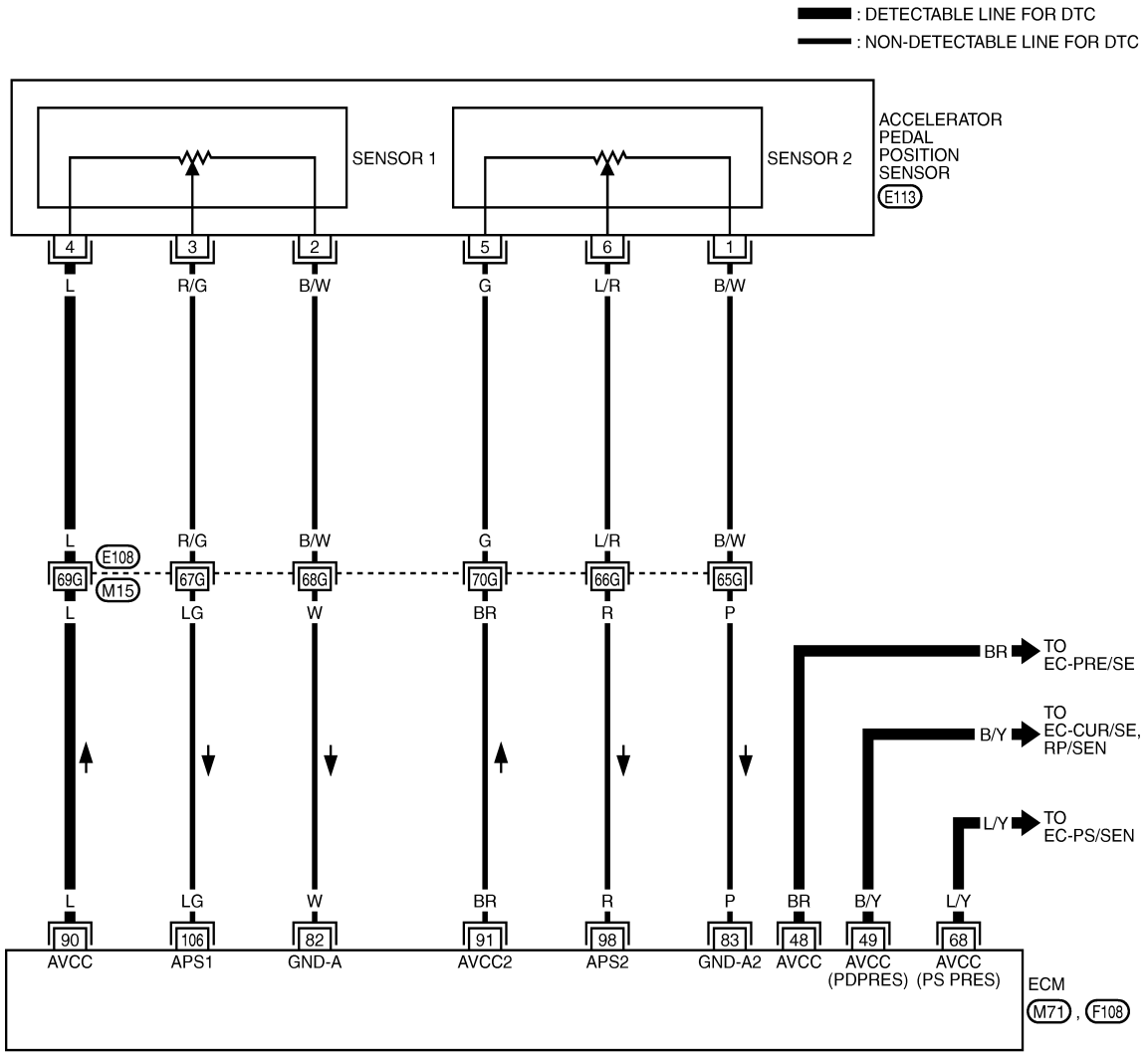
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10 V at idle.

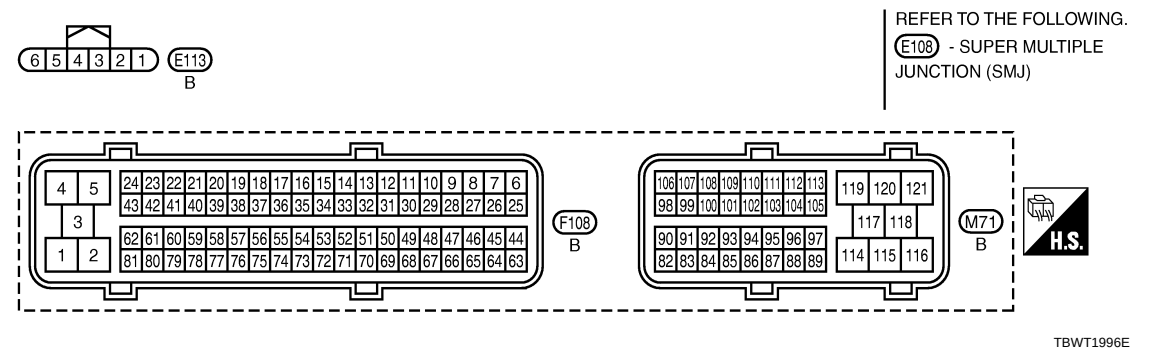
1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to EC-1123, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354279

EC-SEN/PW-01





Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

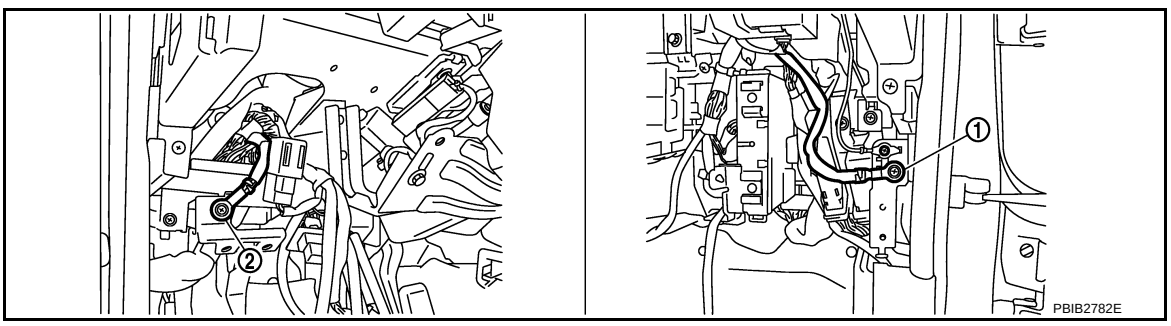
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
48	BR	Sensor power supply (EVAP control system pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V
49	B/Y	Sensor power supply (Refrigerant pressure sensor, Battery current sensor)	**[Ignition switch: ON]**	Approximately 5 V
68	L/Y	Sensor power supply (Power steering pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V
82	W	Sensor ground (APP sensor 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
83	P	Sensor ground (APP sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
90	L	Sensor power supply (APP sensor 1)	**[Ignition switch: ON]**	Approximately 5 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V
98	R	Accelerator pedal position sensor 2	**[Ignition switch: ON]** • Engine stopped • Accelerator pedal: Fully released	0.20 - 0.55 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	1.85 - 2.40 V
106	LG	Accelerator pedal position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.4 - 1.1 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	3.7 - 4.8 V

Diagnosis Procedure

INFOID:0000000005354280

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

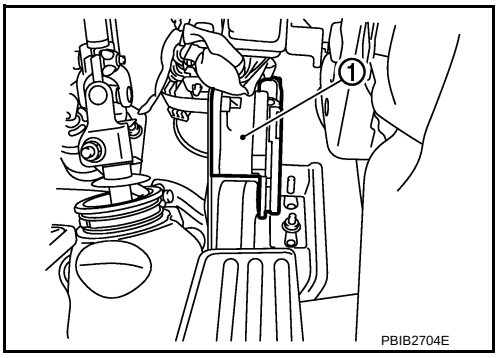
OK or NG

OK >> GO TO 2.

NG >> Repair or replace ground connections.

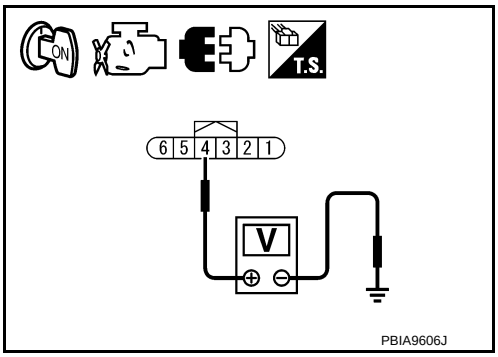
2.CHECK ACCELERATOR PEDAL POSITION SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 5.
NG >> GO TO 3.

3.CHECK SENSOR POWER SUPPLY CIRCUITS

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
90	APP sensor terminal 4	EC-1122, "Wiring Diagram"
48	EVAP control system pressure sensor terminal 3	EC-1072, "Wiring Diagram"
49	Refrigerant pressure sensor terminal 1	EC-1319, "Wiring Diagram"
	Battery current sensor terminal 1	EC-1166, "Wiring Diagram"
68	PSP sensor terminal 1	EC-1110, "Wiring Diagram"

OK or NG

OK >> GO TO 4.
NG >> Repair short to ground or short to power in harness or connectors.

4.CHECK COMPONENTS

Check the following.
- EVAP control system pressure sensor (Refer to EC-1075, "Component Inspection".)
- Refrigerant pressure sensor (Refer to EC-1320, "Diagnosis Procedure".)
- Battery current sensor (Refer to EC-1169, "Component Inspection".)
- Power steering pressure sensor (Refer to EC-1113, "Component Inspection".)

OK or NG

OK >> GO TO 7.
NG >> Replace malfunctioning component.

5.CHECK APP SENSOR

Refer to EC-1252, "Component Inspection".

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

DTC P0850 PNP SWITCH

Component Description

INFOID:0000000005354281

When the selector lever position is P or N, park/neutral position (PNP) signal is sent to ECM from TCM via the “unified meter and A/C amp”.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354282

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
P/N POSI SW	• Ignition switch: ON	Selector lever position: P or N	ON
		Selector lever position: Except above	OFF

On Board Diagnosis Logic

INFOID:0000000005354283

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P0850 0850	Park/neutral position switch	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.] • Park/neutral position (PNP) signal • Unified meter and A/C amp • TCM

DTC Confirmation Procedure

INFOID:0000000005354284

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
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-III

1. Turn ignition switch ON.
2. Select “P/N POSI SW” in “DATA MONITOR” mode with CONSULT-III. Then check the “P/N POSI SW” indication under the following conditions.

Selector lever position	Known-good signal
N or P position	ON
Except above position	OFF

If NG, go to EC-1129, "Diagnosis Procedure".
If OK, go to the following step.

3. Start engine and warm it up to normal operating temperature.
4. Maintain the following conditions for at least 50 consecutive seconds.

ENG SPEED	1,300 - 6,375 rpm
COOLAN TEMP/S	More than 70°C (158°F)
B/FUEL SCHDL	3.0 - 31.8 msec
VHCL SPEED SE	More than 64 km/h (40 MPH)
Selector lever position	Suitable position

5. Check 1st trip DTC.

6. If 1st trip DTC is detected, go to EC-1129, "Diagnosis Procedure".

Overall Function Check

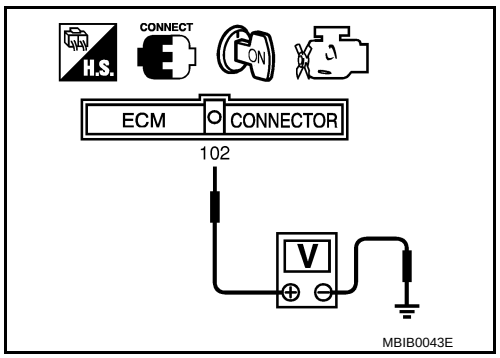
INFOID:0000000005354285

Use this procedure to check the overall function of the park/neutral position (PNP) signal circuit. During this check, a 1st trip DTC might not be confirmed.

WITH GST

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 102 (PNP switch signal) and ground under the following conditions.

Selector lever position	Voltage (Known-good data)
P or N position	Approx. 0 V
Except above position	BATTERY VOLTAGE (11 - 14 V)

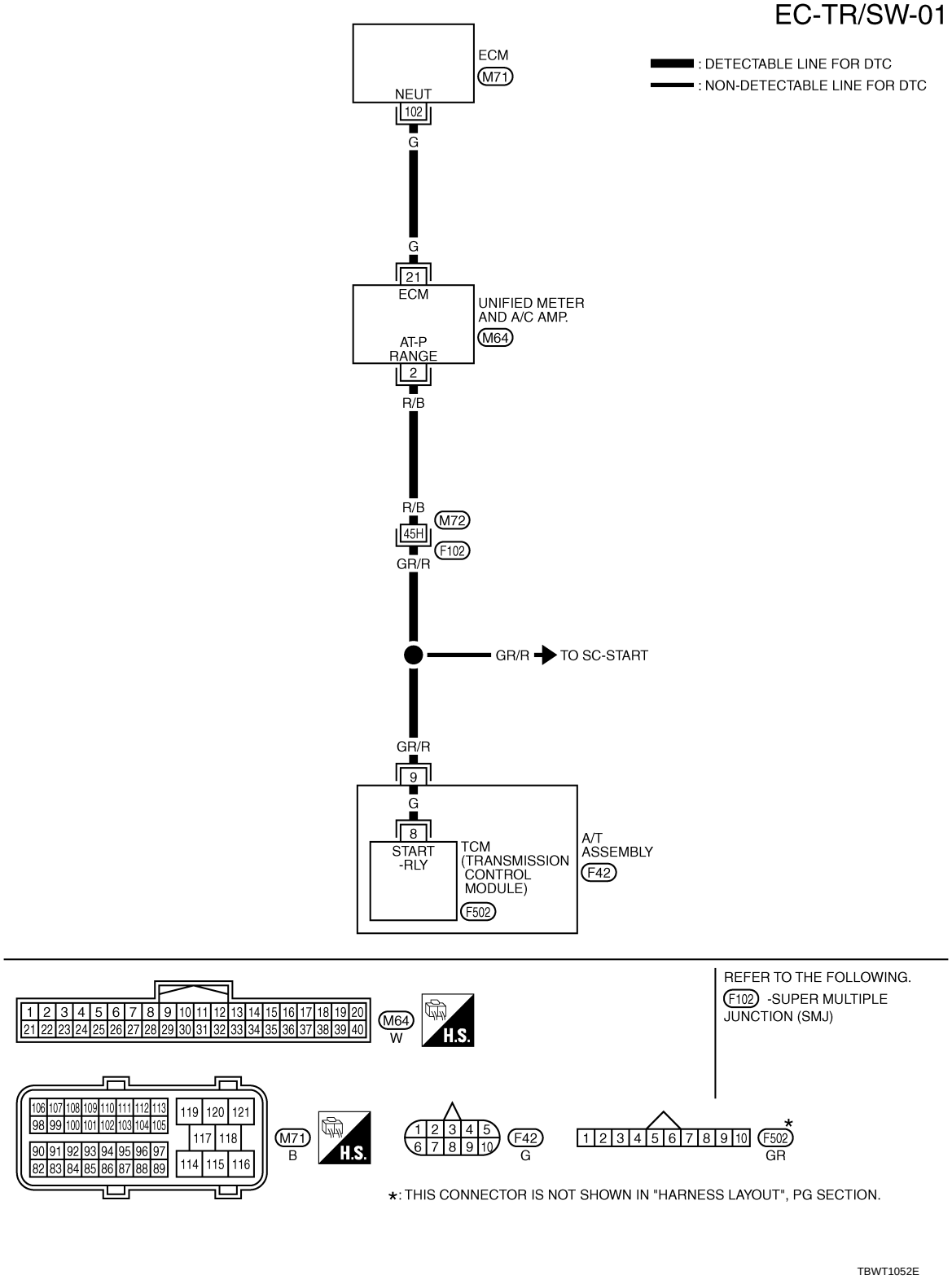


3. If NG, go to EC-1129, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354286

EC-TR/SW-01



TBWT1052E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
102	G	Transmission range switch	**[Ignition switch: ON]** • Selector lever position: P or N	Approximately 0 V
			[Ignition switch: ON] • Selector lever position: Except above	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354287

1.CHECK DTC WITH TCM

Refer to AT-47, "OBD-II Diagnostic Trouble Code (DTC)".

OK or NG

OK >> GO TO 2.
NG >> Repair or replace malfunctioning part.

2.CHECK STARTING SYSTEM

Turn ignition switch OFF, then turn it to START.
Does starter motor operate?

Yes or No

Yes >> GO TO 3.
No >> Refer to SC-10, "Trouble Diagnosis with Starting/Charging System Tester (Starting)".

3.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Disconnect A/T assembly harness connector.
3. Disconnect “unified meter and A/C amp.” harness connector.
4. Check harness continuity between A/T assembly terminal 9 and “unified meter and A/C amp.” terminal 2. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M72, F102
- Harness for open or short between A/T assembly and “unified meter and A/C amp.”

>> Repair open circuit or short to ground or short to power in harness or connectors.

5.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 102 and “unified meter and A/C amp.” terminal 21. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6.CHECK PNP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT-III

1. Check harness continuity between A/T assembly terminal 9 and TCM terminal 8.
Refer to AT-107, "Diagnosis Procedure".

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 8.
NG >> Repair or replace malfunctioning part.

8. REPLACE “UNIFIED METER AND A/C AMP.”

Refer to DI-34, "Removal and Installation of Unified Meter and A/C Amp".

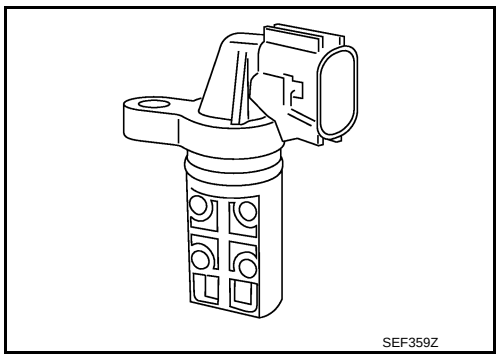
>> **INSPECTION END**

DTC P1140, P1145 IVT CONTROL POSITION SENSOR

Component Description

INFOID:0000000005354288

Intake valve timing control position sensors are located in the front of cylinder heads in both bank 1 and bank 2.
This sensor uses a Hall IC.
The cam position is determined by the intake primary cam sprocket concave (in four places). The ECM provides feedback to the intake valve timing control for appropriate target valve open-close timing according to drive conditions based on detected cam position.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354289

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
INT/V TIM (B1) INT/V TIM (B2)	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	–5 - 5°CA
		2,000 rpm	Approx. 0 - 20°CA

On Board Diagnosis Logic

INFOID:0000000005354290

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1140 1140 (Bank 1)	Intake valve timing control position sensor circuit	An excessively high or low voltage from the sensor is sent to ECM.	• Harness or connectors (Intake valve timing control position sensor circuit is open or shorted) • Intake valve timing control position sensor • Crankshaft position sensor (POS) • Camshaft position sensor (PHASE) • Accumulation of debris to the signal pick-up portion of the camshaft sprocket
P1145 1145 (Bank 2)			

DTC Confirmation Procedure

INFOID:0000000005354291

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

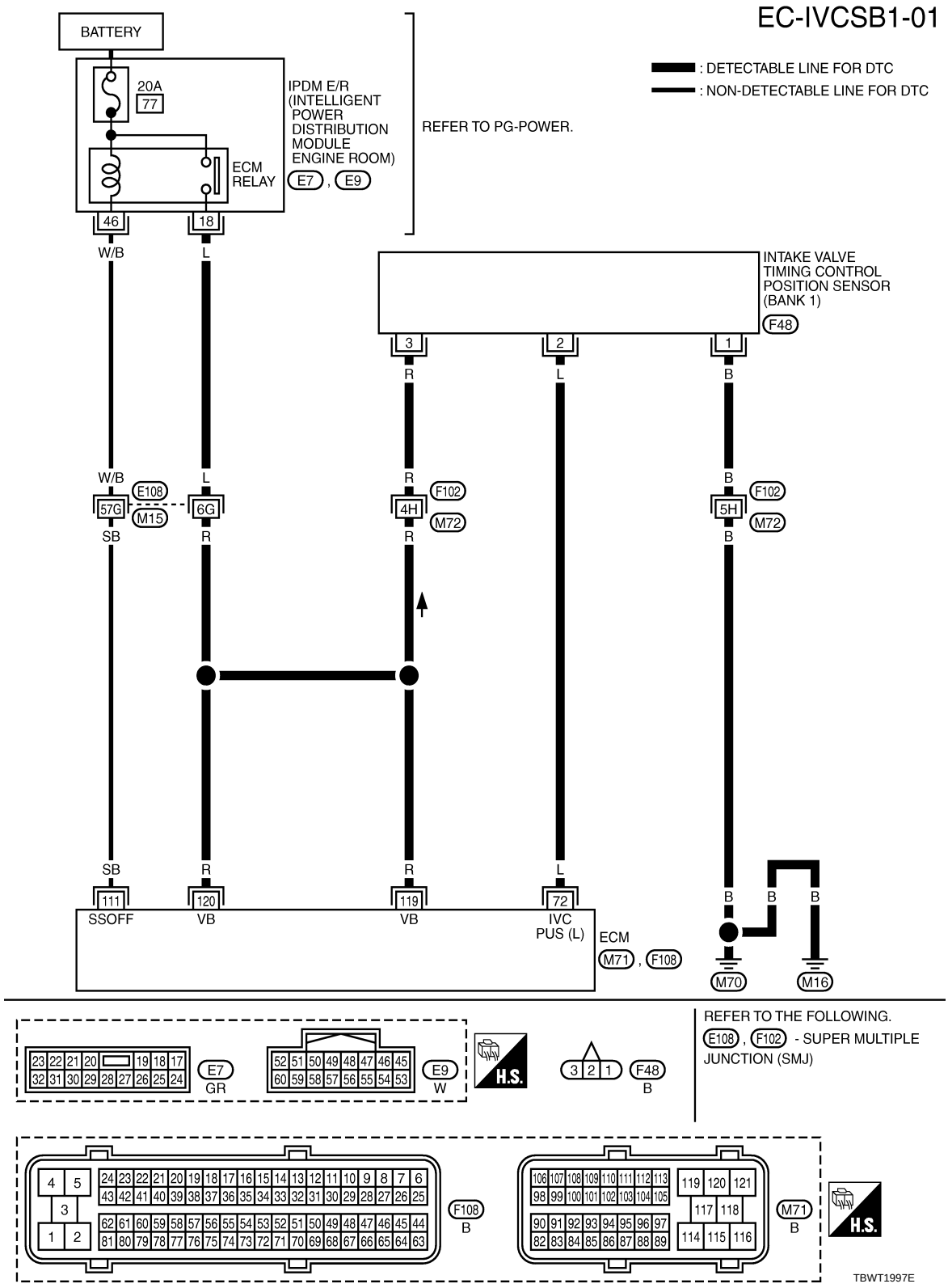
a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

2. Start engine and let it idle for 10 seconds.
3. Check 1st trip DTC.
4. If 1st trip DTC is detected, go to EC-1135, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354292

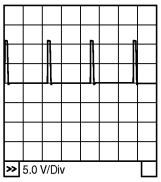
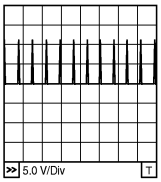
BANK 1



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

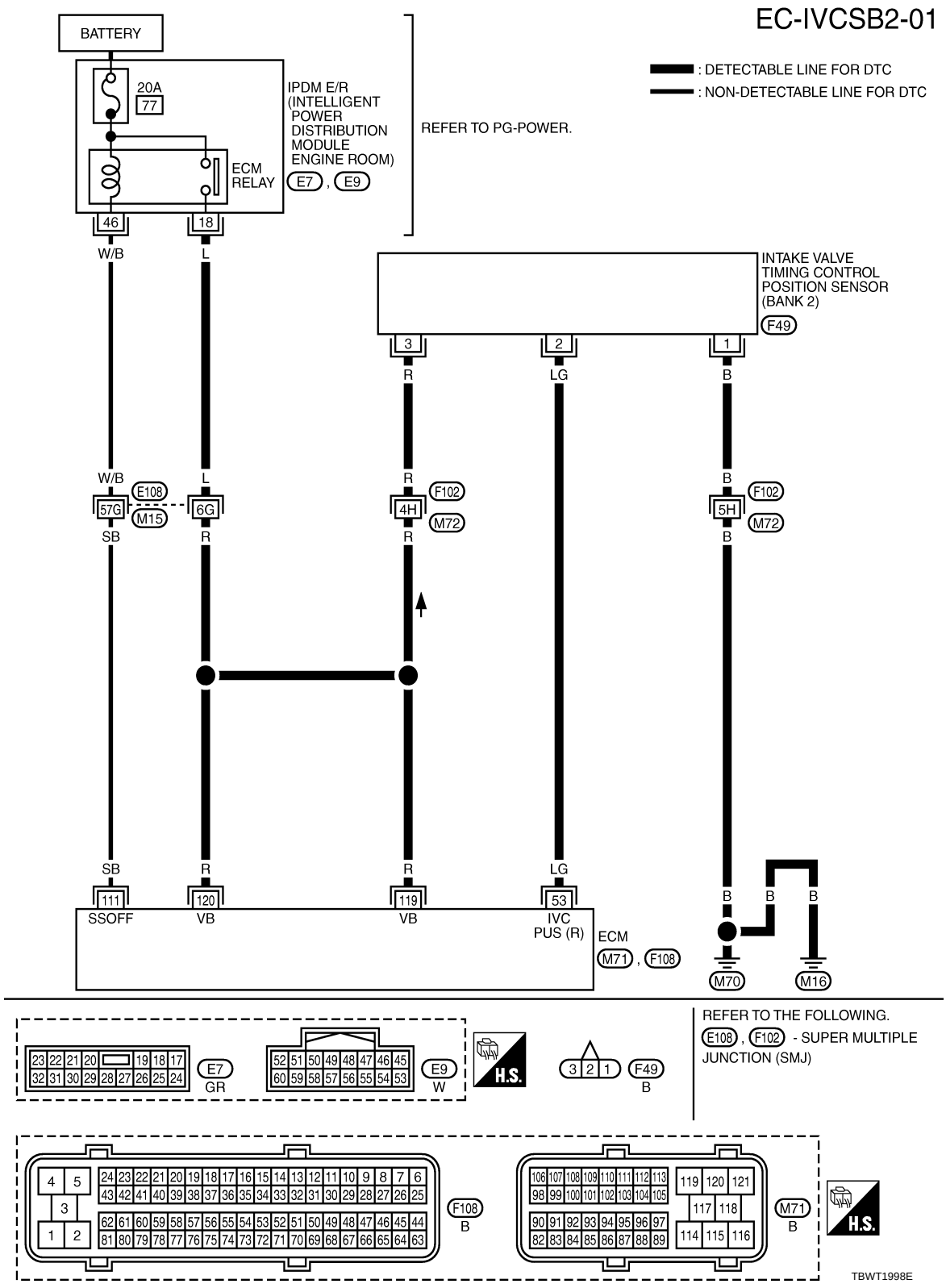
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
72	L	Intake valve timing control position sensor (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 1.0 V★  PBIB2734E
			[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0 V★  PBIB2735E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

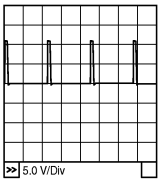
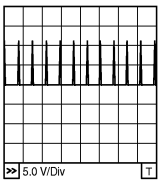
BANK 2



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Do not use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
53	LG	Intake valve timing control position sensor (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	0 - 1.0V★  PBIB2734E
			[Engine is running] • Engine speed: 2,000 rpm	0 - 1.0V★  PBIB2735E
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For a few seconds after turning ignition switch OFF	0 - 1.5V
			[Ignition switch: OFF] • More than a few seconds after turning ignition switch OFF	BATTERY VOLTAGE (11 - 14V)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14V)

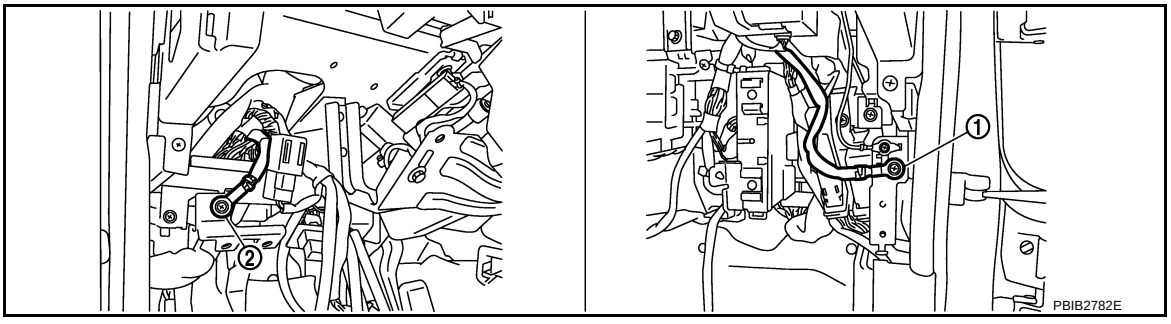
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354293

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



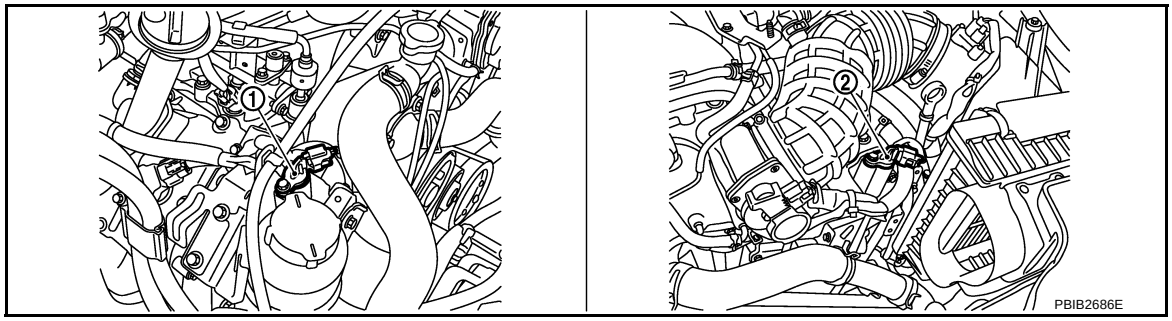
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR POWER SUPPLY CIRCUIT

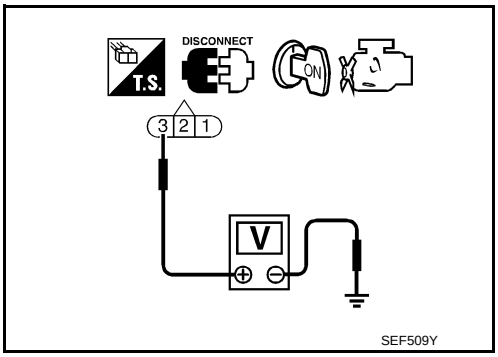
1. Disconnect intake valve timing control position sensor harness connector.



1. Intake valve timing control position sensor (bank 2)
2. Intake valve timing control position sensor (bank 1)

2. Turn ignition switch ON.
3. Check voltage between intake valve timing control position sensor terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness connectors F102, M72
- Harness for open or short between intake valve timing control position sensor and IPDM E/R
- Harness for open or short between intake valve timing control position sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between intake valve timing control position sensor terminal 1 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors F102, M72
- Harness for open or short between intake valve timing control position sensor and ground

>> Repair open circuit or short to power in harness or connectors.

6. CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.

2. Check harness continuity between the following;
ECM terminal 72 and intake valve timing control position sensor (bank 1) terminal 2 or
ECM terminal 53 and intake valve timing control position sensor (bank 2) terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7.CHECK INTAKE VALVE TIMING CONTROL POSITION SENSOR

Refer to EC-1137, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace intake valve timing control position sensor.

8.CHECK CRANKSHAFT POSITION SENSOR (POS)

Refer to EC-1018, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace crankshaft position sensor (POS).

9.CHECK CAMSHAFT POSITION SENSOR (PHASE)

Refer to EC-1024, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> Replace camshaft position sensor (PHASE).

10.CHECK CAMSHAFT SPROCKET

Check accumulation of debris to the signal pick-up portion of the camshaft sprocket.
Refer to EM-211, "Component".

OK or NG

OK >> GO TO 11.
NG >> Remove debris and clean the signal pick-up cutout of camshaft sprocket.

11.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

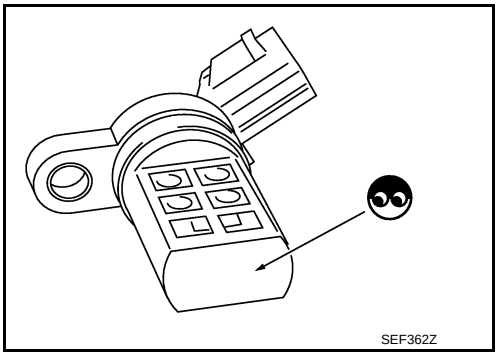
Component Inspection

INFOID:0000000005354294

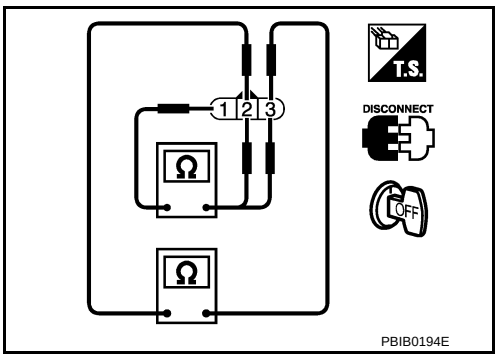
INTAKE VALVE TIMING CONTROL POSITION SENSOR

1. Disconnect intake valve timing control position sensor harness connector.
2. Loosen the fixing bolt of the sensor.
3. Remove the sensor.

4. Visually check the sensor for chipping.



5. Check resistance as shown below.



Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
3 (+) - 1 (-)	Except 0 or ∞ Ω
2 (+) - 1 (-)	
3 (+) - 2 (-)	

6. If NG, replace intake valve timing control position sensor.

Removal and Installation

INFOID:0000000005354295

INTAKE VALVE TIMING CONTROL POSITION SENSOR
Refer to EM-199, "Component".

DTC P1148, P1168 CLOSED LOOP CONTROL

On Board Diagnosis Logic

INFOID:0000000005354296

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1148 1148 (Bank 1)	Closed loop control function	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 1168 (Bank 2)		The closed loop control function for bank 2 does not operate even when vehicle is being driven in the specified condition.	

NOTE:
DTC P1148 or P1168 is displayed with another DTC for A/F sensor 1.
Perform the trouble diagnosis for the corresponding DTC.

DTC P1211 TCS CONTROL UNIT

Description

INFOID:0000000005354297

The malfunction information related to TCS is transferred via the CAN communication line from “ABS actuator and electric unit (control unit)” to ECM.
Always 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.

On Board Diagnosis Logic

INFOID:0000000005354298

Freeze frame data is not stored in the ECM for this self-diagnosis.
The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1211 1211	TCS control unit	ECM receives a malfunction information from “ABS actuator electric unit (control unit)”	• ABS actuator and electric unit (control unit) • TCS related parts

DTC Confirmation Procedure

INFOID:0000000005354299

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

1. Start engine and let it idle for at least 60 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1140, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354300

Go to BRC-30, "CONSULT-III Function (ABS)".

DTC P1212 TCS COMMUNICATION LINE

Description

INFOID:0000000005354301

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-1120, "DTC Confirmation Procedure".**

The 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)”.

Always 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.

On Board Diagnosis Logic

INFOID:0000000005354302

Freeze frame data is not stored in the ECM for this self-diagnosis.
The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1212 1212	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

INFOID:0000000005354303

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 10.5 V at idle.

1. Start engine and let it idle for at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1141, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354304

Go to BRC-30, "CONSULT-III Function (ABS)".

DTC P1217 ENGINE OVER TEMPERATURE

Description

INFOID:0000000005354305

SYSTEM DESCRIPTION

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-1120, "DTC Confirmation Procedure".**

Cooling Fan Control

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*1	Cooling fan control	• IPDM E/R • Cooling fan relay • Cooling fan control module
Battery	Battery voltage*1		
Engine coolant temperature sensor	Engine coolant temperature		
Air conditioner switch	Air conditioner ON signal*2		
Refrigerant pressure sensor	Refrigerant pressure		
Unified meter and A/C amp.	Target A/C evaporator temperature*2		
	Vehicle speed*2		
	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.

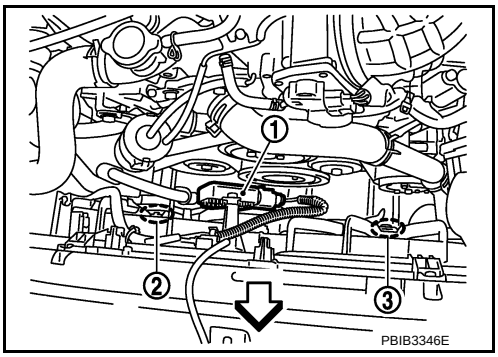
ECM controls cooling fan speed corresponding to vehicle speed, engine coolant temperature, air conditioner ON signal, refrigerant pressure, target A/C evaporator temperature and A/C evaporator temperature.
Cooling fan control signal is sent to IPDM E/R from ECM via the CAN communication line. Then, IPDM 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 DESCRIPTION

Cooling Fan Control Module

Cooling fan control module (1) 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.

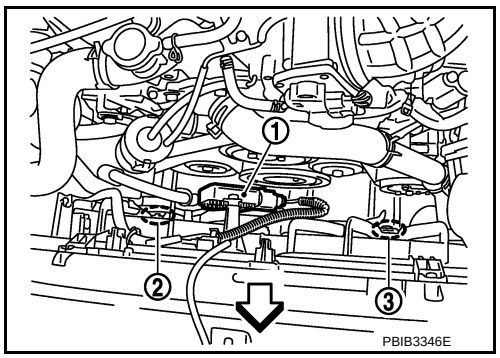
- ⇦: Vehicle front
- Cooling fan motor-2 (2)
- Cooling fan motor-1 (3)



Cooling Fan Motor

Cooling fan motor receives cooling fan motor operating voltage from cooling fan control module (1). The revolution speed of cooling fan motor is controlled by duty cycle of the voltage.

- ⇦: Vehicle front
- Cooling fan motor-2 (2)
- Cooling fan motor-1 (3)



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354306

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FAN DUTY	• Engine: Running	0 - 100%

On Board Diagnosis Logic

INFOID:0000000005354307

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.
This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1217 1217	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 • Water control valve For more information, refer to EC-1150, "Main 13 Causes of Overheating".

CAUTION:
When a malfunction is indicated, always replace the coolant. Refer to CO-36, "Changing Engine Coolant". Also, replace the engine oil. Refer to LU-25, "Changing Engine Oil".

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-10, "Anti-Freeze Coolant Mixture Ratio".**
2. **After refilling coolant, run engine to check that no water-flow noise is emitted.**

Overall Function Check

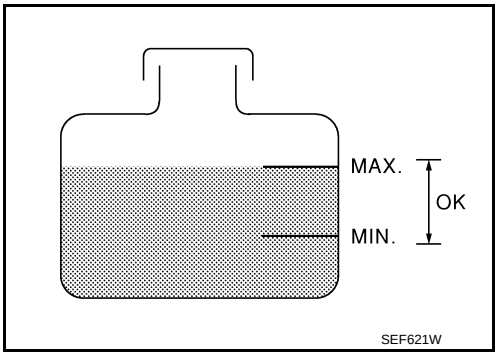
INFOID:0000000005354308

Use this procedure to check the overall function of the cooling fan. During this check, a DTC might not be confirmed.

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.

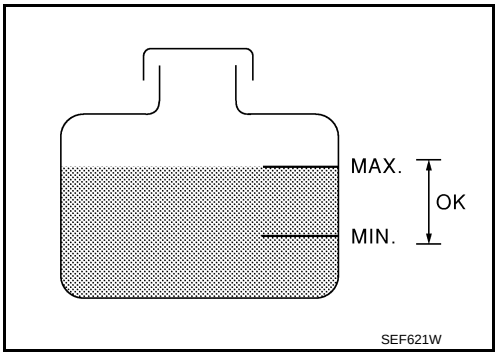
WITH CONSULT-III

1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1146, "Diagnosis Procedure".
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1146, "Diagnosis Procedure".
3. Turn ignition switch ON.
4. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT-III.
5. Check that cooling fan speed varies according to the percent.
6. If the results are NG, go to EC-1146, "Diagnosis Procedure".



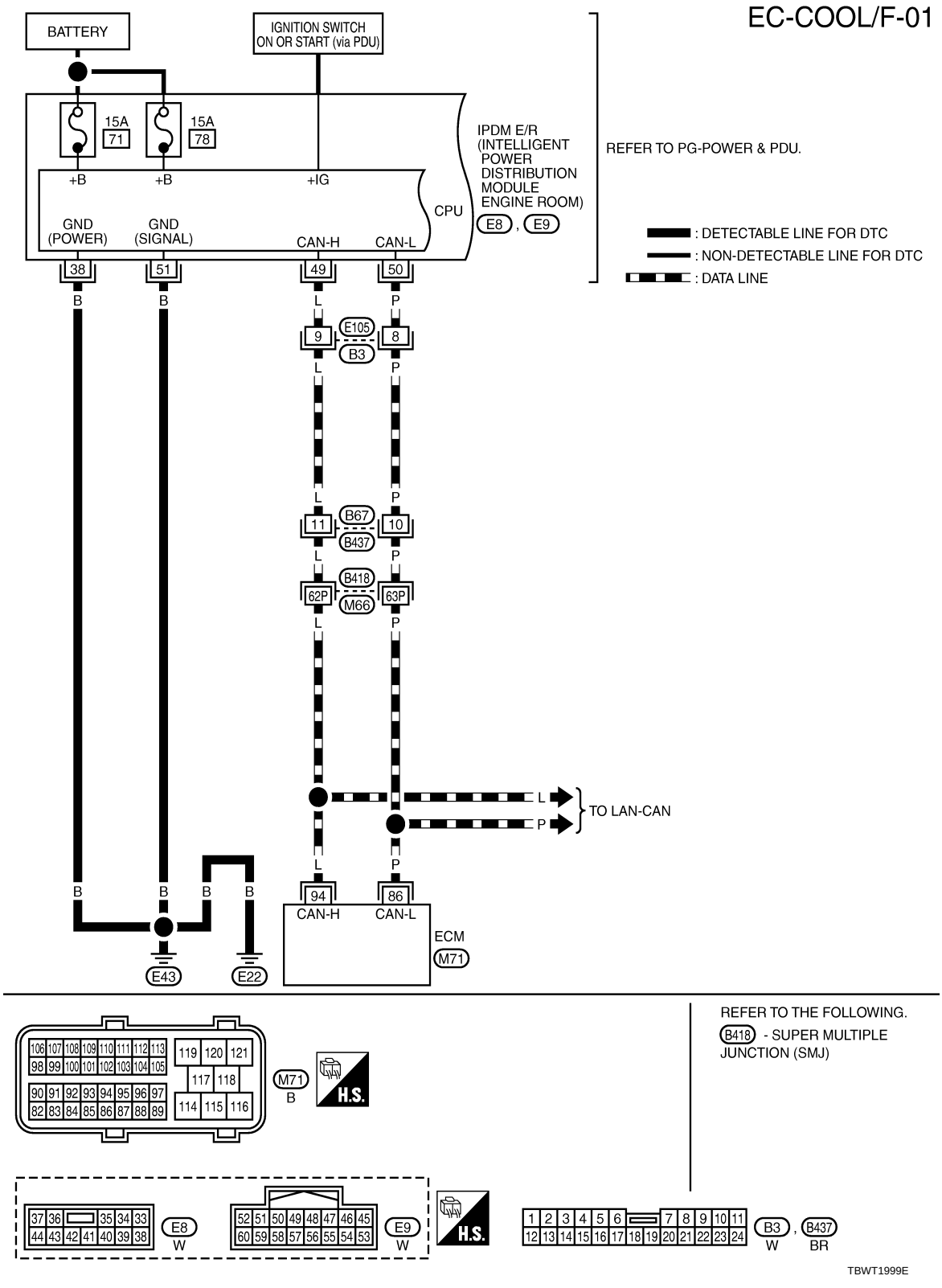
WITH GST

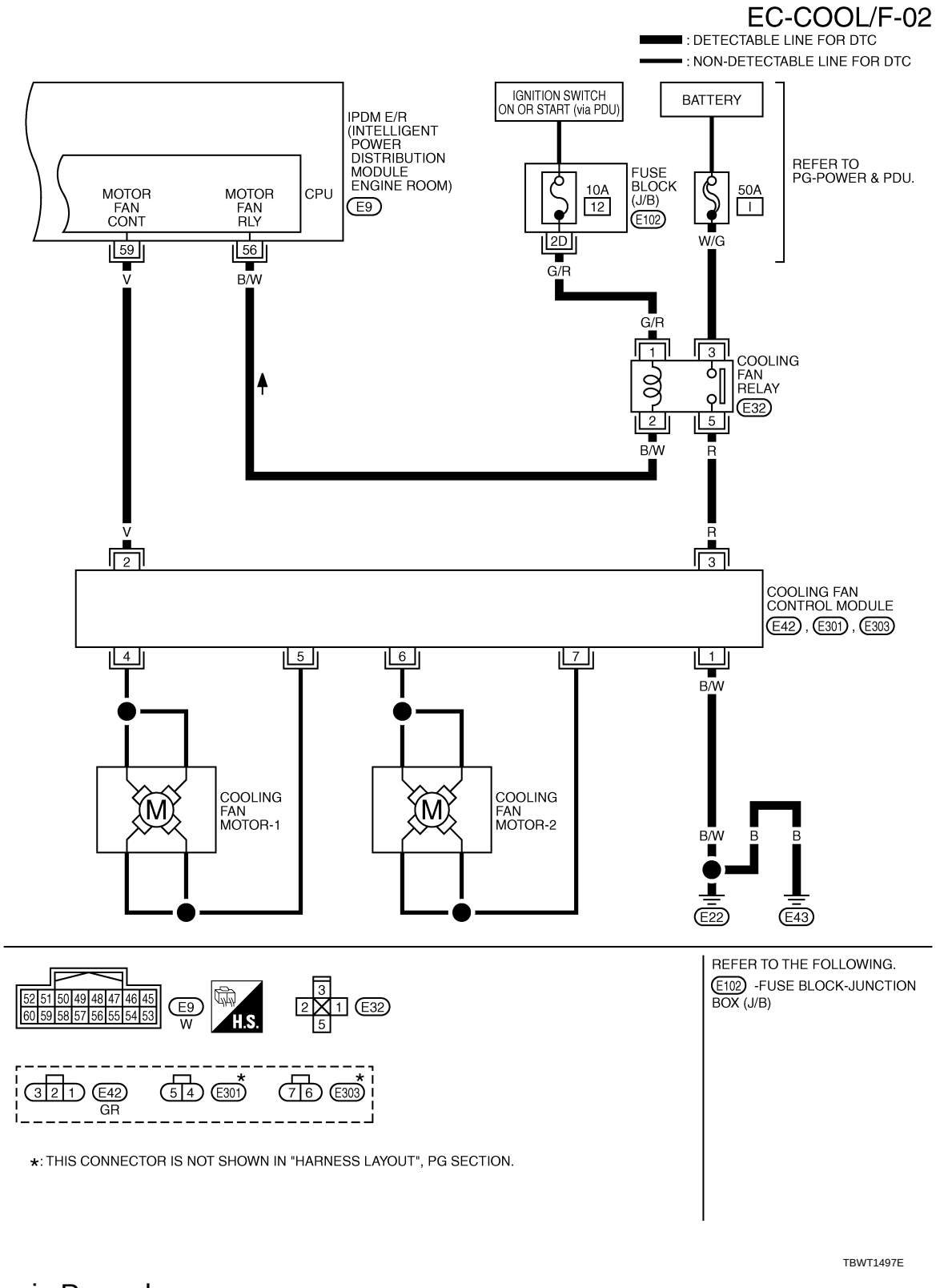
1. Check the coolant level in the reservoir tank and radiator.
   Allow engine to cool before checking coolant level.
   If the coolant level in the reservoir tank and/or radiator is below the proper range, skip the following steps and go to EC-1146, "Diagnosis Procedure".
2. Confirm whether customer filled the coolant or not. If customer filled the coolant, skip the following steps and go to EC-1146, "Diagnosis Procedure".
3. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PG-22, "Auto Active Test".
4. If NG, go to EC-1146, "Diagnosis Procedure".



Wiring Diagram

INFOID:0000000005354309





TBWT1497E

Diagnosis Procedure

INFOID:0000000005354310

1. CHECK COOLING FAN OPERATION

With CONSULT-III

1. Turn ignition switch ON.
2. Perform “FAN DUTY CONTROL” in “ACTIVE TEST” mode with CONSULT-III.
3. Check that cooling fan speed varies according to the percent.

Without CONSULT-III

1. Perform IPDM E/R auto active test and check cooling fan motors operation, refer to PG-22, "Auto Active Test".
2. Check that cooling fan operates.

OK or NG

OK >> GO TO 2.
NG >> GO TO 6.

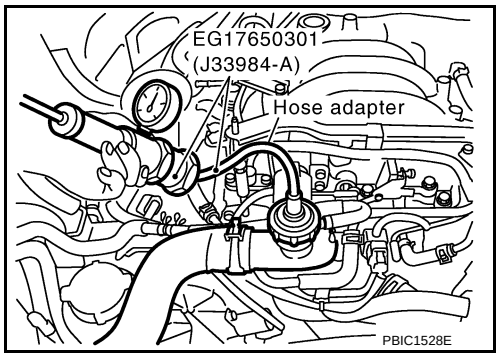
2. CHECK COOLING SYSTEM FOR LEAKAGE

Apply pressure to the cooling system with a tester, and check if the pressure drops.

CAUTION:
Higher than the specified pressure may cause radiator damage.

Testing pressure: 157 kPa (1.6 kg/cm^2, 23 psi)

Pressure should not drop.



OK or NG

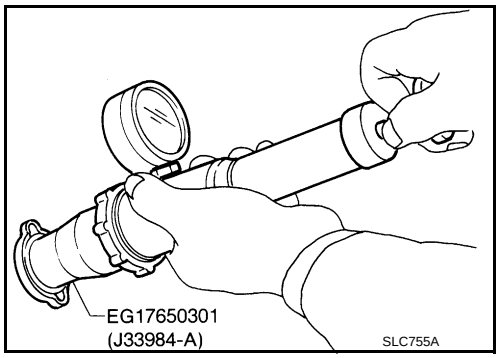
OK >> GO TO 3.
NG >> Check the following for leakage. Refer to CO-36, "Inspection".
- Hose
- Radiator
- Water pump

3. CHECK RADIATOR CAP

Apply pressure to cap with a tester.

Radiator cap relief pressure:

59 - 98 kPa (0.6 - 1.0 kg/cm^2, 9 - 14 psi)



OK or NG

OK >> GO TO 4.
NG >> Replace radiator cap.

4. CHECK THERMOSTAT

Check the following.
- Thermostat. (Refer to CO-51, "Removal and Installation".)
- Water control valve. (Refer to CO-51, "Removal and Installation".)
- Engine coolant temperature sensor. (Refer to EC-892, "Component Inspection".)

OK or NG

OK >> GO TO 5.
NG >> Replace malfunctioning component.

5. CHECK MAIN 13 CAUSES

If the cause cannot be isolated, go to EC-1150, "Main 13 Causes of Overheating".

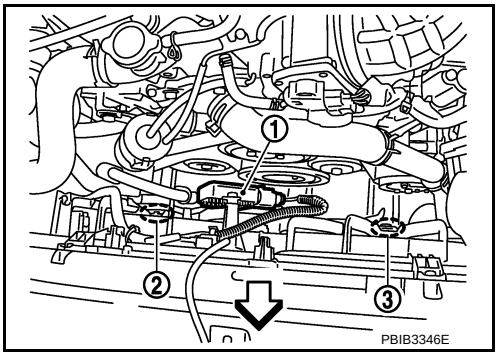
>> **INSPECTION END**

6. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.

2. Disconnect cooling fan control module (1) harness connector E42.
- ⇦: Vehicle front
- Cooling fan motor-2 (2)
- Cooling fan motor-1 (3)

3. Turn ignition switch ON.

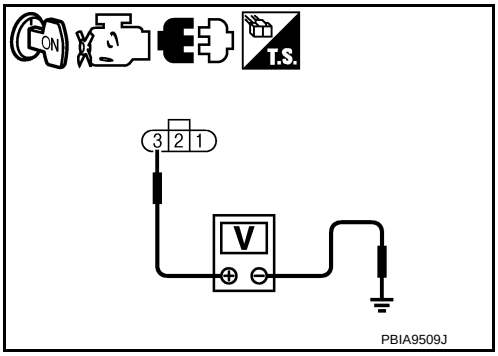


4. Check voltage between cooling fan control module terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 7.
NG >> GO TO 12.



7. CHECK COOLING FAN CONTROL MODULE GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Check harness continuity between cooling fan control module terminal 1 and ground. Refer to wiring diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to power in harness or connectors.

8. CHECK IPDM E/R GROUND CIRCUIT

1. Disconnect IPDM E/R harness connector E8, E9.
2. Check harness continuity between IPDM E/R terminal 38, 51 and ground. Refer to wiring diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to power in harness or connectors.

9. CHECK COOLING FAN CONTROL SIGNAL CIRCUIT

1. Check harness continuity between IPDM E/R terminal 59 and cooling fan control module terminal 2. Refer to wiring diagram.

Continuity should exist.

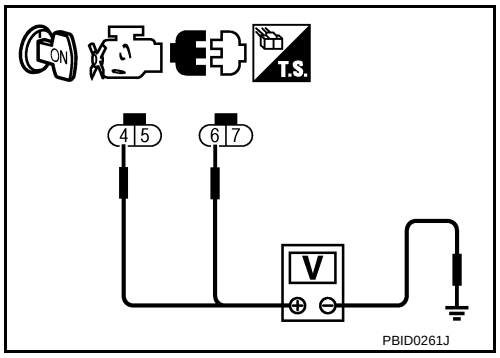
2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK COOLING FAN CONTROL MODULE OUTPUT SIGNAL CIRCUIT

1. Reconnect all harness connectors disconnected.
2. Disconnect cooling fan control module harness connectors E301, E303.
3. Turn ignition switch ON.
4. Check voltage between cooling fan control module terminals 4, 6 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 11.
NG >> Replace cooling fan control module.

11. CHECK COOLING FAN MOTORS -1 AND -2

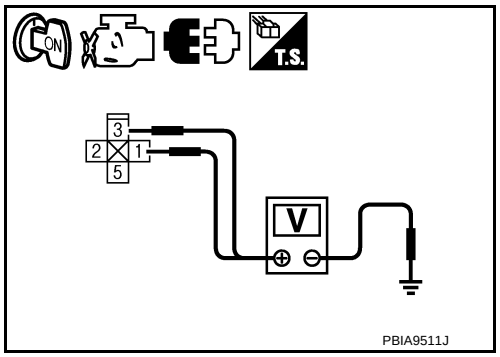
Refer to EC-1150, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> Replace cooling fan motor.

12. 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 voltage between cooling fan relay terminals 1, 3 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.
- 10 A fuse
- Fuse block (J/B) connector E102
- 50 A fusible link
- 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 or short to ground or short to power in harness or connectors.

14. CHECK COOLING FAN CONTROL MODULE POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E9.
3. Check harness continuity between the following;
   Cooling fan relay terminal 2 and IPDM E/R terminal 56,
   Cooling fan relay terminal 5 and cooling fan control module terminal 3.
   Refer to wiring diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 15.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

15. CHECK COOLING FAN RELAY

Refer to EC-1150, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> Replace cooling fan relay.

16. CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R".
NG >> Repair or replace harness connectors.

Main 13 Causes of Overheating

INFOID:0000000005354311

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-10, "Anti-Freeze Coolant Mixture Ratio"x	
	3	• Coolant level	• Visual	Coolant up to MAX level in reservoir tank and radiator filler neck	CO-36, "Inspection"
	4	• Radiator cap	• Pressure tester	CO-41, "Checking Radiator Cap"	
ON*2	5	• Coolant leakage	• Visual	No leakage	CO-36, "Inspection"
ON*2	6	• Thermostat	• Touch the upper and lower radiator hoses	Both hoses should be hot	CO-51, "Removal and Installation"
ON*1	7	• Cooling fan	• CONSULT-III	Operating	See trouble diagnosis for DTC P1217 (EC-1142).
OFF	8	• Combustion gas leakage	• 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-36, "Changing Engine Coolant"
OFF*4	10	• Coolant return from reservoir tank to radiator	• Visual	Should be initial level in reservoir tank	CO-36, "Changing Engine Coolant"
OFF	11	• Water control valve	• Remove and inspect the valve	Within the specified value	CO-51, "Removal and Installation"
OFF	12	• Cylinder head	• Straight gauge feeler gauge	0.1 mm (0.004 in) Maximum distortion (warping)	EM-233, "Inspection After Disassembly"
	13	• Cylinder block and pistons	• Visual	No scuffing on cylinder walls or piston	EM-247, "Disassembly and Assembly"

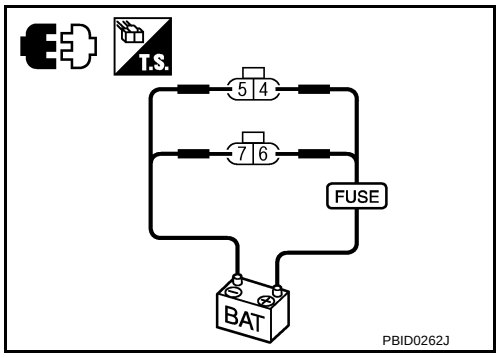
*1: Turn the ignition switch ON.
*2: Engine running at 3,000 rpm for 10 minutes.
*3: Drive at 90 km/h (56 MPH) for 30 minutes and then let idle for 10 minutes.
*4: After 60 minutes of cool down time.
For more information, refer to CO-33, "Troubleshooting Chart".

Component Inspection

INFOID:0000000005354312

COOLING FAN MOTORS -1 AND -2

1. Disconnect cooling fan control module harness connectors.
2. Supply cooling fan control motor terminals with battery voltage and check operation.

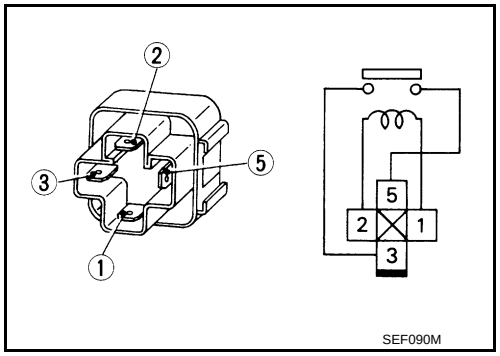


Cooling fan motor	Terminals	
	(+)	(–)
1	4	5
2	6	7

Check that cooling fan operates.
If NG, replace cooling fan motor.

COOLING FAN RELAY

1. Disconnect cooling fan relay harness connector.
2. Check continuity between terminals 3 and 5 under the following conditions.



Conditions	Continuity
12 V direct current supply between terminals 1 and 2	Yes
No current supply	No

If NG, replace cooling fan relay.

DTC P1220 FUEL PUMP CONTROL MODULE (FPCM)

Description

INFOID:0000000005354313

SYSTEM DESCRIPTION

Sensor	Input Signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump control module (FPCM)
Mass air flow sensor	Amount of intake air		
Engine coolant temperature sensor	Engine coolant temperature		
Battery	Battery voltage*		

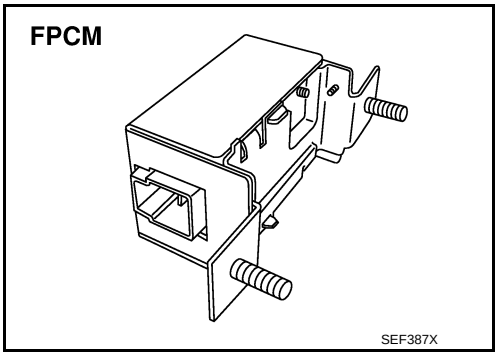
*: ECM determines the start signal status by the signals of engine speed and battery voltage.

This system controls the fuel pump operation. The amount of fuel flow delivered from the fuel pump is altered between two flow rates by the FPCM operation. The FPCM determines the voltage supplied to the fuel pump (and therefore fuel flow) according to the following conditions.

Conditions	Amount of fuel flow	Supplied voltage
• Engine cranking • Engine coolant temperature is below 10°C (50°F). • Engine is running under heavy load and high speed conditions	high	Battery voltage (11 - 14 V)
Except the above	low	Approximately 8 V

COMPONENT DESCRIPTION

The FPCM adjusts the voltage supplied to the fuel pump to control the amount of fuel flow. When the FPCM increases the voltage supplied to the fuel pump, the fuel flow is increased. When the FPCM decreases the voltage, the fuel flow is decreased.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354314

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FPCM	• Engine: Cranking	HI
	• Engine: Idle • Engine coolant temperature: More than 10°C (50°F)	LOW

On Board Diagnosis Logic

INFOID:0000000005354315

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1220 1220	Fuel pump control module (FPCM)	An improper voltage signal from the FPCM, which is supplied to a point between the fuel pump and the dropping resistor, is detected by ECM.	• Harness or connectors (FPCM circuit is shorted.) • Dropping resistor • FPCM

DTC Confirmation Procedure

INFOID:0000000005354316

CAUTION:

Always drive vehicle at a safe speed.

NOTE:

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 with ignition switch ON.

WITH CONSULT-III

1. Turn ignition switch ON and select “DATA MONITOR” mode with CONSULT-III.
2. Check that “COOLAN TEMP/S” indication is less than 70°C (158°F). If not, cool down the engine.
3. Start engine.
4. Hold vehicle under the following conditions for 12 seconds.

ENG SPEED	1,375 - 3,475 rpm
VHCL SPEED SE	More than 70 km/h (43 MPH)
B/FUEL SCHDL	1.5 - 23.0 msec
Selector lever position	Suitable position

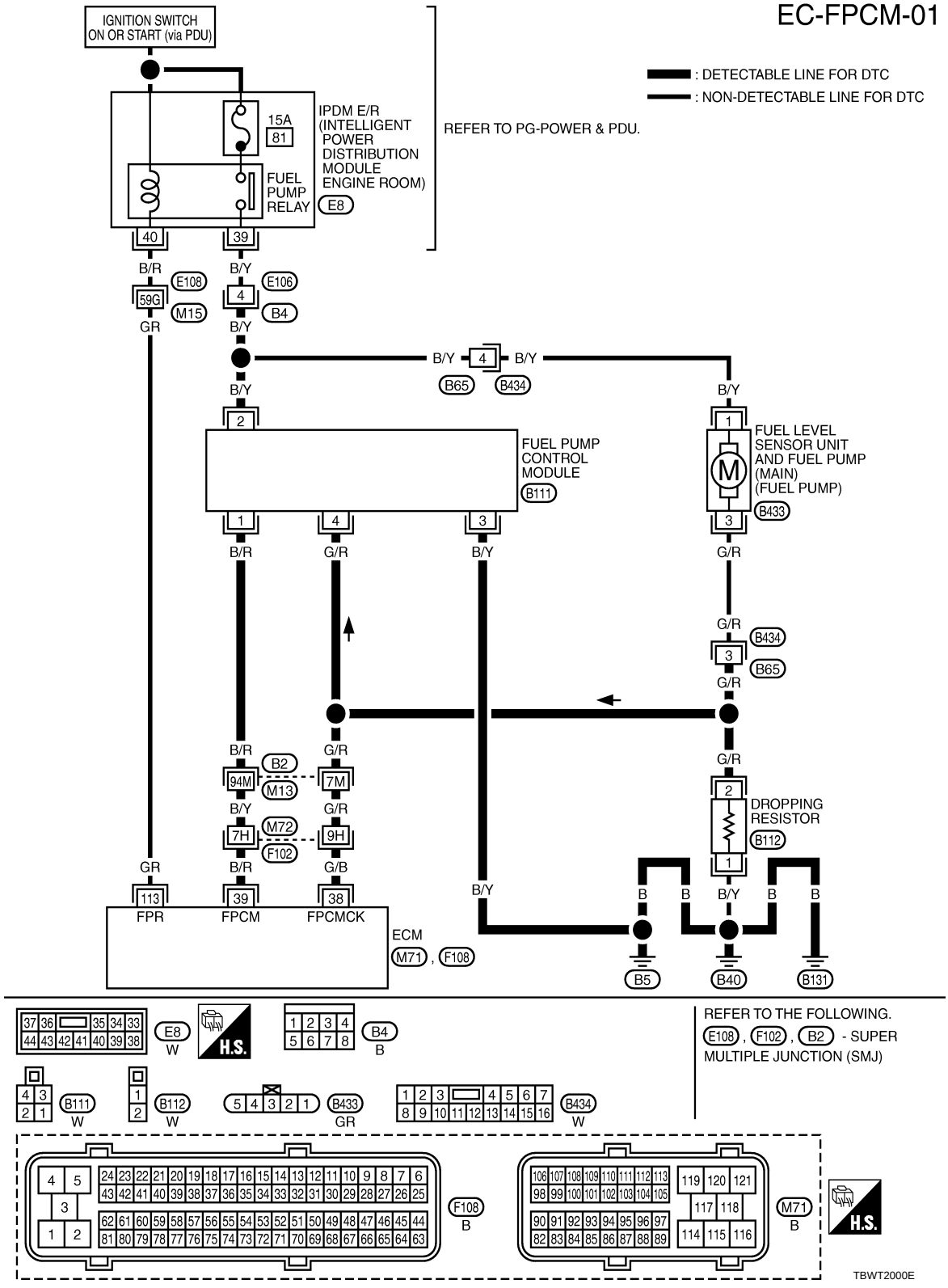
5. Check 1st trip DTC.
6. If 1st trip DTC is detected, go to EC-1155, "Diagnosis Procedure".

WITH GST

Follow the procedure “WITH CONSULT-III” above.

Wiring Diagram

INFOID:0000000005354317



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

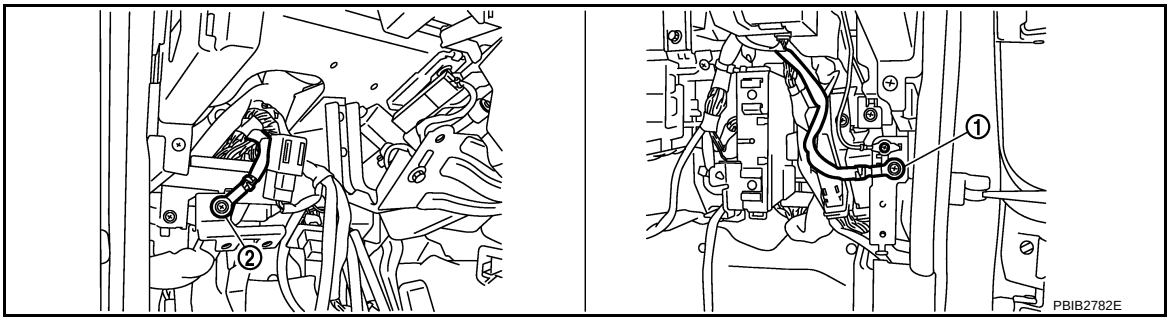
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
38	G/B	Fuel pump control module (FPCM) check	**[When cranking engine]**	Approximately 0 V
			[Engine is running] • **Warm-up condition** • Idle speed	4 - 6 V
39	B/R	Fuel pump control module (FPCM)	**[When cranking engine]**	0 - 0.5 V
			[Engine is running] • **Warm-up condition** • Idle speed	8 - 12 V
113	GR	Fuel pump relay	**[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)

Diagnosis Procedure

INFOID:0000000005354318

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



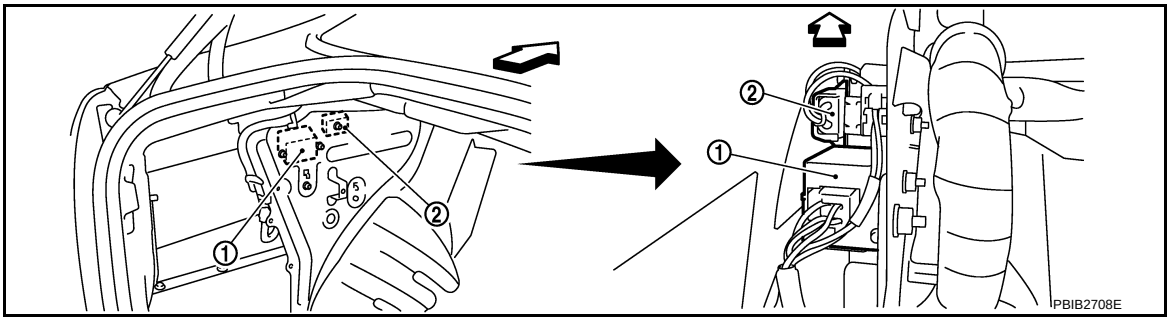
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK FPCM POWER SUPPLY CIRCUIT

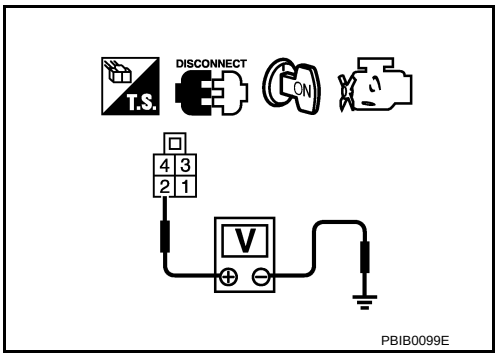
1. Disconnect fuel pump control module (FPCM) harness connector.



⇦ : Vehicle front
1. FPCM
2. Dropping resistor

2. Turn ignition switch ON.
3. Check voltage between FPCM terminal 2 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E106, B4
- Harness for open or short between FPCM and harness connector B4

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT-I

1. Turn ignition switch OFF.
2. Check harness continuity between FPCM terminal 3 and ground. Refer to Wiring Diagram.

Continuity should exist.

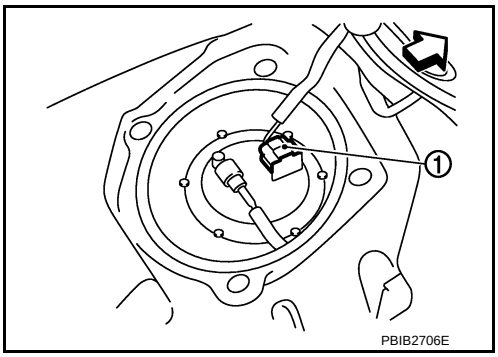
3. Also check harness for short to power.

OK or NG

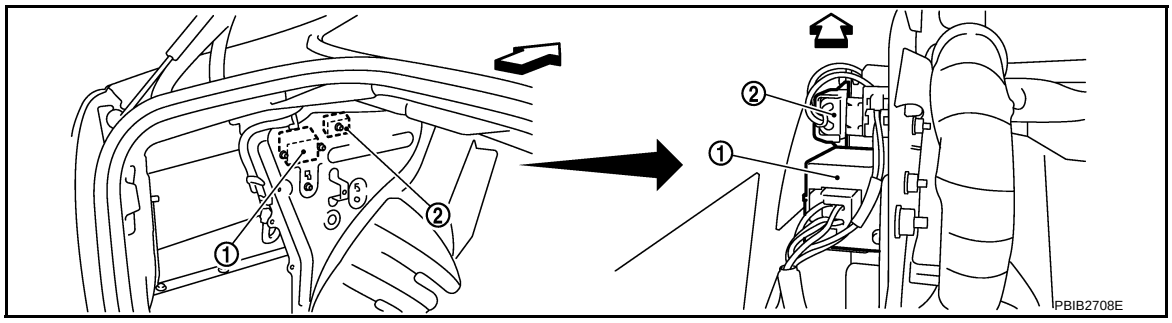
OK >> GO TO 5.
NG >> Repair open circuit or short to power in harness or connectors.

5. CHECK FPCM GROUND CIRCUIT FOR OPEN AND SHORT-II

1. Disconnect “fuel level sensor unit and fuel pump” harness connector (1).
- Illustration shows the view with rear seat cushion and inspection hole cover (RH) removed.
- ⇦: Vehicle front



2. Disconnect dropping resistor harness connector.



⇦ : Vehicle front 1. FPCM 2. Dropping resistor

3. Check harness continuity between the following;
“fuel level sensor unit and fuel pump” terminal 3 and dropping resistor terminal 2,
FPCM terminal 4 and dropping resister terminal 2.
Refer to Wiring Diagram.

Continuity should exist.

4. Check harness continuity between the following;
“fuel level sensor and fuel pump” terminal 3 and ground,
FPCM terminal 4 and ground.
Refer to Wiring Diagram.

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B434, B65
- Harness for open or short between “fuel level sensor unit and fuel pump” and dropping resistor
- Harness for open or short between FPCM and dropping resistor
- Harness for open or short between “fuel level sensor unit and fuel pump” and ground
- Harness for open or short between FPCM and ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FPCM INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 38 and FPCM terminal 4.
Refer to Wiring Diagram.

Continuity should exist.

3. Check harness continuity between ECM terminal 38 and ground.
Refer to Wiring Diagram.

Continuity should not exist.

4. Also check harness for short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B2, M13
- Harness connectors M72, F102
- Harness for open or short between ECM and FPCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK FPCM OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 39 and FPCM terminal 1.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B2, M13
- Harness connectors M72, F102
- Harness for open or short between ECM and FPCM

>> Repair open circuit or short to ground or short to power in harness or connectors.

11. CHECK FPCM

Refer to EC-1158, "Component Inspection".

OK or NG

OK >> GO TO 12.
NG >> Replace FPCM.

12. CHECK INTERMITTENT INCIDENT

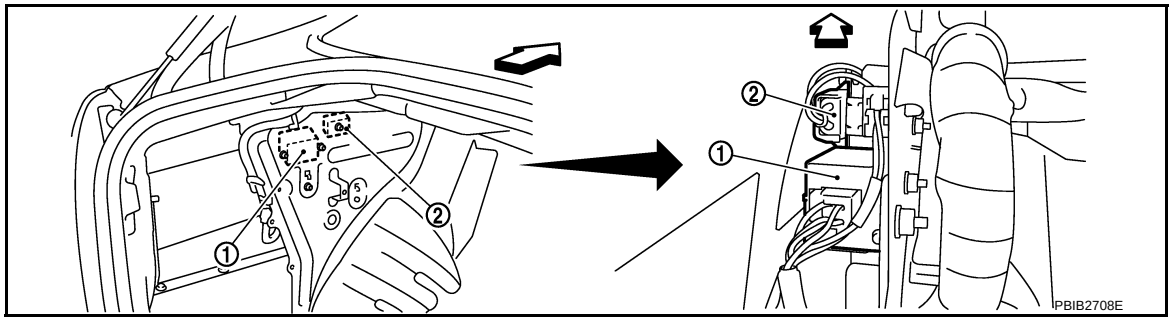
Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354319

FUEL PUMP CONTROL MODULE

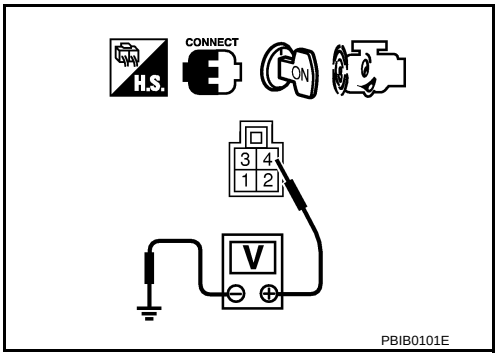


⇦ : Vehicle front 1. FPCM 2. Dropping resistor

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF and wait at least 10 seconds.
3. Check voltage between FPCM terminal 4 and ground under the following conditions.

Condition	Voltage
When engine cranking	Approx. 0 V
After starting engine	Approx. 5 V

4. If NG, replace fuel pump control module.

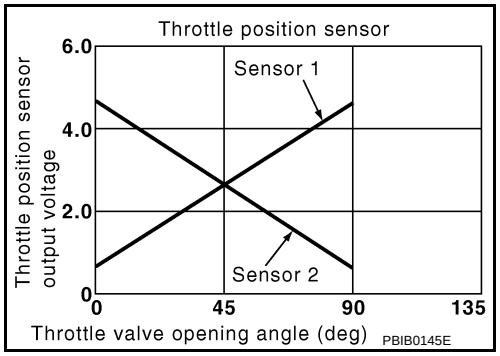


DTC P1225 TP SENSOR

Component Description

INFOID:0000000005354320

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 the 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 in response to driving condition via the throttle control motor.



On Board Diagnosis Logic

INFOID:0000000005354321

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1225 1225	Closed throttle position learning performance	Closed throttle position learning value is excessively low.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

INFOID:0000000005354322

NOTE:
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.

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.
5. If 1st trip DTC is detected, go to EC-1159, "Diagnosis Procedure".

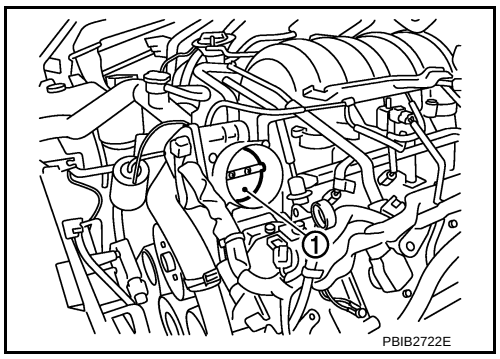
Diagnosis Procedure

INFOID:0000000005354323

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

- This illustration shows the view with intake air duct removed.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

Removal and Installation

INFOID:0000000005354324

ELECTRIC THROTTLE CONTROL ACTUATOR

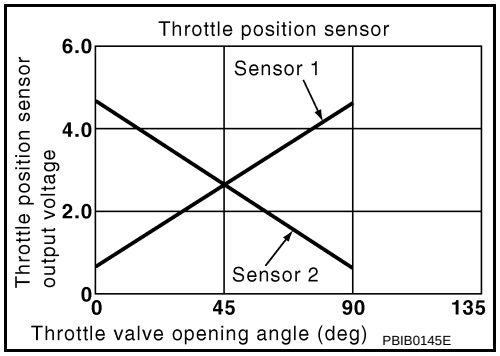
Refer to EM-174, "Component".

DTC P1226 TP SENSOR

Component Description

INFOID:0000000005354325

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 the 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 in response to driving condition via the throttle control motor.



On Board Diagnosis Logic

INFOID:0000000005354326

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1226 1226	Closed throttle position learning performance	Closed throttle position learning is not performed successfully, repeatedly.	• Electric throttle control actuator (TP sensor 1 and 2)

DTC Confirmation Procedure

INFOID:0000000005354327

NOTE:
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.

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.
6. If 1st trip DTC is detected, go to EC-1161, "Diagnosis Procedure".

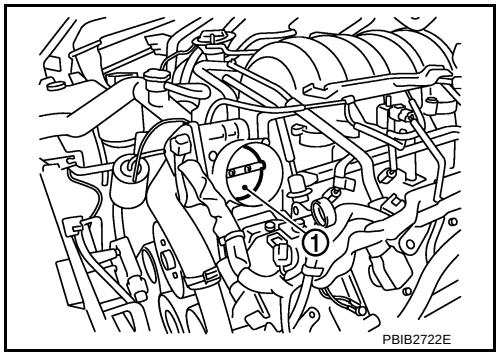
Diagnosis Procedure

INFOID:0000000005354328

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Turn ignition switch OFF.
2. Remove the intake air duct.
3. Check if foreign matter is caught between the throttle valve (1) and the housing.

- This illustration shows the view with intake air duct removed.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2.REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

Removal and Installation

INFOID:0000000005354329

ELECTRIC THROTTLE CONTROL ACTUATOR
Refer to EM-174, "Component".

DTC P1421 COLD START CONTROL

Description

INFOID:0000000005354330

ECM controls ignition timing and engine idle speed when engine is started with prewarming up condition. This control promotes the activation of three way catalyst by heating the catalyst and reduces emissions.

On Board Diagnosis Logic

INFOID:0000000005354331

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1421 1421	Cold start emission reduction strategy monitoring	ECM does not control ignition timing and engine idle speed properly when engine is started with prewarming up condition.	• Lack of intake air volume • Fuel injection system • ECM

DTC Confirmation Procedure

INFOID:0000000005354332

NOTE:
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.

WITH CONSULT-III

1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Select “DATA MONITOR” mode with CONSULT-III.
4. Check that the “COOLAN TEMP/S” indication is between 5°C (41°F) and 36°C (97°F).
   If “COOLAN TEMP/S” indication is within the specified value, go to the following step.
   If “COOLAN TEMP/S” indication is out of the specified value, cool engine down or warm engine up and go to step 1.
5. Start engine and let it idle for 5 minutes.
6. Check 1st trip DTC.
7. If 1st trip DTC is detected, go to EC-1163, "Diagnosis Procedure".

WITH GST

Follow the procedure “WITH CONSULT-III” above.

Diagnosis Procedure

INFOID:0000000005354333

1.PERFORM IDLE AIR VOLUME LEARNING

Perform EC-765, "Idle Air Volume Learning".
Is Idle Air Volume Learning carried out successfully?

Yes or No

Yes >> GO TO 2.
No >> Follow the instructions of Idle Air Volume Learning.

2.CHECK INTAKE SYSTEM

Check for the cause of intake air volume lacking. Refer to the following.
- Crushed intake air passage
- Intake air passage clogging

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK FUEL INJECTION SYSTEM FUNCTION

Perform EC-970, "DTC Confirmation Procedure" for DTC P0171, P0174 FUEL INJECTION SYSTEM FUNCTION.

OK or NG

OK >> GO TO 4.
NG >> Go to EC-975, "Diagnosis Procedure".

4. PERFORM DTC CONFIRMATION PROCEDURE

1. Turn ignition switch ON.
2. Erase DTC.
3. Perform DTC Confirmation Procedure.
   See EC-1163, "DTC Confirmation Procedure".
4. Is the 1st trip DTC P1421 displayed again?

Yes or No

Yes >> GO TO 5.
No >> **INSPECTION END**

5. REPLACE ECM

1. Replace ECM.
2. Perform initialization of IVIS (NATS) system and registration of all IVIS (NATS) ignition key IDs.
   Refer to BL-224, "ECM Re-Communicating Function".
3. Perform EC-764, "VIN Registration".
4. Perform EC-764, "Accelerator Pedal Released Position Learning".
5. Perform EC-764, "Throttle Valve Closed Position Learning".
6. Perform EC-765, "Idle Air Volume Learning".

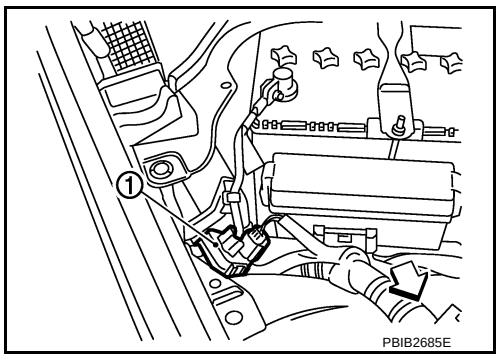
>> **INSPECTION END**

DTC P1550 BATTERY CURRENT SENSOR

Component Description

INFOID:0000000005354334

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 (1) 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 SC section.



- ⇦: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354335

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged* • Selector lever position: P or N • Air conditioner switch: OFF • No load	Approx. 2,600 - 3,500 mV

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

On Board Diagnosis Logic

INFOID:0000000005354336

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1550 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1550 1550	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 (The sensor circuit is open or shorted.) • Battery current sensor

DTC Confirmation Procedure

INFOID:0000000005354337

NOTE:

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:

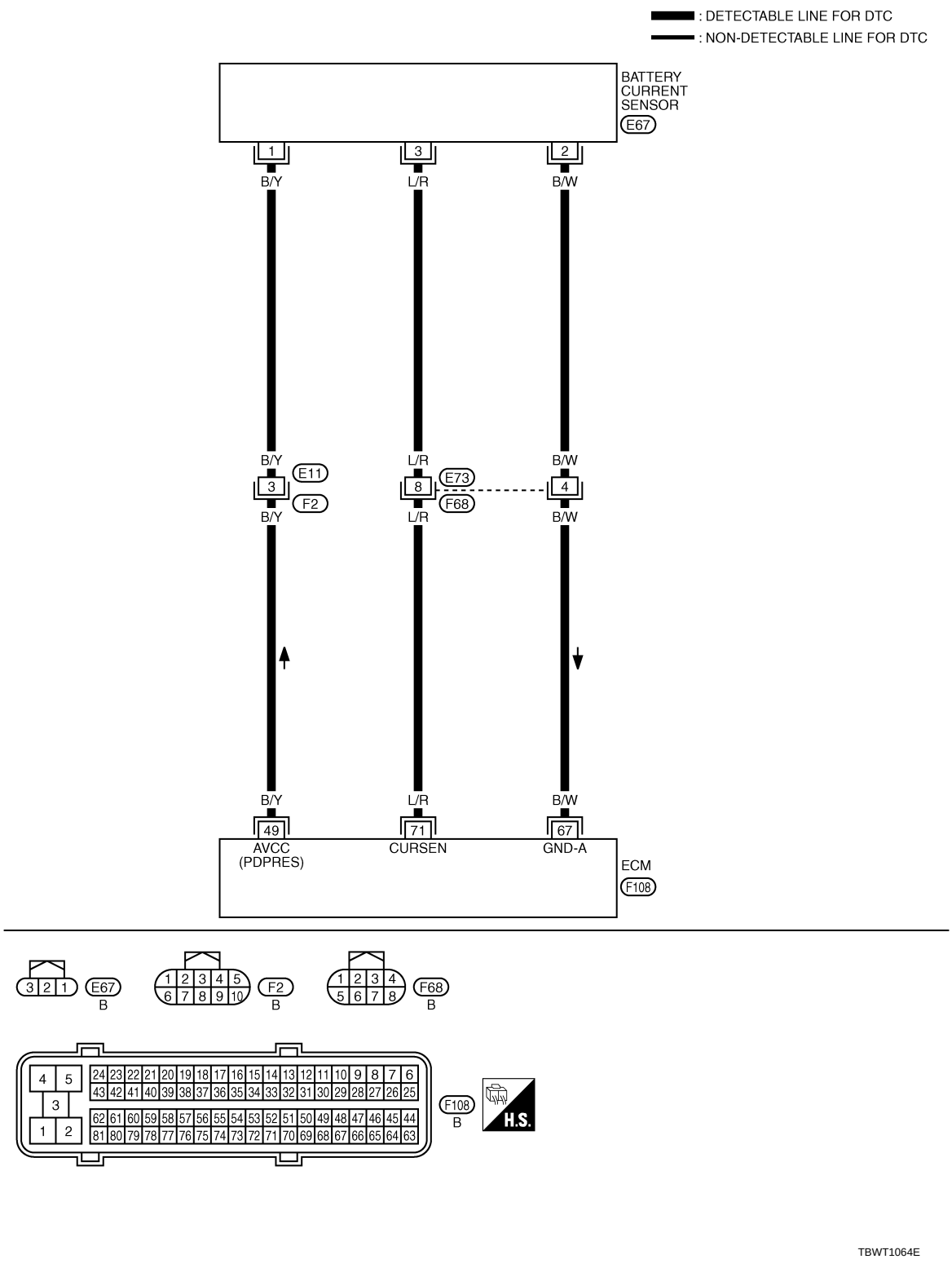
Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1167, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354338

EC-CUR/SE-01



TBWT1064E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	B/Y	Sensor power supply (Battery current sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (Battery current sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
71	L/R	Battery current sensor	**[Engine is running]** • Battery: Fully charged* • Idle speed	Approximately 2.6 - 3.5 V

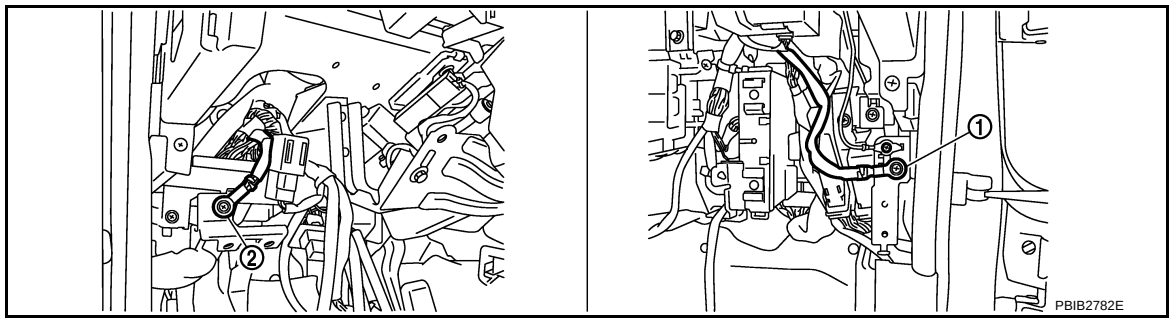
*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Diagnosis Procedure

INFOID:0000000005354339

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



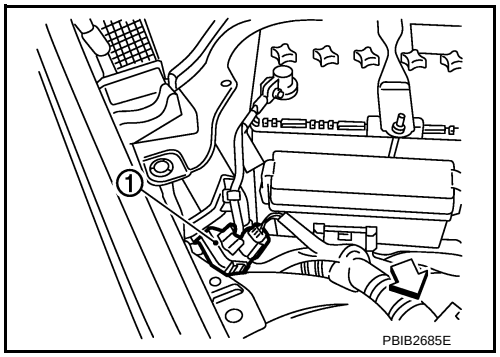
1. Body ground M70
2. Body ground M16

OK or NG

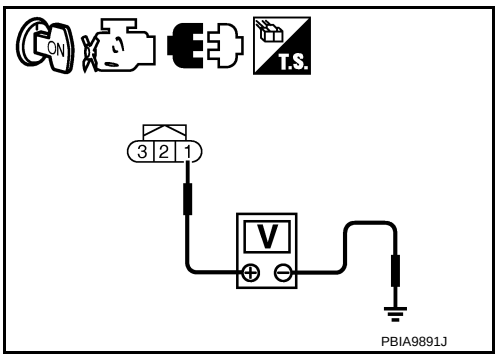
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between battery current sensor terminal 1 and ground with CONSULT-III or tester.



Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or 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 harness continuity between battery current sensor terminal 3 and ECM terminal 71. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to EC-1169, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

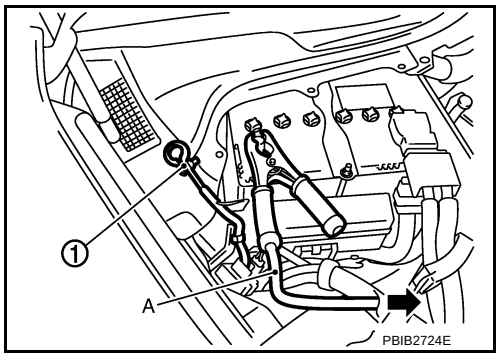
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354340

BATTERY CURRENT SENSOR

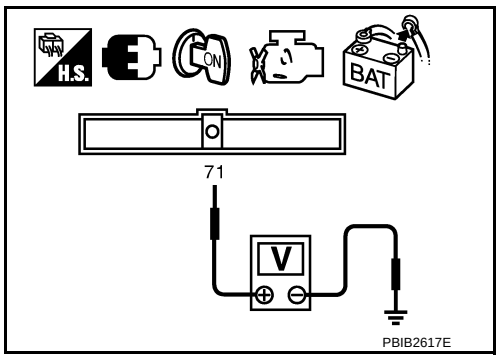
1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
   - ⬅: To body ground
3. Install jumper cable A between battery negative terminal and body ground.
4. Turn ignition switch ON.



5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.

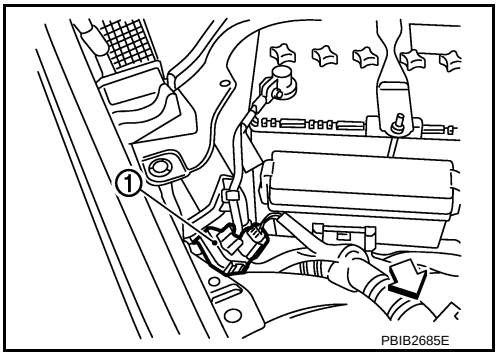


DTC P1551, P1552 BATTERY CURRENT SENSOR

Component Description

INFOID:0000000005354341

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 (1) 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 SC section.



- ⇦: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354342

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged* • Selector lever position: P or N • Air conditioner switch: OFF • No load	Approx. 2,600 - 3,500 mV

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

On Board Diagnosis Logic

INFOID:0000000005354343

The MIL will not illuminate for thes diagnoses.

NOTE:

If DTC P1551 or P1552 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1551 1551	Battery current 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.) • Battery current sensor
P1552 1552	Battery current sensor circuit high input	An excessively high voltage from the sensor is sent to ECM.	

DTC Confirmation Procedure

INFOID:0000000005354344

NOTE:

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

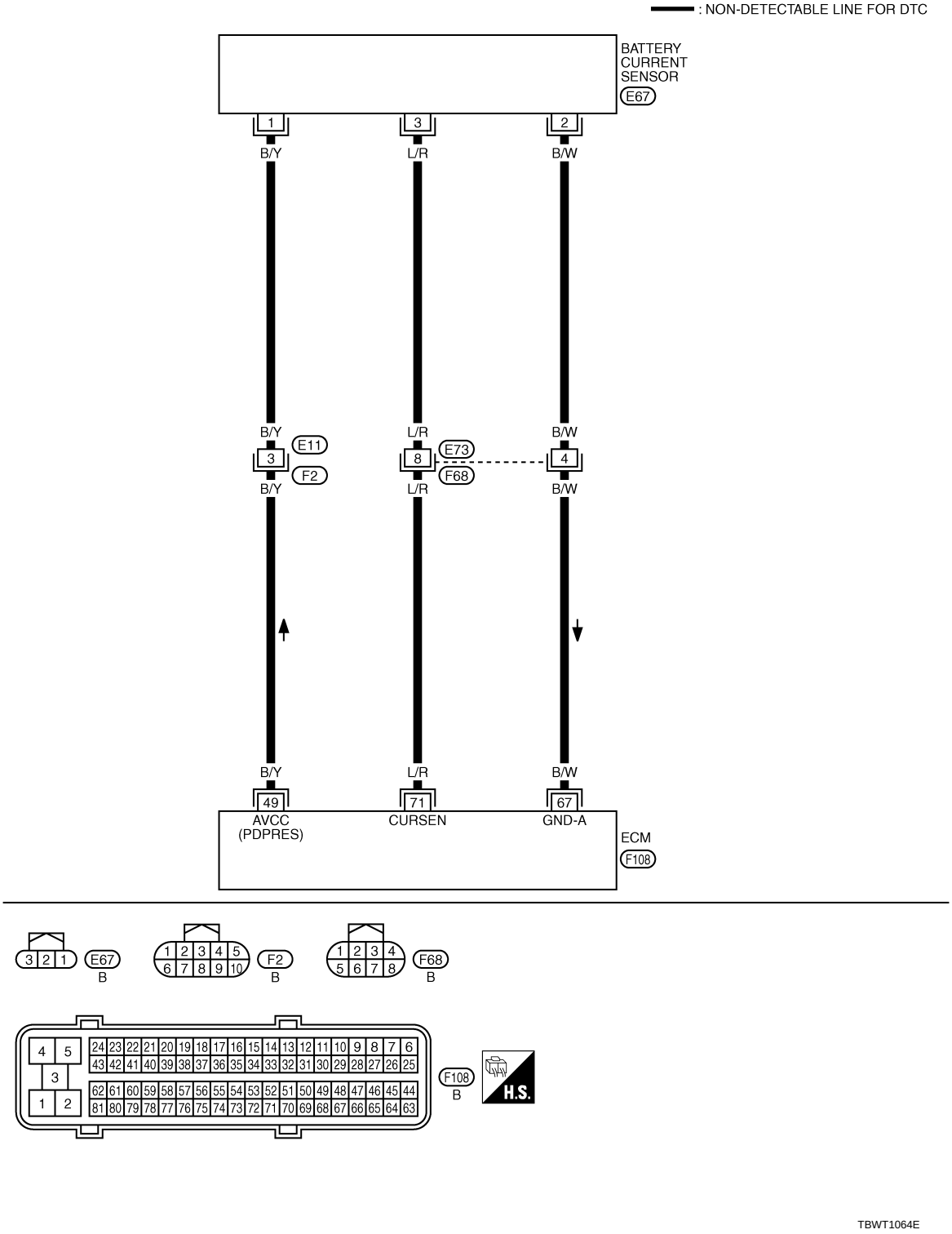
1. Turn ignition switch ON and wait at least 10 seconds.
2. Check 1st trip DTC.

3. If 1st trip DTC is detected, go to EC-1172, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354345

EC-CUR/SE-01



TBWT1064E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	B/Y	Sensor power supply (Battery current sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (Battery current sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
71	L/R	Battery current sensor	**[Engine is running]** • Battery: Fully charged* • Idle speed	Approximately 2.6 - 3.5 V

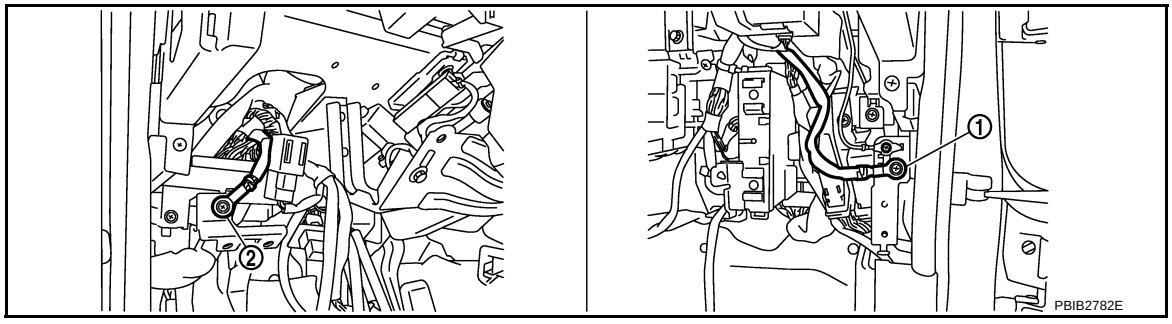
*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Diagnosis Procedure

INFOID:0000000005354346

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body. Refer to EC-828, "Ground Inspection".



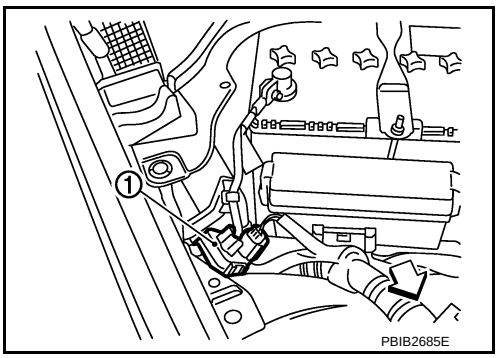
1. Body ground M70
2. Body ground M16

OK or NG

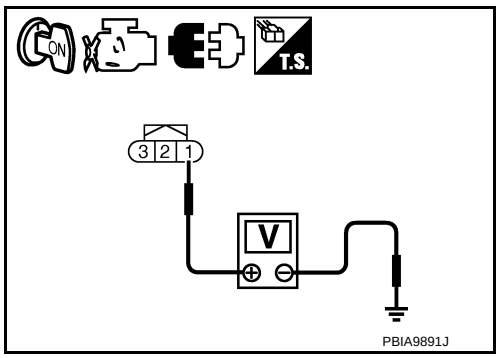
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between battery current sensor terminal 1 and ground with CONSULT-III or tester.



Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or 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 harness continuity between battery current sensor terminal 3 and ECM terminal 71. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to EC-1174, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

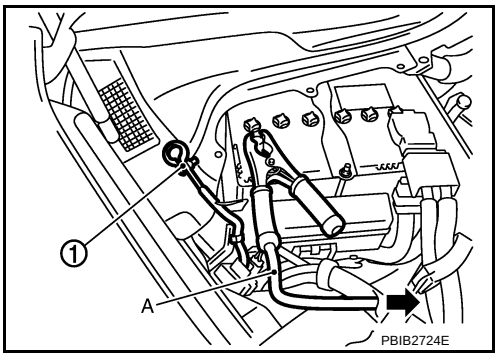
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354347

BATTERY CURRENT SENSOR

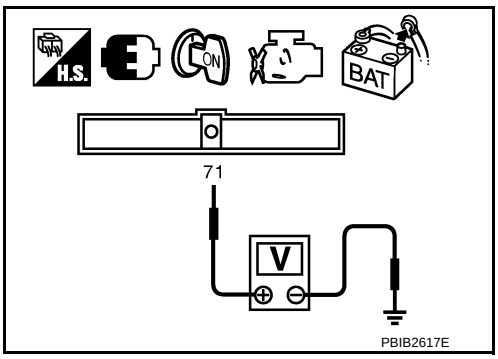
1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
   - ⬅: To body ground
3. Install jumper cable A between battery negative terminal and body ground.
4. Turn ignition switch ON.



5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.

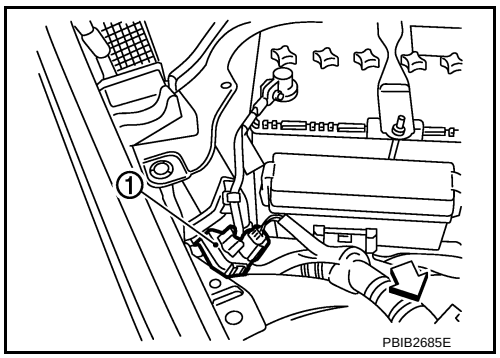


DTC P1553 BATTERY CURRENT SENSOR

Component Description

INFOID:0000000005354348

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 (1) 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 SC section.



- ⇦: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354349

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged* • Selector lever position: P or N • Air conditioner switch: OFF • No load	Approx. 2,600 - 3,500 mV

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

On Board Diagnosis Logic

INFOID:0000000005354350

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1553 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1553 1553	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 (The sensor circuit is open or shorted.) • Battery current sensor

DTC Confirmation Procedure

INFOID:0000000005354351

NOTE:

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:

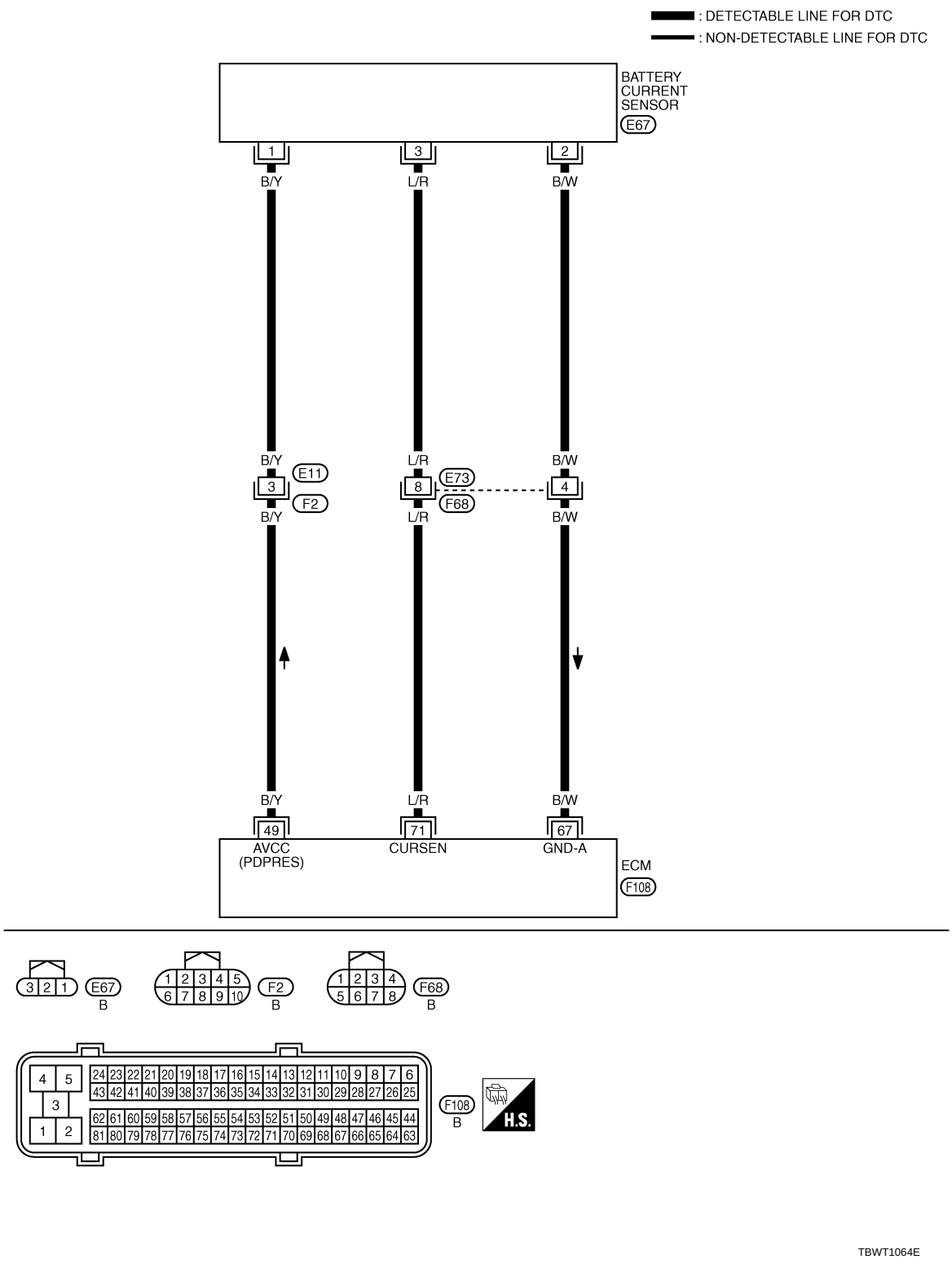
Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

1. Start engine and wait at least 10 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1177, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354352

EC-CUR/SE-01



TBWT1064E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	B/Y	Sensor power supply (Battery current sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (Battery current sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
71	L/R	Battery current sensor	**[Engine is running]** • Battery: Fully charged* • Idle speed	Approximately 2.6 - 3.5 V

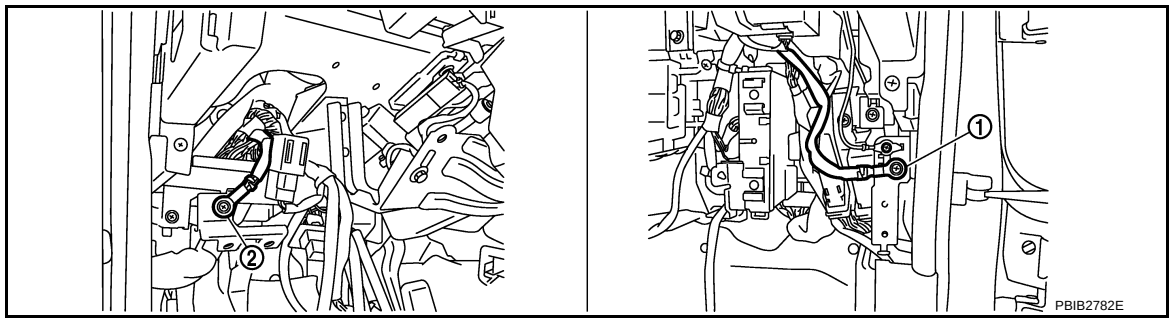
*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Diagnosis Procedure

INFOID:0000000005354353

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



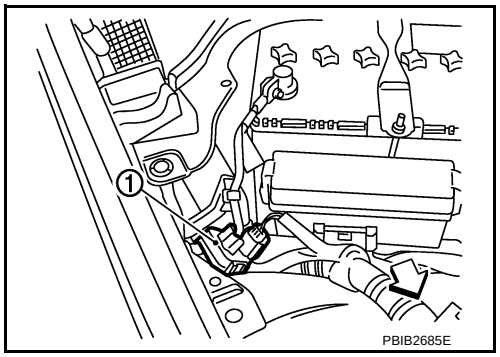
1. Body ground M70
2. Body ground M16

OK or NG

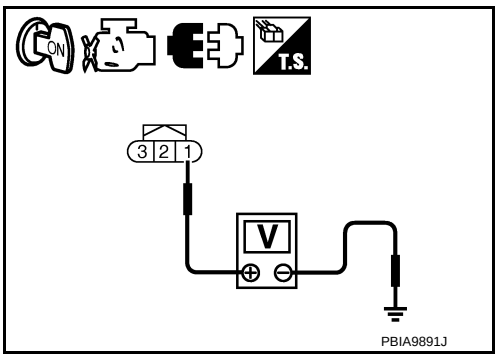
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between battery current sensor terminal 1 and ground with CONSULT-III or tester.



Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or 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 harness continuity between battery current sensor terminal 3 and ECM terminal 71. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to EC-1179, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

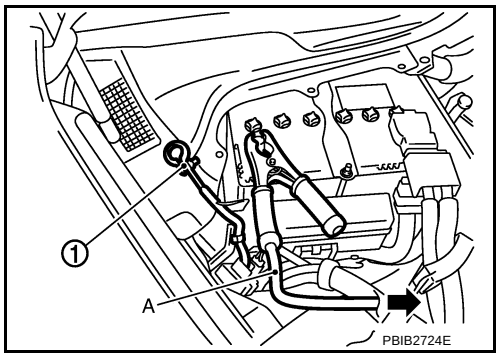
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354354

BATTERY CURRENT SENSOR

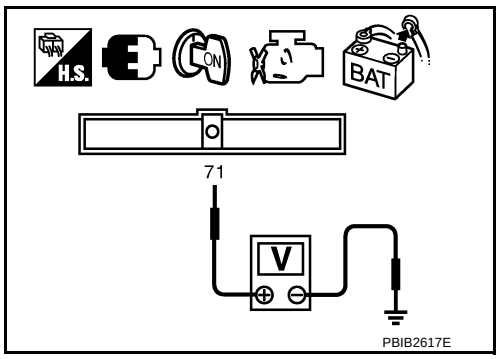
1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
   - ⬅: To body ground
3. Install jumper cable A between battery negative terminal and body ground.
4. Turn ignition switch ON.



5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.

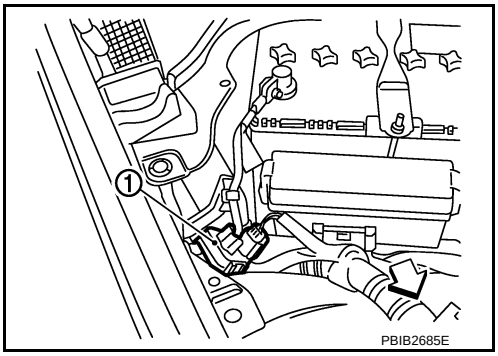


DTC P1554 BATTERY CURRENT SENSOR

Component Description

INFOID:0000000005354355

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 (1) 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 SC section.



- ⇦: Vehicle front

CAUTION:

Never connect the electrical component or the ground wire directly to the battery terminal. The connection causes the malfunction of the power generation voltage variable control, and then the battery discharge may occur.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354356

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
BAT CUR SEN	• Engine speed: Idle • Battery: Fully charged* • Selector lever position: P or N • Air conditioner switch: OFF • No load	Approx. 2,600 - 3,500 mV

*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

On Board Diagnosis Logic

INFOID:0000000005354357

The MIL will not illuminate for this diagnosis.

NOTE:

If DTC P1554 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1554 1554	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 (The sensor circuit is open or shorted.) • Battery current sensor

Overall Function Check

INFOID:0000000005354358

Use this procedure to check the overall function of the battery current sensor circuit. During this check, a 1st trip DTC might not be confirmed.

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.**

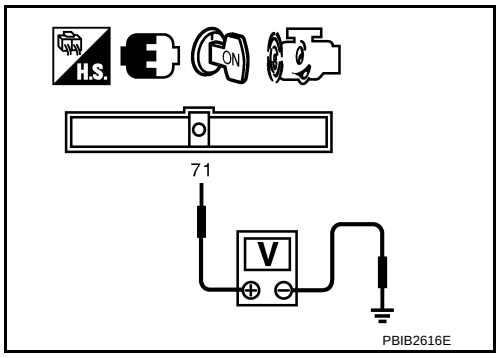
WITH CONSULT-III

1. Start engine and let it idle.
2. Select “BAT CUR SEN” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BAT CUR SEN” indication for 10 seconds.
   “BAT CUR SEN” indication should be above 2,300 mV at least once.

4. If NG, go to EC-1183, "Diagnosis Procedure".

WITH GST

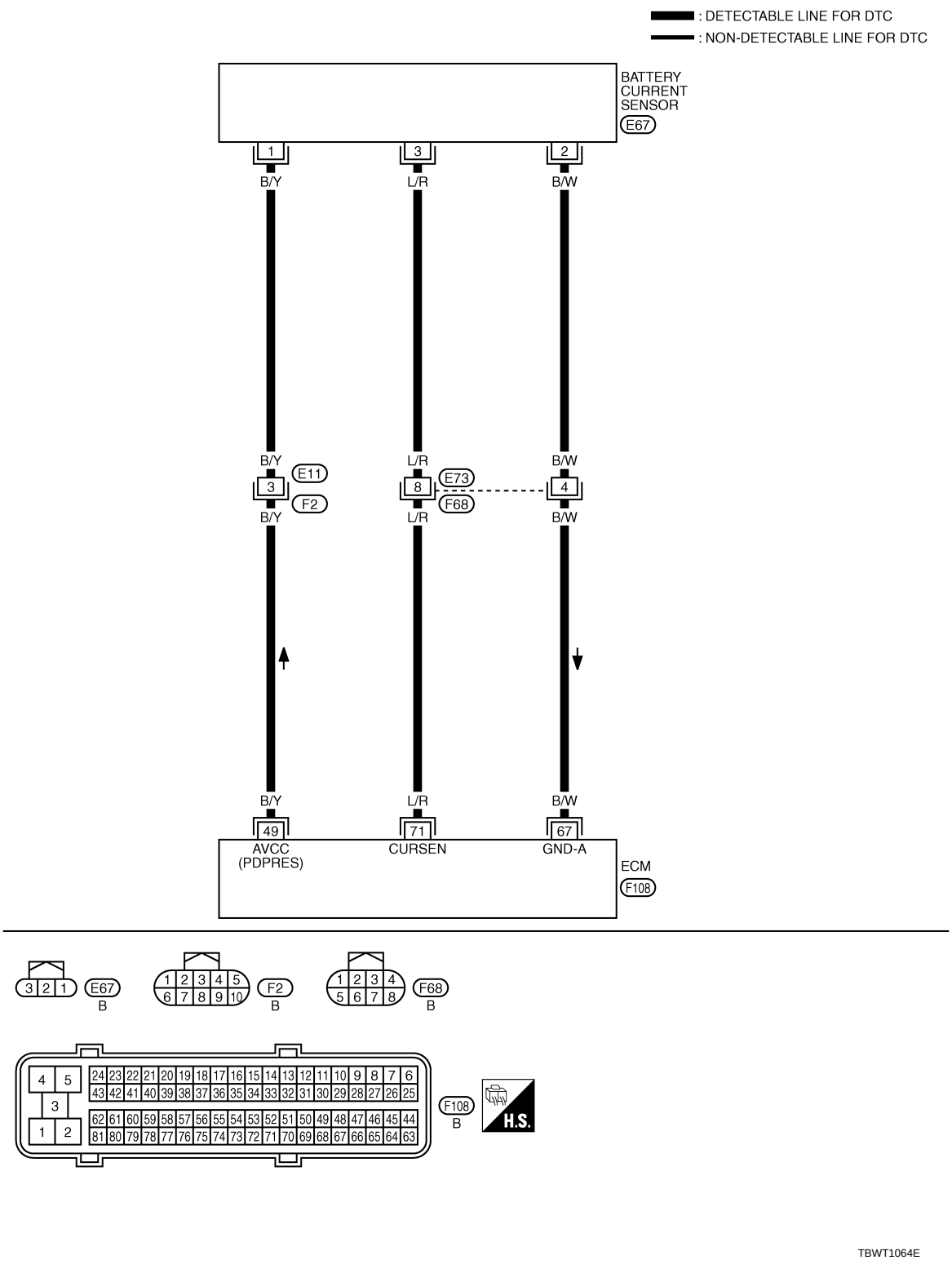
1. Start engine and let it idle.
2. Check voltage between ECM terminal 71 (battery current sensor signal) and ground for 10 seconds.
   The voltage should be above 2.3 V at least once.
3. If NG, go to EC-1183, "Diagnosis Procedure".



Wiring Diagram

INFOID:0000000005354359

EC-CUR/SE-01



TBWT1064E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	B/Y	Sensor power supply (Battery current sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (Battery current sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
71	L/R	Battery current sensor	**[Engine is running]** • Battery: Fully charged* • Idle speed	Approximately 2.6 - 3.5 V

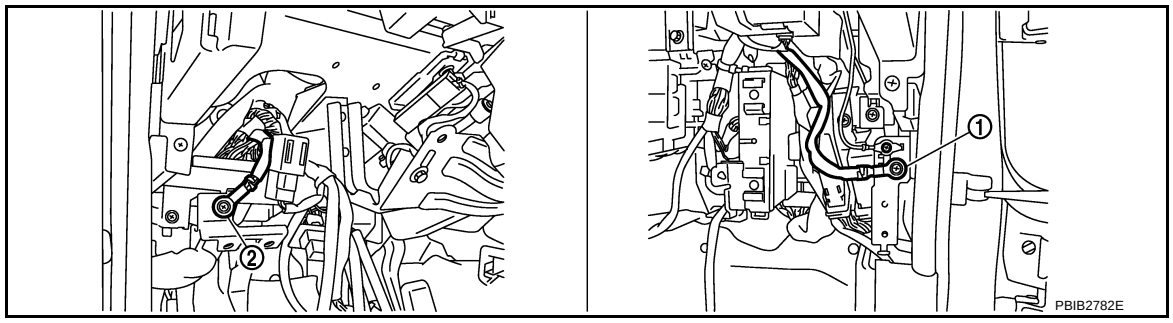
*: Before measuring the terminal voltage, confirm that the battery is fully charged. Refer to SC-4, "How to Handle Battery".

Diagnosis Procedure

INFOID:0000000005354360

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



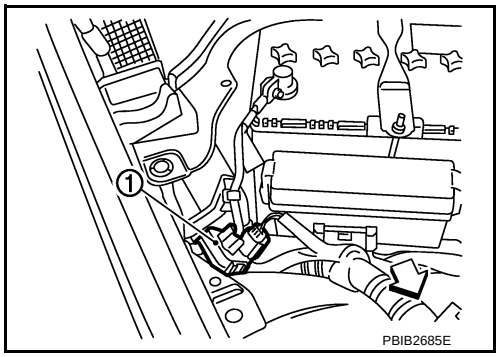
1. Body ground M70
2. Body ground M16

OK or NG

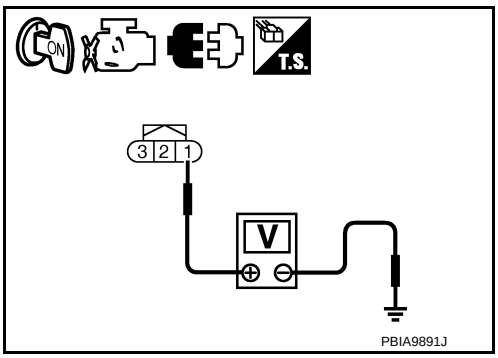
OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK BATTERY CURRENT SENSOR POWER SUPPLY CIRCUIT

1. Disconnect battery current sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between battery current sensor terminal 1 and ground with CONSULT-III or tester.



Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK BATTERY CURRENT SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between battery current sensor terminal 2 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or 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 harness continuity between battery current sensor terminal 3 and ECM terminal 71. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E73, F68
- Harness for open or short between battery current sensor and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK BATTERY CURRENT SENSOR

Refer to EC-1185, "Component Inspection".

OK or NG

OK >> GO TO 9.
NG >> Replace battery negative cable assembly.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

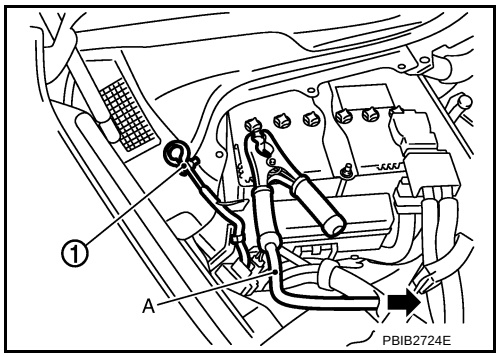
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354361

BATTERY CURRENT SENSOR

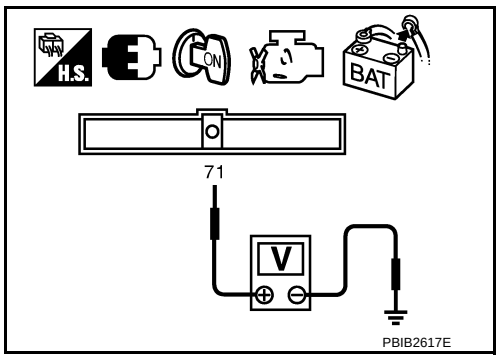
1. Reconnect harness connectors disconnected.
2. Disconnect battery negative cable (1).
   - ⬅: To body ground
3. Install jumper cable A between battery negative terminal and body ground.
4. Turn ignition switch ON.



5. Check voltage between ECM terminal 71 (battery current sensor signal) and ground.

Voltage: Approximately 2.5 V

6. If NG, replace battery negative cable assembly.

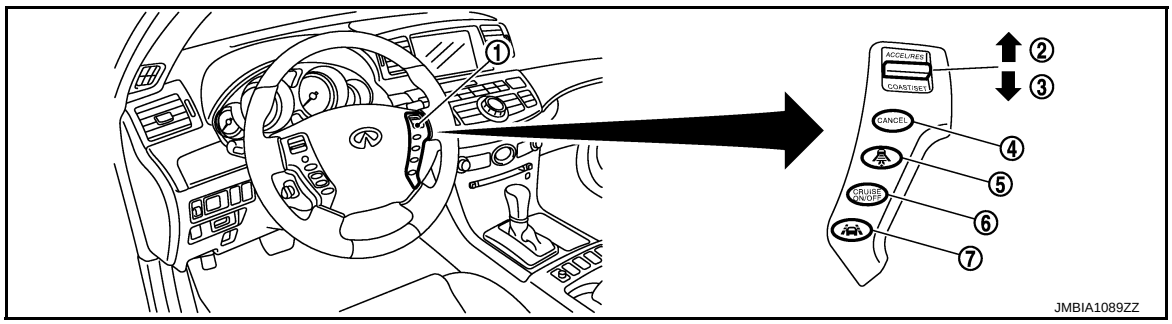


DTC P1564 ICC STEERING SWITCH

Component Description

INFOID:0000000005354362

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 ACS-9, "Outline" for the ICC function.



1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. DISTANCE switch
6. MAIN switch
7. LDP ON switch

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354363

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
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
DIST SW	• Ignition switch: ON	DISTANCE switch: Pressed	ON
		DISTANCE switch: Released	OFF

On Board Diagnosis Logic

INFOID:0000000005354364

This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564 1564	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

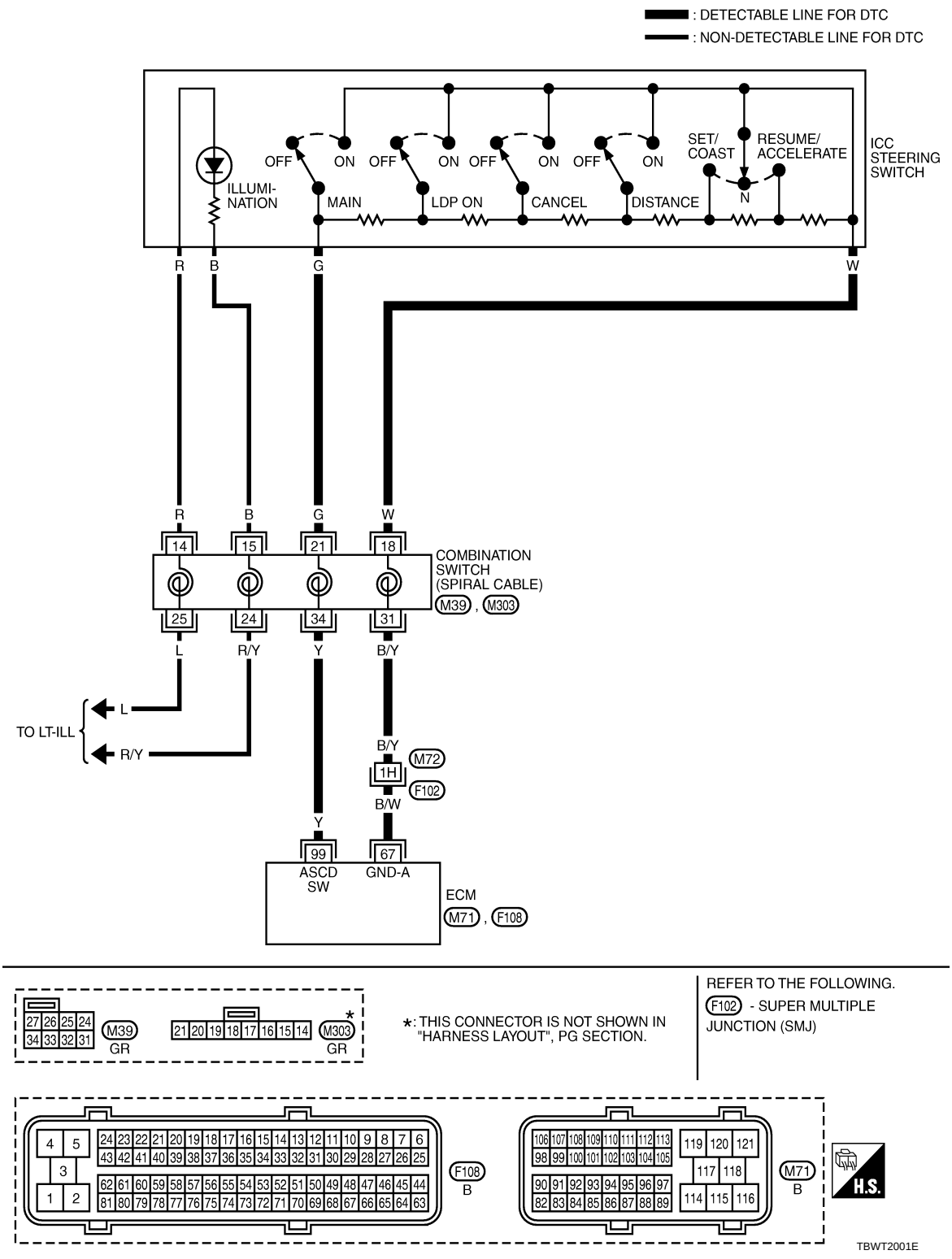
INFOID:0000000005354365

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 10 seconds.
3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Press DISTANCE switch for at least 10 seconds, then release it and wait at least 10 seconds.
8. Press LDP ON switch for at least 10 seconds, then release it and wait at least 10 seconds.
9. Check DTC.
10. If DTC is detected, go to EC-1189, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354366

EC-ICC/SW-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

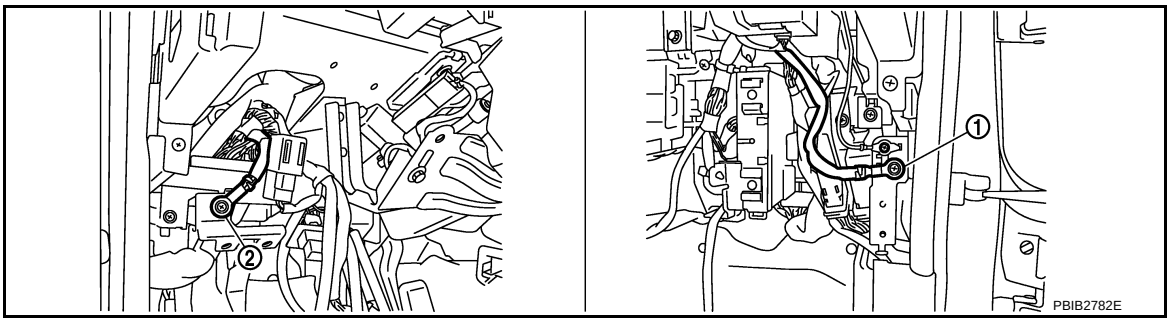
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
67	B/W	Sensor ground (ICC steering switch)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
99	Y	ICC steering switch	**[Ignition switch: ON]** • ICC steering switch: OFF	Approximately 4.3 V
			[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0 V
			[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1.9 V
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3.8 V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 3.3 V
			[Ignition switch: ON] • DISTANCE switch: Pressed	Approximately 2.6 V
			[Ignition switch: ON] • LDP ON switch: Pressed	Approximately 1.1 V

Diagnosis Procedure

INFOID:0000000005354367

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

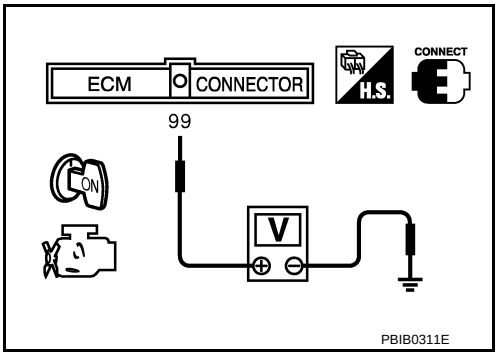
OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK ICC STEERING SWITCH CIRCUIT

1. Turn ignition switch ON.

2. Check voltage between ECM terminal 99 and ground with pressing each button.



Switch	Condition	Voltage (V)
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4.3
CANCEL switch	Pressed	Approx. 1.9
	Released	Approx. 4.3
RESUME/ACCELERATE switch	Pressed	Approx. 3.8
	Released	Approx. 4.3
SET/COAST switch	Pressed	Approx. 3.3
	Released	Approx. 4.3
DISTANCE switch	Pressed	Approx. 2.6
	Released	Approx. 4.3
LDP ON switch	Pressed	Approx. 1.1
	Released	Approx. 4.3

OK or NG

OK >> GO TO 8.
NG >> 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 harness continuity between combination switch terminal 18 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M72, F102
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or 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 harness continuity between ECM terminal 99 and combination switch terminal 21. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> 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 or short to ground or short to power in harness or connectors.

7. CHECK ICC STEERING SWITCH

Refer to EC-1191, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace ICC steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

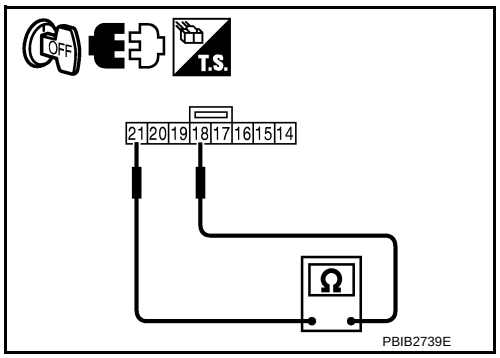
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354368

ICC STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector M303.
2. Check continuity between combination switch terminals 18 and 21 with pushing each switch.



Switch	Condition	Resistance (Ω)
MAIN switch	Pressed	Approx. 0
	Released	Approx. 5,410
CANCEL switch	Pressed	Approx. 610
	Released	Approx. 5,410
RESUME/ACCELERATE switch	Pressed	Approx. 3,000
	Released	Approx. 5,410
SET/COAST switch	Pressed	Approx. 1,800
	Released	Approx. 5,410
DISTANCE switch	Pressed	Approx. 1090
	Released	Approx. 5,410
LDP ON switch	Pressed	Approx. 270
	Released	Approx. 5,410

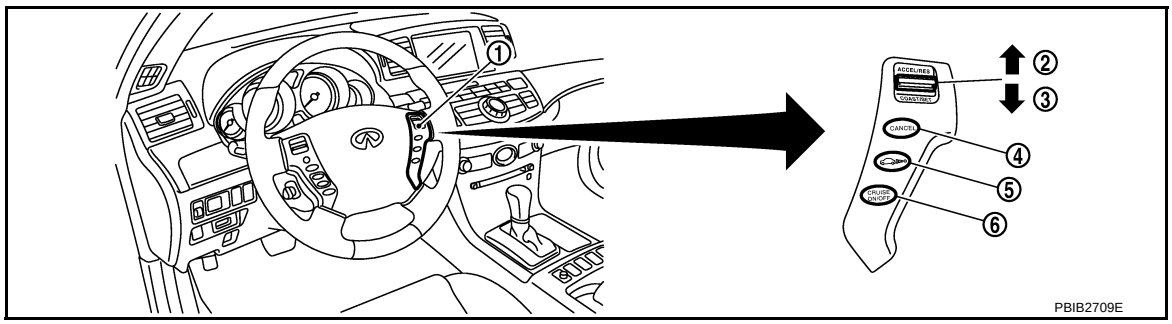
If NG, replace ICC steering switch.

DTC P1564 ASCD STEERING SWITCH

Component Description

INFOID:0000000005354369

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-717, "System Description" for the ASCD function.



1. ASCD steering switch
2. RESUME/ACCELERATE switch
3. SET/COAST switch
4. CANCEL switch
5. DISTANCE switch (Models with ICC)
6. MAIN switch

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354370

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
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

On Board Diagnosis Logic

INFOID:0000000005354371

This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
NOTE:
If DTC P1564 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1564 1564	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

INFOID:0000000005354372

1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

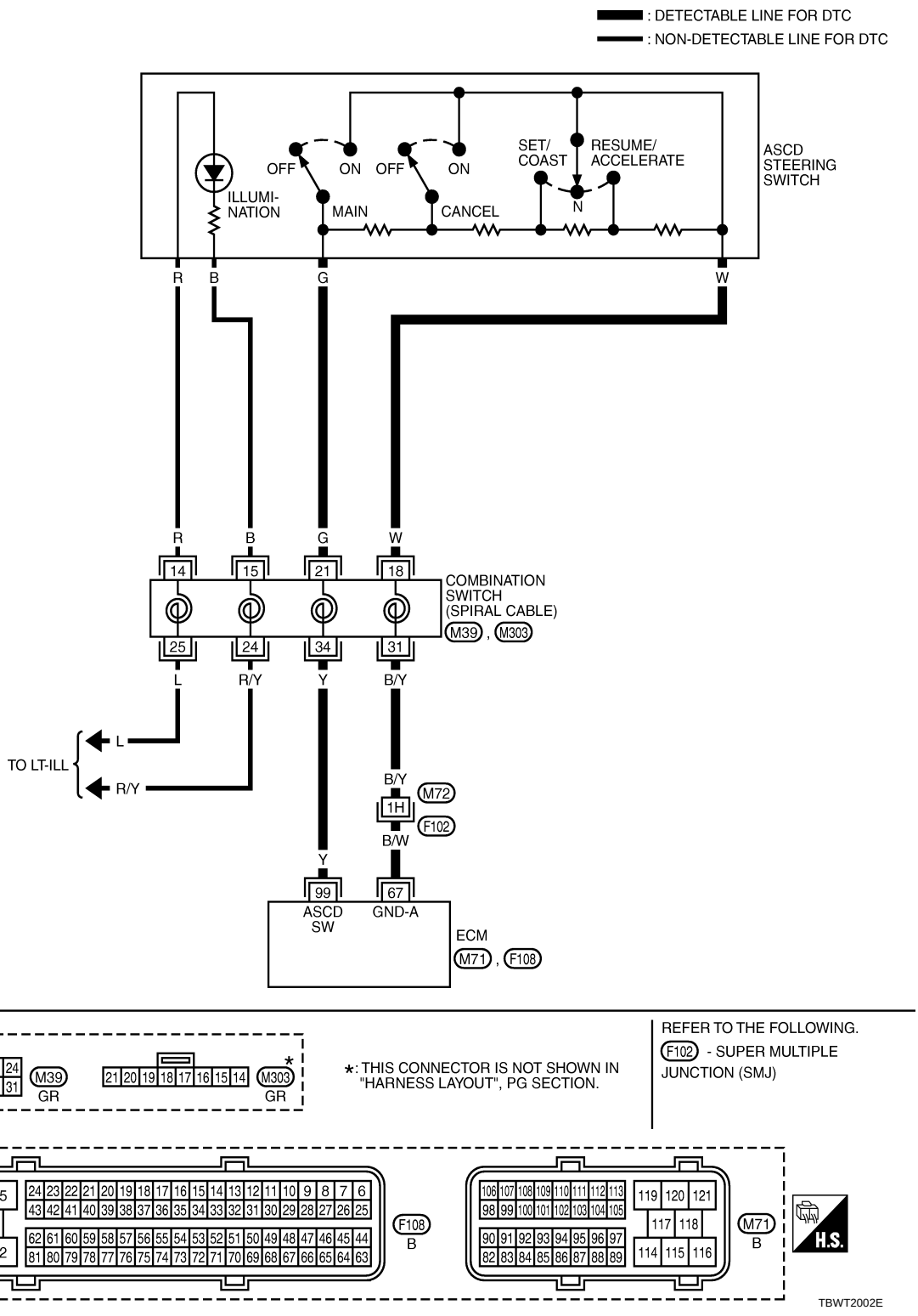
a. Turn ignition switch OFF and wait at least 10 seconds.

b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON and wait at least 10 seconds.
3. Press MAIN switch for at least 10 seconds, then release it and wait at least 10 seconds.
4. Press CANCEL switch for at least 10 seconds, then release it and wait at least 10 seconds.
5. Press RESUME/ACCELERATE switch for at least 10 seconds, then release it and wait at least 10 seconds.
6. Press SET/COAST switch for at least 10 seconds, then release it and wait at least 10 seconds.
7. Check DTC.
8. If DTC is detected, go to EC-1195, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354373

EC-ASC/SW-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

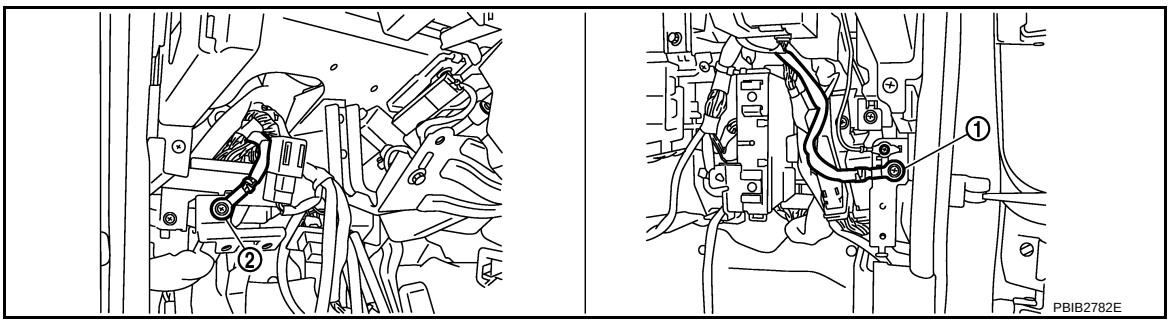
TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
67	B/W	Sensor ground (ASCD steering switch)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
99	Y	ASCD steering switch	**[Ignition switch: ON]** • ASCD steering switch: OFF	Approximately 4 V
			[Ignition switch: ON] • MAIN switch: Pressed	Approximately 0 V
			[Ignition switch: ON] • CANCEL switch: Pressed	Approximately 1 V
			[Ignition switch: ON] • RESUME/ACCELERATE switch: Pressed	Approximately 3 V
			[Ignition switch: ON] • SET/COAST switch: Pressed	Approximately 2 V

Diagnosis Procedure

INFOID:0000000005354374

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK ASCD STEERING SWITCH CIRCUIT

With CONSULT-III

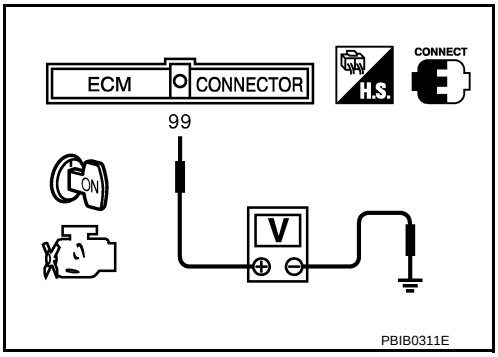
1. Turn ignition switch ON.
2. Select “MAIN SW”, “CANCEL SW”, “RESUME/ACC SW” and “SET SW” in “DATA MONITOR” mode with CONSULT-III.
3. Check each item indication under the following conditions.

Switch	Monitor item	Condition	Indication
MAIN switch	MAIN SW	Pressed	ON
		Released	OFF
CANCEL switch	CANCEL SW	Pressed	ON
		Released	OFF

Switch	Monitor item	Condition	Indication
RESUME/ACCELERATE switch	RESUME/ACC SW	Pressed	ON
		Released	OFF
SET/COAST switch	SET SW	Pressed	ON
		Released	OFF

Without CONSULT-III

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 99 and ground with pressing each button.



Switch	Condition	Voltage (V)
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4
CANCEL switch	Pressed	Approx. 1
	Released	Approx. 4
RESUME/ACCELERATE switch	Pressed	Approx. 3
	Released	Approx. 4
SET/COAST switch	Pressed	Approx. 2
	Released	Approx. 4

OK or NG

OK >> GO TO 8.
NG >> 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 harness continuity between combination switch terminal 18 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.

- Harness connectors M72, F102
- Combination switch (spiral cable)
- Harness for open and short between ECM and combination switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ASCD STEERING SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 99 and combination switch terminal 21. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> 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 or short to ground or short to power in harness or connectors.

7. CHECK ASCD STEERING SWITCH

Refer to EC-1197, "Component Inspection".

OK or NG

OK >> GO TO 8.
NG >> Replace ASCD steering switch.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

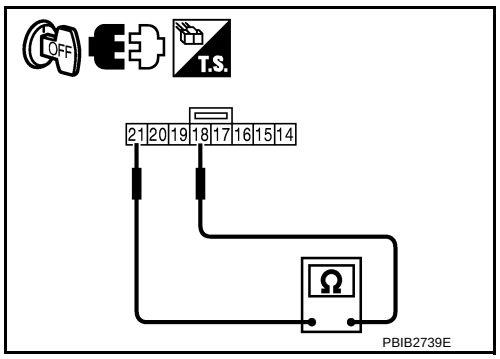
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354375

ASCD STEERING SWITCH

1. Disconnect combination switch (spiral cable) harness connector M303.
2. Check continuity between combination switch terminals 18 and 21 with pushing each switch.



Switch	Condition	Resistance (Ω)
MAIN switch	Pressed	Approx. 0
	Released	Approx. 4,000
CANCEL switch	Pressed	Approx. 250
	Released	Approx. 4,000
RESUME/ACCELERATE switch	Pressed	Approx. 1,480
	Released	Approx. 4,000
SET/COAST switch	Pressed	Approx. 660
	Released	Approx. 4,000

DTC P1568 ICC FUNCTION

On Board Diagnosis Logic

INFOID:0000000005354376

This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
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-1118, "DTC Confirmation Procedure".**
- **If DTC P1568 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-1120, "DTC Confirmation Procedure".**

DTC No.	Trouble Diagnosis Name	DTC Detecting Condition	Possible Cause
P1568 1568	ICC function	ECM detects a difference between signals from ICC 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

INFOID:0000000005354377

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
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 3 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.

1. Start engine (VDC switch OFF).
2. Press MAIN switch on ICC steering switch.
3. Drive the vehicle at more than 40 km/h (25 MPH).
4. Press SET/COAST switch.
5. Check DTC.
6. If DTC is detected, go to EC-1198, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354378

1.REPLACE ICC SENSOR INTEGRATED UNIT

1. Replace ICC sensor integrated unit.
2. Perform ACS-14, "ICC System Running Test".
3. Check DTC of ICC sensor integrated unit. Refer to ACS-40, "Diagnostic Trouble Code (DTC) Chart".

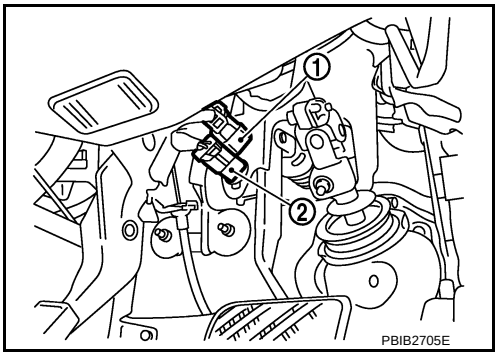
>> **INSPECTION END**

DTC P1572 ICC BRAKE SWITCH

Component Description

INFOID:0000000005354379

When the brake pedal is depressed, ICC brake switch (2) is turned OFF and stop lamp switch (1) is turned ON. ECM detects the state of the brake pedal by two kinds of input (ON/OFF signal).
Refer to ACS-9, "Outline" for the ICC function.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354380

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ICC brake switch)	• Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

INFOID:0000000005354381

This diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
NOTE:
- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".**
- **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 1572	ICC brake switch	A)	When the vehicle speed is above 30 km/h (19MPH), 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

INFOID:0000000005354382

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
- Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.
- 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:

Steps 3 to 6 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.

1. Start engine (VDC switch OFF).
2. Press MAIN switch and check that CRUISE lamp illuminates.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

Vehicle speed	More than 30 km/h (19 MPH)
Selector lever	Suitable position

4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to EC-1202, "Diagnosis Procedure".
   If 1st trip DTC is not detected, go to the following step.
6. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

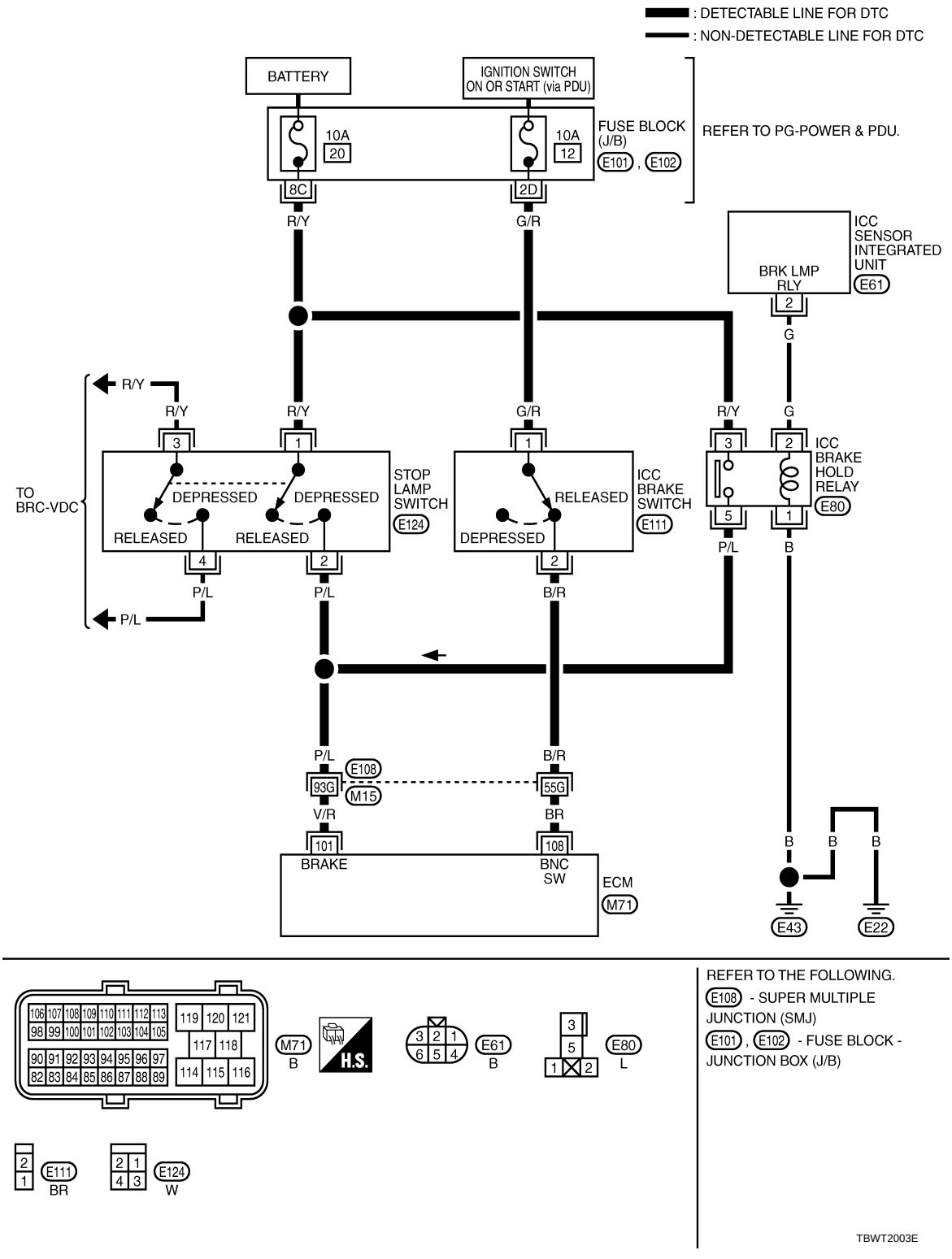
Vehicle speed	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1202, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354383

EC-ICC/BS-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	V/R	Stop lamp switch	**[Ignition switch: OFF]** • Brake pedal: Fully released	Approximately 0 V
			[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
108	BR	ICC brake switch	**[Ignition switch: ON]** • Brake pedal: Slightly depressed	Approximately 0 V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354384

1.CHECK OVERALL FUNCTION-I

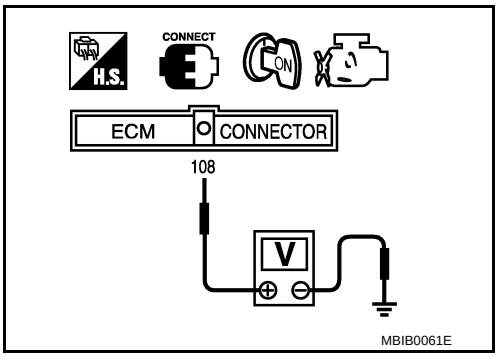
With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

CONDITION	INDICATION
Brake pedal: Fully released	ON
Brake pedal: Slightly depressed	OFF

Without CONSULT-III

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 108 and ground under the following conditions.



CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approximately 0 V

OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

With CONSULT-III

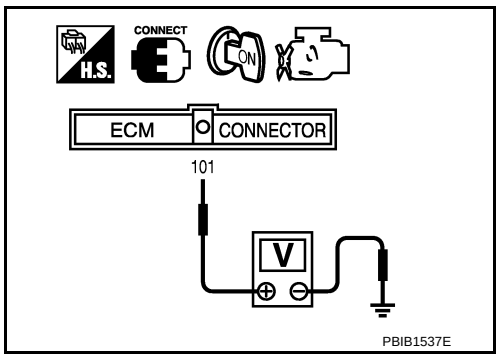
Check “BRAKE SW2” indication in “DATA MONITOR” mode.

CONDITION	INDICATION
Brake pedal: Fully released	OFF
Brake pedal: Slightly depressed	ON

Without CONSULT-III

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0 V
Brake pedal: Slightly depressed	Battery voltage

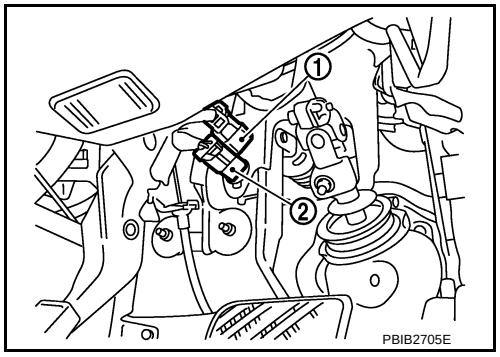


OK or NG

OK >> GO TO 15.
NG >> GO TO 8.

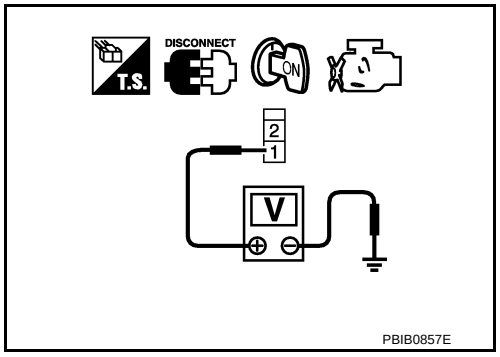
3. CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch (2) harness connector.
- Stop lamp switch (1)
3. Turn ignition switch ON.



4. Check voltage between ICC brake switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E102
- 10 A fuse
- Harness for open or short between ICC brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ICC brake switch terminal 2 and ECM terminal 108. Refer Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ICC BRAKE SWITCH

Refer to EC-1206, "Component Inspection".

OK or NG

OK >> GO TO 15.
NG >> Replace ICC brake switch.

8. CHECK DTC WITH ICC SENSOR INTEGRATED UNIT

Refer to ACS-35, "Self-Diagnostic Function".

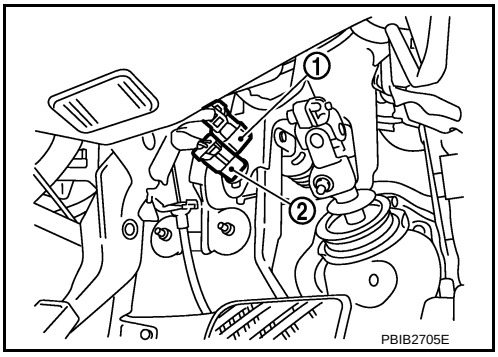
OK or NG

OK >> GO TO 9.
NG >> Repair or replace malfunctioning part.

9. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

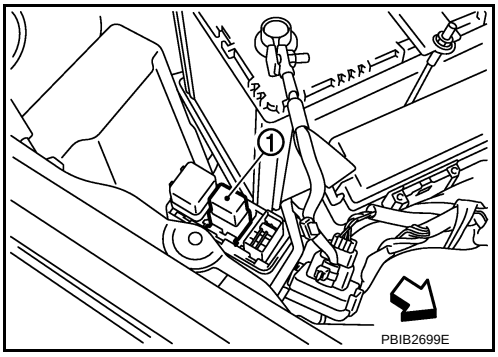
1. Turn ignition switch OFF.
2. Disconnect stop lamp switch (1) harness connector.

- ICC brake switch (2)



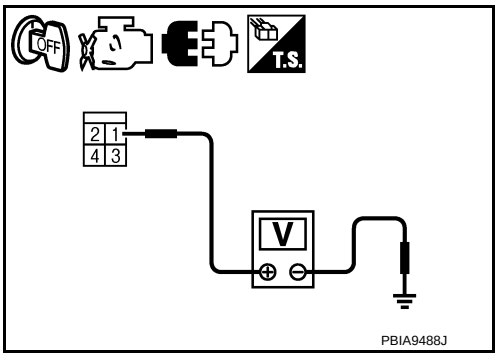
3. Disconnect ICC brake hold relay (1) harness connector.

- ⇦: Vehicle front

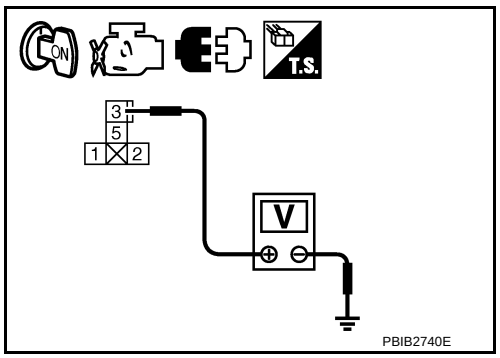


4. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



5. Check voltage between ICC brake hold relay terminal 3 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E101
- 10 A fuse
- 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 or short to power in harness or connectors.

11. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between the following;
   ECM terminal 101 and stop lamp switch terminal 2,
   ECM terminal 101 and ICC brake hold relay terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 13.
NG >> GO TO 12.

12. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- 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 or short to ground or short to power in harness or connectors.

13. CHECK STOP LAMP SWITCH

Refer to EC-1206, "Component Inspection".

OK or NG

OK >> GO TO 14.
NG >> Replace stop lamp switch.

14. CHECK ICC BRAKE HOLD RELAY

Refer to EC-1206, "Component Inspection".

OK >> GO TO 15.
NG >> Replace ICC brake hold relay.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

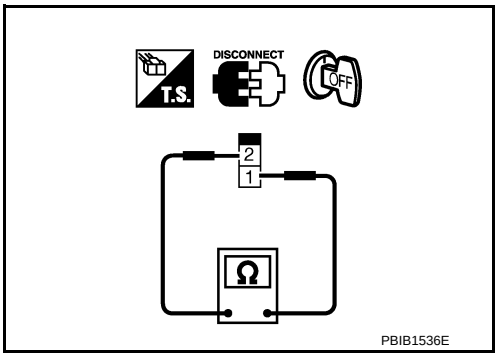
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354385

ICC BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.
3. Check continuity between ICC brake switch terminals 1 and 2 under the following conditions.

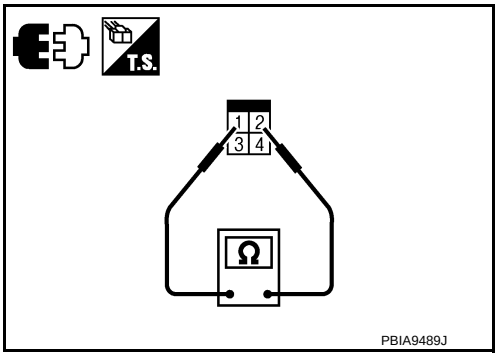


Condition	Continuity
Brake pedal: Fully released	Should exist
Brake pedal: Slightly depressed	Should not exist

4. If NG, adjust ICC brake switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.

STOP LAMP SWITCH

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

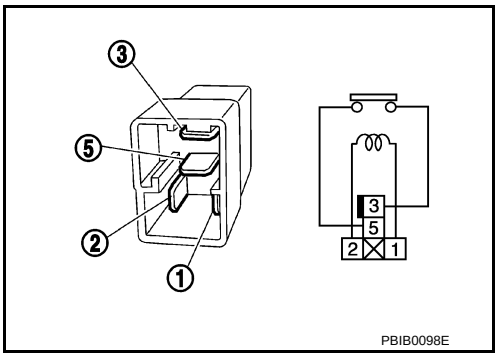


Condition	Continuity
Brake pedal: Fully released	Should not exist
Brake pedal: Slightly depressed	Should exist

4. If NG, adjust stop lamp switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.

ICC BRAKE HOLD RELAY

1. Check continuity between ICC brake hold relay terminals 3 and 5 under the following conditions.



Condition	Continuity
12 V direct current supply between terminals 1 and 2	Should not exist
No current supply	Should exist

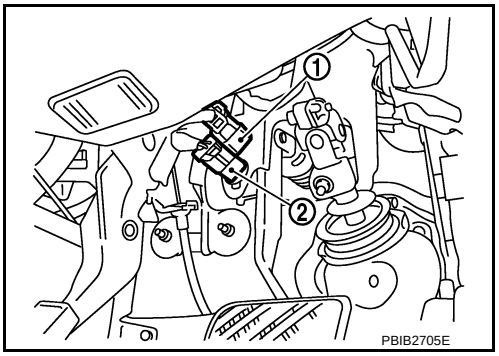
2. If NG, replace ICC brake hold relay.

DTC P1572 ASCD BRAKE SWITCH

Component Description

INFOID:0000000005354386

When the brake pedal is depressed, ASCD brake switch (2) is turned OFF and stop lamp switch (1) is turned ON. ECM detects the state of the brake pedal by two kinds of input (ON/OFF signal).
Refer to EC-717, "System Description" for the ASCD function.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354387

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (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

On Board Diagnosis Logic

INFOID:0000000005354388

This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
NOTE:
- **If DTC P1572 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".**
- **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 1572	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

INFOID:0000000005354389

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
- Procedure for malfunction B is not described here. It takes extremely long time to complete procedure for malfunction B. By performing procedure for malfunction A, the incident that causes malfunction B can be detected.
- 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:

Steps 4 to 6 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.

1. Start engine (VDC switch OFF).
2. Press MAIN switch and check that CRUISE lamp illuminate.
3. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

Vehicle speed	More than 30 km/h (19 MPH)
Selector lever	Suitable position

4. Check 1st trip DTC.
5. If 1st trip DTC is detected, go to EC-1210, "Diagnosis Procedure".
   If 1st trip DTC is not detected, go to the following step.
6. Drive the vehicle for at least 5 consecutive seconds under the following conditions.

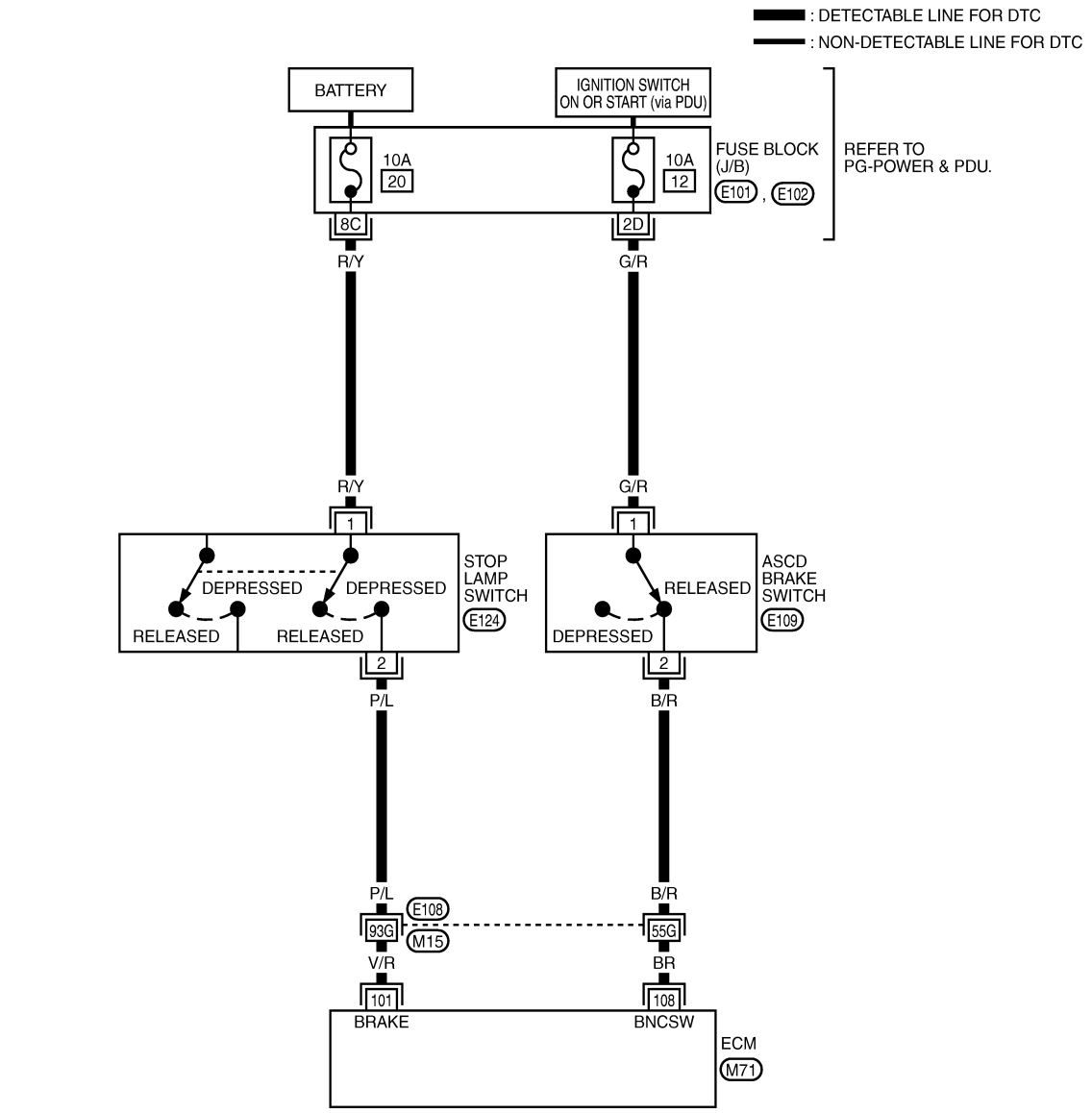
Vehicle speed	More than 30 km/h (19 MPH)
Selector lever	Suitable position
Driving location	Depress the brake pedal for more than 5 seconds so as not to come off from the above-mentioned vehicle speed.

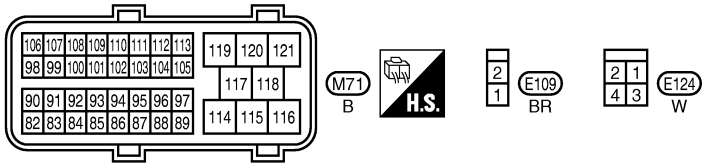
7. Check 1st trip DTC.
8. If 1st trip DTC is detected, go to EC-1210, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354390

EC-ASC/BS-01





REFER TO THE FOLLOWING.
E108 - SUPER MULTIPLE JUNCTION (SMJ)
E101, E102 - FUSE BLOCK - JUNCTION BOX (J/B)

TBWT2004E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	V/R	Stop lamp switch	**[Ignition switch: OFF]** • Brake pedal: Fully released	Approximately 0 V
			[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
108	BR	ASCD brake switch	**[Ignition switch: ON]** • Brake pedal: Slightly depressed	Approximately 0 V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354391

1.CHECK OVERALL FUNCTION-I

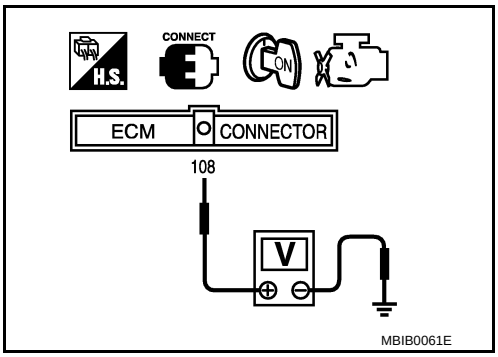
With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

CONDITION	INDICATION
Brake pedal: Fully released	ON
Brake pedal: Slightly depressed	OFF

Without CONSULT-III

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 108 and ground under the following conditions.



CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approximately 0 V

OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2.CHECK OVERALL FUNCTION-II

With CONSULT-III

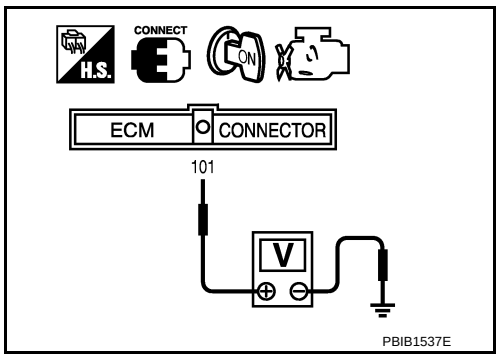
Check “BRAKE SW2” indication in “DATA MONITOR” mode.

CONDITION	INDICATION
Brake pedal: Fully released	OFF
Brake pedal: Slightly depressed	ON

Without CONSULT-III

Check voltage between ECM terminal 101 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Approximately 0 V
Brake pedal: Slightly depressed	Battery voltage

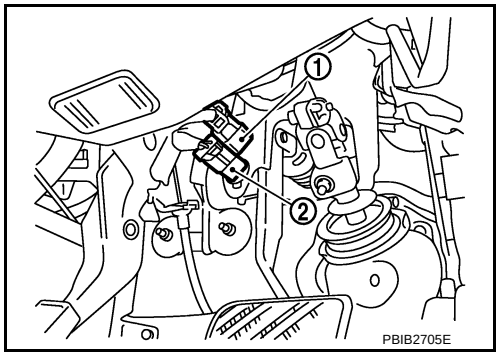


OK or NG

OK >> GO TO 13.
NG >> GO TO 8.

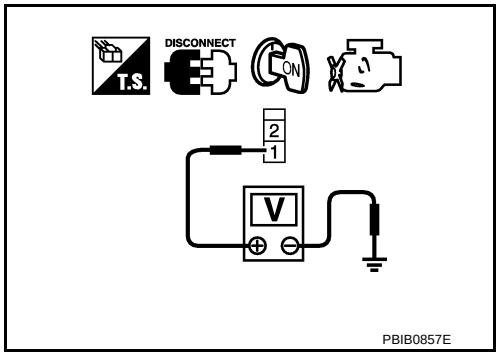
3. CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch (2) harness connector.
- Stop lamp switch (1)
3. Turn ignition switch ON.



4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E102
- 10 A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK ASCD BRAKE SWITCH

Refer to EC-1213, "Component Inspection"

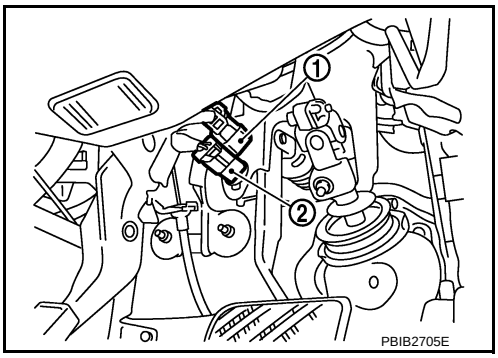
OK or NG

OK >> GO TO 13.
NG >> Replace ASCD brake switch.

8. CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch (1) harness connector.

- ASCD brake switch (2)

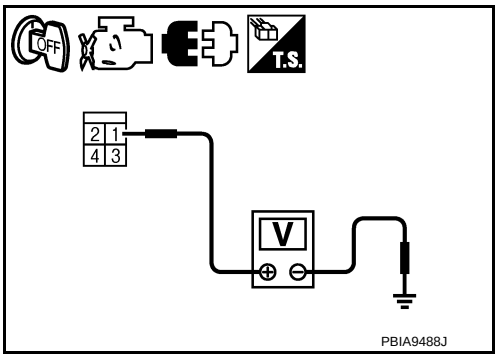


3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT -III or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.



9. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E101
- 10 A fuse
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.

NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK STOP LAMP SWITCH

Refer to EC-1213, "Component Inspection"

OK or NG

OK >> GO TO 13.
NG >> Replace stop lamp switch.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

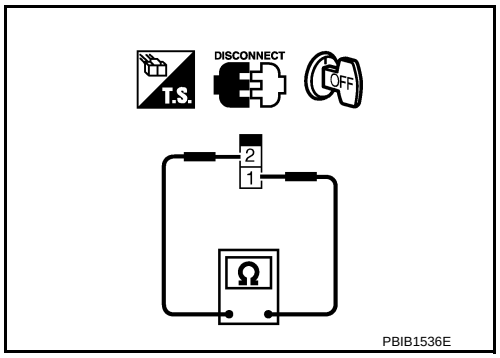
Component Inspection

INFOID:0000000005354392

ASCD BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.
3. Check continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should exist
Brake pedal: Slightly depressed	Should not exist

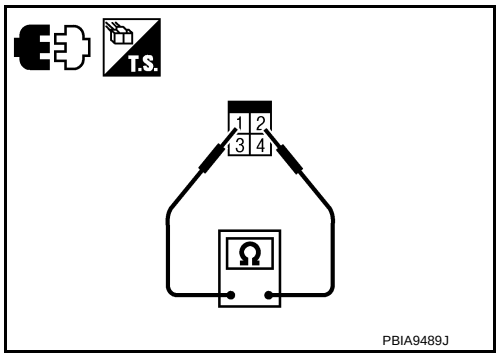


4. If NG, adjust ASCD brake switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.

STOP LAMP SWITCH

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should not exist
Brake pedal: Slightly depressed	Should exist



4. If NG, adjust stop lamp switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.

DTC P1574 ICC VEHICLE SPEED SENSOR

Component Description

INFOID:0000000005354393

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 ICC control. Refer to ACS-9, "Outline" for ICC functions.

On Board Diagnosis Logic

INFOID:0000000005354394

This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
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-1103, "DTC Confirmation Procedure".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-1120, "DTC Confirmation Procedure".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574 1574	ICC vehicle speed sensor	Thethe difference between 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

INFOID:0000000005354395

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
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 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25MPH).
3. Check DTC.
4. If DTC is detected, go to EC-1214, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354396

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-47, "OBD-II Diagnostic Trouble Code (DTC)".

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-30, "CONSULT-III Function (ABS)".

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

>> **INSPECTION END**

DTC P1574 ASCD VEHICLE SPEED SENSOR

Component Description

INFOID:0000000005354397

The ECM receives two vehicle speed sensor 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-717, "System Description" for ASCD functions.

On Board Diagnosis Logic

INFOID:0000000005354398

This self-diagnosis has the one trip detection logic.
The MIL will not illuminate for this diagnosis.
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-1103, "DTC Confirmation Procedure".**
- **If DTC P1574 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".**
- **If DTC P1574 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-1120, "DTC Confirmation Procedure".**

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1574 1574	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

INFOID:0000000005354399

CAUTION:
Always drive vehicle at a safe speed.
NOTE:
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 2 may be conducted with the drive wheels lifted in the shop or by driving the vehicle. If a road test is expected to be easier, it is unnecessary to lift the vehicle.

1. Start engine (VDC switch OFF).
2. Drive the vehicle at more than 40 km/h (25 MPH).
3. Check DTC.
4. If DTC is detected, go to EC-1216, "Diagnosis Procedure".

Diagnosis Procedure

INFOID:0000000005354400

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-47, "OBD-II Diagnostic Trouble Code (DTC)".

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2.CHECK DTC WITH “ABS ACTUATOR AND ELECTRIC UNIT (CONTROL UNIT)”

Refer to BRC-30, "CONSULT-III Function (ABS)".

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

>> **INSPECTION END**

DTC P1715 INPUT SPEED SENSOR

Description

INFOID:0000000005354401

ECM receives input speed sensor signal from TCM via the CAN communication line. ECM uses this signal for engine control.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354402

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
I/P PULLY SPD	• Vehicle speed: More than 20 km/h (12 MPH)	Almost the same speed as the tachometer indication

On Board Diagnosis Logic

INFOID:0000000005354403

NOTE:
- **If DTC P1715 is displayed with DTC UXXXX, first perform the trouble diagnosis for DTC UXXXX.**
- **If DTC P1715 is displayed with DTC P0335, first perform the trouble diagnosis for DTC P0335. Refer to EC-1014, "DTC Confirmation Procedure".**
- **If DTC P1715 is displayed with DTC P0340, first perform the trouble diagnosis for DTC P0340. Refer to EC-1020, "DTC Confirmation Procedure".**
- **If DTC P1715 is displayed with DTC P0605, first perform the trouble diagnosis for DTC P0605. Refer to EC-1118, "DTC Confirmation Procedure".**
- **If DTC P1715 is displayed with DTC P0607, first perform the trouble diagnosis for DTC P0607. Refer to EC-1120, "DTC Confirmation Procedure".**

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1715 1715	Input speed sensor (TCM output)	Input speed sensor signal is different from the theoretical value calculated by ECM from output shaft revolution signal and engine rpm signal.	• Harness or connectors (The CAN communication line is open or shorted) • Harness or connectors (Input speed sensor circuit is open or shorted) • TCM

Diagnosis Procedure

INFOID:0000000005354404

1.CHECK DTC WITH TCM

Check DTC with TCM. Refer to AT-47, "OBD-II Diagnostic Trouble Code (DTC)".

OK or NG

OK >> GO TO 2.
NG >> Perform trouble shooting relevant to DTC indicated.

2.REPLACE TCM

Replace TCM.

>> **INSPECTION END**

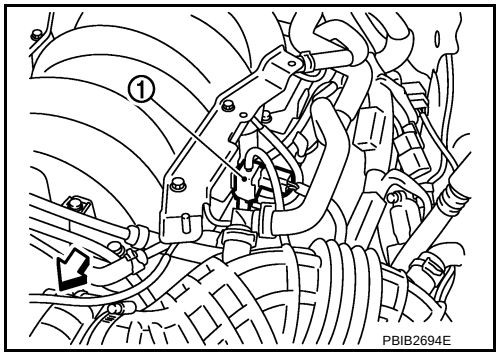
DTC P1800 VIAS CONTROL SOLENOID VALVE

Component Description

INFOID:0000000005354405

The VIAS control solenoid valve (1) cuts the intake manifold vacuum signal for power valve actuator. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and sends the vacuum signal to the power valve actuator.

- ⇦: Vehicle front



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354406

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
VIAS S/V-1	• Selector lever position: P or N • Engine speed: More than 5,000 rpm	ON
	• Selector lever position: Except P or N • Engine speed: Less than 5,000 rpm	OFF

On Board Diagnosis Logic

INFOID:0000000005354407

The MIL will not illuminate for this self-diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1800 1800	VIAS control solenoid valve circuit	An excessively low or high voltage signal is sent to ECM through the valve	• Harness or connectors (The solenoid valve circuit is open or shorted.) • VIAS control solenoid valve

DTC Confirmation Procedure

INFOID:0000000005354408

NOTE:
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.

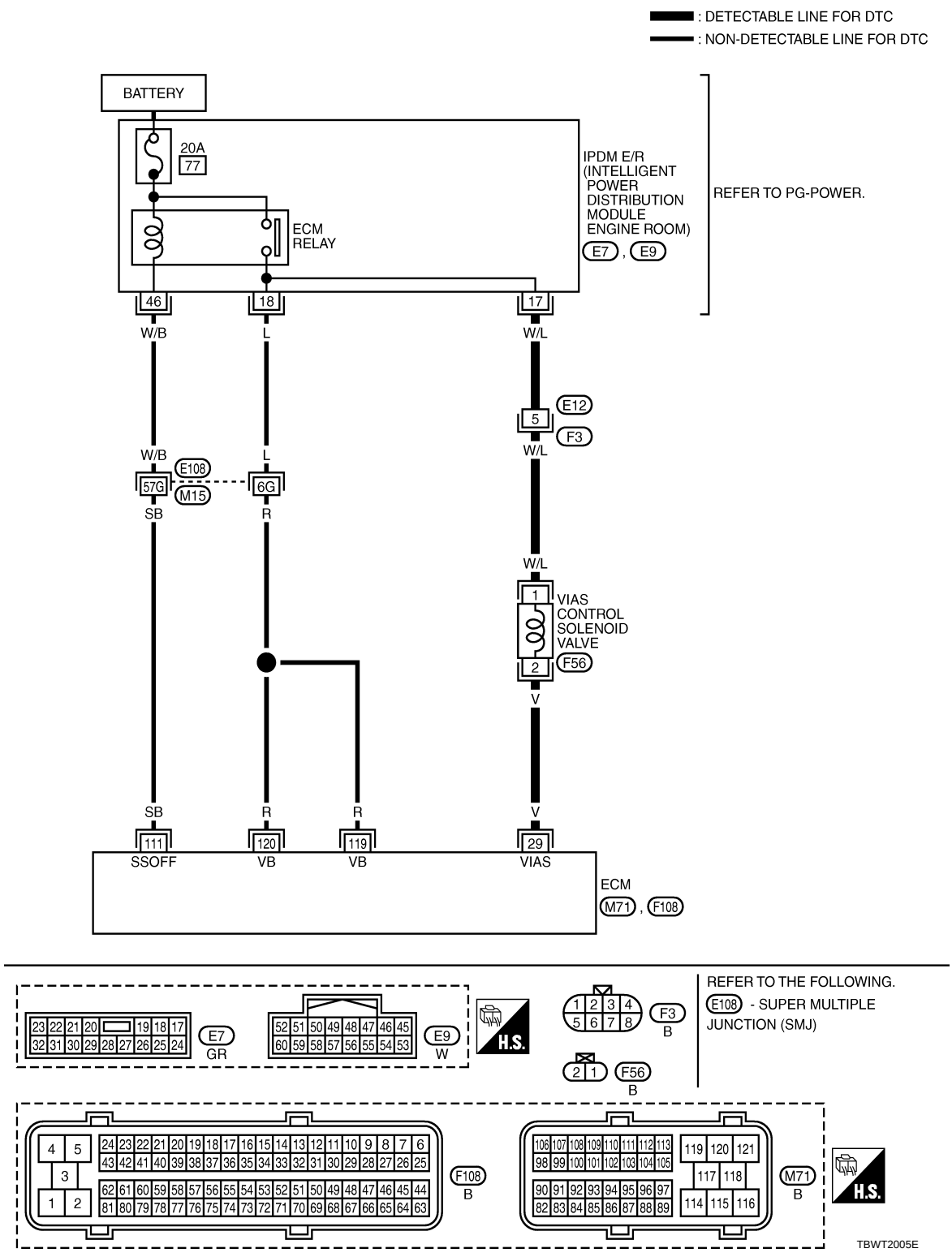
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is between 11 V at idle.

1. Start engine and let it idle for at least 5 seconds.
2. Check 1st trip DTC.
3. If 1st trip DTC is detected, go to EC-1221, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354409

EC-VIAS/V-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
29	V	VIAS control solenoid valve	**[Engine is running]** • Selector lever position: P or N	0 - 1.0 V
			[Engine is running] • Selector lever position: D • Engine speed: Below 5,000 rpm	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • Engine speed: Above 5,000 rpm	0 - 1.0 V
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

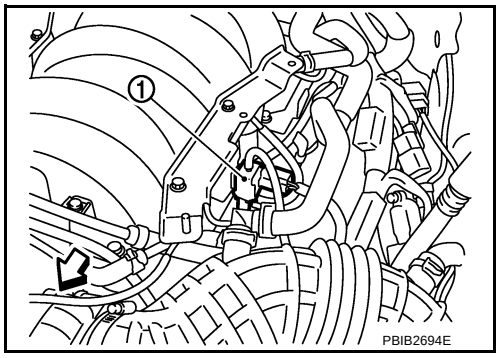
INFOID:0000000005354410

1. CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect VIAS control solenoid (1) valve harness connector.

- ⇦: Vehicle front

3. Turn ignition switch ON.

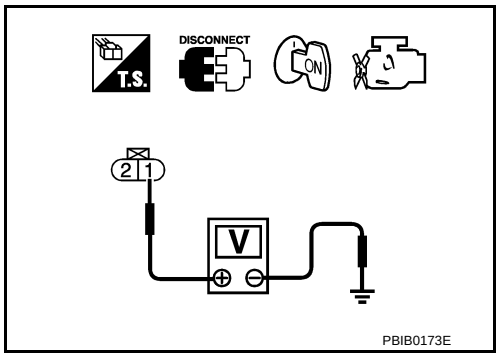


4. Check voltage between terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 3.
NG >> GO TO 2.



2. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- Harness for open or short between VIAS control solenoid valve and IPDM E/R

>> Repair or replace harness or connectors.

3. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and VIAS control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

4.CHECK VIAS CONTROL SOLENOID VALVE

Refer to EC-1222, "Component Inspection".

OK or NG

OK >> GO TO 5.
NG >> Replace VIAS control solenoid valve.

5.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354411

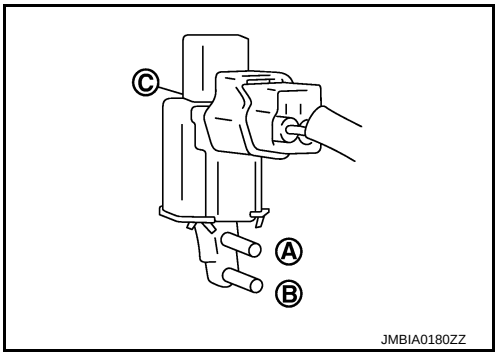
VIAS CONTROL SOLENOID VALVE

With CONSULT-III

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VIAS S/V-1” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time under the following conditions.

Condition VIAS S/V-1	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

Operation takes less than 1 second.



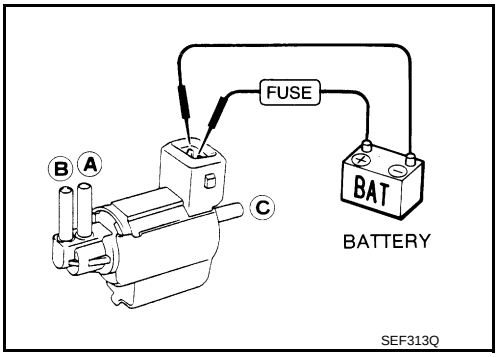
JMBIA0180ZZ

Without CONSULT-III

Check air passage continuity and operation delay time under the following conditions.

Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12 V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

Operation takes less than 1 second.



SEF313Q

Removal and Installation

INFOID:0000000005354412

VIAS CONTROL SOLENOID VALVE

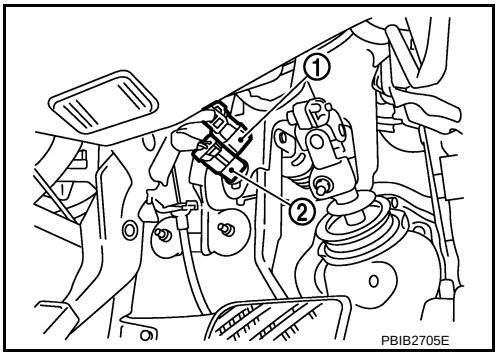
Refer to EM-174, "Component".

DTC P1805 BRAKE SWITCH

Component Description

INFOID:0000000005354413

Brake switch signal is applied to the ECM through the stop lamp switch (1) when the brake pedal is depressed. This signal is used mainly to decrease the engine speed when the vehicle is being driven.
- ICC brake switch (models with ICC) (2)
- ASCD brake switch (models with ASCD) (2)



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354414

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

On Board Diagnosis Logic

INFOID:0000000005354415

The MIL will not illuminate for this diagnosis.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P1805 1805	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

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode.

Engine operating condition in fail-safe mode	
ECM controls the electric throttle control actuator by regulating the throttle opening to a small range. Therefore, acceleration will be poor.	
Vehicle condition	Driving condition
When engine is idling	Normal
When accelerating	Poor acceleration

DTC Confirmation Procedure

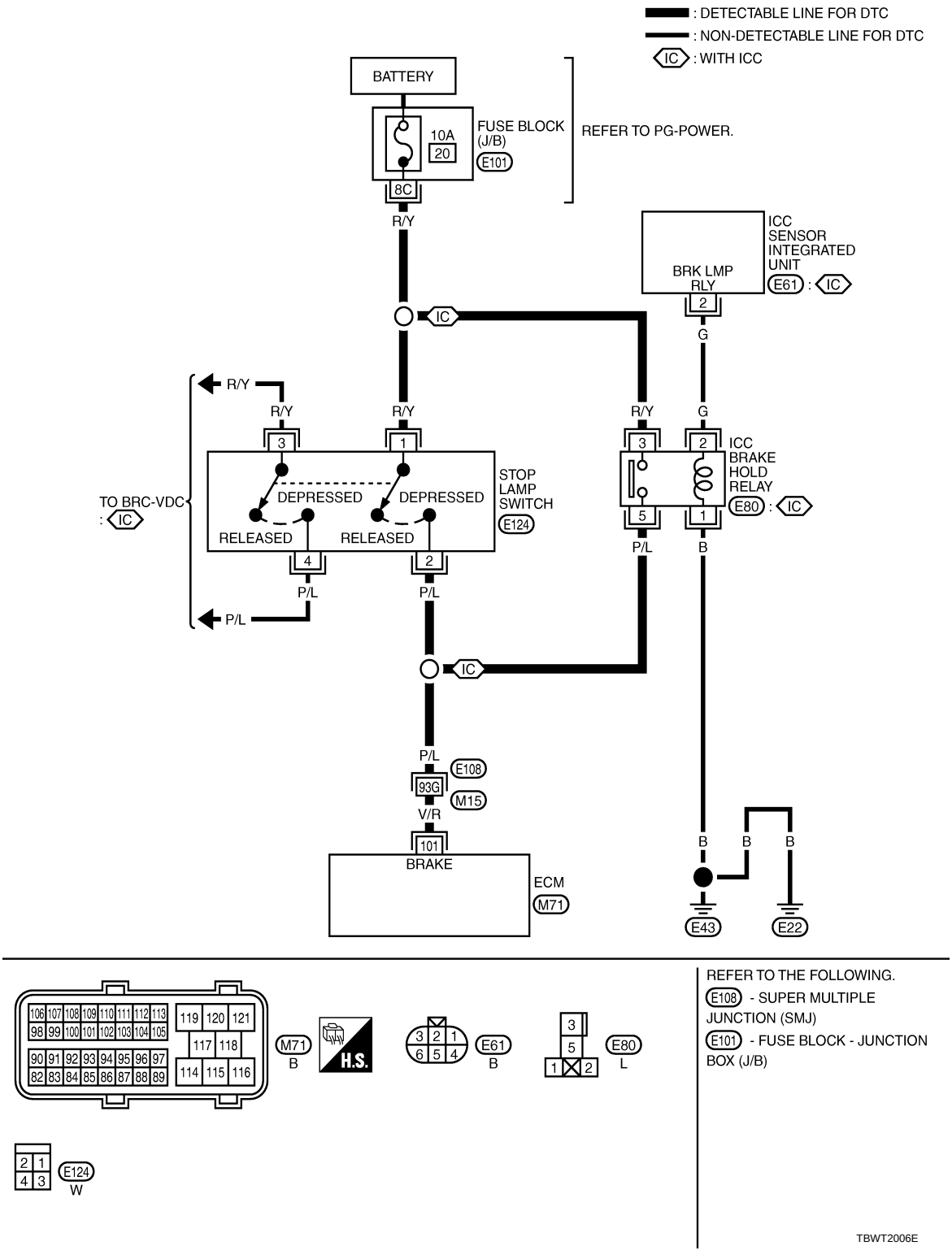
INFOID:0000000005354416

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.
5. If 1st trip DTC is detected, go to EC-1226, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354417

EC-BRK/SW-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	V/R	Stop lamp switch	**[Ignition switch: OFF]** • Brake pedal: Fully released	Approximately 0 V
			[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354418

ICC MODELS

1.CHECK DTC WITH ICC SENSOR INTEGRATED UNIT

Refer to ACS-35, "Self-Diagnostic Function".

OK or NG

OK >> GO TO 2.
NG >> Repair or replace malfunctioning part.

2.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

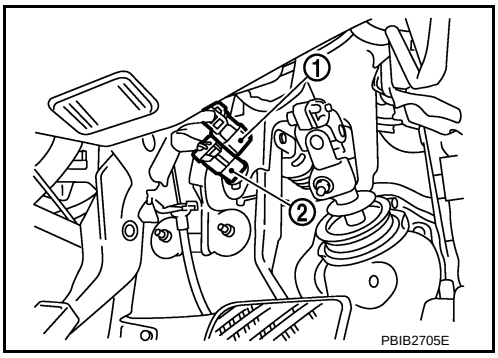
Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

OK or NG

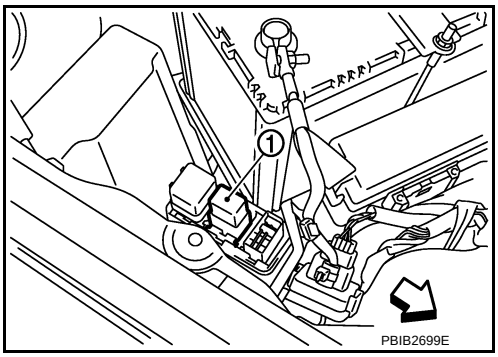
OK >> GO TO 5.
NG >> GO TO 3.

3.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch (1) harness connector.
- ICC brake switch (2)

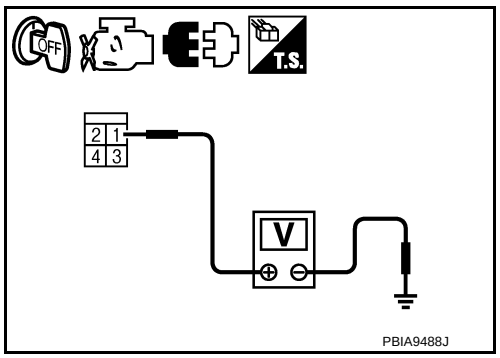


2. Disconnect ICC brake hold relay (1) harness connector.
- ⇦: Vehicle front



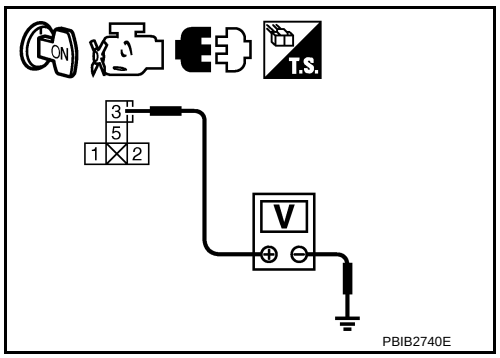
3. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



4. Check voltage between ICC brake hold relay terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E101
- 10 A fuse
- 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 or short to power in harness or connectors.

5. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between the following;
   ECM terminal 101 and stop lamp switch terminal 2,
   ECM terminal 101 and ICC brake hold relay terminal 5.
   Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- 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 or short to ground or short to power in harness or connectors.

7. CHECK STOP LAMP SWITCH

Refer to EC-1229, "Component Inspection".

OK or NG

OK >> GO TO 8.

NG >> Replace stop lamp switch.

8.CHECK ICC BRAKE HOLD RELAY

Refer to EC-1229, "Component Inspection".

OK >> GO TO 9.
NG >> Replace ICC brake hold relay.

9.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

ASCD MODELS

1.CHECK STOP LAMP SWITCH CIRCUIT

1. Turn ignition switch OFF.
2. Check the stop lamp when depressing and releasing the brake pedal.

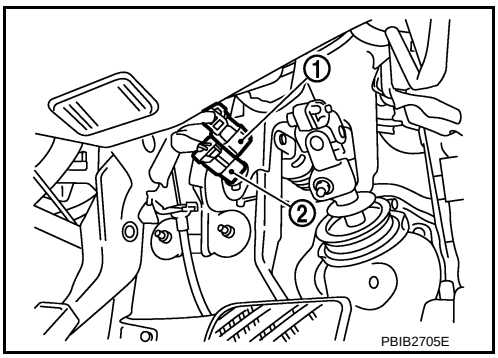
Brake pedal	Stop lamp
Fully released	Not illuminated
Slightly depressed	Illuminated

OK or NG

OK >> GO TO 4.
NG >> GO TO 2.

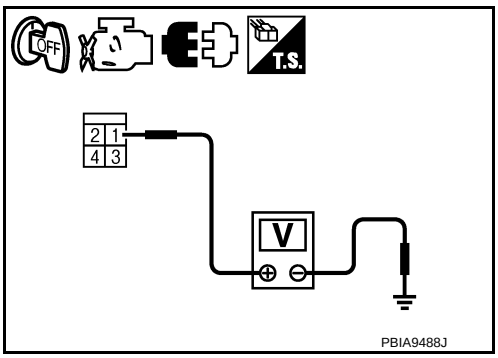
2.CHECK STOP LAMP SWITCH POWER SUPPLY CIRCUIT

1. Disconnect stop lamp switch (1) harness connector.
- ASCD brake switch (2)



2. Check voltage between stop lamp switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3.DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E101
- 10 A fuse
- Harness for open or short between stop lamp switch and battery

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK STOP LAMP SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminal 101 and stop lamp switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and stop lamp switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK STOP LAMP SWITCH

Refer to EC-1229, "Component Inspection".

OK or NG

OK >> GO TO 7.
NG >> Replace stop lamp switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

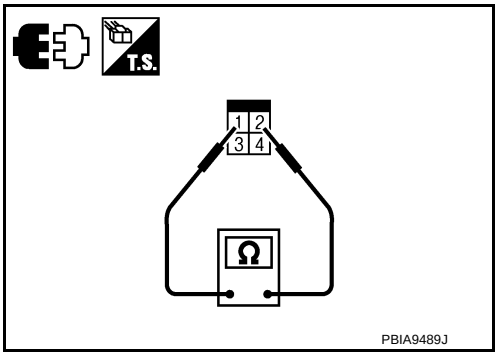
Component Inspection

INFOID:0000000005354419

STOP LAMP SWITCH

1. Turn ignition switch OFF.
2. Disconnect stop lamp switch harness connector.
3. Check continuity between stop lamp switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should not exist
Brake pedal: Slightly depressed	Should exist



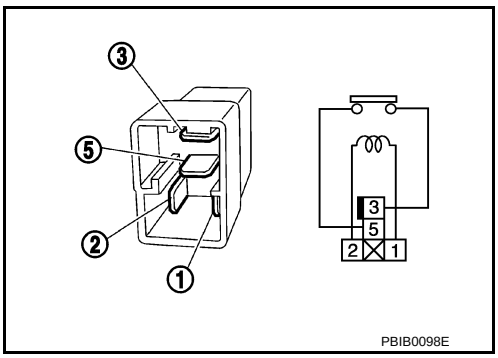
4. If NG, adjust stop lamp switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.

ICC BRAKE HOLD RELAY

1. Check continuity between ICC brake hold relay terminals 3 and 5 under the following conditions.

Condition	Continuity
12 V direct current supply between terminals 1 and 2	Should not exist
No current supply	Should exist

2. If NG, replace ICC brake hold relay.



DTC P2100, P2103 THROTTLE CONTROL MOTOR RELAY

Component Description

INFOID:0000000005354420

Power supply for the throttle control motor is provided to the ECM via throttle control motor relay. The throttle control motor relay is controlled ON/OFF 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.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354421

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
THRTL RELAY	• Ignition switch: ON	ON

On Board Diagnosis Logic

INFOID:0000000005354422

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2100 2100	Throttle control motor relay circuit open	ECM detects that the voltage of power source for throttle control motor is excessively low.	• Harness or connectors (Throttle control motor relay circuit is open) • Throttle control motor relay
P2103 2103	Throttle control motor relay circuit short	ECM detects that the throttle control motor relay is stuck ON.	• Harness or connectors (Throttle control motor relay circuit is shorted) • Throttle control motor relay

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:0000000005354423

NOTE:
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.

PROCEDURE FOR DTC P2100

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.
4. If DTC is detected, go to EC-1233, "Diagnosis Procedure".

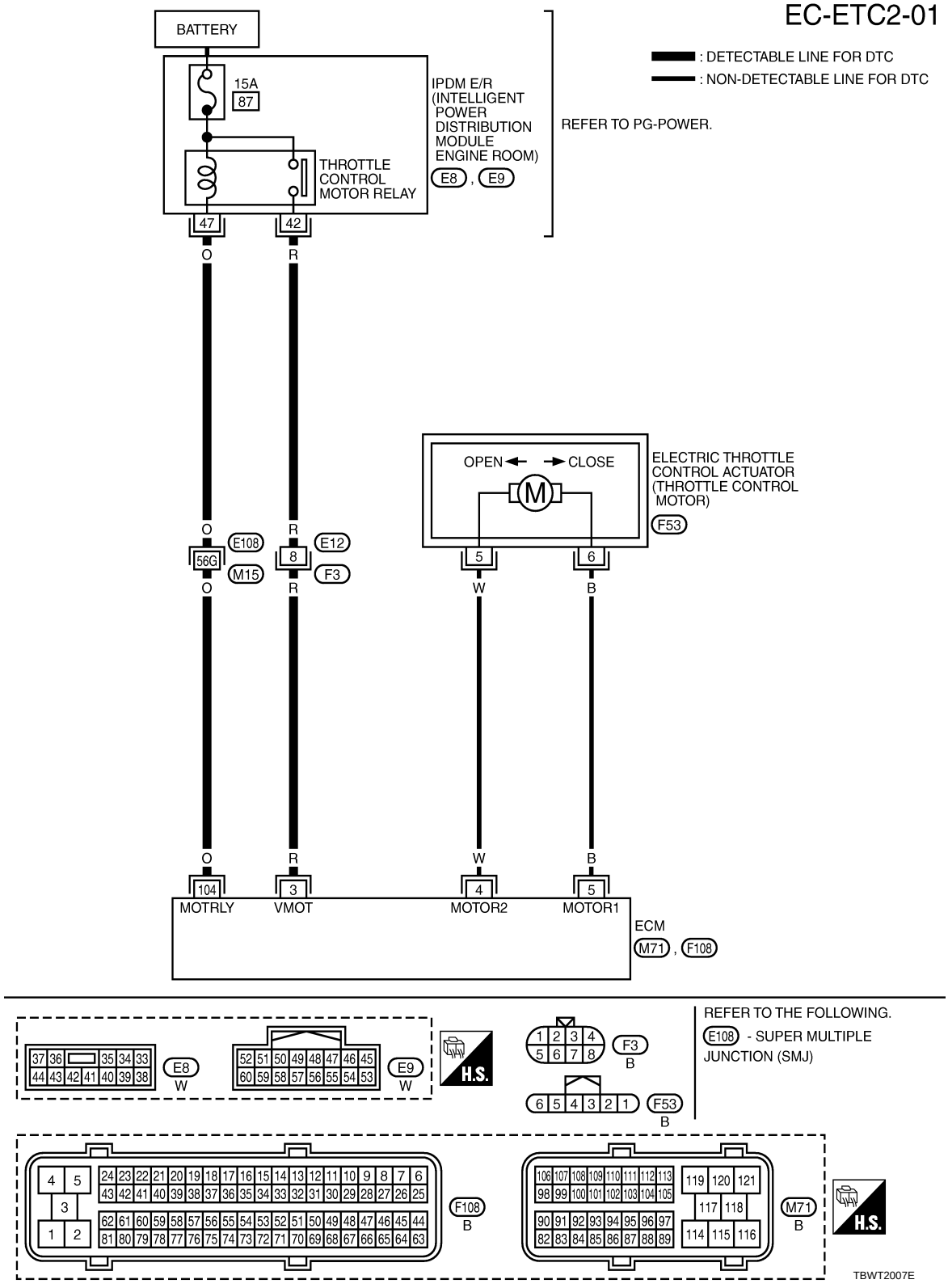
PROCEDURE FOR DTC P2103

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 8 V.

1. Turn ignition switch ON and wait at least 1 second.
2. Check DTC.
3. If DTC is detected, go to EC-1233, "Diagnosis Procedure".

Wiring Diagram

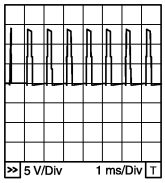
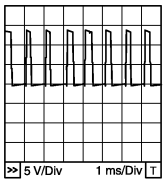
INFOID:0000000005354424



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
4	W	Throttle control motor (Close)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Released	0 - 14 V★  PBIB1104E
5	B	Throttle control motor (Open)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	0 - 14 V★  PBIB1105E
104	O	Throttle control motor relay	**[Ignition switch: OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch: ON]	0 - 1.0 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354425

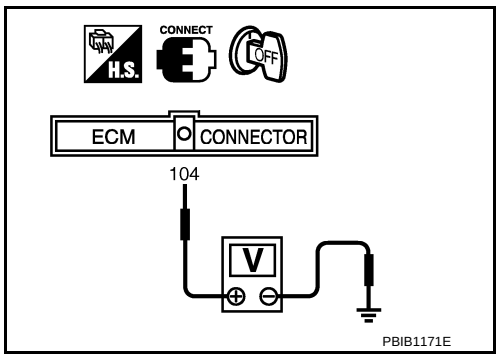
1. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Check voltage between ECM terminal 104 and ground with CONSULT-III or tester.

Voltage: Battery voltage

OK or NG

OK >> GO TO 5.
NG >> GO TO 2.



PBIB1171E

2. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E9.
3. Check continuity between ECM terminal 104 and IPDM E/R terminal 47. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK FUSE

1. Disconnect 15 A fuse.
2. Check if 15 A fuse is blown.

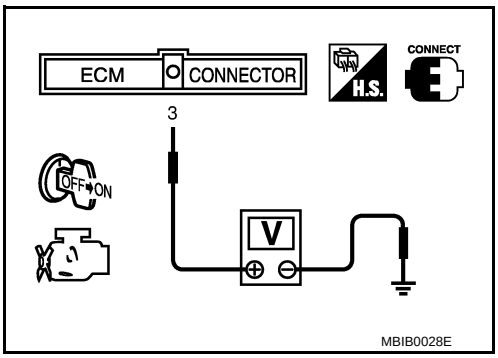
OK or NG

OK >> GO TO 8.
NG >> Replace 15 A fuse.

5. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

1. Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-III or tester.

Ignition switch	Voltage
OFF	Approximately 0 V
ON	Battery voltage (11 - 14 V)



OK or NG

OK >> GO TO 8.
NG >> GO TO 6.

6. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E8.
4. Check continuity between ECM terminal 3 and IPDM E/R terminal 42. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R".
NG >> Repair or replace harness or connectors.

DTC P2101 ELECTRIC THROTTLE CONTROL FUNCTION

Description

INFOID:0000000005354426

NOTE:
- **If DTC P2101 is displayed with DTC P2100, first perform the trouble diagnosis for DTC P2100. Refer to EC-1231, "DTC Confirmation Procedure".**
- **If DTC P2101 is displayed with DTC P2119, first perform the trouble diagnosis for DTC P2119. Refer to EC-1246, "DTC Confirmation Procedure".**

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. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:0000000005354427

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2101 2101	Electric throttle control performance	Electric throttle control function does not operate properly.	• Harness or connectors (Throttle control motor circuit is open or shorted) • Electric throttle control actuator

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:0000000005354428

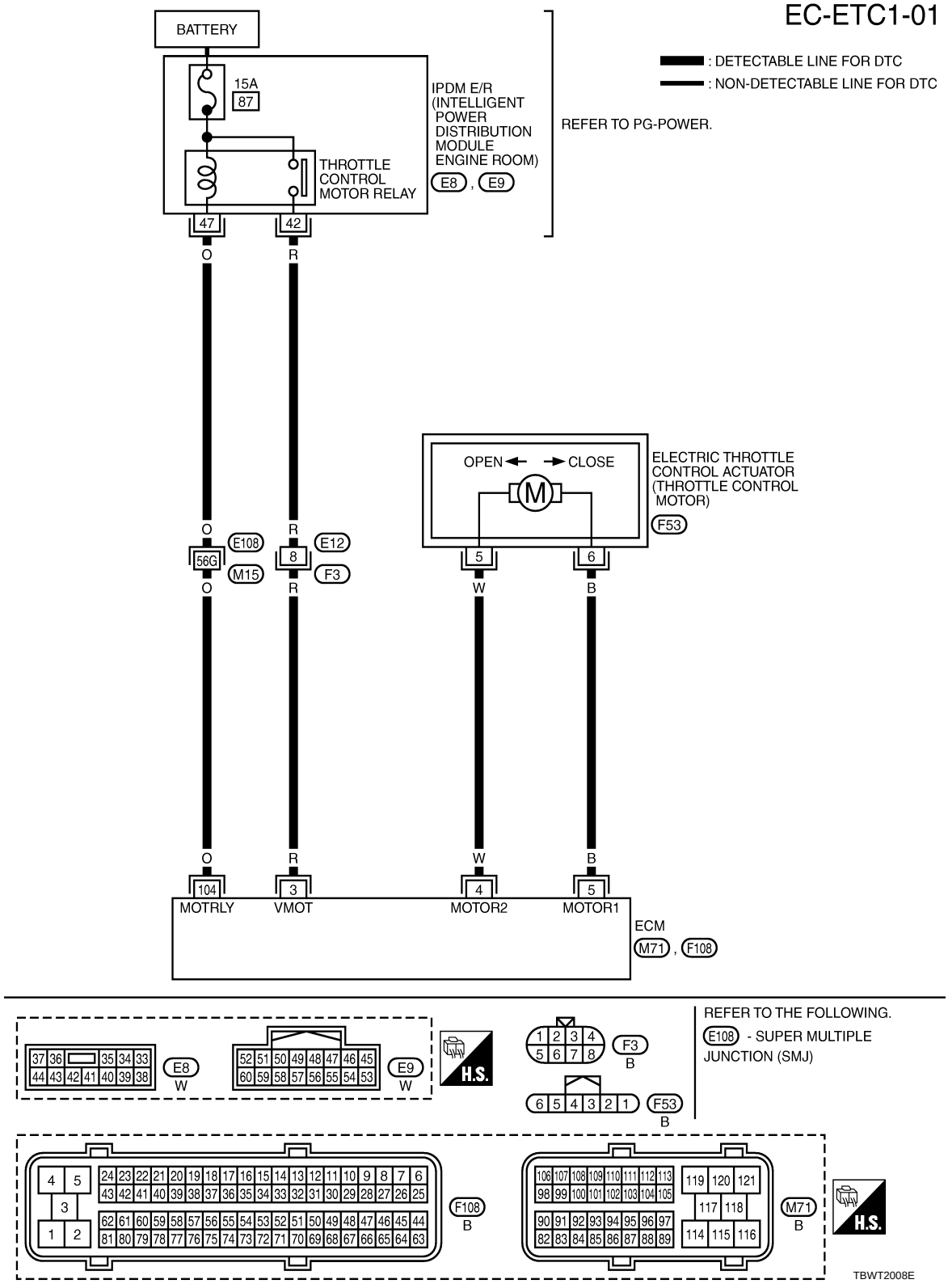
NOTE:
If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.
1. Turn ignition switch OFF and wait at least 10 seconds.
2. Turn ignition switch ON.
3. Turn ignition switch OFF and wait at least 10 seconds.

TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V when engine is running.

1. Turn ignition switch ON and wait at least 2 seconds.
2. Start engine and let it idle for 5 seconds.
3. Check DTC.
4. If DTC is detected, go to EC-1237, "Diagnosis Procedure".

Wiring Diagram

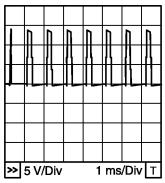
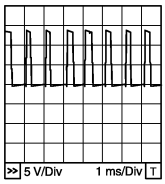
INFOID:0000000005354429



Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
4	W	Throttle control motor (Close)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Released	0 - 14 V★  PBIB1104E
5	B	Throttle control motor (Open)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	0 - 14 V★  PBIB1105E
104	O	Throttle control motor relay	**[Ignition switch: OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch: ON]	0 - 1.0 V

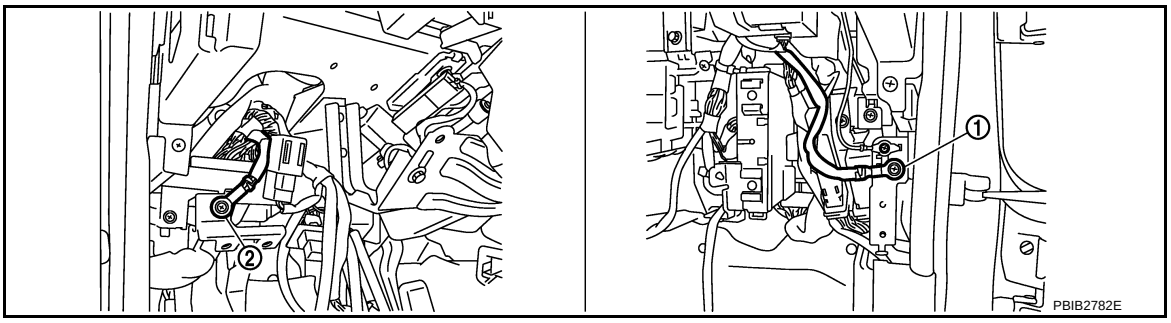
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354430

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

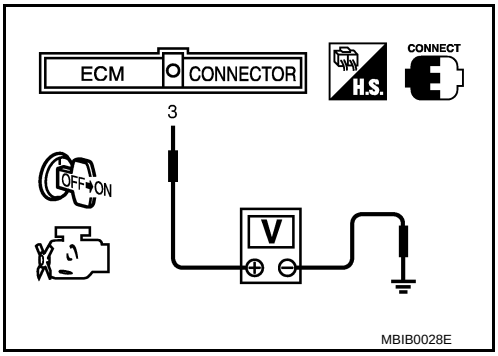
OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-I

Check voltage between ECM terminal 3 and ground under the following conditions with CONSULT-III or tester.

Ignition switch	Voltage
OFF	Approximately 0 V
ON	Battery voltage (11 - 14 V)



OK or NG

OK >> GO TO 10.
NG >> GO TO 3.

3. CHECK THROTTLE CONTROL MOTOR RELAY INPUT SIGNAL CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Disconnect IPDM E/R harness connector E8.
4. Check harness continuity between ECM terminal 3 and IPDM E/R terminal 42. Refer to Wiring Diagram.

Continuity should exist.

5. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

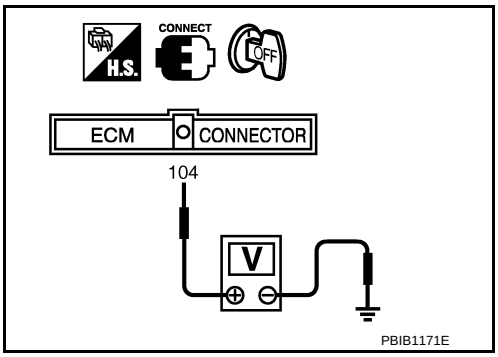
Check the following.
- Harness connectors E12, F3
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-I

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch OFF.
3. Check voltage between ECM terminal 104 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 9.
NG >> GO TO 6.

6. CHECK THROTTLE CONTROL MOTOR RELAY POWER SUPPLY CIRCUIT-II

1. Disconnect ECM harness connector.
2. Disconnect IPDM E/R harness connector E9.
3. Check harness continuity between ECM terminal 104 and IPDM E/R terminal 47. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.

NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and IPDM E/R

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK FUSE

1. Disconnect 15 A fuse.
2. Check if 15 A fuse is blown.

OK or NG

OK >> GO TO 9.
NG >> Replace 15 A fuse.

9. CHECK INTERMITTENT INCIDENT

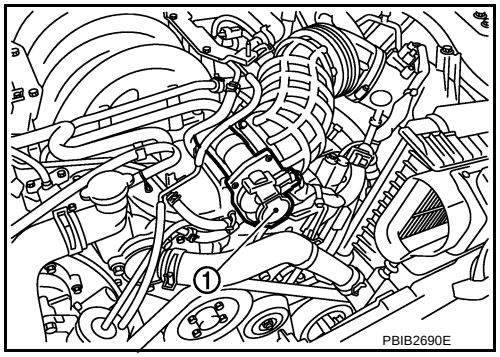
Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> Replace IPDM E/R. Refer to PG-27, "Removal and Installation of IPDM E/R".
NG >> Repair or replace harness or connectors.

10. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN OR SHORT

1. Turn ignition switch OFF.
2. Disconnect electric throttle control actuator (1) harness connector.
- Illustration shows the view with intake air duct removed.
3. Disconnect ECM harness connector.
4. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
5	5	Should not exist.
	4	Should exist.
6	5	Should exist.
	4	Should not exist.

5. Also check harness for short to ground and short to power.

OK or NG

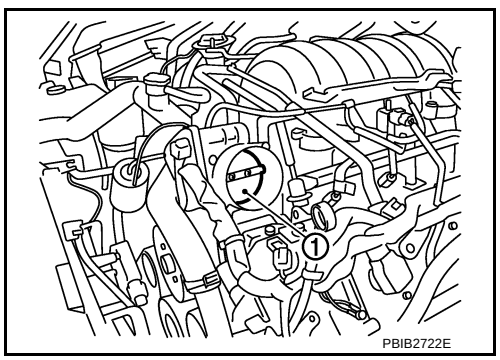
OK >> GO TO 11.
NG >> Repair or replace malfunctioning part.

11. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve (1) and the housing.
This illustration shows the view with intake air removed.

OK or NG

OK >> GO TO 12.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.



12. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1240, "Component Inspection".

OK or NG

OK >> GO TO 13.
NG >> GO TO 14.

13. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 14.
NG >> Repair or replace harness or connectors.

14. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

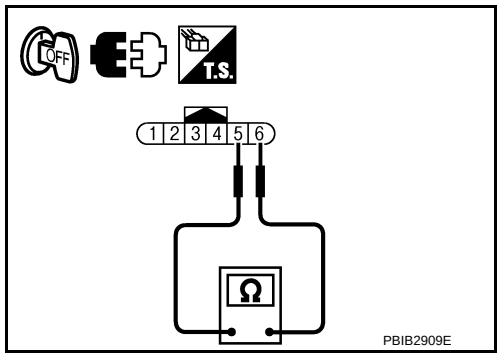
Component Inspection

INFOID:0000000005354431

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 5 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-764, "Throttle Valve Closed Position Learning".
5. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354432

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-174, "Component".

DTC P2118 THROTTLE CONTROL MOTOR

Component Description

INFOID:0000000005354433

The throttle control motor is operated by the ECM and it opens and closes the throttle valve.
The current opening angle of the throttle valve is detected by the throttle position sensor. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:0000000005354434

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2118 2118	Throttle control motor circuit short	ECM detects short in both circuits between ECM and throttle control motor.	• Harness or connectors (Throttle control motor circuit is shorted.) • Electric throttle control actuator (Throttle control motor)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode
ECM stops the electric throttle control actuator control, throttle valve is maintained at a fixed opening (approx. 5 degrees) by the return spring.

DTC Confirmation Procedure

INFOID:0000000005354435

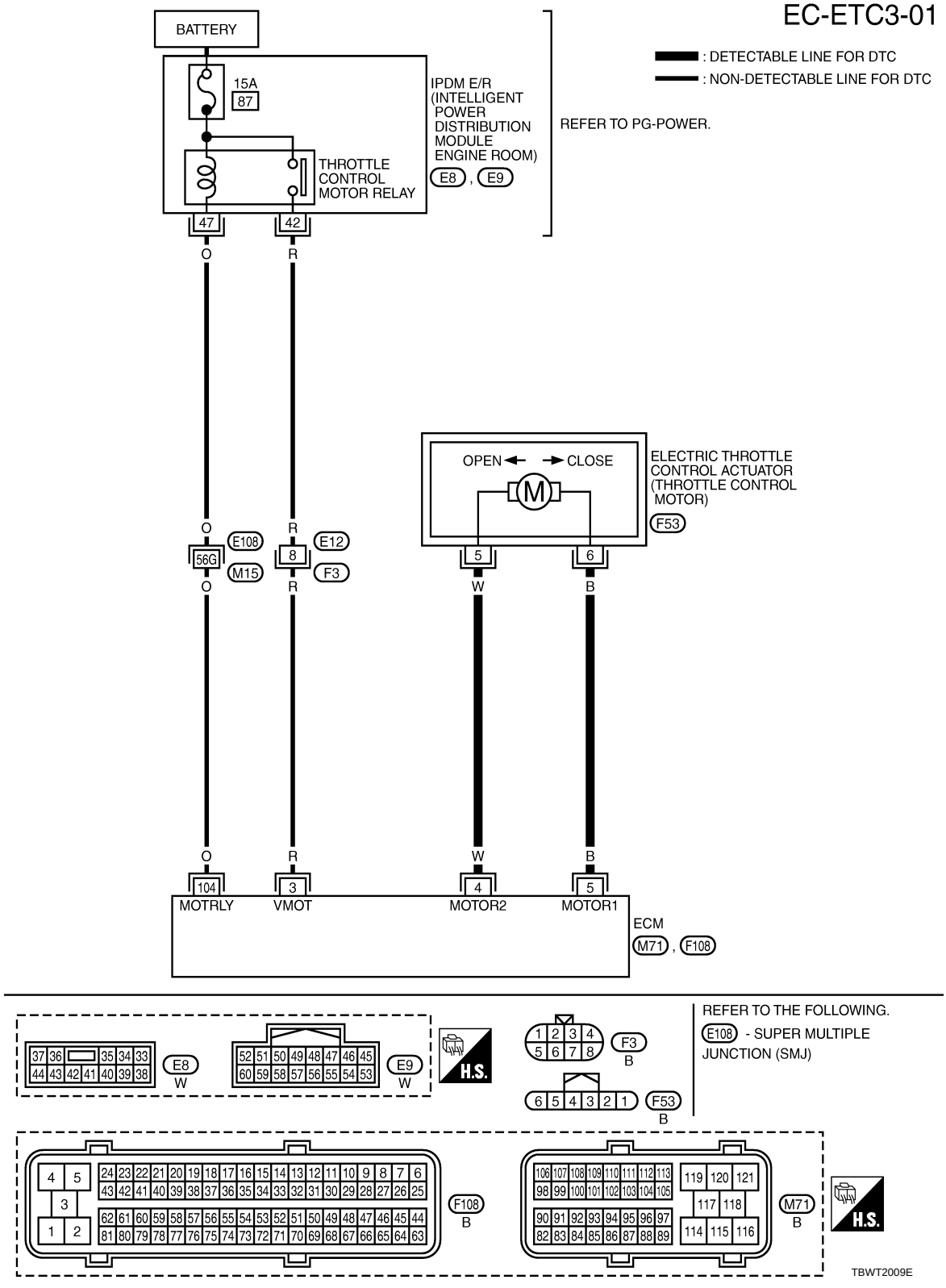
1. If DTC Confirmation Procedure has been previously conducted, always perform the following procedure before conducting the next test.

a. Turn ignition switch OFF and wait at least 10 seconds.
b. Turn ignition switch ON.
c. Turn ignition switch OFF and wait at least 10 seconds.

2. Turn ignition switch ON and wait at least 2 seconds.
3. Start engine and let it idle for 5 seconds.
4. Check DTC.
5. If DTC is detected, go to EC-1243, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354436

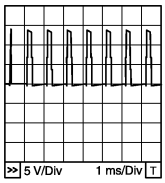
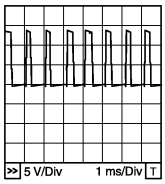


TBWT2009E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
3	R	Throttle control motor relay power supply	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)
4	W	Throttle control motor (Close)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Released	0 - 14 V★  PBIB1104E
5	B	Throttle control motor (Open)	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	0 - 14 V★  PBIB1105E
104	O	Throttle control motor relay	**[Ignition switch: OFF]**	BATTERY VOLTAGE (11 - 14 V)
			[Ignition switch: ON]	0 - 1.0 V

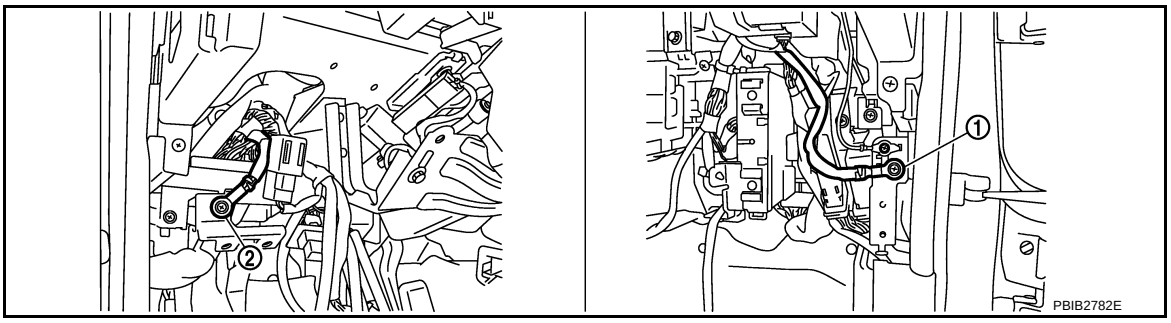
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354437

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



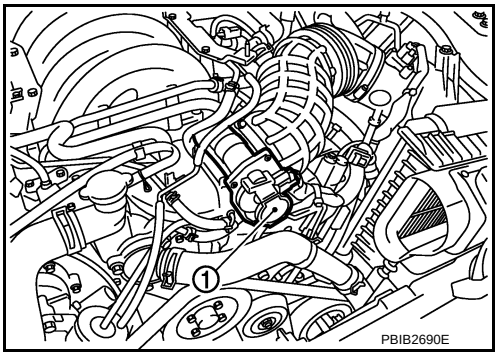
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2. CHECK THROTTLE CONTROL MOTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect electric throttle control actuator (1) harness connector.
- Illustration shows the view with intake air duct removed.
2. Disconnect ECM harness connector.
3. Check harness continuity between the following terminals. Refer to Wiring Diagram.



Electric throttle control actuator terminal	ECM terminal	Continuity
5	5	Should not exist.
	4	Should exist.
6	5	Should exist.
	4	Should not exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 3.
NG >> Repair or replace malfunctioning part.

3. CHECK THROTTLE CONTROL MOTOR

Refer to EC-1244, "Component Inspection".

OK or NG

OK >> GO TO 4.
NG >> GO TO 5.

4. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 5.
NG >> Repair or replace harness or connectors.

5. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

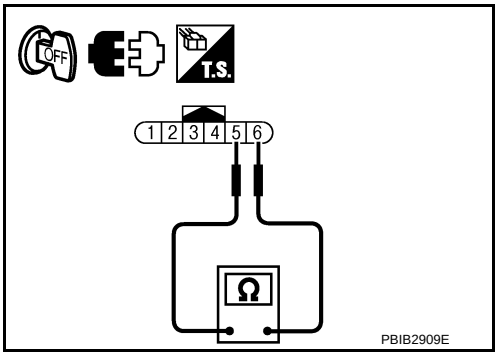
Component Inspection

INFOID:0000000005354438

THROTTLE CONTROL MOTOR

1. Disconnect electric throttle control actuator harness connector.
2. Check resistance between terminals 5 and 6.

Resistance: Approximately 1 - 15 Ω [at 25 °C (77°F)]



3. If NG, replace electric throttle control actuator and go to next step.
4. Perform EC-764, "Throttle Valve Closed Position Learning".
5. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354439

ELECTRIC THROTTLE CONTROL ACTUATOR

Refer to EM-174, "Component".

DTC P2119 ELECTRIC THROTTLE CONTROL ACTUATOR

Component Description

INFOID:0000000005354440

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. The throttle position sensor provides feedback to the ECM, when opens/closes the throttle valve in response to driving conditions via the throttle control motor.

On Board Diagnosis Logic

INFOID:0000000005354441

This self-diagnosis has one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition		Possible cause
P2119 2119	Electric throttle control actuator	A	Electric throttle control actuator does not function properly due to the return spring malfunction.	• Electric throttle control actuator
		B	Throttle valve opening angle in fail-safe mode is not in specified range.	
		C	ECM detects that the throttle valve is stuck open.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminate.

Detected items	Engine operating condition in fail-safe mode
Malfunction A	The 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.
Malfunction B	ECM controls the electric throttle control actuator by regulating the throttle opening to 20 degrees or less.
Malfunction C	While the vehicle is driving, it slows down gradually by fuel cut. After the vehicle stops, the engine stalls. The engine can restart in the N or P position, and engine speed will not exceed 1,000 rpm or more.

DTC Confirmation Procedure

INFOID:0000000005354442

NOTE:

- **Perform PROCEDURE FOR MALFUNCTION A AND B first. If the DTC cannot be confirmed, perform PROCEDURE FOR MALFUNCTION C.**
- 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.

PROCEDURE FOR MALFUNCTION A AND B

1. Turn ignition switch ON and wait at least 1 second.
2. Shift selector lever to the D position and wait at least 3 seconds.
3. Shift selector lever to the 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 the D position and wait at least 3 seconds.
7. Shift selector lever to the P position.
8. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
9. Check DTC.
10. If DTC is detected, go to EC-1247, "Diagnosis Procedure".

PROCEDURE FOR MALFUNCTION C

1. Turn ignition switch ON and wait at least 1 second.

2. Shift selector lever to the D position and wait at least 3 seconds.
3. Shift selector lever to the P position.
4. Start engine and let it idle for 3 seconds.
5. Check DTC.
6. If DTC is detected, go to EC-1247, "Diagnosis Procedure".

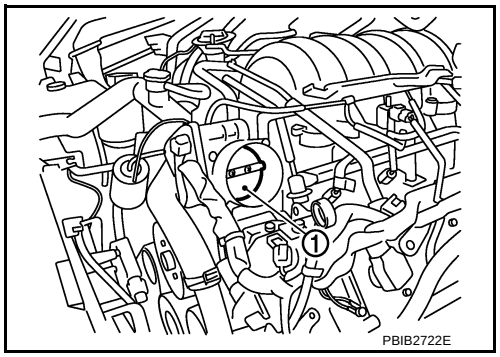
Diagnosis Procedure

INFOID:0000000005354443

1. CHECK ELECTRIC THROTTLE CONTROL ACTUATOR VISUALLY

1. Remove the intake air duct.
2. Check if foreign matter is caught between the throttle valve (1) and the housing.

- This illustration shows the view with intake air removed.



OK or NG

OK >> GO TO 2.
NG >> Remove the foreign matter and clean the electric throttle control actuator inside.

2. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

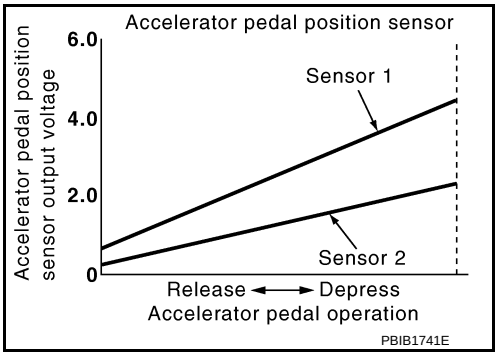
>> **INSPECTION END**

DTC P2122, P2123 APP SENSOR

Component Description

INFOID:0000000005354444

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354445

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1 ACCEL SEN 2*	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.4 - 1.1 V
		Accelerator pedal: Fully depressed	3.7 - 4.8 V
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

On Board Diagnosis Logic

INFOID:0000000005354446

These self-diagnoses have the one trip detection logic.
NOTE:
If DTC P2122 or P2123 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2122 2122	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 2123	Accelerator pedal position sensor 1 circuit high input	An excessively high voltage from the APP sensor 1 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminate.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:0000000005354447

NOTE:
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:

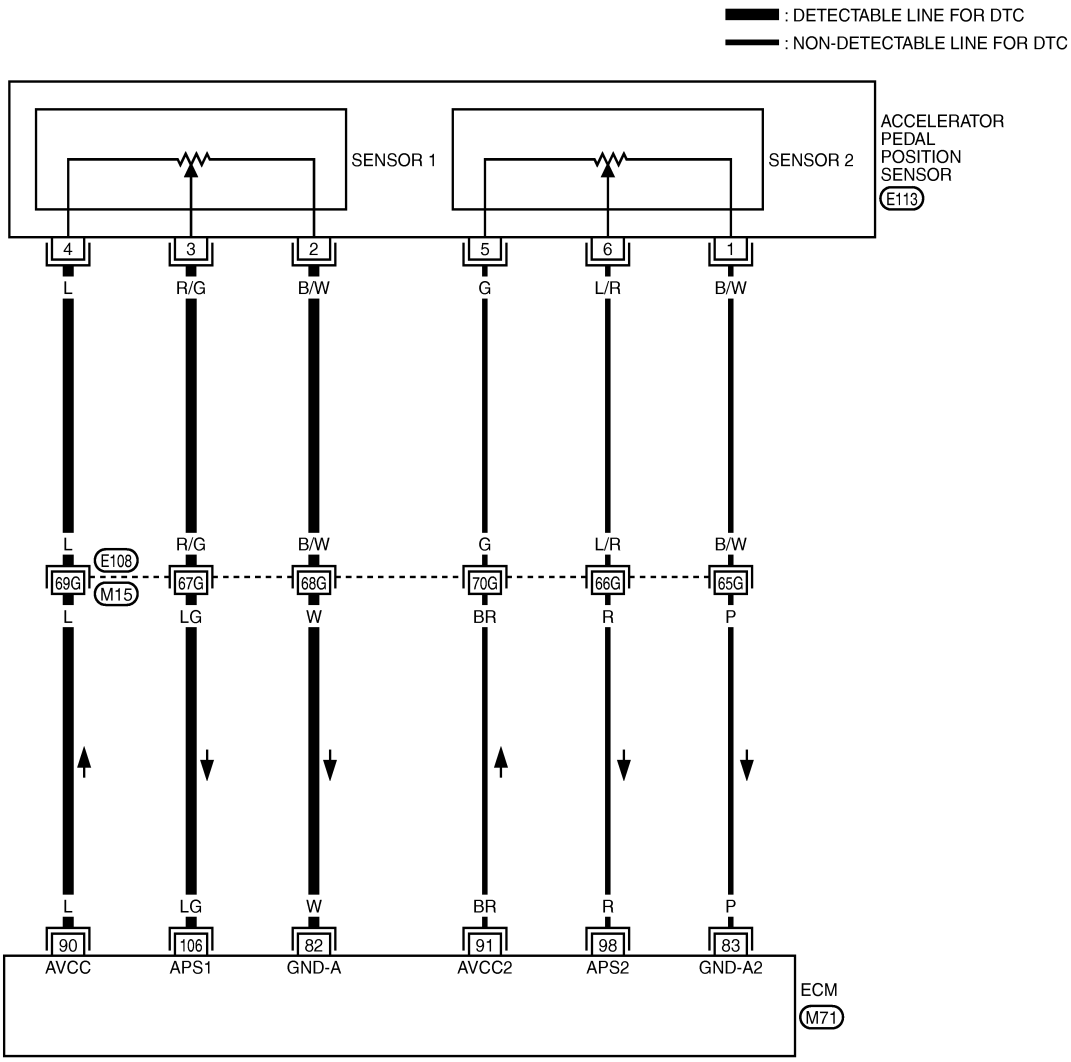
Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

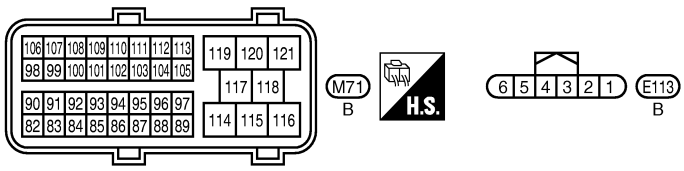
1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to EC-1250, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354448

EC-APPS1-01





REFER TO THE FOLLOWING.
E108 - SUPER MULTIPLE JUNCTION (SMJ)

TBWT2010E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

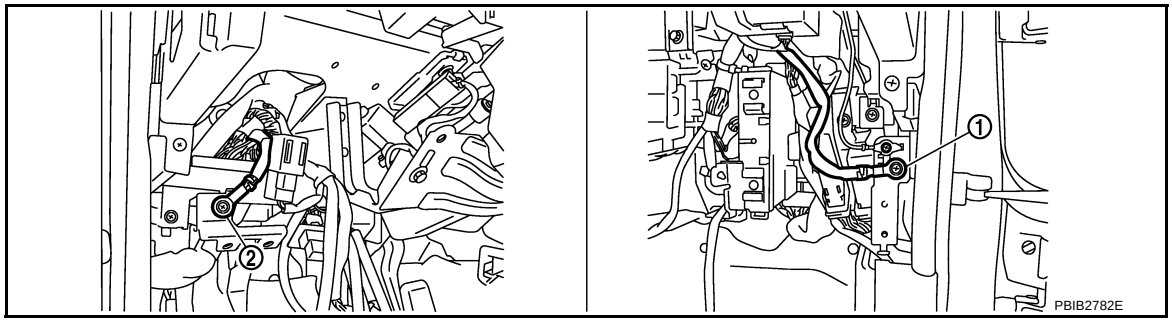
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
82	W	Sensor ground (APP sensor 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
83	P	Sensor ground (APP sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
90	L	Sensor power supply (APP sensor 1)	**[Ignition switch: ON]**	Approximately 5 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V
98	R	Accelerator pedal position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.20 - 0.55 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	1.85 - 2.40 V
106	LG	Accelerator pedal position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.4 - 1.1 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	3.7 - 4.8 V

Diagnosis Procedure

INFOID:0000000005354449

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



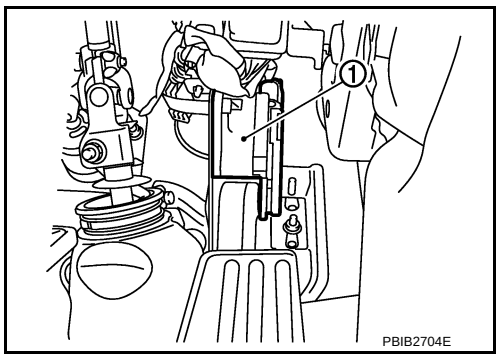
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

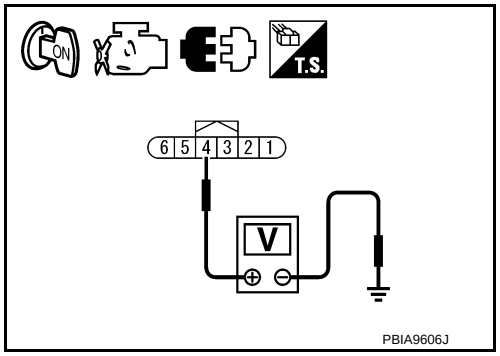
2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or 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 harness continuity between APP sensor terminal 2 and ECM terminal 82. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK APP SENSOR

Refer to EC-1252, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

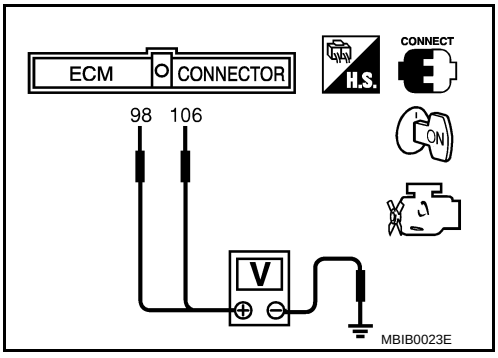
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354450

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.4 - 1.1 V
	Fully depressed	3.7 - 4.8 V
98 (Accelerator pedal position sensor 2)	Fully released	0.20 - 0.55 V
	Fully depressed	1.85 - 2.40 V

4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-764, "Accelerator Pedal Released Position Learning".
6. Perform EC-764, "Throttle Valve Closed Position Learning".
7. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354451

ACCELERATOR PEDAL

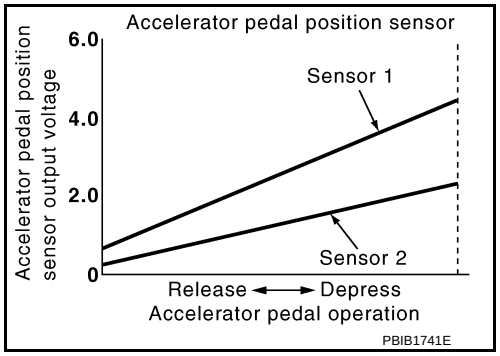
Refer to ACC-3, "Component".

DTC P2127, P2128 APP SENSOR

Component Description

INFOID:0000000005354452

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354453

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1 ACCEL SEN 2*	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.4 - 1.1 V
		Accelerator pedal: Fully depressed	3.7 - 4.8 V
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

On Board Diagnosis Logic

INFOID:0000000005354454

These self-diagnoses have the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2127 2127	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.) (TP sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 2) • Electric throttle control actuator (TP sensor 1 and 2)
P2128 2128	Accelerator pedal position sensor 2 circuit high input	An excessively high voltage from the APP sensor 2 is sent to ECM.	

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:0000000005354455

NOTE:
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:

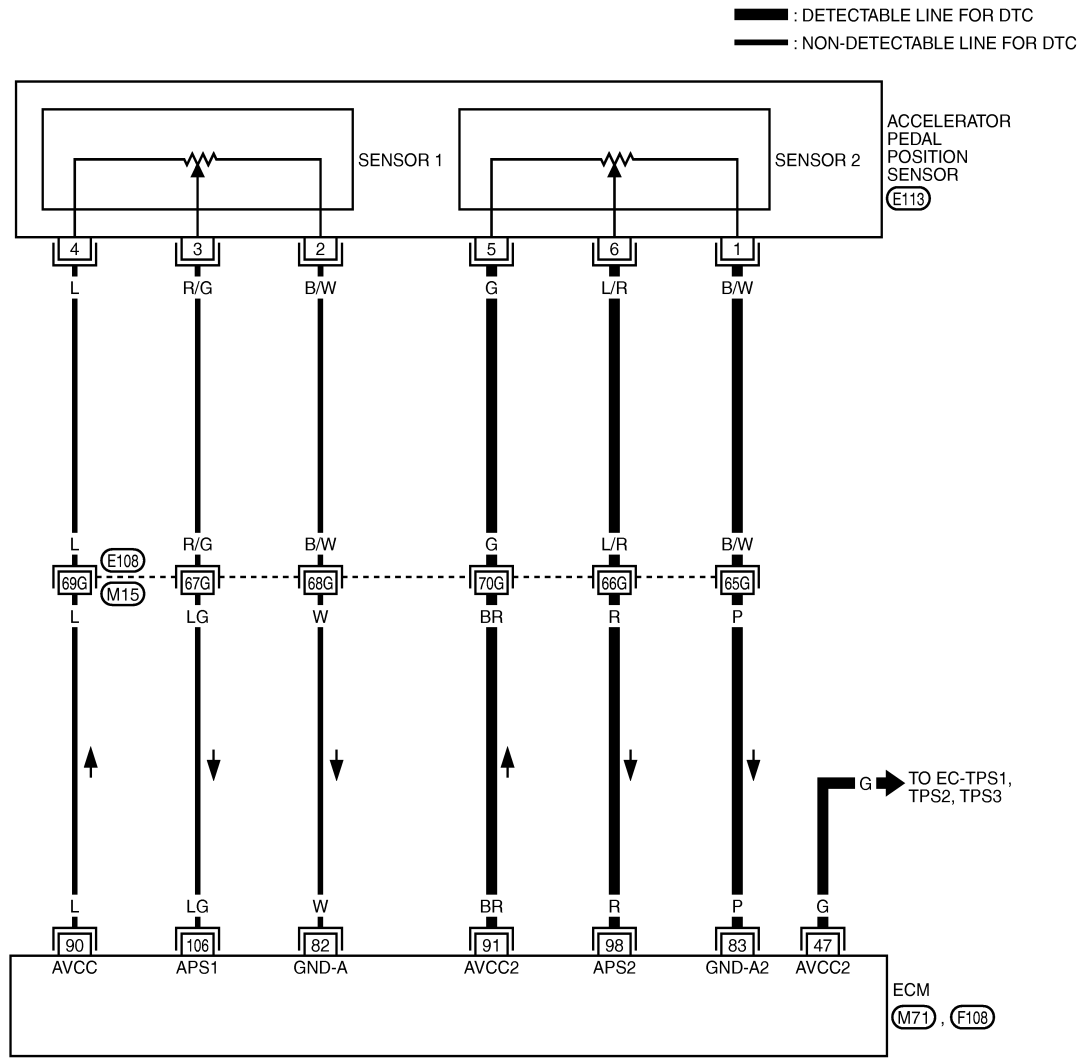
Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

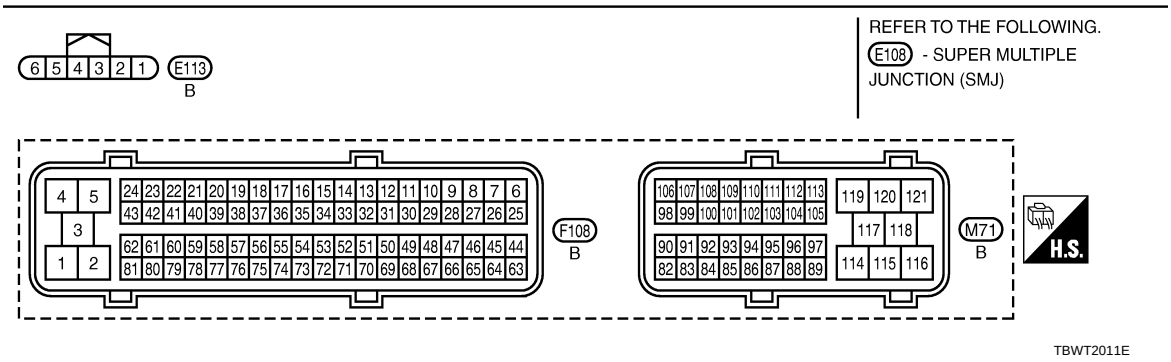
1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to EC-1255, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354456

EC-APPS2-01





TBWT2011E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

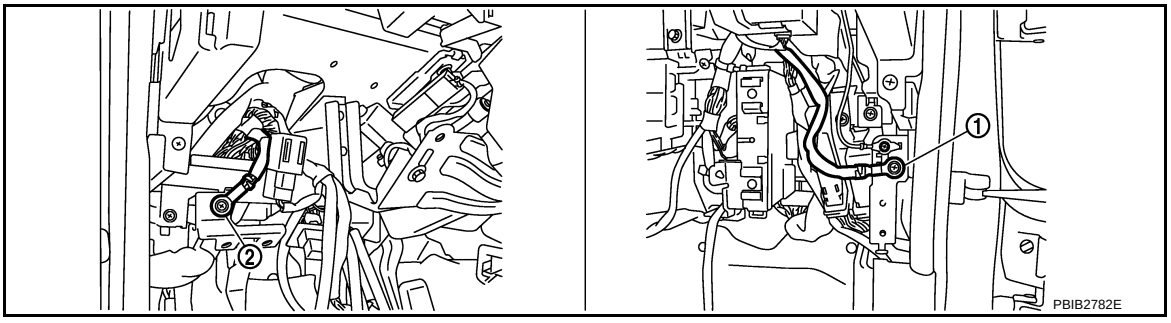
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch: ON]**	Approximately 5 V
82	W	Sensor ground (APP sensor 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
83	P	Sensor ground (APP sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
90	L	Sensor power supply (APP sensor 1)	**[Ignition switch: ON]**	Approximately 5 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V
98	R	Accelerator pedal position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.20 - 0.55 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	1.85 - 2.40 V
106	LG	Accelerator pedal position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.4 - 1.1 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	3.7 - 4.8 V

Diagnosis Procedure

INFOID:0000000005354457

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



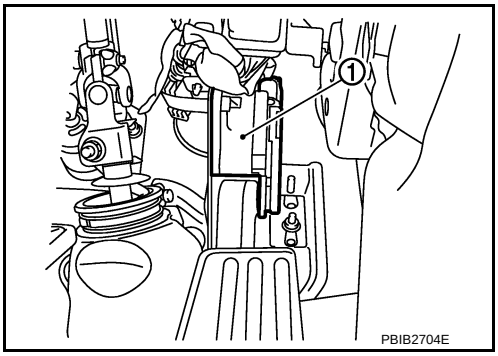
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

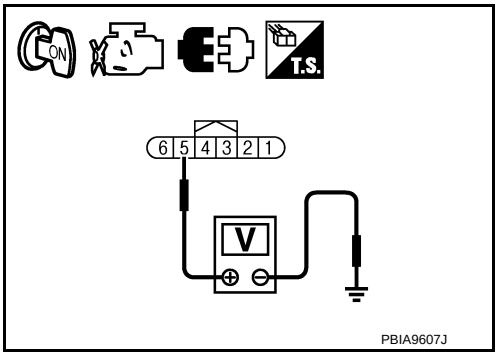
2. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between APP sensor terminal 5 and ground with CONSULT-III or tester.

Voltage: Approximately 5V



OK or NG

OK >> GO TO 8.
NG >> GO TO 3.

3. CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 5 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit.

5. CHECK SENSOR2 POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
91	APP sensor terminal 5	EC-1254, "Wiring Diagram"
47	Electric throttle control actuator terminal 1	EC-1260, "Wiring Diagram"

OK or NG

OK >> GO TO 6.
NG >> Repair short to ground or short to power in harness or connectors.

6. CHECK THROTTLE POSITION SENSOR

Refer to EC-1263, "Component Inspection".

OK or NG

OK >> GO TO 14.

NG >> GO TO 7.

7. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

8. CHECK APP SENSOR 2 GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 1 and ECM terminal 83.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 10.
NG >> GO TO 9.

9. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

10. CHECK APP SENSOR 2 INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR

Refer to EC-1263, "Component Inspection".

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

14. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

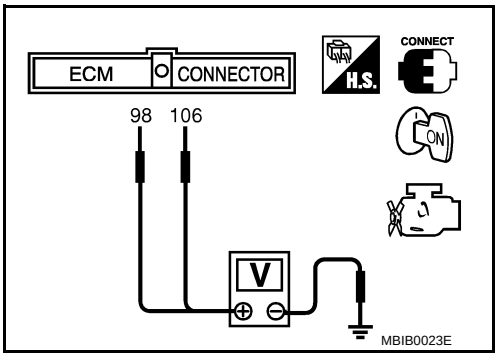
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354458

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.4 - 1.1 V
	Fully depressed	3.7 - 4.8 V
98 (Accelerator pedal position sensor 2)	Fully released	0.20 - 0.55 V
	Fully depressed	1.85 - 2.40 V

4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-764, "Accelerator Pedal Released Position Learning".
6. Perform EC-764, "Throttle Valve Closed Position Learning".
7. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354459

ACCELERATOR PEDAL

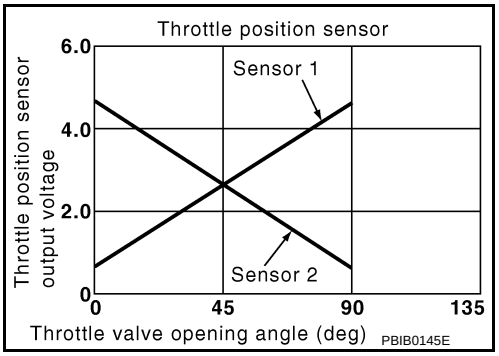
Refer to ACC-3, "Component".

DTC P2135 TP SENSOR

Component Description

INFOID:0000000005354460

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 the 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 in response to driving condition via the throttle control motor.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354461

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
TP SEN 1-B1 TP SEN 2-B1*	• Ignition switch: ON (Engine stopped) • Selector lever position: D	Accelerator pedal: Fully released	More than 0.36V
		Accelerator pedal: Fully depressed	Less than 4.75V

*: Throttle position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage signal.

On Board Diagnosis Logic

INFOID:0000000005354462

This self-diagnosis has the one trip detection logic.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2135 2135	Throttle position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from TP sensor 1 and TP sensor 2.	• Harness or connector (TP sensor 1 and 2 circuit is open or shorted.) (APP sensor 2 circuit is shorted.) • Electric throttle control actuator (TP sensor 1 and 2) • Accelerator pedal position sensor (APP sensor 2)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminate.

Engine operation condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:0000000005354463

NOTE:
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.

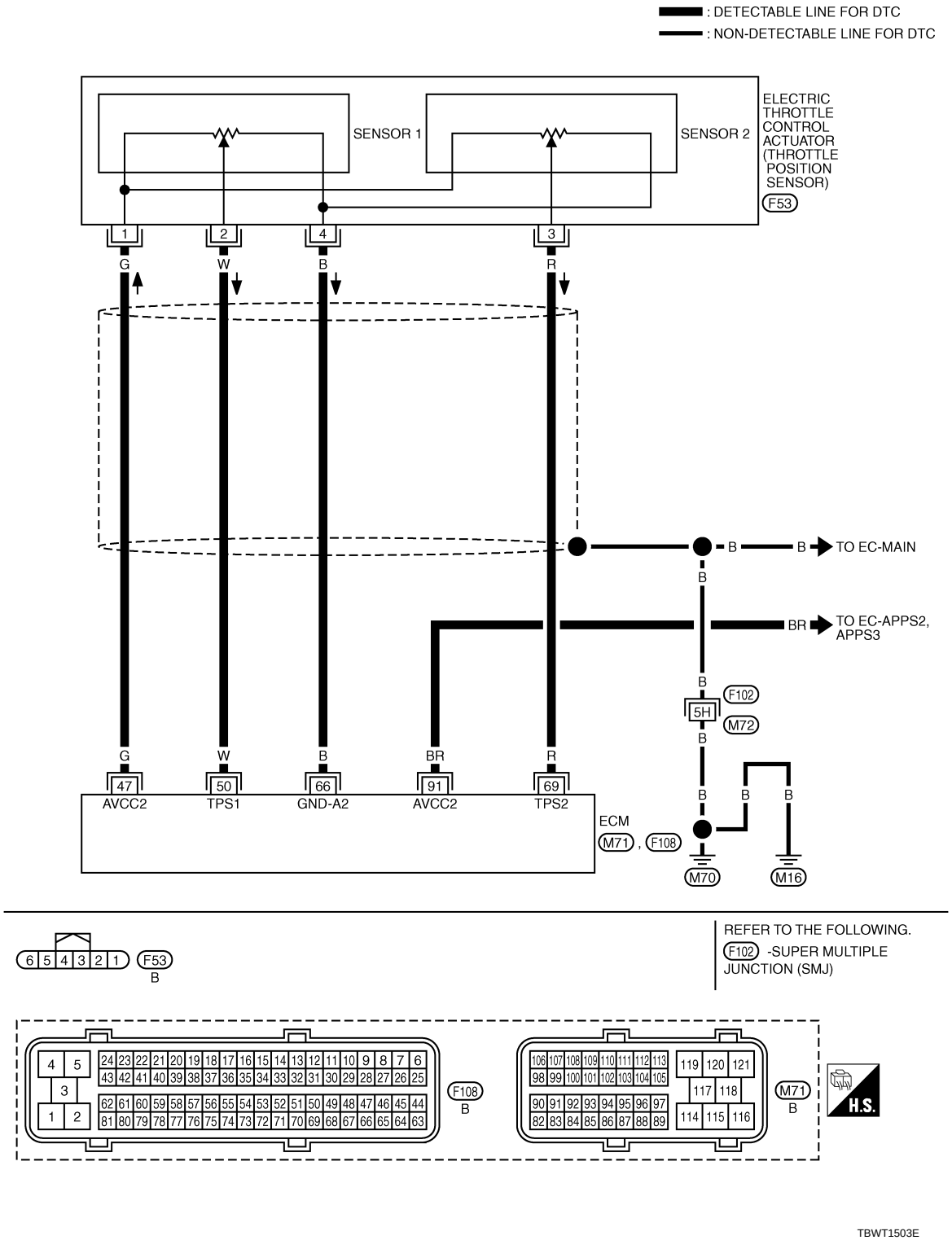
1. Start engine and let it idle for 1 second.
2. Check DTC.

3. If DTC is detected, go to EC-1261, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354464

EC-TPS3-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

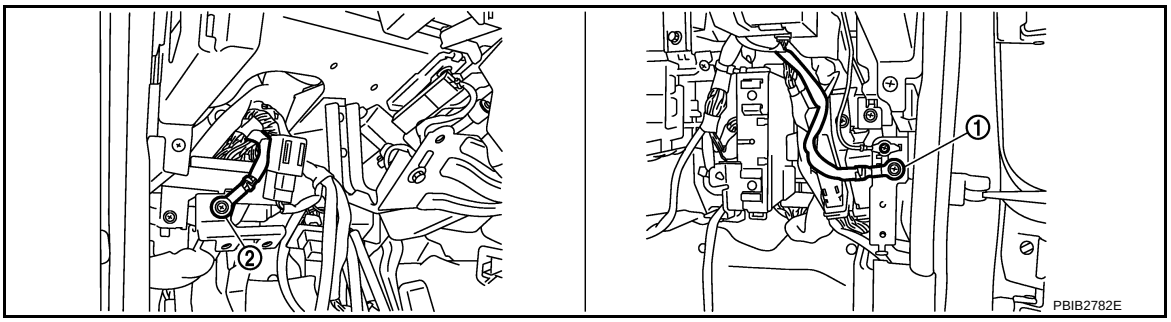
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch: ON]**	Approximately 5 V
50	W	Throttle position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully released	More than 0.36 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	Less than 4.75 V
66	B	Sensor ground (Throttle position sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
69	R	Throttle position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully released	Less than 4.75 V
			[Ignition switch: ON] • Engine: Stopped • Selector lever position: D • Accelerator pedal: Fully depressed	More than 0.36 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V

Diagnosis Procedure

INFOID:0000000005354465

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



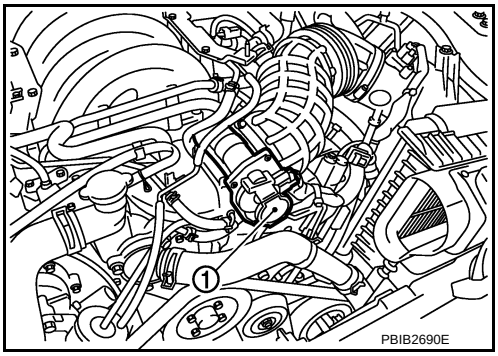
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

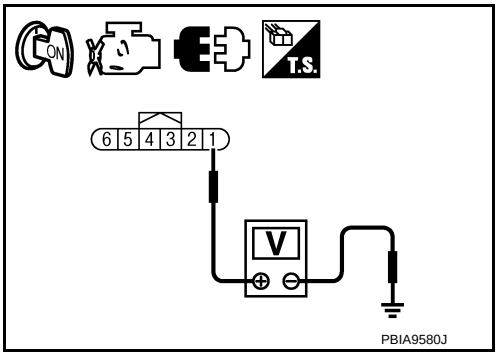
2.CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-I

1. Disconnect electric throttle control actuator (1) harness connector.
- Illustration shows the view with intake air duct removed.
2. Turn ignition switch ON.



3. Check voltage between electric throttle control actuator terminal 1 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 7.
NG >> GO TO 3.

3. CHECK THROTTLE POSITION SENSOR POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 1 and ECM terminal 47. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 4.
NG >> Repair open circuit.

4. CHECK SENSOR POWER SUPPLY CIRCUIT

Check harness for short to power and short to ground, between the following terminals.

ECM terminal	Sensor terminal	Reference Wiring Diagram
47	Electric throttle control actuator terminal 1	EC-1260, "Wiring Diagram"
91	APP sensor terminal 5	EC-1266, "Wiring Diagram"

OK or NG

OK >> GO TO 5.
NG >> Repair short to ground or short to power in harness or connectors.

5. CHECK APP SENSOR

Refer to EC-1270, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> GO TO 6.

6. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

7. CHECK THROTTLE POSITION SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between electric throttle control actuator terminal 4 and ECM terminal 66. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 8.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 50 and electric throttle control actuator terminal 2, ECM terminal 69 and electric throttle control actuator terminal 3. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK THROTTLE POSITION SENSOR

Refer to EC-1263, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> GO TO 10.

10. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

11. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

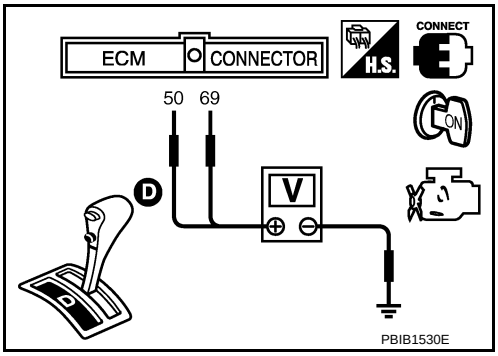
INFOID:0000000005354466

THROTTLE POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Turn ignition switch ON.
4. Set selector lever to the D position.

5. Check voltage between ECM terminal 50 (TP sensor 1 signal) and ground, ECM terminal 69 (TP sensor 2 signal) and ground under the following conditions.

Terminal	Accelerator pedal	Voltage
50 (Throttle position sensor 1)	Fully released	More than 0.36 V
	Fully depressed	Less than 4.75 V
69 (Throttle position sensor 2)	Fully released	Less than 4.75 V
	Fully depressed	More than 0.36 V



6. If NG, replace electric throttle control actuator and go to the next step.
7. Perform EC-764, "Throttle Valve Closed Position Learning".
8. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354467

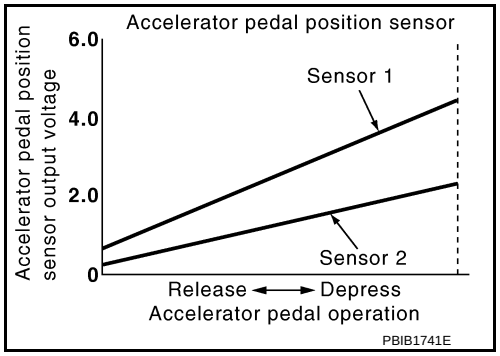
ELECTRIC THROTTLE CONTROL ACTUATOR
Refer to EM-174, "Component".

DTC P2138 APP SENSOR

Component Description

INFOID:0000000005354468

The accelerator pedal position sensor is installed on the upper end of the accelerator pedal assembly. The sensor detects the accelerator position and sends a signal to the ECM.
Accelerator pedal position sensor has two sensors. These sensors are a kind of potentiometer which transform the accelerator pedal position into output voltage, and emit the voltage signals to the ECM. The ECM judges the current opening angle of the accelerator pedal from these signals and controls the throttle valve in response to driving conditions via the throttle control motor.
Idle position of the accelerator pedal is determined by the ECM receiving the signal from the accelerator pedal position sensor. The ECM uses this signal for the engine operation such as fuel cut.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354469

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
ACCEL SEN 1 ACCEL SEN 2*	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	0.4 - 1.1 V
		Accelerator pedal: Fully depressed	3.7 - 4.8 V
CLSD THL POS	• Ignition switch: ON (Engine stopped)	Accelerator pedal: Fully released	ON
		Accelerator pedal: Slightly depressed	OFF

*: Accelerator pedal position sensor 2 signal is converted by ECM internally. Thus, it differs from ECM terminal voltage.

On Board Diagnosis Logic

INFOID:0000000005354470

This self-diagnosis has the one trip detection logic.
NOTE:
If DTC P2138 is displayed with DTC P0643, first perform the trouble diagnosis for DTC P0643. Refer to EC-1121, "DTC Confirmation Procedure".

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2138 2138	Accelerator pedal position sensor circuit range/performance	Rationally incorrect voltage is sent to ECM compared with the signals from APP sensor 1 and APP sensor 2.	• Harness or connector (APP sensor 1 or 2 circuit is open or shorted.) (TP sensor circuit is shorted.) • Accelerator pedal position sensor (APP sensor 1 or 2) • Electric throttle control actuator (TP sensor 1 or 2)

FAIL-SAFE MODE

When the malfunction is detected, ECM enters fail-safe mode and the MIL illuminates.

Engine operating condition in fail-safe mode
The ECM controls the electric throttle control actuator in regulating the throttle opening in order for the idle position to be within +10 degrees. The ECM regulates the opening speed of the throttle valve to be slower than the normal condition. So, the acceleration will be poor.

DTC Confirmation Procedure

INFOID:0000000005354471

NOTE:
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:

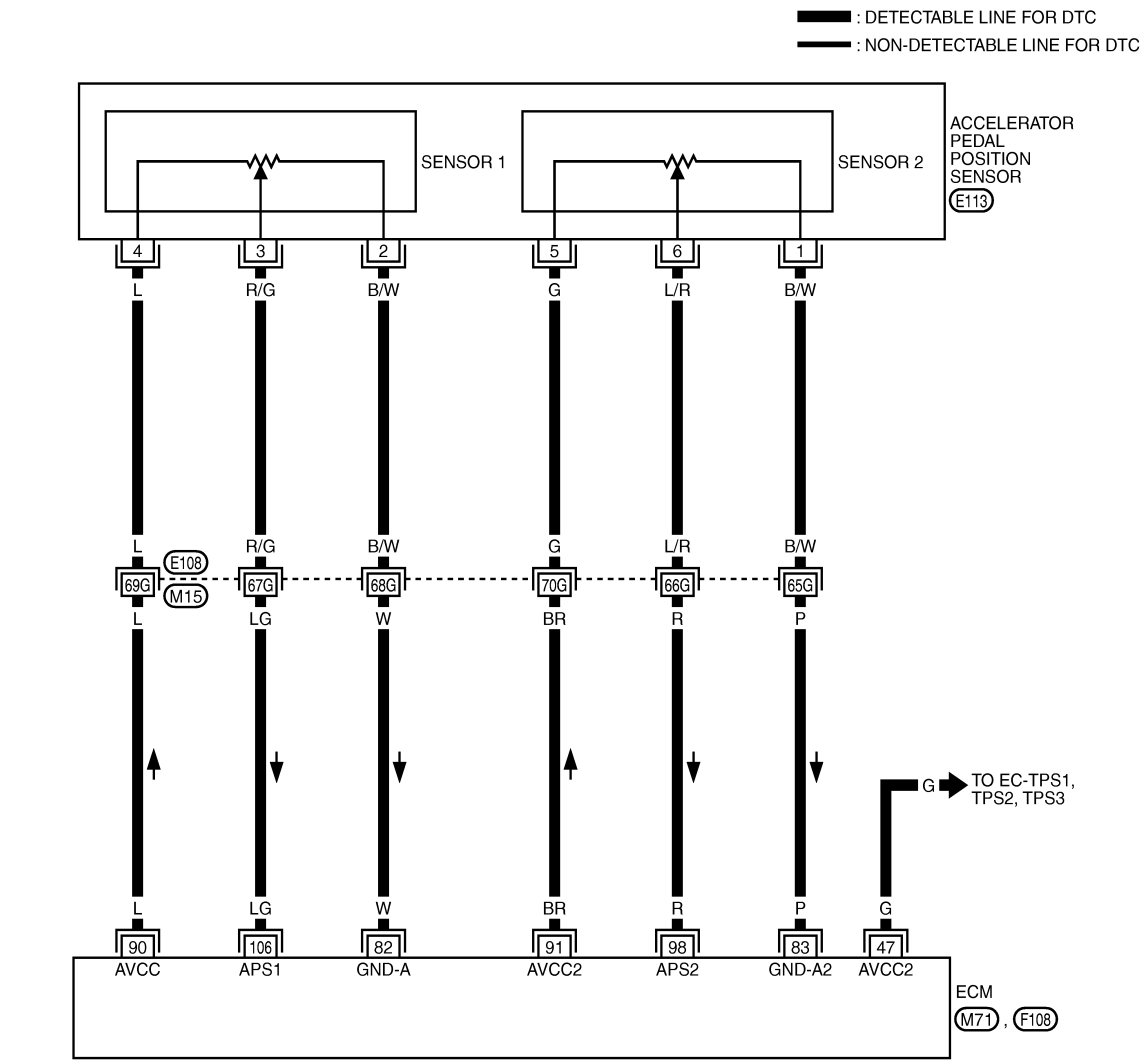
Before performing the following procedure, confirm that battery voltage is more than 8 V at idle.

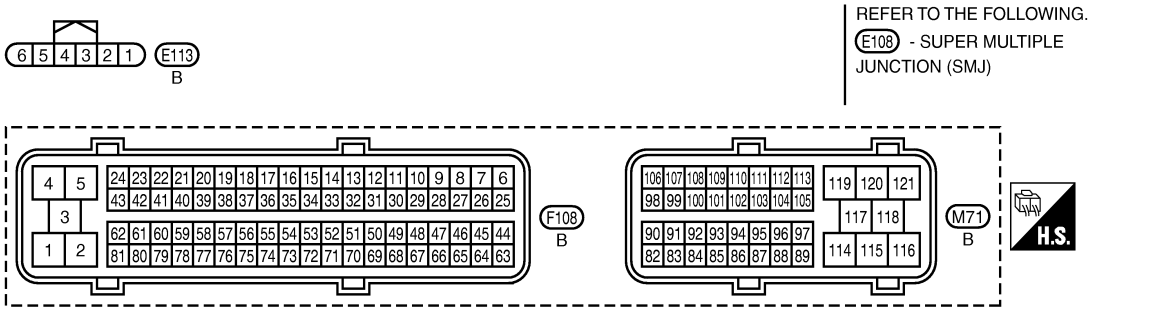
1. Start engine and let it idle for 1 second.
2. Check DTC.
3. If DTC is detected, go to EC-1267, "Diagnosis Procedure".

Wiring Diagram

INFOID:0000000005354472

EC-APPS3-01





TBWT2012E

Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

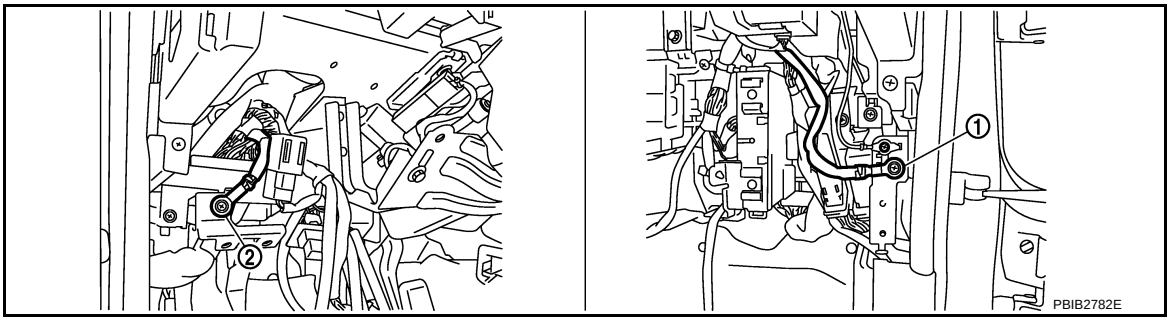
TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
47	G	Sensor power supply (Throttle position sensor)	**[Ignition switch: ON]**	Approximately 5 V
82	W	Sensor ground (APP sensor 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
83	P	Sensor ground (APP sensor 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
90	L	Sensor power supply (APP sensor 1)	**[Ignition switch: ON]**	Approximately 5 V
91	BR	Sensor power supply (APP sensor 2)	**[Ignition switch: ON]**	Approximately 5 V
98	R	Accelerator pedal position sensor 2	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.20 - 0.55 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	1.85 - 2.40 V
106	LG	Accelerator pedal position sensor 1	**[Ignition switch: ON]** • Engine: Stopped • Accelerator pedal: Fully released	0.4 - 1.1 V
			[Ignition switch: ON] • Engine: Stopped • Accelerator pedal: Fully depressed	3.7 - 4.8 V

Diagnosis Procedure

INFOID:0000000005354473

1. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



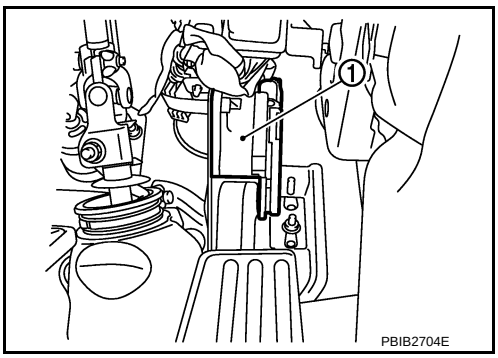
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.CHECK APP SENSOR 1 POWER SUPPLY CIRCUIT

1. Disconnect accelerator pedal position (APP) sensor (1) harness connector.
2. Turn ignition switch ON.

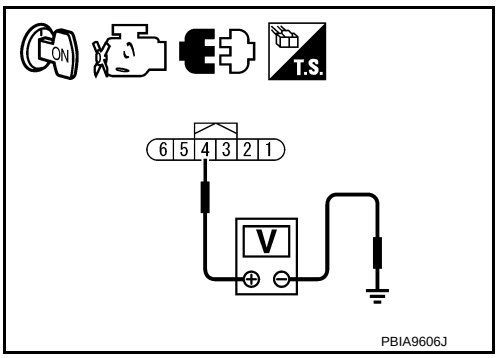


3. Check voltage between APP sensor terminal 4 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V

OK or NG

OK >> GO TO 4.
NG >> GO TO 3.



3.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

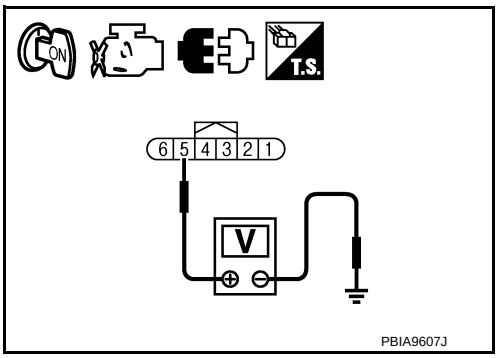
4.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-I

1. Check voltage between APP sensor terminal 5 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V

OK or NG

OK >> GO TO 10.
NG >> GO TO 5.



5.CHECK APP SENSOR 2 POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 5 and ECM terminal 91. Refer to Wiring Diagram.

Continuity should exist.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6.DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- 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 terminal	Sensor terminal	Reference Wiring Diagram
91	APP sensor terminal 4	EC-1266, "Wiring Diagram"
47	Electric throttle control actuator terminal 1	EC-1260, "Wiring Diagram"

OK or NG

OK >> GO TO 8.
NG >> Repair short to ground or short to power in harness or connectors.

8. CHECK THROTTLE POSITION SENSOR

Refer to EC-1263, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> GO TO 9.

9. REPLACE ELECTRIC THROTTLE CONTROL ACTUATOR

1. Replace the electric throttle control actuator.
2. Perform EC-764, "Throttle Valve Closed Position Learning".
3. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

10. CHECK APP SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between APP sensor terminal 2 and ECM terminal 82, APP sensor terminal 1 and ECM terminal 83.
   Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

12. CHECK APP SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 106 and APP sensor terminal 3, ECM terminal 98 and APP sensor terminal 6.
   Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.
NG >> GO TO 13.

13. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and accelerator pedal position sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK APP SENSOR

Refer to EC-1270, "Component Inspection".

OK or NG

OK >> GO TO 16.
NG >> GO TO 15.

15. REPLACE ACCELERATOR PEDAL ASSEMBLY

1. Replace accelerator pedal assembly.
2. Perform EC-764, "Accelerator Pedal Released Position Learning".
3. Perform EC-764, "Throttle Valve Closed Position Learning".
4. Perform EC-765, "Idle Air Volume Learning".

>> **INSPECTION END**

16. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

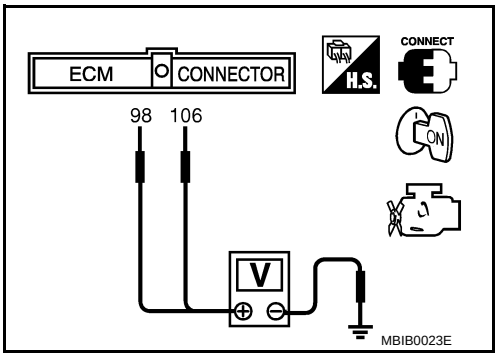
>> **INSPECTION END**

Component Inspection

INFOID:0000000005354474

ACCELERATOR PEDAL POSITION SENSOR

1. Reconnect all harness connectors disconnected.
2. Turn ignition switch ON.
3. Check voltage between ECM terminals 106 (APP sensor 1 signal), 98 (APP sensor 2 signal) and ground under the following conditions.



Terminal	Accelerator pedal	Voltage
106 (Accelerator pedal position sensor 1)	Fully released	0.4 - 1.1 V
	Fully depressed	3.7 - 4.8 V
98 (Accelerator pedal position sensor 2)	Fully released	0.20 - 0.55 V
	Fully depressed	1.85 - 2.40 V

4. If NG, replace accelerator pedal assembly and go to next step.
5. Perform EC-764, "Accelerator Pedal Released Position Learning".
6. Perform EC-764, "Throttle Valve Closed Position Learning".
7. Perform EC-765, "Idle Air Volume Learning".

Removal and Installation

INFOID:0000000005354475

ACCELERATOR PEDAL

Refer to ACC-3, "Component".

DTC P2A00, P2A03 A/F SENSOR 1

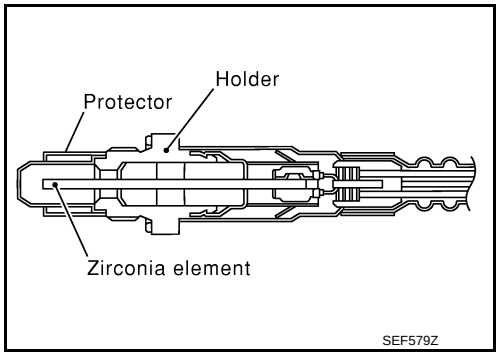
Component Description

INFOID:0000000005354476

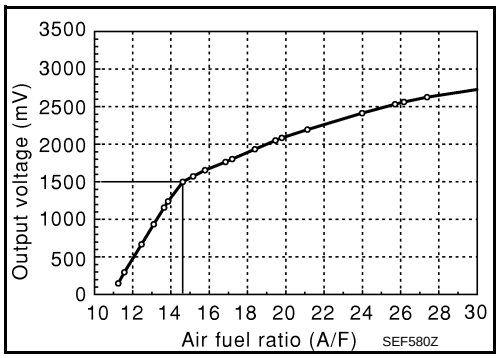
The air fuel ratio (A/F) sensor 1 is a planar dual-cell limit current sensor. The sensor element of the A/F sensor 1 is the combination of a Nernst concentration cell (sensor cell) with an oxygen-pump cell, which transports ions. It has a heater in the element.

The sensor is capable of precise measurement $\lambda = 1$, but also in the lean and rich range. Together with its control electronics, the sensor outputs a clear, continuous signal throughout a wide λ range ($0.7 < \lambda <$ air).

The exhaust gas components diffuse through the diffusion gap at the electrode of the oxygen pump and Nernst concentration cell, where they are brought to thermodynamic balance.



An electronic circuit controls the pump current through the oxygen pump cell so that the composition of the exhaust gas in the diffusion gap remains constant at $\lambda = 1$. Therefore, the A/F sensor 1 is able to indicate air/fuel ratio by this pumping of current. In addition, a heater is integrated in the sensor to ensure the required operating temperature of 700 - 800°C (1,292 - 1,472°F).



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354477

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
A/F SEN1 (B1) A/F SEN1 (B2)	• Engine: After warming up	Maintaining engine speed at 2,000 rpm	Fluctuates around 1.5 V

On Board Diagnosis Logic

INFOID:0000000005354478

To judge the malfunction, the A/F signal computed by ECM from the A/F sensor 1 signal is monitored not to shift to LEAN side or RICH side.

DTC No.	Trouble diagnosis name	DTC detecting condition	Possible cause
P2A00 2A00 (Bank 1) P2A03 2A03 (Bank 2)	Air fuel ratio (A/F) sensor 1 circuit range/performance	• The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the lean side for a specified period. • The A/F signal computed by ECM from the A/F sensor 1 signal shifts to the rich side for a specified period.	• A/F sensor 1 • A/F sensor 1 heater • Fuel pressure • Fuel injector • Intake air leakage

DTC Confirmation Procedure

INFOID:0000000005354479

NOTE:
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.

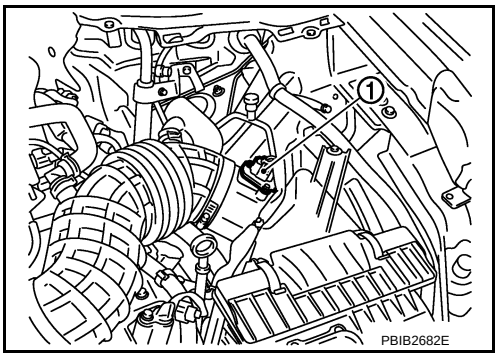
TESTING CONDITION:
Before performing the following procedure, confirm that battery voltage is more than 11 V at idle.

WITH CONSULT-III

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 and select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
6. Clear the self-learning coefficient by touching “CLEAR”.
7. Turn ignition switch OFF and wait at least 10 seconds.
8. Turn ignition switch ON.
9. Turn ignition switch OFF and wait at least 10 seconds.
10. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
11. Let engine idle for 1 minute.
12. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
13. Check 1st trip DTC.
14. If 1st trip DTC is detected, go to EC-1276, "Diagnosis 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. Disconnect mass air flow sensor (1) harness connector.
4. Start engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Turn ignition switch ON.
7. Select Service $03 with GST and check that DTC P0102 is detected.
8. Select Service $04 with GST and erase the DTC P0102.
9. Turn ignition switch OFF and wait at least 10 seconds.
10. Turn ignition switch ON.
11. Turn ignition switch OFF and wait at least 10 seconds.
12. Start engine and keep the engine speed between 3,500 and 4,000 rpm for 1 minute under no load.
13. Let engine idle for 1 minute.
14. Keep engine speed between 2,500 and 3,000 rpm for 20 minutes.
15. Check 1st trip DTC.
16. If 1st trip DTC is detected, go to EC-1276, "Diagnosis Procedure".

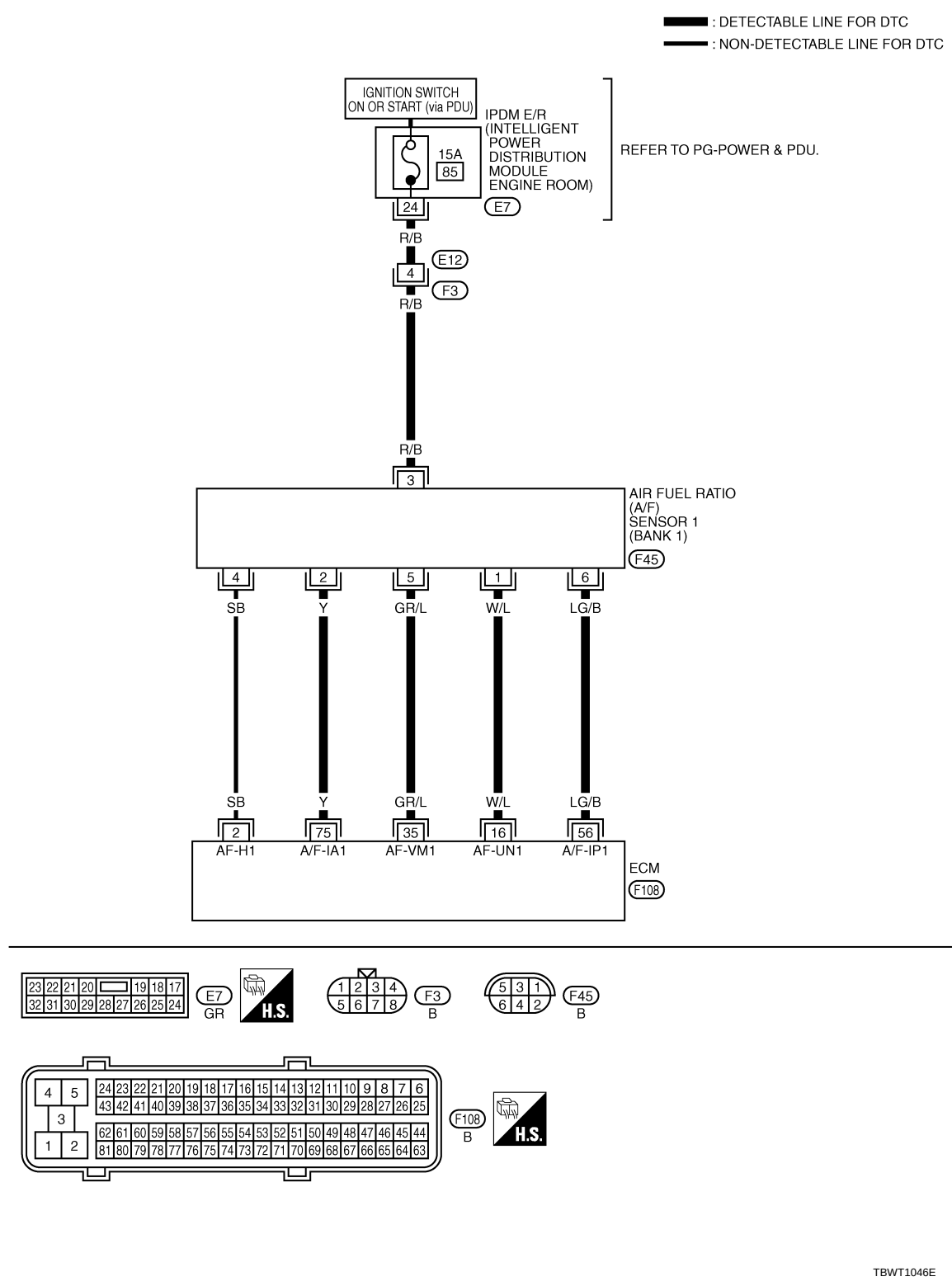


Wiring Diagram

INFOID:0000000005354480

BANK 1

EC-AF1B1-01

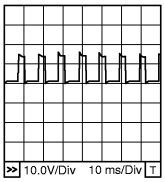


TBWT1046E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

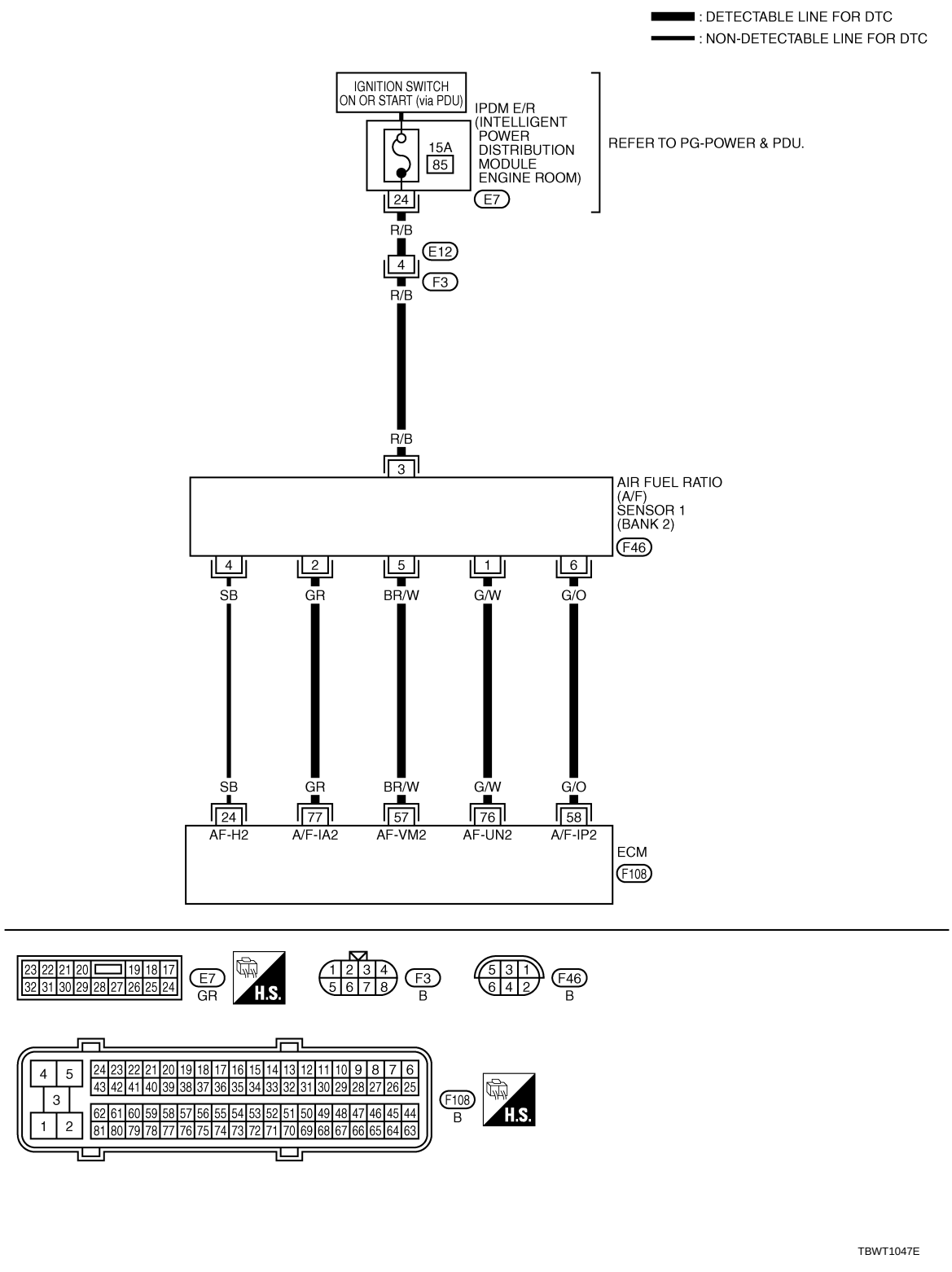
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
2	SB	A/F sensor 1 heater (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
16	W/L	A/F sensor 1 (bank 1)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 3.1 V
35	GR/L			Approximately 2.6 V
56	LG/B			Approximately 2.3 V
75	Y			Approximately 2.3 V

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-AF1B2-01

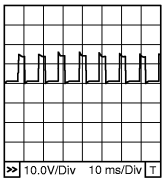


TBWT1047E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
24	SB	A/F sensor 1 heater (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 5 V★  PBIB1584E
57	BR/W	A/F sensor 1 (bank 2)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 2.6 V
58	G/O			Approximately 2.3 V
76	G/W			Approximately 3.1 V
77	GR			Approximately 2.3 V

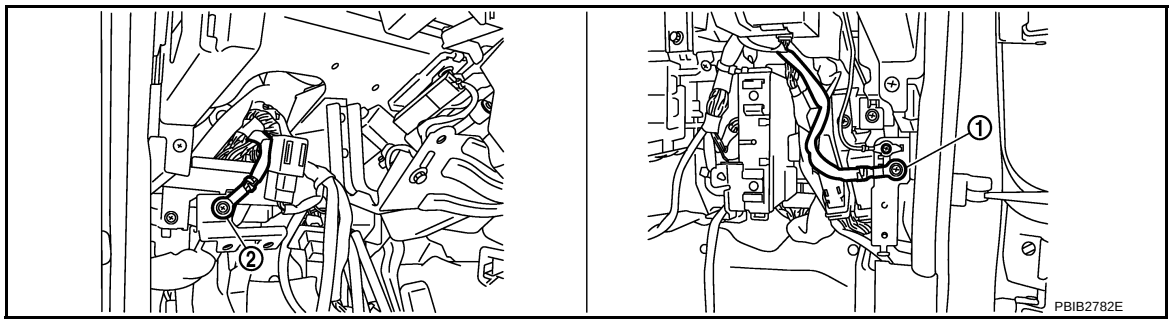
★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354481

1.CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
   Refer to EC-828, "Ground Inspection".



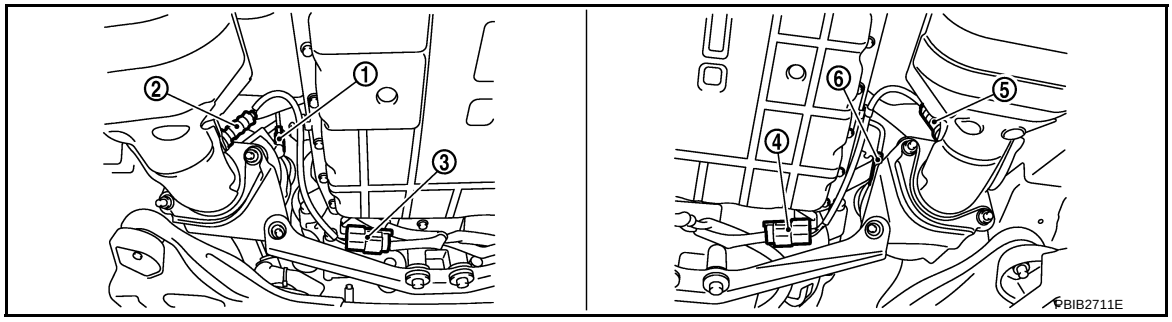
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 2.
NG >> Repair or replace ground connections.

2.RETIGHTEN AIR FUEL RATIO (A/F) SENSOR 1

1. Loosen and retighten the air fuel ratio (A/F) sensor 1.



1. A/F sensor 1 (bank 1)
2. Heated oxygen sensor 2 (bank 1)
3. Heated oxygen sensor 2 (bank 1) harness connector
4. Heated oxygen sensor 2 (bank 2) harness connector
5. Heated oxygen sensor 2 (bank 2)
6. A/F sensor 1 (bank 2)

Tightening torque: 50 N-m (5.1 kg-m, 37 ft-lb)

>> GO TO 3.

3.CHECK FOR INTAKE AIR LEAKAGE

1. Start engine and run it at idle.
2. Listen for an intake air leakage after the mass air flow sensor.

OK or NG

OK >> GO TO 4.
NG >> Repair or replace malfunctioning part.

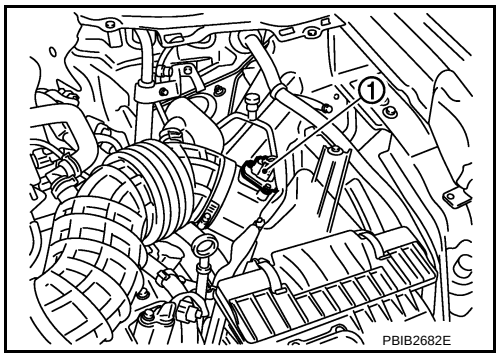
4.CLEAR THE SELF-LEARNING DATA

With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
3. Clear the self-learning control coefficient by touching “CLEAR”.
4. 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?

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.
3. Disconnect mass air flow sensor (1) harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC memory. Refer to “How to Erase DTC” in EC-735, "Emission-Related Diagnostic Information".
8. Check that DTC P0000 is displayed.
9. 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?

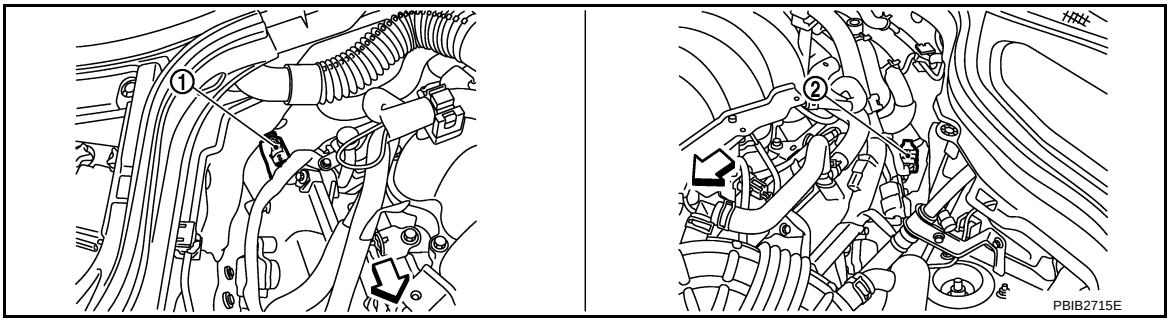


Yes or No

Yes >> Perform trouble diagnosis for DTC P0171, P0174 or P0172, P0175. Refer to EC-970, "DTC Confirmation Procedure" or EC-979, "DTC Confirmation Procedure".
No >> GO TO 5.

5.CHECK HARNESS CONNECTOR

1. Turn ignition switch OFF.
2. Disconnect A/F sensor 1 harness connector.



⇦ : Vehicle front
1. A/F sensor 1 (bank 2) harness connector
2. A/F sensor 1 (bank 1) harness connector

3. Check harness connector for water.

Water should not exit.

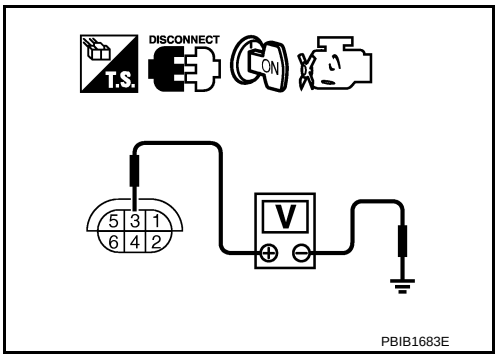
OK or NG

OK >> GO TO 6.
NG >> Repair or replace harness connector.

6. CHECK A/F SENSOR 1 POWER SUPPLY CIRCUIT

1. Turn ignition switch ON.
2. Check voltage between A/F sensor 1 terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- IPDM E/R harness connector E7
- 15 A fuse
- 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 harness continuity between A/F sensor 1 terminal and ECM terminal as per the following. Refer to Wiring Diagram.

	A/F sensor 1 terminal	ECM terminal
Bank1	1	16
	2	75
	5	35
	6	56
Bank 2	1	76
	2	77
	5	57
	6	58

Continuity should exist.

4. Check harness continuity between the following terminals and ground. Refer to Wiring Diagram.

Bank 1		Bank 2	
A/F sensor 1 terminal	ECM terminal	A/F sensor 1 terminal	ECM terminal
1	16	1	76
2	75	2	77
5	35	5	57
6	56	6	58

Continuity should not exist.

5. Also check harness for short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK A/F SENSOR 1 HEATER

Refer to EC-851, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> GO TO 11.

10. CHECK INTERMITTENT INCIDENT

Perform EC-822, "Diagnosis Procedure".

OK or NG

OK >> GO TO 11.
NG >> Repair or replace malfunctioning part.

11. REPLACE AIR FUEL RATIO (A/F) SENSOR 1

Replace malfunctioning air fuel ratio (A/F) sensor 1.

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).**

>> GO TO 12.

12. CONFIRM A/F ADJUSTMENT DATA

1. Turn ignition switch ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT-III.
3. Check that that “0.000” is displayed on CONSULT-III screen.

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 13.

13. CLEAR A/F ADJUSTMENT DATA

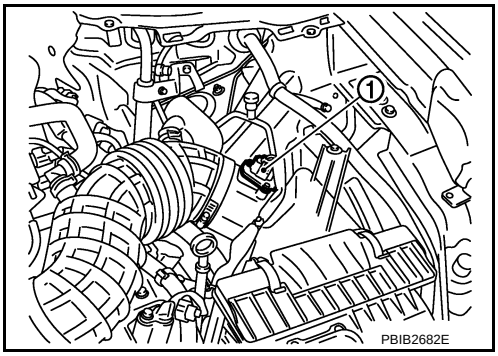
With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Select “SELF-LEARNING CONT” in “WORK SUPPORT” mode with CONSULT-III.
3. Clear the self-learning control coefficient by touching “CLEAR”.

Without CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Turn ignition switch OFF.

3. Disconnect mass air flow sensor (1) harness connector.
4. Restart engine and let it idle for at least 5 seconds.
5. Stop engine and reconnect mass air flow sensor harness connector.
6. Check that DTC P0102 is displayed.
7. Erase the DTC memory. Refer to “How to Erase DTC” in EC-735, "Emission-Related Diagnostic Information".
8. Check that DTC P0000 is displayed.



>> GO TO 14.

14. CONFIRM A/F ADJUSTMENT DATA

1. Turn ignition switch OFF and then ON.
2. Select “A/F ADJ-B1” and “A/F ADJ-B2” in “DATA MONITOR” mode with CONSULT-III.
3. Check that that “0.000” is displayed on CONSULT-III screen.

>> **INSPECTION END**

Removal and Installation

INFOID:0000000005354482

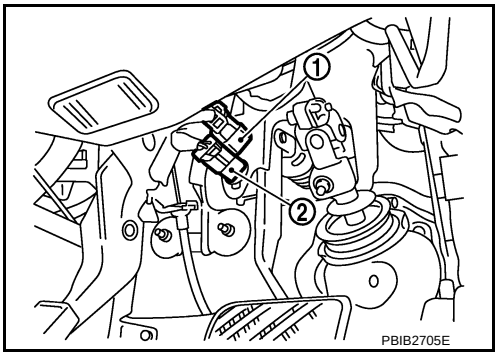
AIR FUEL RATIO (A/F) SENSOR 1
Refer to EM-178, "Component".

ASCD BRAKE SWITCH

Component Description

INFOID:0000000005354483

When the brake pedal is depressed, ASCD brake switch (2) is turned OFF and stop lamp switch (1) is turned ON. ECM detects the state of the brake pedal by two kinds of input (ON/OFF signal).
Refer to EC-717, "System Description" for the ASCD function.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354484

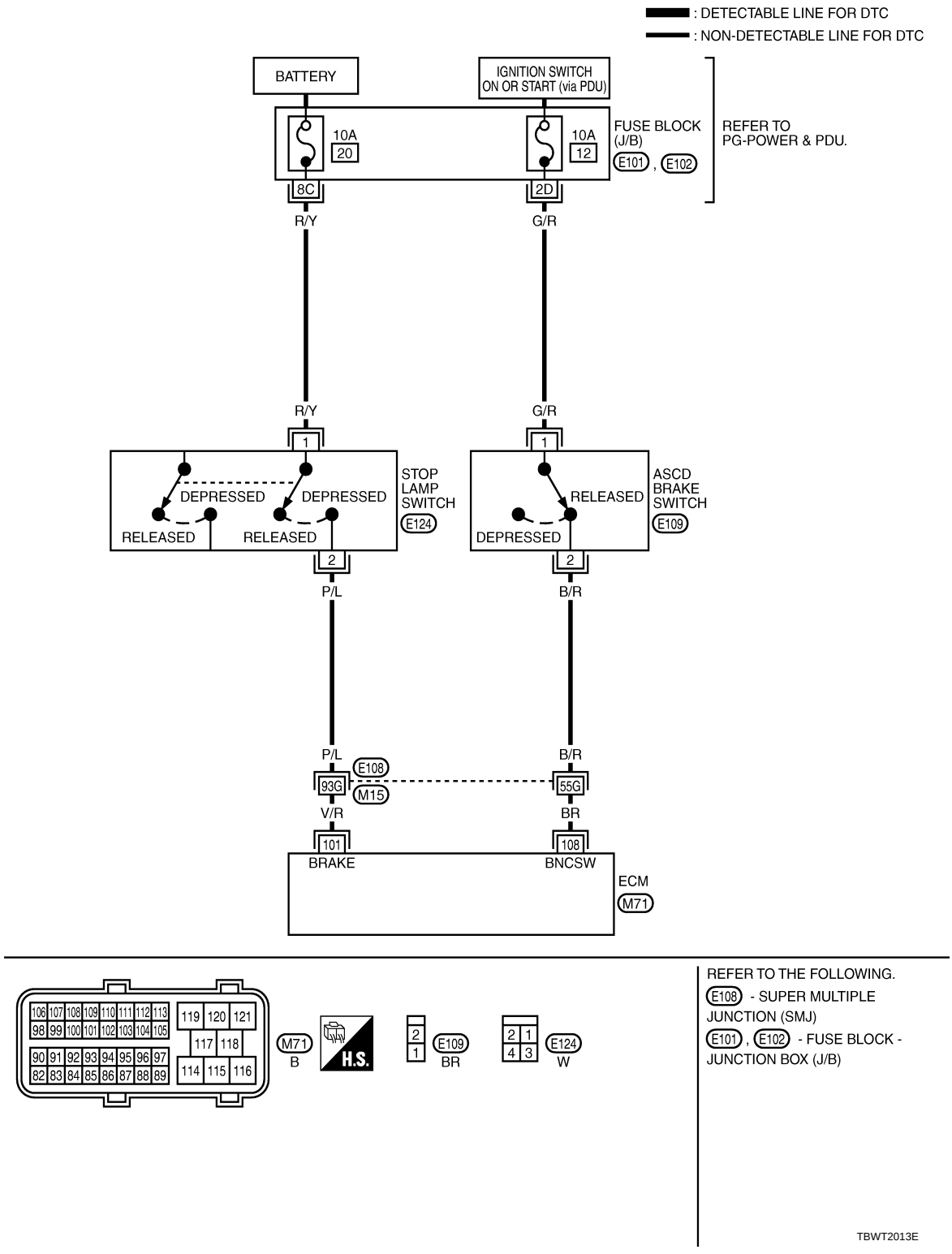
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (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

Wiring Diagram

INFOID:0000000005354485

EC-ASCBOF-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	V/R	Stop lamp switch	**[Ignition switch: OFF]** • Brake pedal: Fully released	Approximately 0 V
			[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
108	BR	ASCD brake switch	**[Ignition switch: ON]** • Brake pedal: Slightly depressed	Approximately 0 V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354486

1.CHECK OVERALL FUNCTION-I

With CONSULT-III

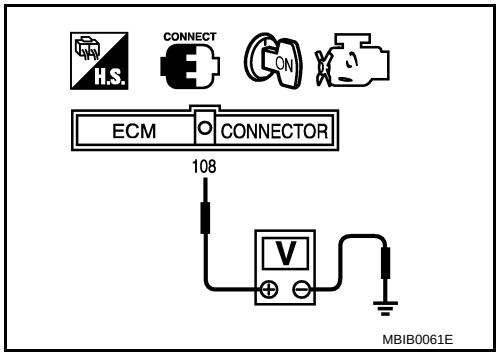
1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

CONDITION	INDICATION
Brake pedal: Fully released	ON
Brake pedal: Slightly depressed	OFF

Without CONSULT-III

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 108 and ground under the following conditions.

CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approximately 0 V



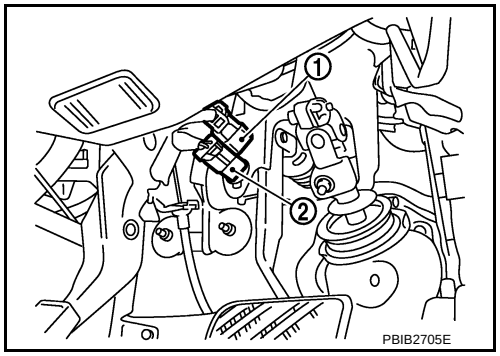
MBIB0061E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2.CHECK ASCD BRAKE SWITCH POWER SUPPLY CIRCUIT

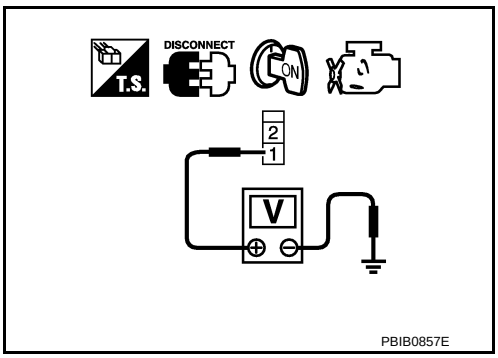
1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch (2) harness connector.
- Stop lamp switch (1)
3. Turn ignition switch ON.



PBIB2705E

4. Check voltage between ASCD brake switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E102
- 10 A fuse
- Harness for open or short between ASCD brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ASCD BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 108 and ASCD brake switch terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ECM and ASCD brake switch

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ASCD BRAKE SWITCH

Refer to EC-1213, "Component Inspection"

OK or NG

OK >> GO TO 7.
NG >> Replace ASCD brake switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354487

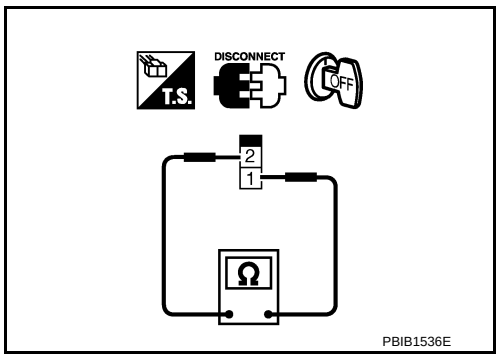
ASCD BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ASCD brake switch harness connector.

3. Check continuity between ASCD brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should exist
Brake pedal: Slightly depressed	Should not exist

4. If NG, adjust ASCD brake switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.



ASCD INDICATOR

Component Description

INFOID:0000000005354488

ASCD indicator lamp illuminates to indicate ASCD operation status. Lamp has two indicators, CRUISE and SET, and is integrated in combination meter.
CRUISE lamp illuminates when MAIN switch on ASCD steering switch is turned ON to indicate that ASCD system is ready for operation.
SET lamp illuminates when the following conditions are met.
- CRUISE lamp is illuminated.
- SET/COAST switch on ASCD steering switch is turned ON while vehicle speed is within the range of the ASCD setting.

SET lamp remains lit during ASCD control.
Refer to EC-717, "System Description" for the ASCD function.

CONSULT-III Reference Value in Data Monitor Mode

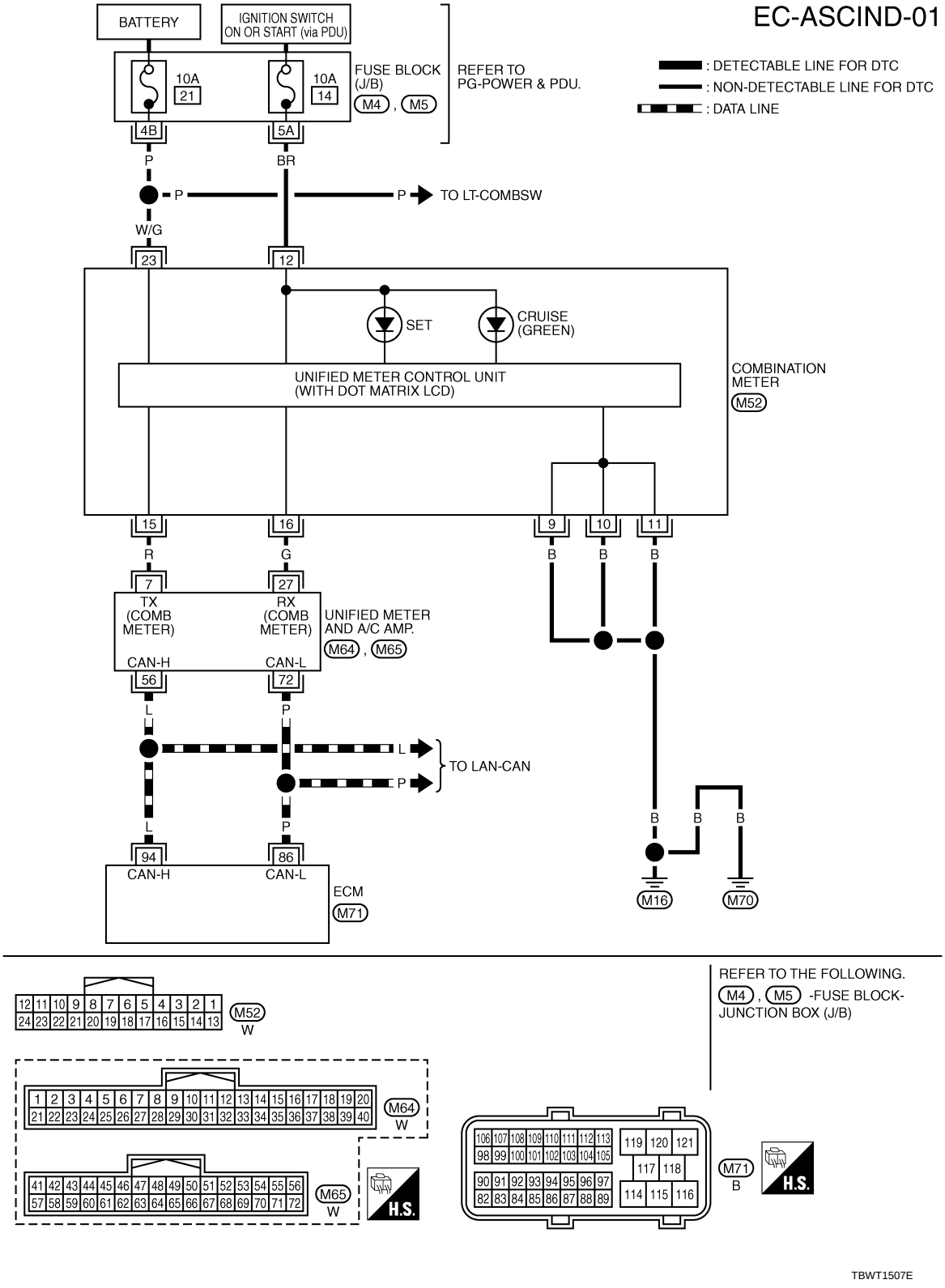
INFOID:0000000005354489

Specification data are reference values.

MONITOR ITEM	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 • Vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	ASCD: Operating	ON
		ASCD: Not operating	OFF

Wiring Diagram

INFOID:0000000005354490



Diagnosis Procedure

INFOID:0000000005354491

1. CHECK OVERALL 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 • Vehicle speed: Between 40 km/h (25 MPH) and 144 km/h (89 MPH)	• ASCD: Operating	ON
		• ASCD: Not operating	OFF

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2.CHECK DTC

Check that DTC UXXXX is not displayed.

OK or NG

OK >> GO TO 3.
NG >> Perform trouble diagnosis for DTC UXXXX.

3.CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

OK >> GO TO 4.
NG >> Go to DI-31, "DTC [B2202] Meter Communication Circuit".

4.CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

ELECTRICAL LOAD SIGNAL

Description

INFOID:0000000005354492

The electrical load signal (Headlamp switch signal, rear window defogger switch signal, heater fan switch signal, etc.) is transferred via the CAN communication line.

CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354493

Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
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
HEATER FAN SW	• Engine: After warming up, idle the engine	Heater fan switch: ON	ON
		Heater fan switch: OFF	OFF

Diagnosis Procedure

INFOID:0000000005354494

1.CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-I

1. Turn ignition switch ON.
2. Select “DATA MONITOR” mode with CONSULT-III.
3. Select “LOAD SIGNAL” and check indication under the following conditions.

Condition	Indication
Rear window defogger switch: ON	ON
Rear window defogger switch: OFF	OFF

OK or NG

OK >> GO TO 2.
NG >> GO TO 4.

2.CHECK LOAD SIGNAL CIRCUIT OVERALL FUNCTION-II

Check “LOAD SIGNAL” indication under the following conditions.

Condition	Indication
Lighting switch: ON at 2nd position	ON
Lighting switch: OFF	OFF

OK or NG

OK >> GO TO 3.
NG >> GO TO 5.

3.CHECK HEATER FAN SIGNAL CIRCUIT OVERALL FUNCTION

Select “HEATER FAN SW” and check indication under the following conditions.

Condition	Indication
Heater fan control switch: ON	ON
Heater fan control switch: OFF	OFF

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 6.

4. CHECK REAR WINDOW DEFOGGER SYSTEM

Refer to GW-72, "Work Flow".

>> **INSPECTION END**

5. CHECK HEADLAMP SYSTEM

Refer to LT-6, "System Description" (For USA) or LT-35, "System Description" (For Canada).

>> **INSPECTION END**

6. CHECK HEATER FAN CONTROL SYSTEM

Refer to ATC-48, "Self-Diagnosis Function".

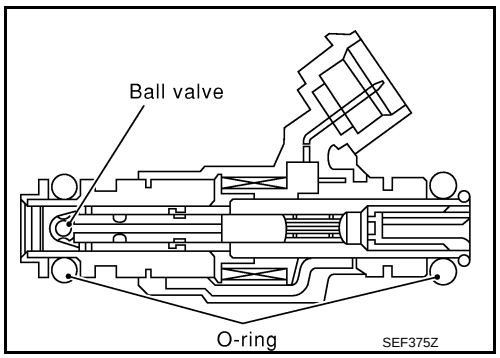
>> **INSPECTION END**

FUEL INJECTOR

Component Description

INFOID:0000000005354495

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.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354496

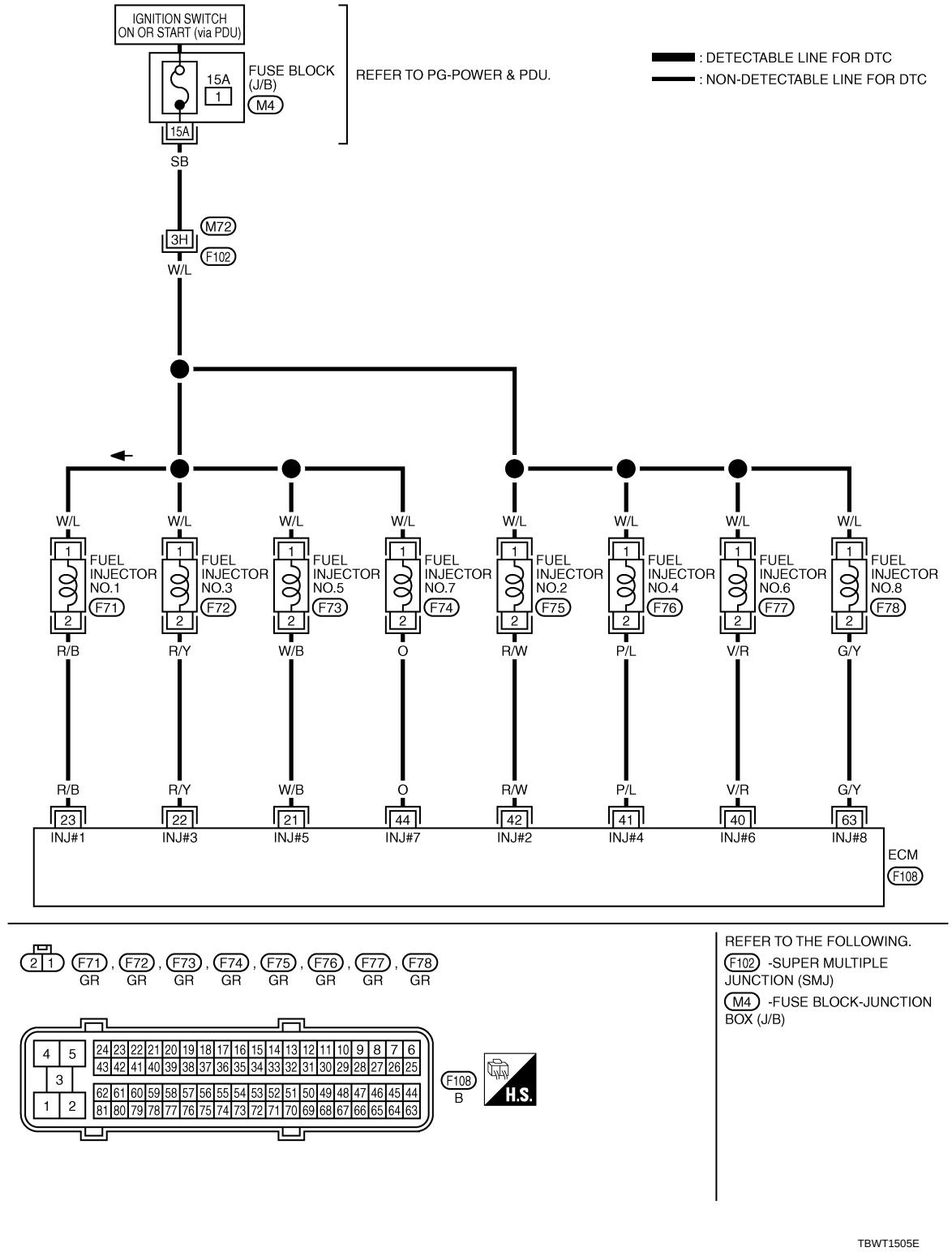
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
B/FUEL SCHDL	See EC-814, "Inspection Procedure".		
INJ PULSE-B1 INJ PULSE-B2	• Engine: After warming up • Selector lever position: P or N • Air conditioner switch: OFF • No load	Idle	2.0 - 3.0 msec
		2,000 rpm	1.9 - 2.9 msec

Wiring Diagram

INFOID:0000000005354497

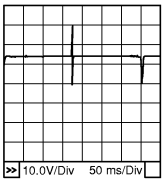
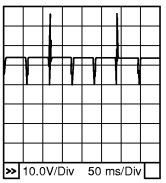
EC-INJECT-01



TBWT1505E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
21 22 23 40 41 42 44 63	W/B R/Y R/B V/R P/L R/W O G/Y	Fuel injector No. 5 Fuel injector No. 3 Fuel injector No. 1 Fuel injector No. 6 Fuel injector No. 4 Fuel injector No. 2 Fuel injector No. 7 Fuel injector No. 8	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	BATTERY VOLTAGE (11 - 14 V)★  PBIB0042E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	BATTERY VOLTAGE (11 - 14 V)★  PBIB0043E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354498

1.INSPECTION START

Turn ignition switch to START.
Are any cylinders ignited?

Yes or No

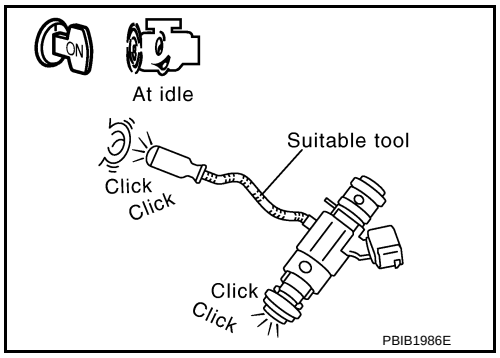
Yes >> GO TO 2.
No >> GO TO 3.

2.CHECK OVERALL FUNCTION

With CONSULT-III
1. Start engine.
2. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
3. Check that each circuit produces a momentary engine speed drop.

Without CONSULT-III
1. Start engine.
2. Listen to each fuel injector operating sound.

Operating sound should exist.



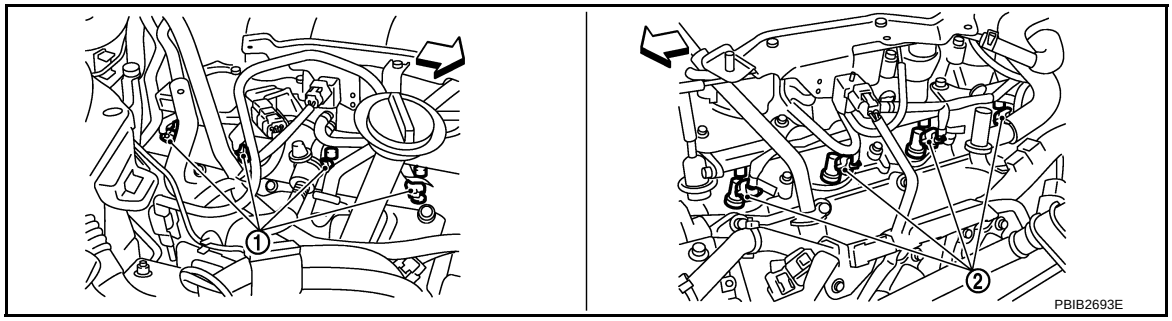
PBIB1986E

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 3.

3.CHECK FUEL INJECTOR POWER SUPPLY CIRCUIT

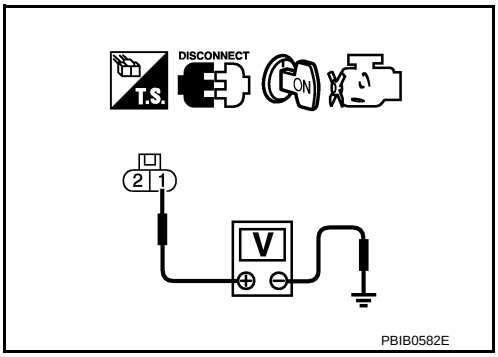
1. Turn ignition switch OFF.
2. Disconnect fuel injector harness connectors.



⇦ : Vehicle front 1. Fuel injector (bank 2) 2. Fuel injector (bank 1)

3. Turn ignition switch ON.
4. Check voltage between fuel injector terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors M72, F102
- Fuse block (J/B) connector M4
- 15 A fuse
- Harness for open or short between fuel injector and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK FUEL INJECTOR OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminals 21, 22, 23, 40, 41, 42, 44, 63 and fuel injector terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK FUEL INJECTOR

Refer to EC-1295, "Component Inspection".

OK or NG

OK >> GO TO 7.
NG >> Replace malfuncioning fuel injector.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

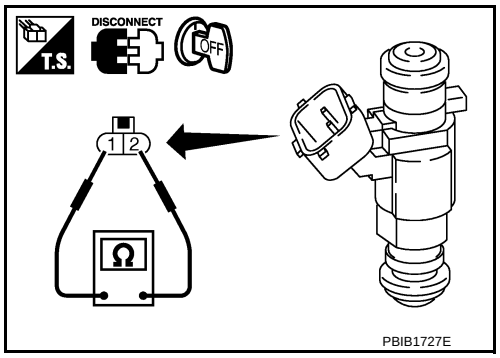
Component Inspection

INFOID:0000000005354499

FUEL INJECTOR

1. Disconnect fuel injector harness connector.
2. Check resistance between terminals as shown in the figure.

Resistance: 13.5 - 17.5 Ω [at 10 - 60°C (50 - 140°F)]



Removal and Installation

INFOID:0000000005354500

FUEL INJECTOR

Refer to EM-189, "Component".

FUEL PUMP

Description

INFOID:0000000005354501

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	Fuel pump control	Fuel pump relay
Battery	Battery voltage*		

*: ECM determines the start signal status by the signals of engine speed and battery voltage.

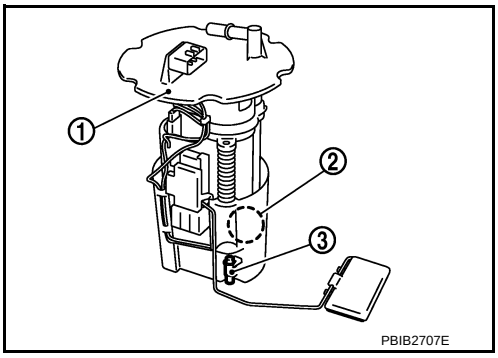
The ECM activates the fuel pump for several seconds after the ignition switch is turned ON to improve engine start ability. If the ECM receives a engine speed signal from the camshaft position sensor (PHASE), it knows that the engine is rotating, and causes the pump to operate. If the engine speed signal 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 DESCRIPTION

A turbine type design fuel pump is used in the fuel tank.

- Fuel level sensor unit and fuel pump (1)
- Fuel pressure regulator (2)
- Fuel tank temperature sensor (3)



PBIB2707E

CONSULT-III Reference Value in Data Monitor Mode

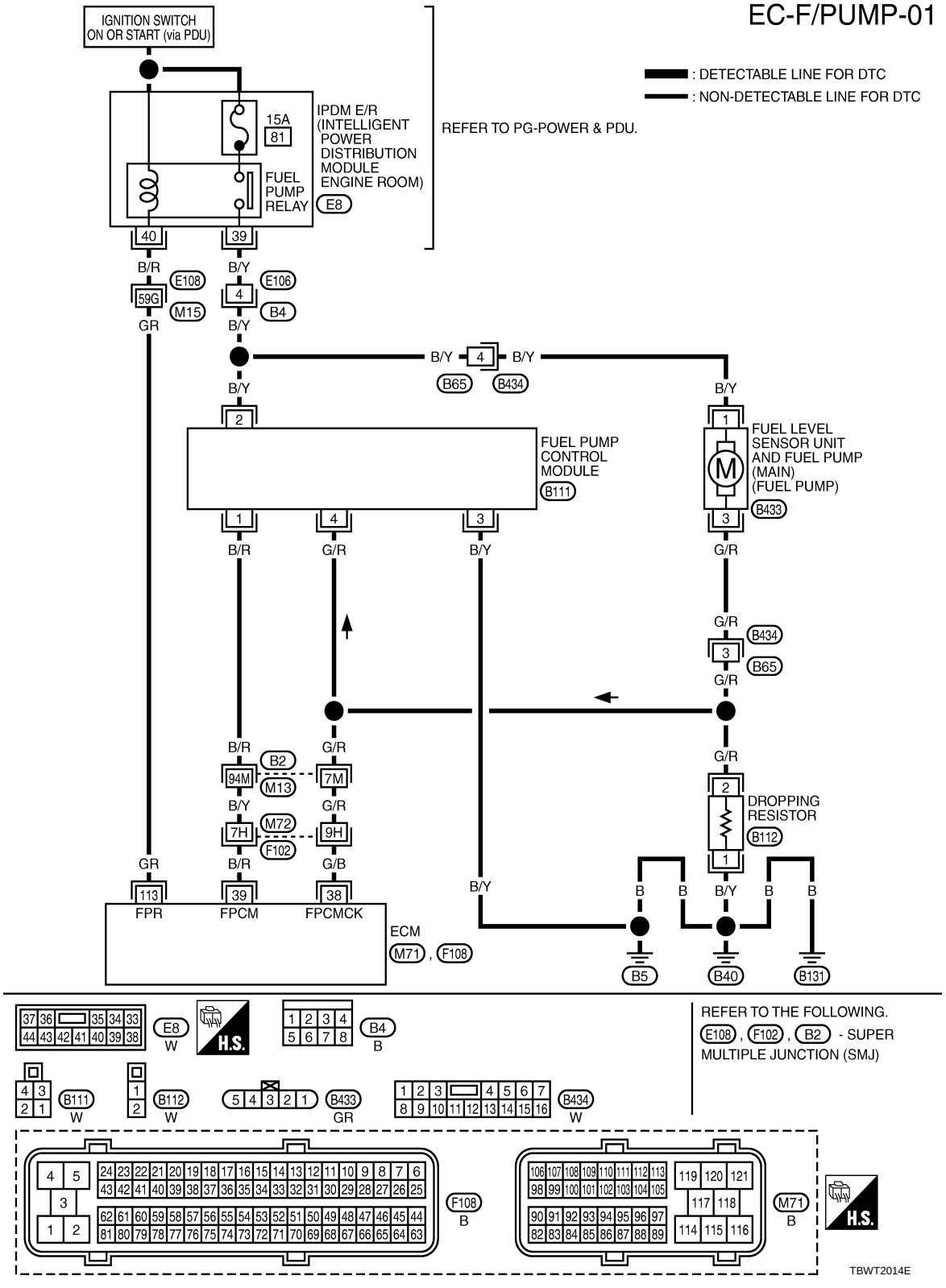
INFOID:0000000005354502

Specification data are reference values.

MONITOR ITEM	CONDITION	SPECIFICATION
FUEL PUMP RLY	• For 1 seconds after turning ignition switch: ON • Engine running or cranking	ON
	• Except above	OFF

Wiring Diagram

INFOID:0000000005354503



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
38	G/B	Fuel pump control module (FPCM) check	**[When cranking engine]**	Approximately 0 V
			[Engine is running] • **Warm-up condition** • Idle speed	4 - 6 V
39	B/R	Fuel pump control module (FPCM)	**[When cranking engine]**	0 - 0.5 V
			[Engine is running] • **Warm-up condition** • Idle speed	8 - 12 V
113	GR	Fuel pump relay	**[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)

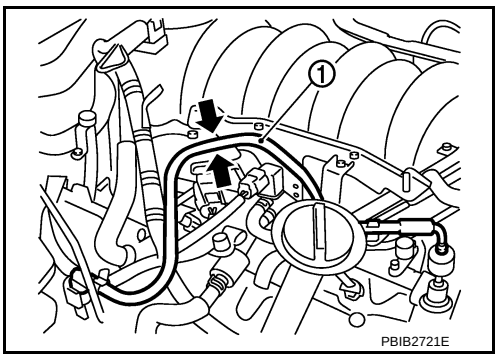
Diagnosis Procedure

INFOID:0000000005354504

1.CHECK OVERALL 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.



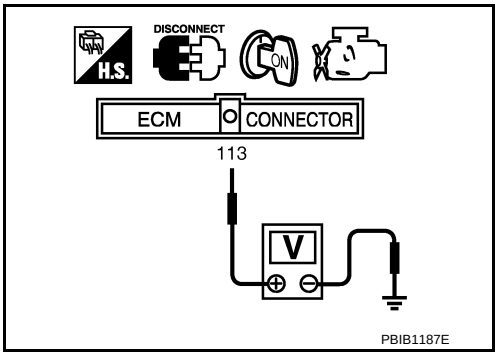
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Turn ignition switch ON.
4. Check voltage between ECM terminal 113 and ground with CONSULT-III or tester.

Voltage: Battery voltage

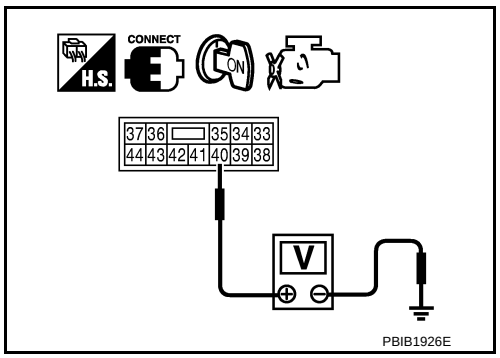


OK or NG

OK >> GO TO 5.
NG >> GO TO 3.

3.CHECK FUEL PUMP POWER SUPPLY CIRCUIT-II

Check voltage between IPDM E/R terminal 40 and ground with CONSULT-III or tester.



Voltage: Battery voltage

OK or NG

OK >> GO TO 4.
NG >> GO TO 11.

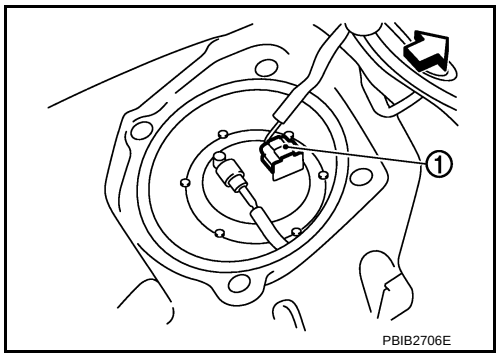
4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between IPDM E/R and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK FUEL PUMP POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect “fuel level sensor unit and fuel pump” harness connector (1).
- Illustration shows the view with rear seat cushion and inspection hole cover (RH) removed.
- ⇦: Vehicle front
4. Turn ignition switch ON.
5. Check voltage between “fuel level sensor unit and fuel pump” terminal 1 and ground with CONSULT-III or tester.



Voltage: Battery voltage should exist for 1 second after ignition switch is turned ON.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

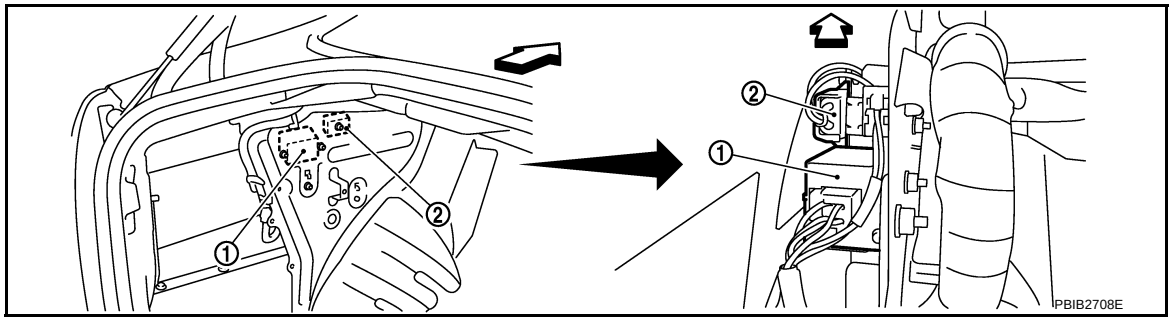
6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E106, B4
- Harness connectors B65, B434
- IPDM E/R connector E8
- 15 A fuse
- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK FUEL PUMP GROUND CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect dropping resistor harness connector.



⇦ : Vehicle front 1. FPCM 2. Dropping resistor

3. Check harness continuity between “fuel level sensor unit and fuel pump” terminal 3 and dropping resistor terminal 2, dropping resistor terminal 1 and ground.
Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors B65, B434
- Harness for open or short between “fuel level sensor unit and fuel pump” and dropping resistor
- Harness for open or short between dropping resistor and ground

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK DROPPING RESISTOR

Refer to EC-1300, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> Replace dropping resistor.

10. CHECK FUEL PUMP

Refer to EC-1300, "Component Inspection".

OK or NG

OK >> GO TO 11.
NG >> Replace fuel pump.

11. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> Replace IPDM E/R.
NG >> Repair or replace harness or connectors.

Component Inspection

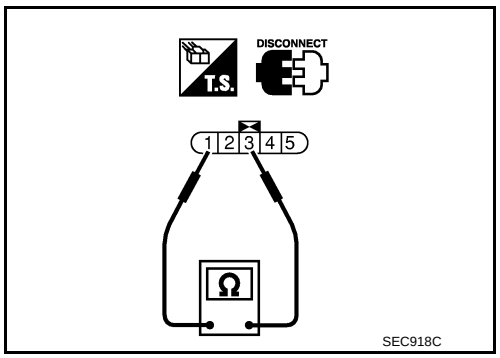
INFOID:0000000005354505

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 1 and 3.

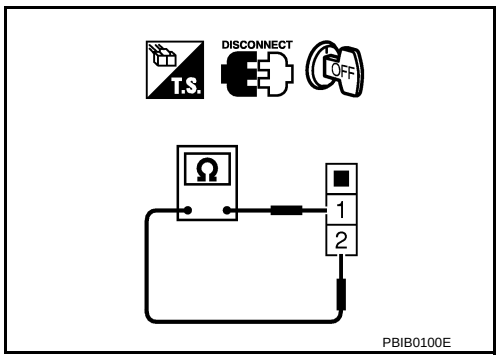
Resistance: 0.2 - 5.0 Ω [at 25°C (77°F)]



DROPPING RESISTOR

1. Turn ignition switch OFF.
2. Disconnect dropping resistor harness connector.
3. Check resistance between dropping resistor terminals 1 and 2.

Resistance: Approximately 0.9 Ω [at 20°C (68°F)]



Removal and Installation

INFOID:0000000005354506

FUEL PUMP

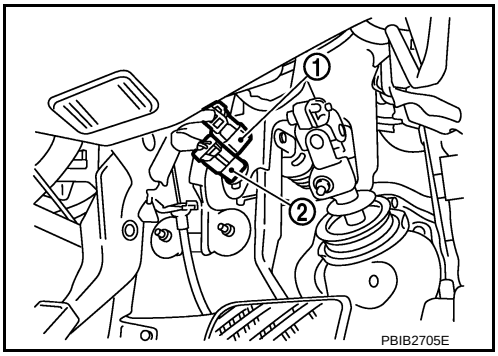
Refer to FL-4, "Component".

ICC BRAKE SWITCH

Component Description

INFOID:0000000005354507

When the brake pedal is depressed, ICC brake switch (2) is turned OFF and stop lamp switch (1) is turned ON. ECM detects the state of the brake pedal by two kinds of input (ON/OFF signal).
Refer to ACS-9, "Outline" for the ICC function.



CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354508

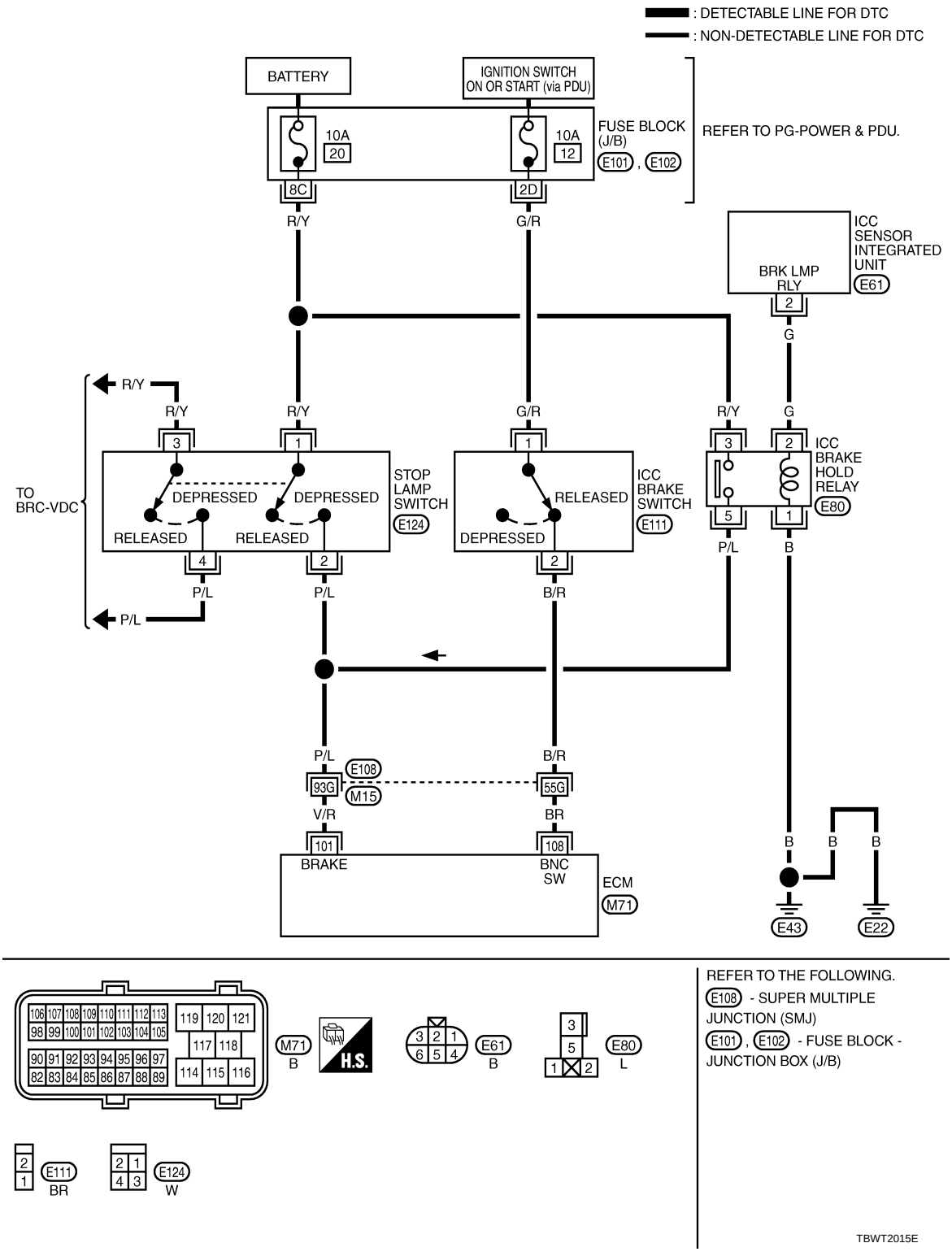
Specification data are reference values.

MONITOR ITEM	CONDITION		SPECIFICATION
BRAKE SW1 (ICC brake switch)	• Ignition switch: ON	Brake pedal: Fully released	ON
		Brake pedal: Slightly depressed	OFF
BRAKE SW2 (Stop lamp switch)	• Ignition switch: ON	Brake pedal: Fully released	OFF
		Brake pedal: Slightly depressed	ON

Wiring Diagram

INFOID:0000000005354509

EC-ICCBOF-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
101	V/R	Stop lamp switch	**[Ignition switch: OFF]** • Brake pedal: Fully released	Approximately 0 V
			[Ignition switch: OFF] • Brake pedal: Slightly depressed	BATTERY VOLTAGE (11 - 14 V)
108	BR	ICC brake switch	**[Ignition switch: ON]** • Brake pedal: Slightly depressed	Approximately 0 V
			[Ignition switch: ON] • Brake pedal: Fully released	BATTERY VOLTAGE (11 - 14 V)

Diagnosis Procedure

INFOID:0000000005354510

1.CHECK OVERALL FUNCTION-I

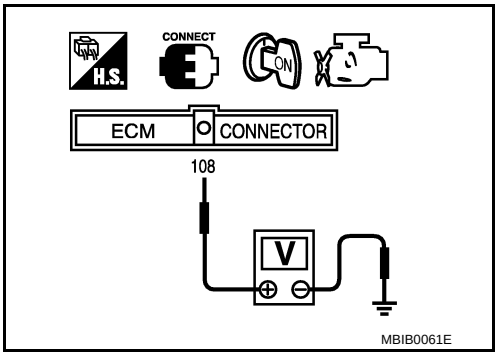
With CONSULT-III

1. Turn ignition switch ON.
2. Select “BRAKE SW1” in “DATA MONITOR” mode with CONSULT-III.
3. Check “BRAKE SW1” indication under the following conditions.

CONDITION	INDICATION
Brake pedal: Fully released	ON
Brake pedal: Slightly depressed	OFF

Without CONSULT-III

1. Turn ignition switch ON.
2. Check voltage between ECM terminal 108 and ground under the following conditions.



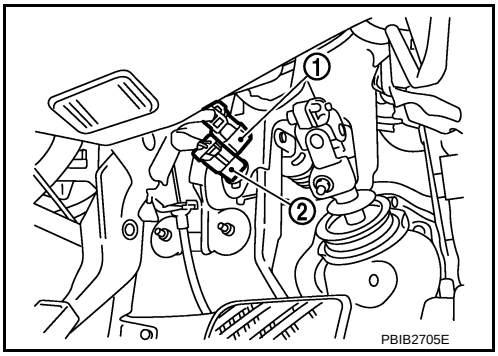
CONDITION	VOLTAGE
Brake pedal: Fully released	Battery voltage
Brake pedal: Slightly depressed	Approximately 0 V

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

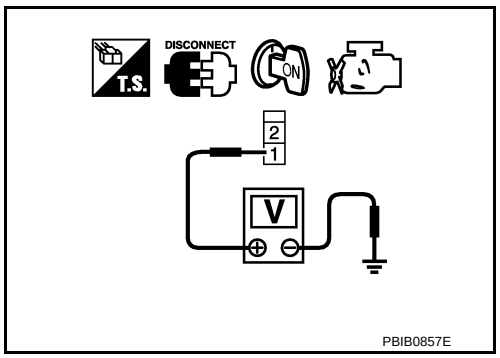
2.CHECK ICC BRAKE SWITCH POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch (2) harness connector.
- Stop lamp switch (1)
3. Turn ignition switch ON.



4. Check voltage between ICC brake switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 4.
NG >> GO TO 3.

3. DETECT MALFUNCTIONING PART

Check the following.
- Fuse block (J/B) connector E102
- 10 A fuse
- Harness for open or short between ICC brake switch and fuse

>> Repair open circuit or short to ground or short to power in harness or connectors.

4. CHECK ICC BRAKE SWITCH INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ICC brake switch terminal 2 and ECM terminal 108. Refer Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- Harness for open or short between ICC brake switch and ECM

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. CHECK ICC BRAKE SWITCH

Refer to EC-1305, "Component Inspection".

OK or NG

OK >> GO TO 7.
NG >> Replace ICC brake switch.

7. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354511

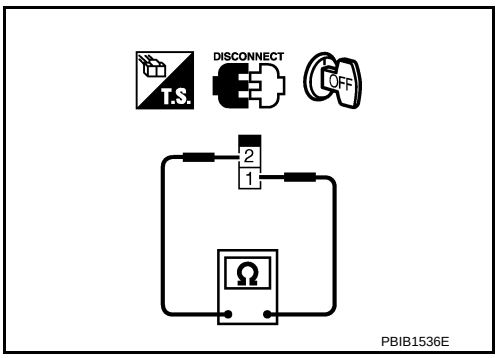
ICC BRAKE SWITCH

1. Turn ignition switch OFF.
2. Disconnect ICC brake switch harness connector.

3. Check continuity between ICC brake switch terminals 1 and 2 under the following conditions.

Condition	Continuity
Brake pedal: Fully released	Should exist
Brake pedal: Slightly depressed	Should not exist

4. If NG, adjust ICC brake switch installation, refer to BR-6, "Inspection and Adjustment", and perform step 3 again.



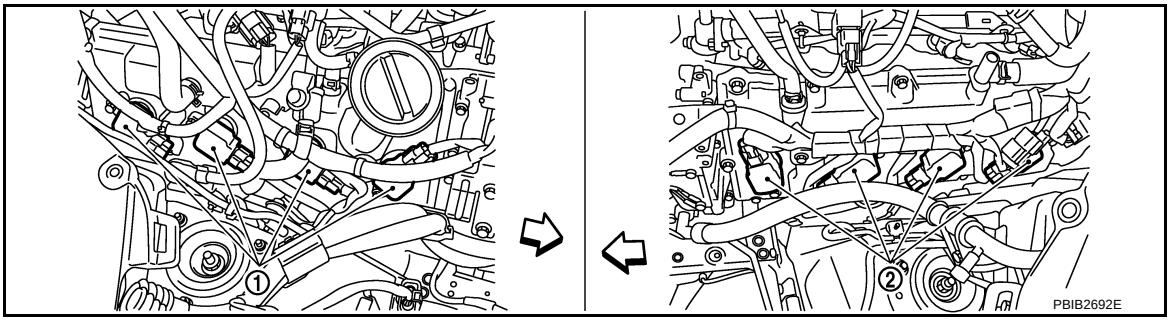
IGNITION SIGNAL

Component Description

INFOID:0000000005354512

IGNITION COIL & POWER TRANSISTOR

The ignition signal from the ECM is sent to and amplified by the power transistor. The power transistor turns ON and OFF the ignition coil primary circuit. This ON/OFF operation induces the proper high voltage in the coil secondary circuit.

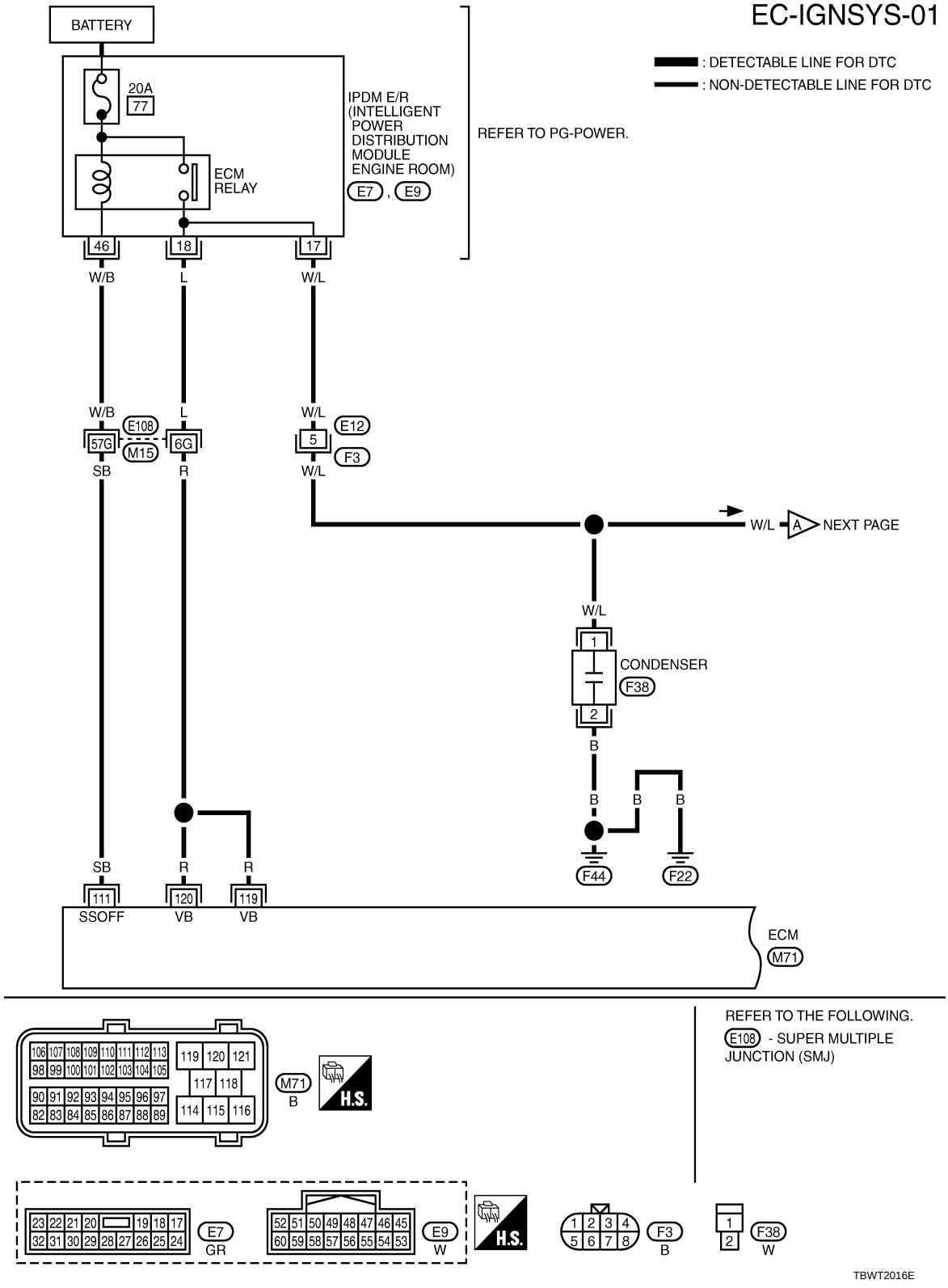


⇦ : Vehicle front

1. Ignition coil (with power transistor) (bank 2)
2. Ignition coil (with power transistor) (bank 1)

Wiring Diagram

INFOID:0000000005354513



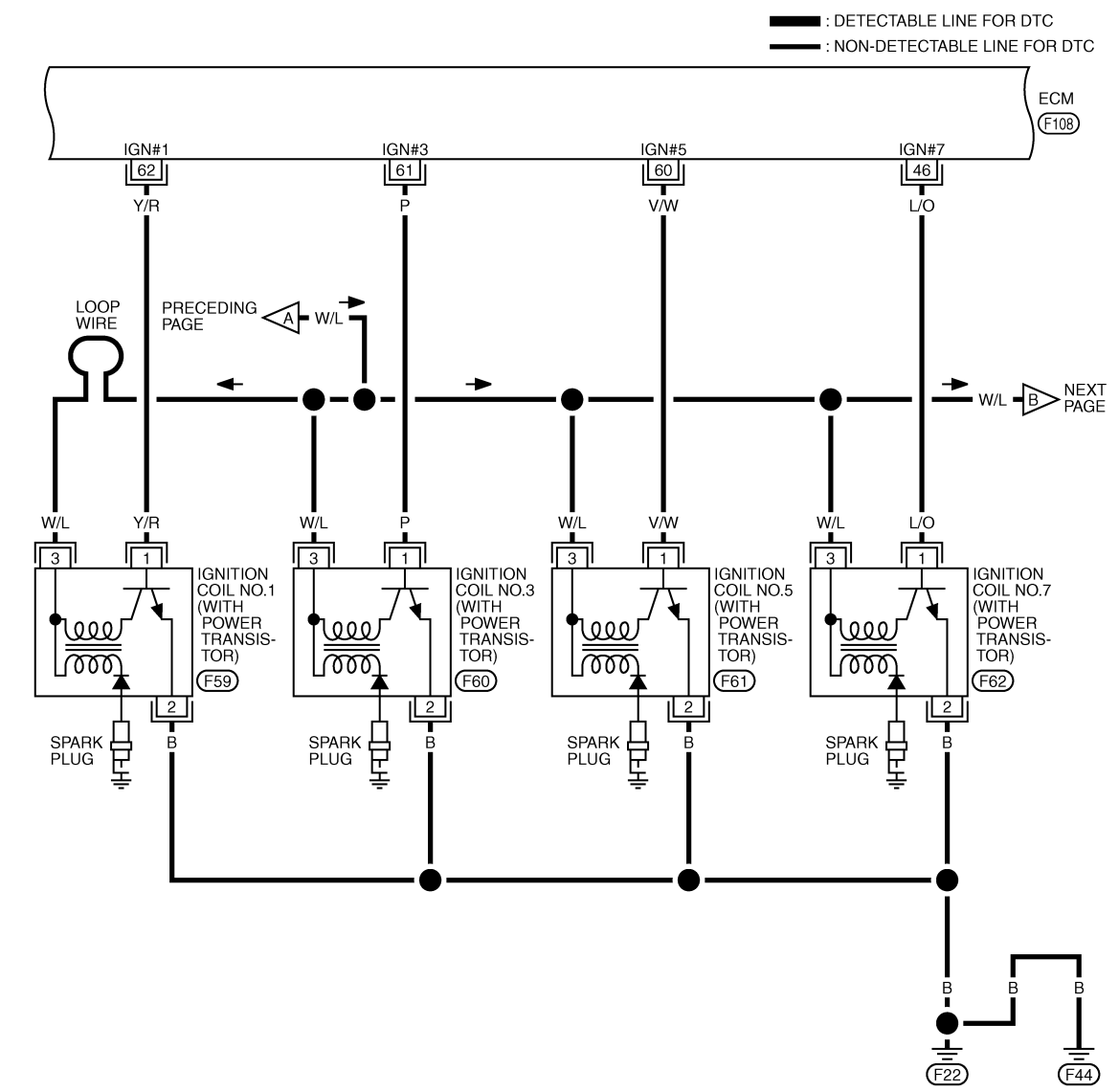
Specification data are reference values and are measured between each terminal and ground.

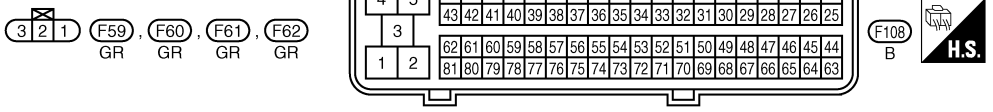
CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

EC-IGNSYS-02



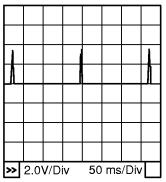
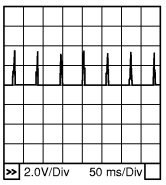


TBWT1062E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

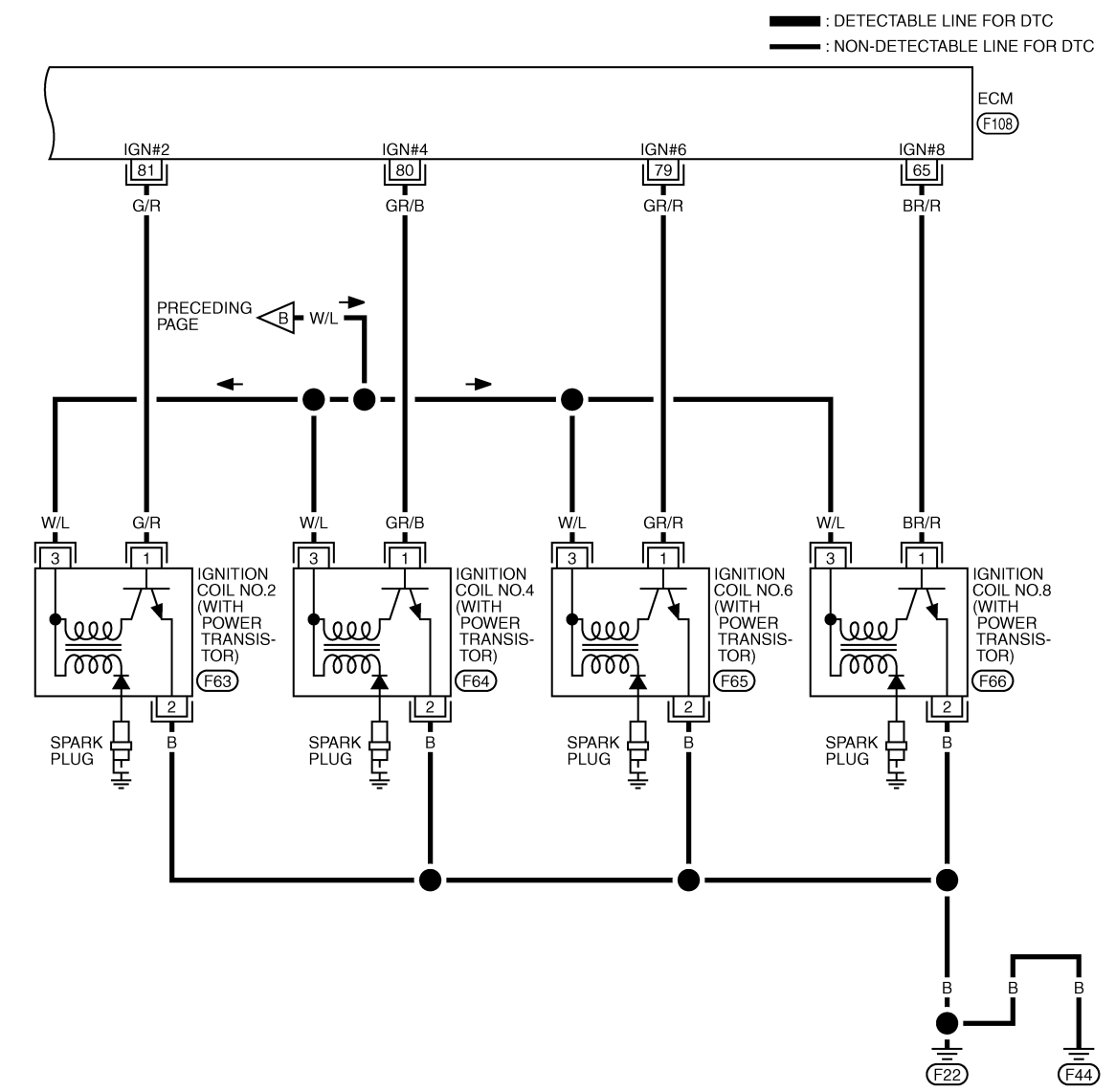
CAUTION:

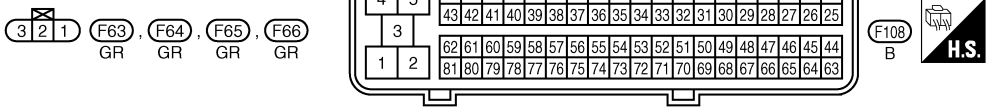
Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
46 60 61 62	L/O V/W P Y/R	Ignition signal No. 7 Ignition signal No. 5 Ignition signal No. 3 Ignition signal No. 1	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★  PBIB0044E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	0.1 - 0.4 V★  PBIB0045E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

EC-IGNSYS-03



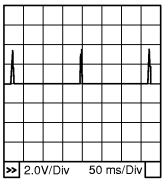
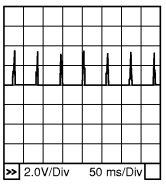


TBWT1063E

Specification data are reference values and are measured between each terminal and ground.
Pulse signal is measured by CONSULT-III.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
65 79 80 81	BR/R GR/R GR/B G/R	Ignition signal No. 8 Ignition signal No. 6 Ignition signal No. 4 Ignition signal No. 2	**[Engine is running]** • **Warm-up condition** • Idle speed **NOTE:** The pulse cycle changes depending on rpm at idle	0 - 0.2 V★  PBIB0044E
			[Engine is running] • **Warm-up condition** • Engine speed: 2,000 rpm	0.1 - 0.4 V★  PBIB0045E

★: Average voltage for pulse signal (Actual pulse signal can be confirmed by oscilloscope.)

Diagnosis Procedure

INFOID:0000000005354514

1.CHECK ENGINE START

Turn ignition switch OFF, and restart engine.
Is engine running?

Yes or No

Yes (With CONSULT-III)>>GO TO 2.
Yes (Without CONSULT-III)>>GO TO 3.
No >> GO TO 4.

2.CHECK OVERALL FUNCTION

With CONSULT-III

1. Perform “POWER BALANCE” in “ACTIVE TEST” mode with CONSULT-III.
2. Check that each circuit produces a momentary engine speed drop.

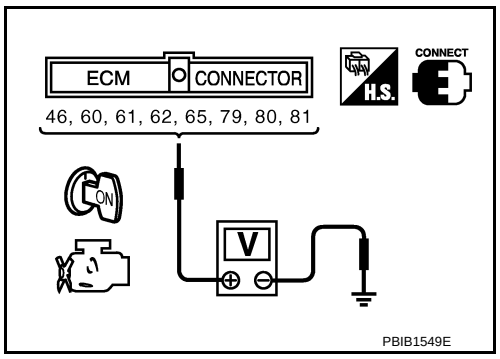
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

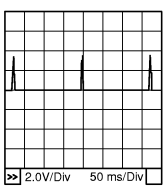
3.CHECK OVERALL FUNCTION

Without CONSULT-III

1. Let engine idle.
2. Read the voltage signal between ECM terminals 46, 60, 61, 62, 65, 79, 80, 81 and ground with an oscilloscope.
3. Verify that the oscilloscope screen shows the signal wave as shown below.
   NOTE:
   The pulse cycle changes depending on rpm at idle.



PBIB1549E



PBIB0044E

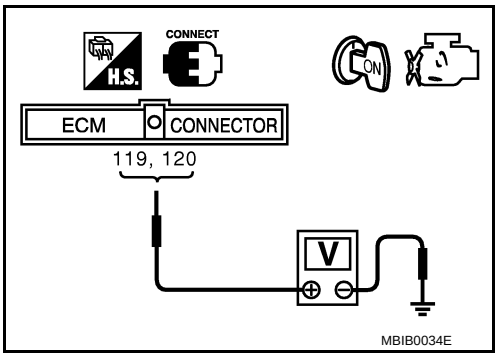
OK or NG

OK >> **INSPECTION END**
NG >> GO TO 10.

4. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-I

1. Turn ignition switch OFF, wait at least 10 seconds and then turn ON.
2. Check voltage between ECM terminals 119, 120 and ground with CONSULT-III or tester.

Voltage: Battery voltage

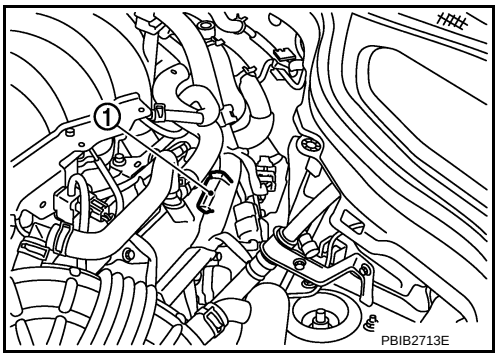


OK or NG

OK >> GO TO 5.
NG >> Go to EC-824, "Diagnosis Procedure".

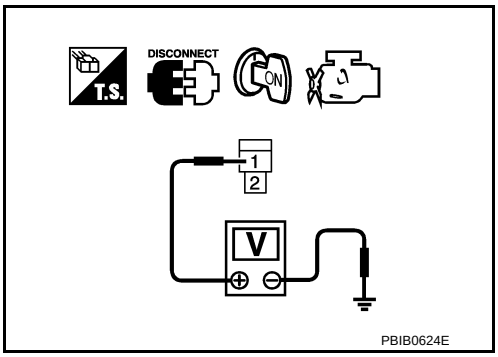
5. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-II

1. Turn ignition switch OFF.
2. Disconnect condenser (1) harness connector.
3. Turn ignition switch ON.



4. Check voltage between condenser terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 6.

6. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-III

1. Turn ignition switch OFF.
2. Disconnect IPDM E/R harness connector E7.
3. Check harness continuity between IPDM E/R terminal 17 and condenser terminal 1. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> Go to EC-824, "Diagnosis Procedure".
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3

- Harness for open or short between IPDM E/R and condenser

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK CONDENSER GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between condenser terminal 2 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to power in harness or connectors.

9. CHECK CONDENSER

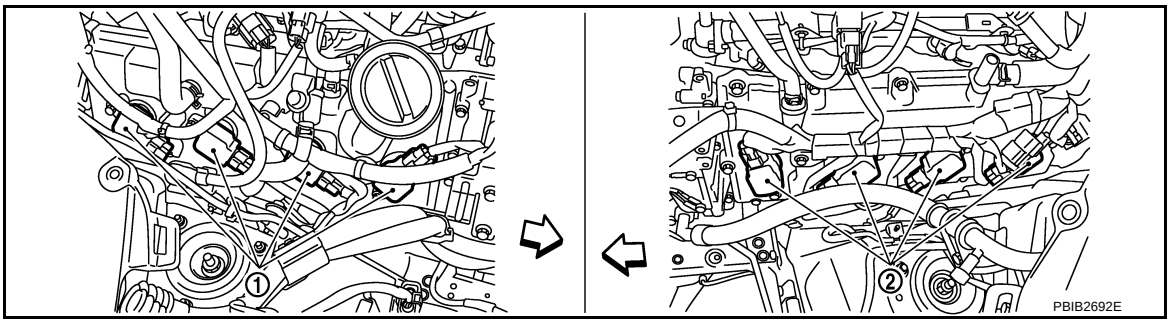
Refer to EC-1316, "Component Inspection"

OK or NG

OK >> GO TO 10.
NG >> Replace condenser.

10. CHECK IGNITION COIL POWER SUPPLY CIRCUIT-IV

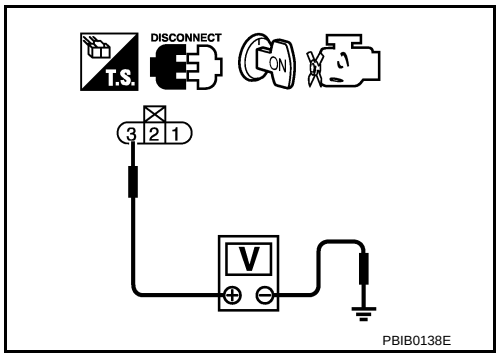
1. Turn ignition switch OFF.
2. Reconnect all harness connectors disconnected.
3. Disconnect ignition coil harness connector.



⇦ : Vehicle front
1. Ignition coil (with power transistor) (bank 2)
2. Ignition coil (with power transistor) (bank 1)

4. Turn ignition switch ON.
5. Check voltage between ignition coil terminal 3 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 12.
NG >> GO TO 11.

11. DETECT MALFUNCTIONING PART

Check the following.
- Harness connector F3
- Harness for open or short between ignition coil and harness connector F3

>> Repair or replace harness or connectors.

12. CHECK IGNITION COIL GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Check harness continuity between ignition coil terminal 2 and ground. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to power.

OK or NG

OK >> GO TO 13.
NG >> Repair open circuit or short to power in harness or connectors.

13. CHECK IGNITION COIL OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Disconnect ECM harness connector.
2. Check harness continuity between ECM terminals 46, 60, 61, 62, 65, 79, 80, 81 and ignition coil terminal 1. Refer to Wiring Diagram.

Continuity should exist.

3. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 14.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

14. CHECK IGNITION COIL WITH POWER TRANSISTOR

Refer to EC-1316, "Component Inspection".

OK or NG

OK >> GO TO 15.
NG >> Replace malfunctioning ignition coil with power transistor.

15. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

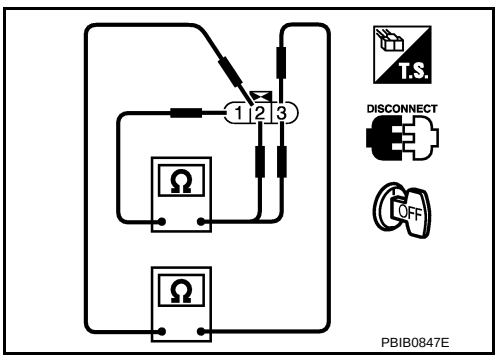
INFOID:0000000005354515

IGNITION COIL WITH POWER TRANSISTOR

CAUTION:

Perform the following procedure in a place with no combustible objects and good ventilation .

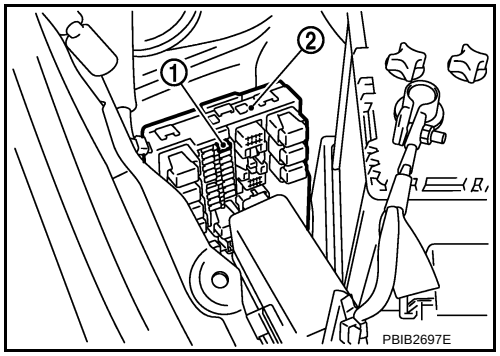
1. Turn ignition switch OFF.
2. Disconnect ignition coil harness connector.
3. Check resistance between ignition coil terminals as per the following.



Terminal No. (Polarity)	Resistance [at 25°C (77°F)]
1 and 2	Except 0 or ∞ Ω
1 and 3	Except 0 Ω
2 and 3	

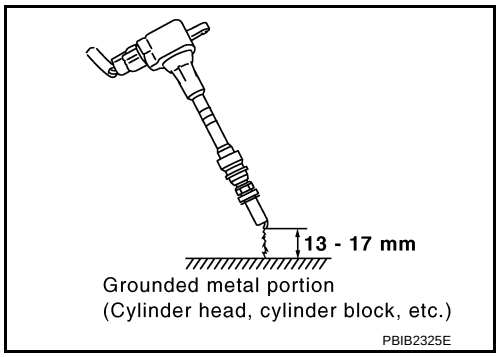
4. If NG, replace ignition coil with power transistor. If OK, go to next step.
5. Turn ignition switch OFF.
6. Reconnect all harness connectors disconnected.

7. Remove fuel pump fuse (1) in IPDM E/R (2) to release fuel pressure.
   NOTE:
   Do not use CONSULT-III to release fuel pressure, or fuel pressure applies again during the following procedure.
8. Start engine.
9. After engine stalls, crank it two or three times to release all fuel pressure.
10. Turn ignition switch OFF.
11. Remove all ignition coil harness connectors to avoid the electrical discharge from the ignition coils.
12. Remove ignition coil and spark plug of the cylinder to be checked.
13. Crank engine for 5 seconds or more to remove combustion gas in the cylinder.
14. Connect spark plug and harness connector to ignition coil.
15. Fix ignition coil using a rope etc. with gap of 13 - 17 mm between the edge of the spark plug and grounded metal portion as shown in the figure.
16. Crank engine for approximately 3 seconds, and check whether spark is generated between the spark plug and the grounded metal portion.



Spark should be generated.

CAUTION:
- **Never place the spark plug and the ignition coil within 50 cm 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 is made.**



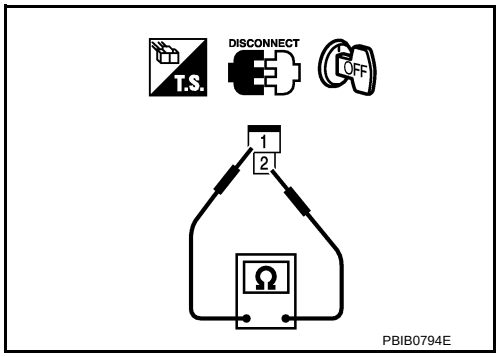
NOTE:
When the gap is less than 13 mm, spark might be generated even if the coil is malfunctioning.

17. If NG, replace malfunctioning ignition coil with power transistor.

CONDENSER

1. Turn ignition switch OFF.
2. Disconnect condenser harness connector.
3. Check resistance between condenser terminals 1 and 2.

Resistance: **Above 1 MΩ [at 25°C (77°F)]**



Removal and Installation

INFOID:0000000005354516

IGNITION COIL WITH POWER TRANSISTOR

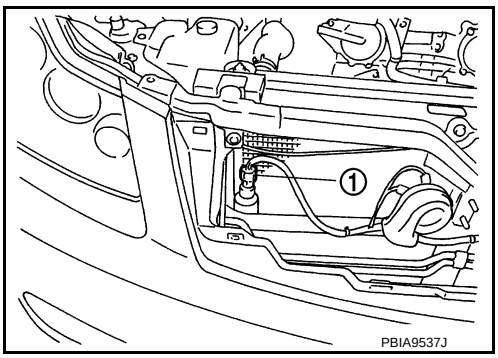
Refer to EM-187, "Component".

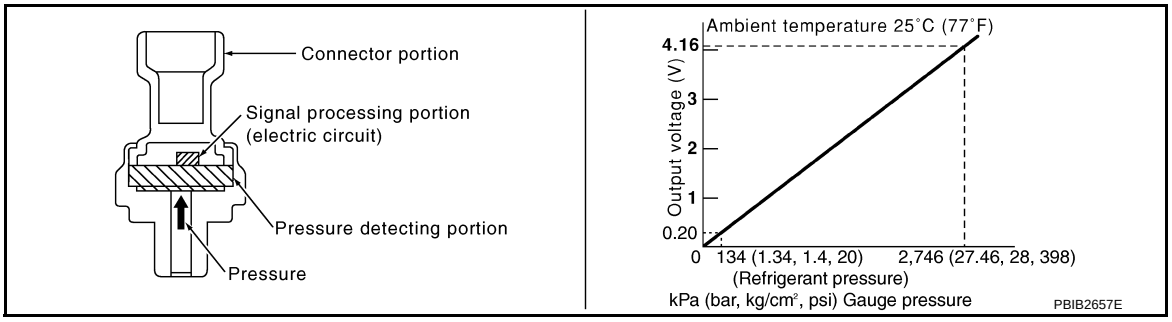
REFRIGERANT PRESSURE SENSOR

Component Description

INFOID:0000000005354517

The refrigerant pressure sensor (1) 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.

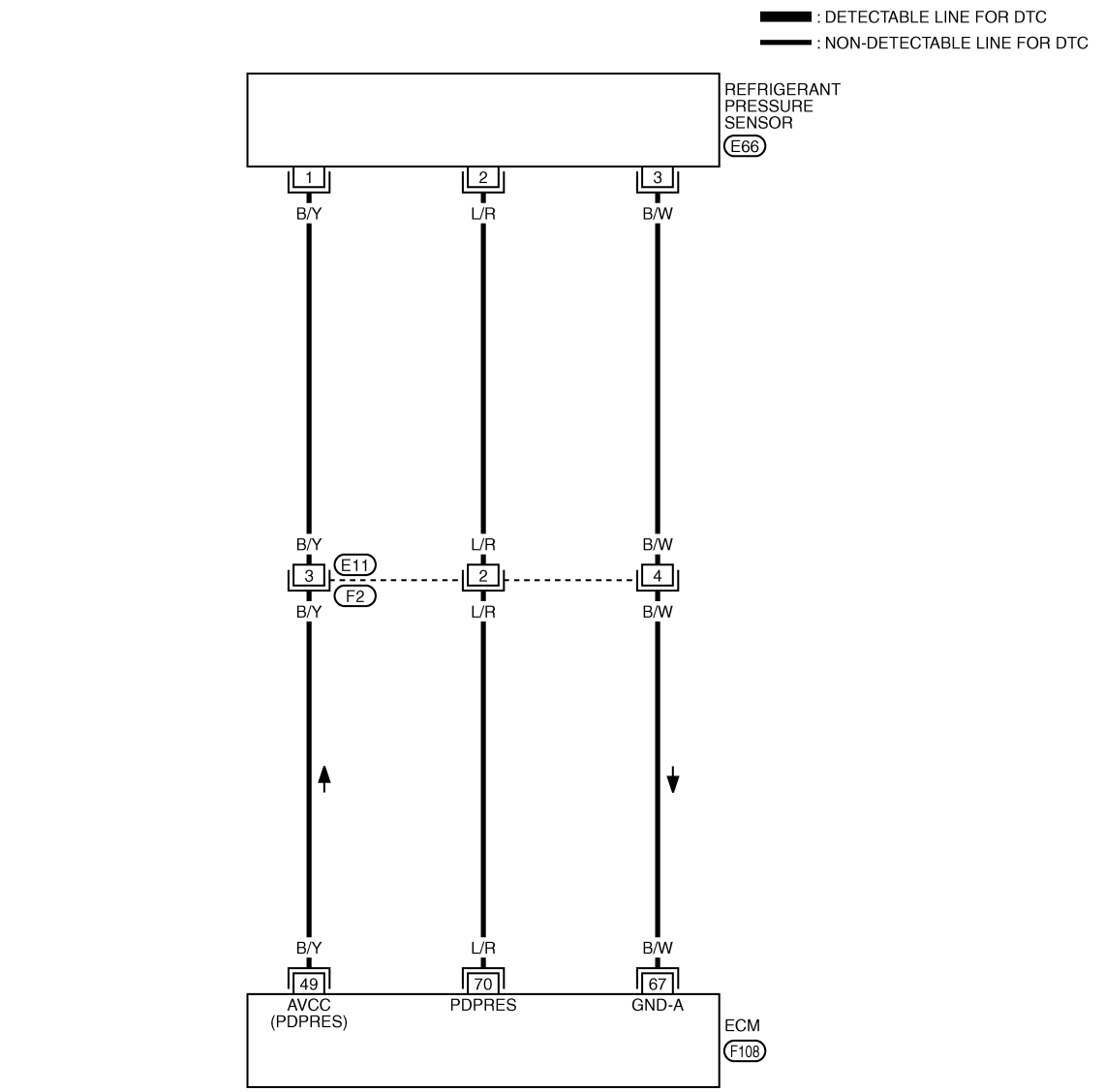




Wiring Diagram

INFOID:0000000005354518

EC-RP/SEN-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TER-MI-NAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
49	B/Y	Sensor power supply (Refrigerant pressure sensor)	**[Ignition switch: ON]**	Approximately 5 V
67	B/W	Sensor ground (Refrigerant pressure sensor)	**[Engine is running]** • **Warm-up condition** • Idle speed	Approximately 0 V
70	L/R	Refrigerant pressure sensor	**[Engine is running]** • **Warm-up condition** • Both A/C switch and blower fan motor switch: ON (Compressor operates)	1.0 - 4.0 V

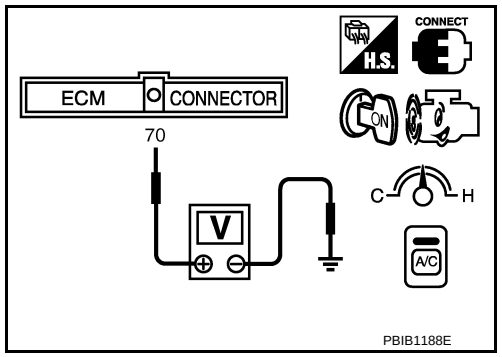
Diagnosis Procedure

INFOID:0000000005354519

1.CHECK REFRIGERANT PRESSURE SENSOR OVERALL FUNCTION

1. Start engine and warm it up to normal operating temperature.
2. Turn A/C switch and blower fan switch ON.
3. Check voltage between ECM terminal 70 and ground with CONSULT-III or tester.

Voltage: 1.0 - 4.0 V

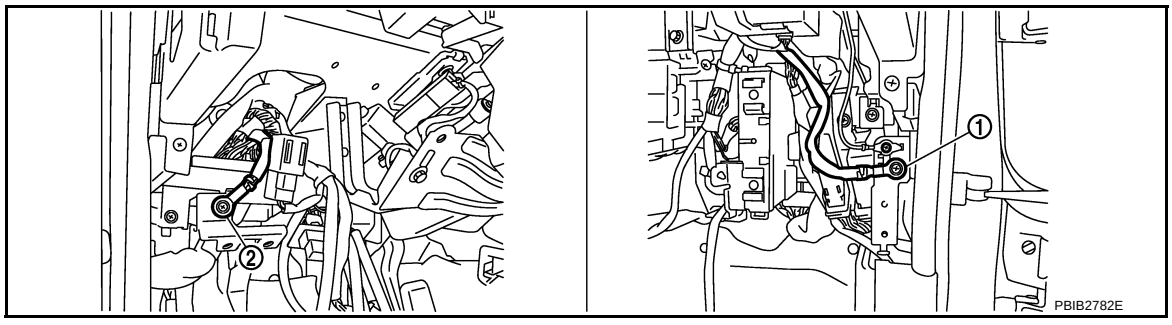


OK or NG

OK >> **INSPECTION END**
NG >> GO TO 2.

2.CHECK GROUND CONNECTIONS

1. Turn A/C switch and blower fan switch OFF.
2. Turn ignition switch OFF.
3. Loosen and retighten ground screws on the body.
Refer to EC-828, "Ground Inspection".



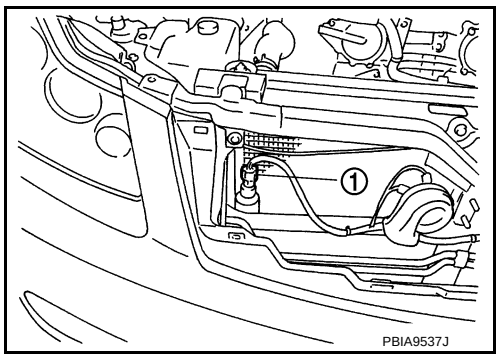
1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 3.
NG >> Repair or replace ground connections.

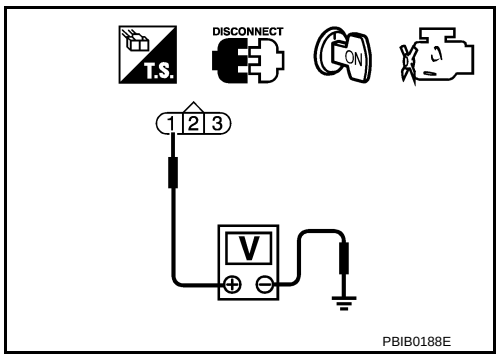
3.CHECK REFRIGERANT PRESSURE SENSOR POWER SUPPLY CIRCUIT

1. Disconnect refrigerant pressure sensor (1) harness connector.
2. Turn ignition switch ON.



3. Check voltage between refrigerant pressure sensor terminal 1 and ground with CONSULT-III or tester.

Voltage: Approximately 5 V



OK or NG

OK >> GO TO 5.
NG >> GO TO 4.

4. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

5. CHECK REFRIGERANT PRESSURE SENSOR GROUND CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between refrigerant pressure sensor terminal 3 and ECM terminal 67. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 7.
NG >> GO TO 6.

6. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK REFRIGERANT PRESSURE SENSOR INPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between ECM terminal 70 and refrigerant pressure sensor terminal 2. Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> GO TO 8.

8. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E11, F2
- Harness for open or short between ECM and refrigerant pressure sensor

>> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

OK or NG

OK >> Replace refrigerant pressure sensor.
NG >> Repair or replace malfunctioning part.

Removal and Installation

INFOID:0000000005354520

REFRIGERANT PRESSURE SENSOR

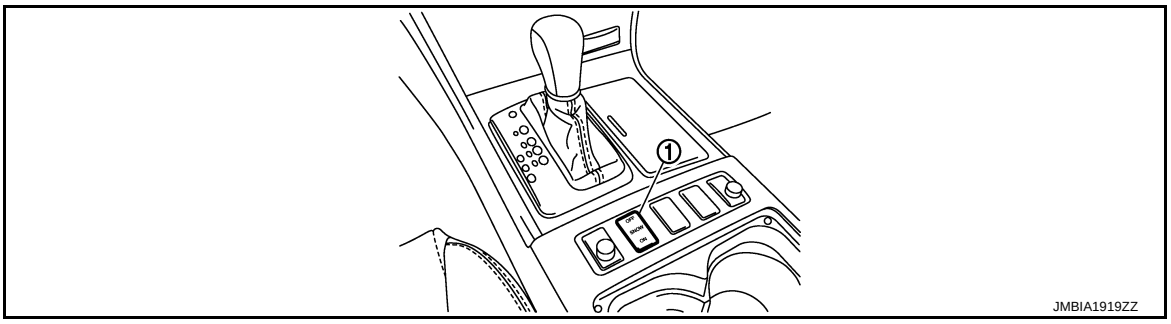
Refer to ATC-165, "VK45DE : Removal and Installation of Refrigerant Pressure Sensor".

SNOW MODE SWITCH

Description

INFOID:0000000005354521

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 be accelerated immediately than your original pedal in due to avoid the vehicle slip. In other words, ECM controls the rapid engine torque change by controlling the electric throttle control actuator operating speed.



1. Snow mode switch

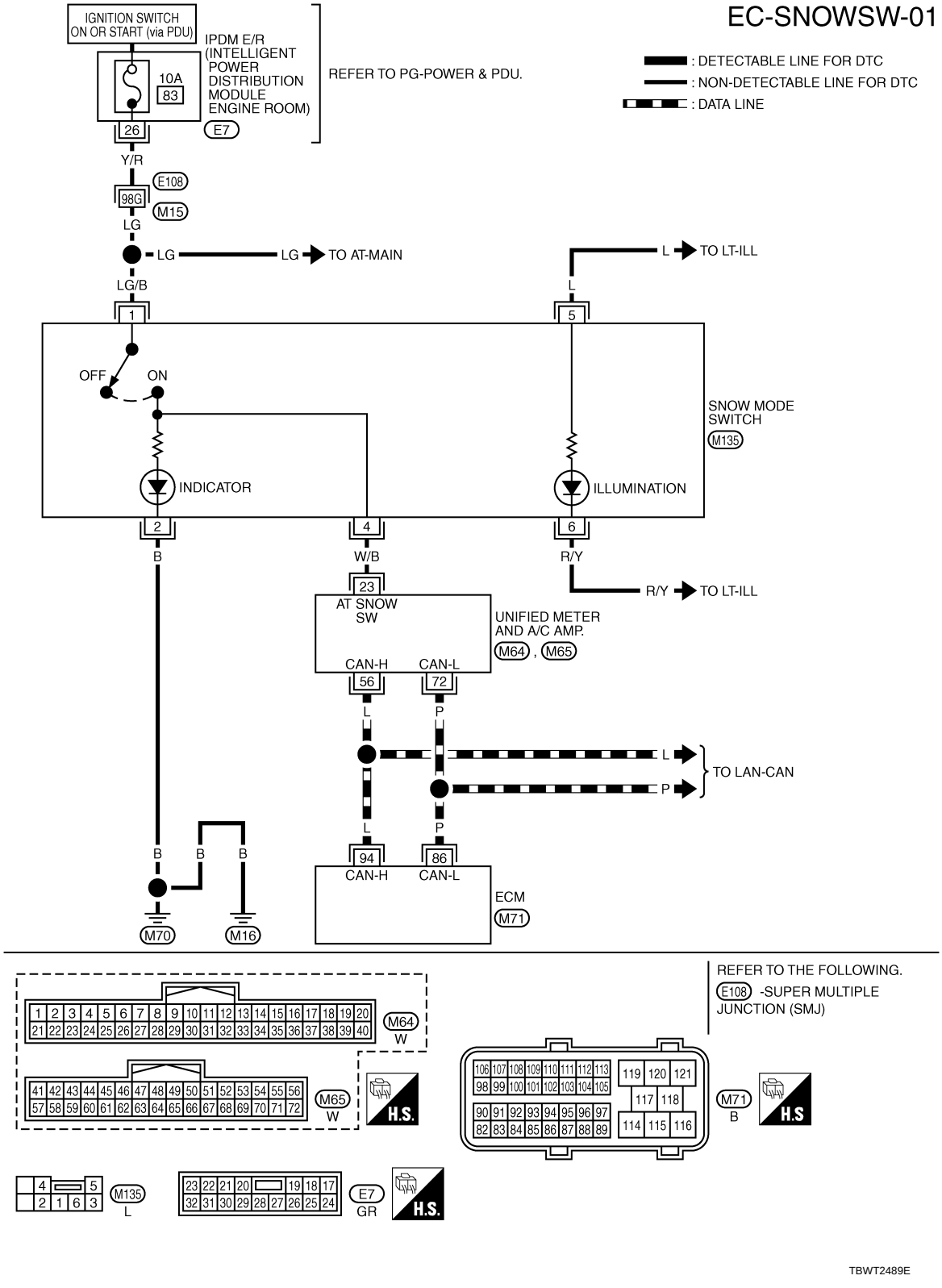
CONSULT-III Reference Value in Data Monitor Mode

INFOID:0000000005354522

MONITOR ITEM	CONDITION		SPECIFICATION
SNOW MODE SW	• Ignition switch: ON	SNOW MODE SW: ON	ON
		SNOW MODE SW: OFF	OFF

Wiring Diagram

INFOID:0000000005354523



TBWT2489E

Diagnosis Procedure

INFOID:0000000005354524

1. CHECK SNOW MODE SWITICH OVERALL FUNCTION-I

1. Turn ignition switch ON.
2. Select “SNOW MODE SW” in “DATA MONITOR” mode with CONSULT-III.
3. Check “SNOW MODE SW” indication under the following conditions.

CONDITION	INDICATION
Snow mode switch: ON	ON
Snow mode switch: OFF	OFF

OK or NG

OK >> GO TO 2.
NG >> GO TO 3.

2. CHECK SNOW MODE SWITICH OVERALL FUNCTION-II

1. Turn ignition switch ON.
2. Start engine.
3. Check the snow mode indicator in the snow mode switch under the following condition.

CONDITION	INDICATION
Snow mode switch: ON	ON
Snow mode switch: OFF	OFF

OK or NG

OK >> **INSPECTION END**
NG >> GO TO 7.

3. CHECK DTC WITH “UNIFIED METER AND A/C AMP.”

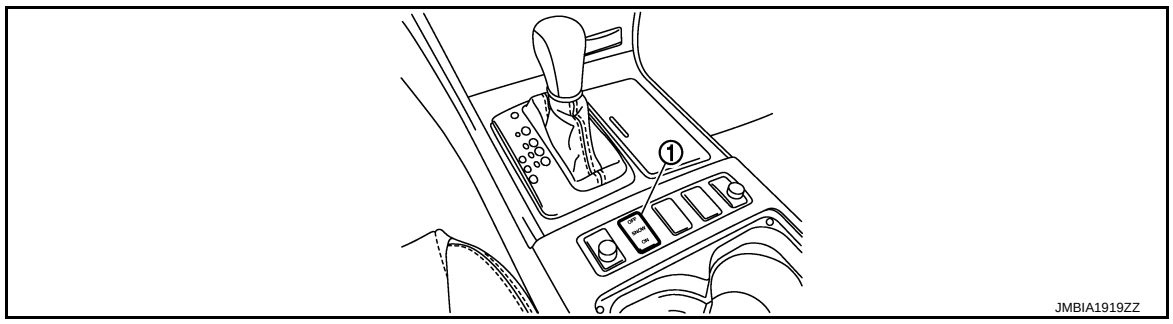
Refer to DI-28, "CONSULT-III Function (METER/M&A)".

OK or NG

OK >> GO TO 4.
NG >> Follow the instructions of DI-28, "CONSULT-III Function (METER/M&A)".

4. CHECK SNOW MODE SWITCH POWER SUPPLY CIRCUIT

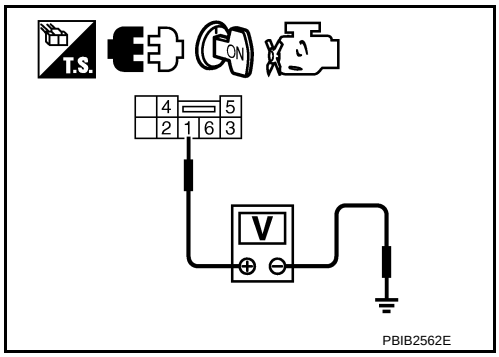
1. Turn ignition switch OFF.
2. Disconnect snow mode switch harness connector.



1. Snow mode switch

3. Turn ignition switch ON.
4. Check voltage between snow mode switch terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage.



OK or NG

OK >> GO TO 6.
NG >> GO TO 5.

5. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E108, M15
- IPDM E/R harness connector E7
- 10 A fuse
- Harness for open or short between snow mode switch and fuse.

>> Repair open circuit or short to ground or short to power in harness or connectors.

6. 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 harness continuity between snow mode switch terminal 4 and “unified meter and A/C amp.” terminal 23. Refer to Wiring Diagram.

Continuity should exist.

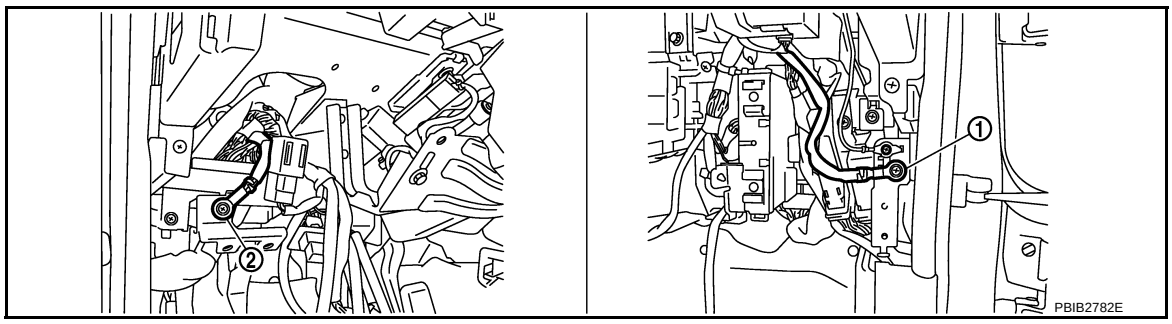
4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

7. CHECK GROUND CONNECTIONS

1. Turn ignition switch OFF.
2. Loosen and retighten ground screws on the body.
Refer to EC-828, "Ground Inspection".



1. Body ground M70
2. Body ground M16

OK or NG

OK >> GO TO 8.
NG >> Repair or replace ground connections.

8. CHECK SNOW MODE INDICATOR LAMP GROUND CIRCUIT FOR OPEN AND SHORT

1. Check harness continuity between snow mode switch terminal 2 and ground.
Refer to Wiring Diagram.

Continuity should exist.

2. Also check harness for short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to power in harness or connectors.

9. CHECK SNOW MODE SWITCH

Refer to EC-1327, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> Replace snow mode switch.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

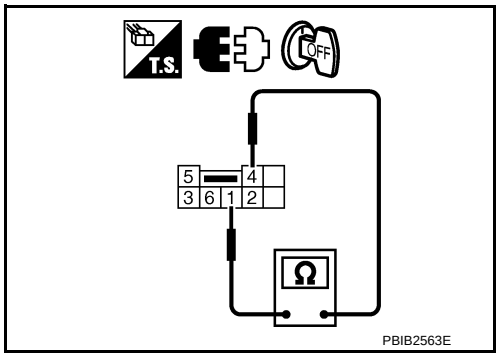
Component Inspection

INFOID:0000000005354525

SNOW MODE SWITCH

1. Check continuity between snow mode switch terminals 1 and 4 under the following conditions.

CONDITION	CONTINUITY
Snow mode switch: ON	Should exist
Snow mode switch: OFF	Should not exist

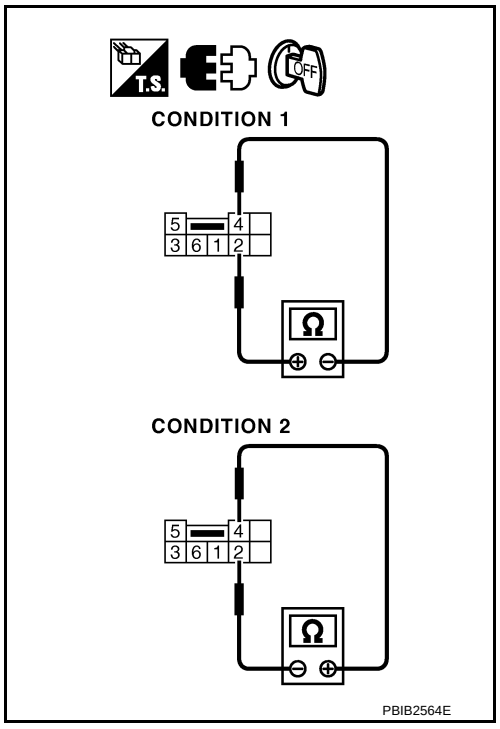


PBIB2563E

2. If NG, replace snow mode switch.
   If OK, go to following step.

3. Check continuity between snow mode switch terminals 2 and 4 under the following conditions.

CONDITION	CONTINUITY
1	Should exist.
2	Should not exist.



PBIB2564E

4. If NG, replace snow mode switch.

VIAS

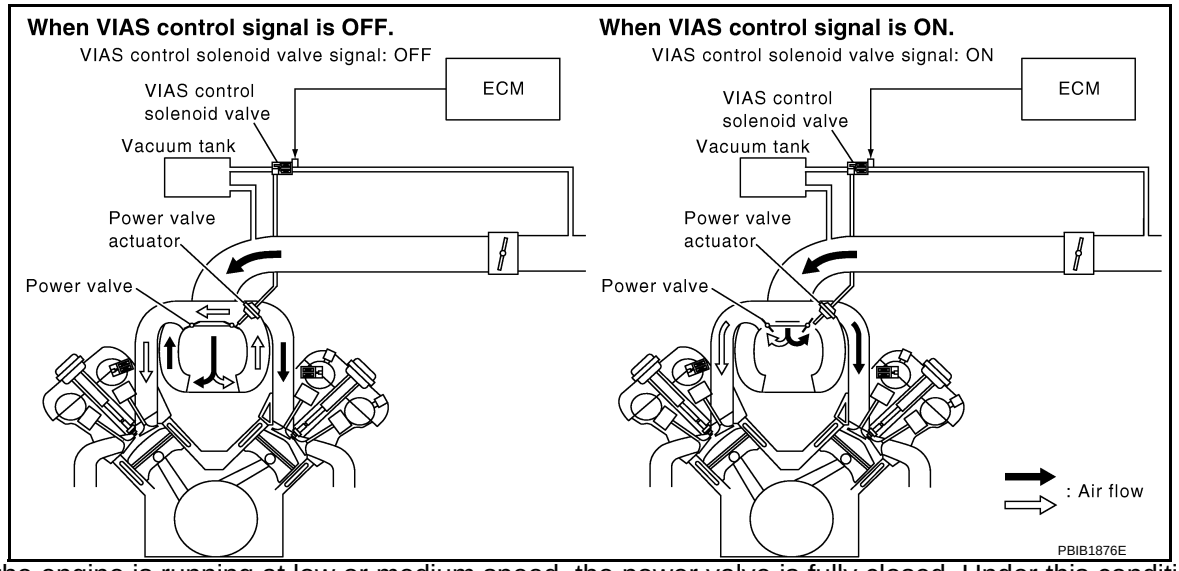
Description

INFOID:0000000005354526

SYSTEM DESCRIPTION

Sensor	Input signal to ECM	ECM function	Actuator
Crankshaft position sensor (POS) Camshaft position sensor (PHASE)	Engine speed*	VIAS control	VIAS control solenoid valve
Mass air flow sensor	Amount of intake air		
Throttle position sensor	Throttle position		
Accelerator pedal position sensor	Accelerator pedal position		
Battery	Battery voltage*		
Engine coolant temperature sensor	Engine coolant temperature		

*: The ECM determines the start signal status by the signals of engine speed and battery voltage.



When the engine is running at low or medium speed, the power valve is fully closed. Under this condition, the effective suction port length is equivalent to the total length of the intake manifold collector's suction port including the intake valve. This long suction port provides increased air intake which results in improved suction efficiency and higher torque generation.

The surge tank and one-way valve are provided. When engine is running at high speed, the ECM sends the signal to the VIAS control solenoid valve. This signal introduces the intake manifold vacuum into the power valve actuator and therefore opens the power valve to two suction passages together in the collector.

Under this condition, the effective port length is equivalent to the length of the suction port provided independently for each cylinder. This shortened port length results in enhanced engine output with reduced suction resistance under high speeds.

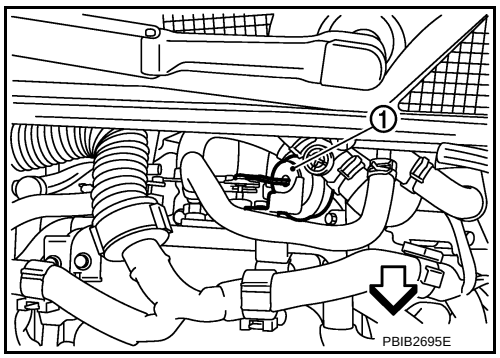
The power valve is always open regardless of the engine speed when gear position is in N or P.

COMPONENT DESCRIPTION

Power Valve

The power valve is installed in intake manifold collector and used to control the suction passage of the variable induction air control system. It is set in the fully closed or fully opened position by the power valve actuator (1) operated by the vacuum stored in the surge tank. The vacuum in the surge tank is controlled by the VIAS control solenoid valve.

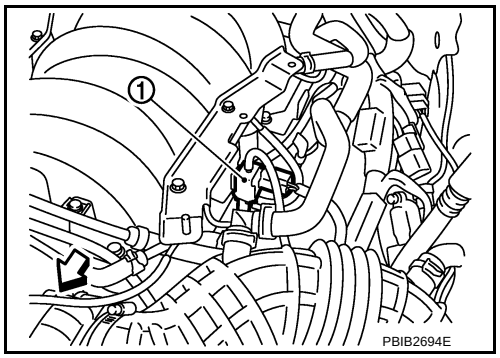
- ⇦: Vehicle front



VIAS Control Solenoid Valve

The VIAS control solenoid valve (1) cuts the intake manifold vacuum signal for power valve actuator. It responds to ON/OFF signals from the ECM. When the solenoid is off, the vacuum signal from the intake manifold is cut. When the ECM sends an ON signal the coil pulls the plunger downward and feeds the vacuum signal to the power valve actuator.

- ⇦: Vehicle front



CONSULT-III Reference Value in Data Monitor Mode

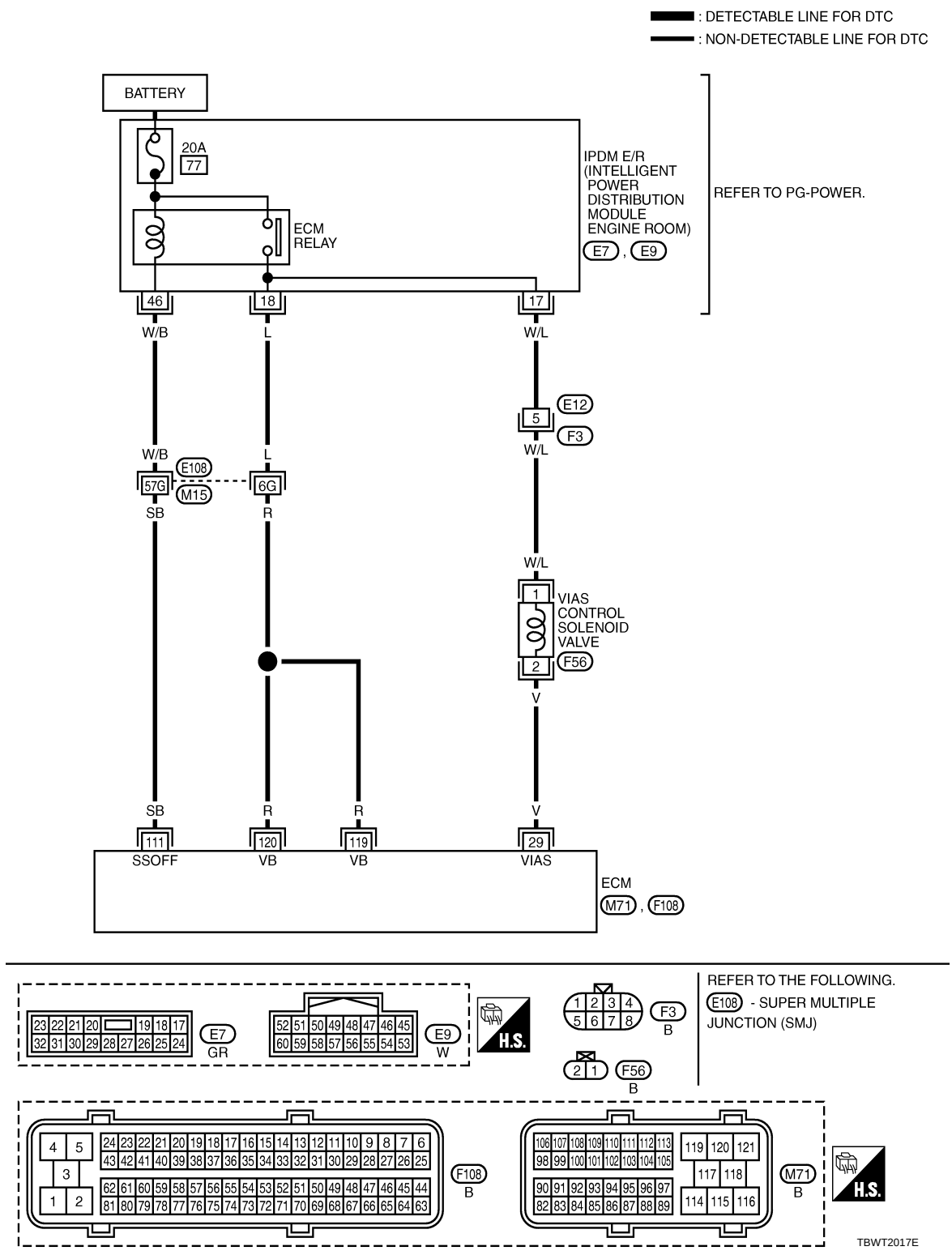
INFOID:0000000005354527

MONITOR ITEM	CONDITION	SPECIFICATION
VIAS S/V-1	• Selector lever position: P or N	ON
	• Engine speed: More than 5,000 rpm	
	• Selector lever position: Except P or N • Engine speed: Less than 5,000 rpm	OFF

Wiring Diagram

INFOID:0000000005354528

EC-VIAS-01



Specification data are reference values and are measured between each terminal and ground.

CAUTION:

Never use ECM ground terminals when measuring input/output voltage. Doing so may result in damage to the ECM's transistor. Use a ground other than ECM terminals, such as the ground.

TERMINAL NO.	WIRE COLOR	ITEM	CONDITION	DATA (DC Voltage)
29	V	VIAS control solenoid valve	**[Engine is running]** • Selector lever position: P or N	0 - 1.0 V
			[Engine is running] • Selector lever position: D • Engine speed: Below 5,000 rpm	BATTERY VOLTAGE (11 - 14 V)
			[Engine is running] • Engine speed: Above 5,000 rpm	0 - 1.0 V
111	SB	ECM relay (Self shut-off)	**[Engine is running]** **[Ignition switch: OFF]** • For 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)
119 120	R R	Power supply for ECM	**[Ignition switch: ON]**	BATTERY VOLTAGE (11 - 14 V)

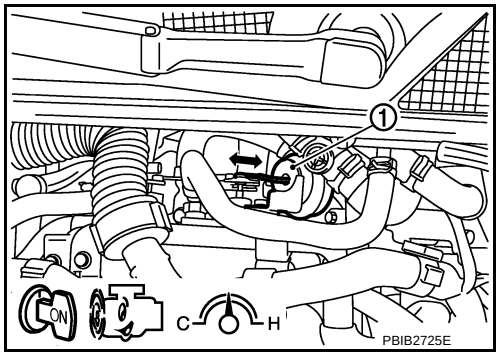
Diagnosis Procedure

INFOID:0000000005354529

1. CHECK OVERALL FUNCTION

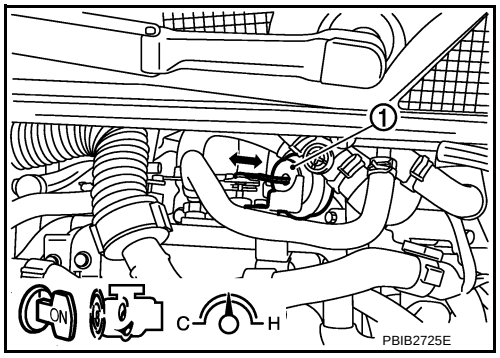
With CONSULT-III

1. Start engine and warm it up to normal operating temperature.
2. Perform “VIAS S/V-1” in “ACTIVE TEST” mode with CONSULT-III.
3. Turn VIAS control solenoid valve ON and OFF, and check that power valve actuator (1) rod moves.



Without CONSULT-III

1. Lift up the vehicle.
2. Start engine and warm it up to normal operating temperature.
3. Check that power valve actuator (1) rod moves when changing the selector lever position to the N and D alternately.



OK or NG

OK >> **INSPECTION END**
NG (With CONSULT-III)>>GO TO 2.
NG (Without CONSULT-III)>>GO TO 3.

2. CHECK VACUUM EXISTENCE

With CONSULT-III

1. Stop engine and disconnect vacuum hose connected to power valve actuator.

2. Start engine and let it idle.
3. Perform “VIAS S/V-1” in “ACTIVE TEST” mode with CONSULT-III.
4. Turn VIAS control solenoid valve ON and OFF, and check vacuum existence under the following conditions.

VIAS S/V-1	Vacuum
ON	Should exist.
OFF	Should not exist.

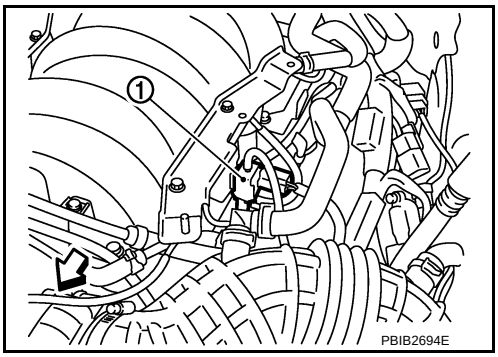
OK or NG

OK >> Repair or replace power valve actuator.
NG >> GO TO 4.

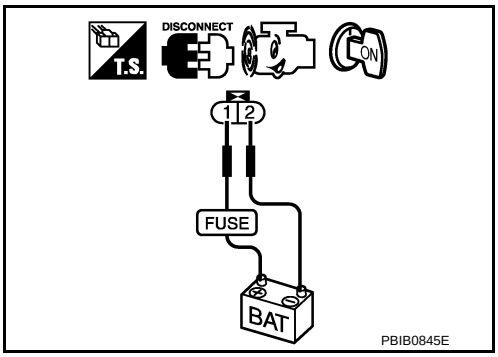
3. CHECK VACUUM EXISTENCE

Without CONSULT-III

1. Stop engine and disconnect vacuum hose connected to power valve actuator.
2. Disconnect VIAS control solenoid valve (1) harness connector.
- ⇦: Vehicle front
3. Start engine and let it idle.



4. Apply 12 V of direct current between VIAS control solenoid valve terminals 1 and 2.
5. Check vacuum existence under the following conditions.



Condition	Vacuum
12 V direct current supply	Should exist.
No supply	Should not exist.

OK or NG

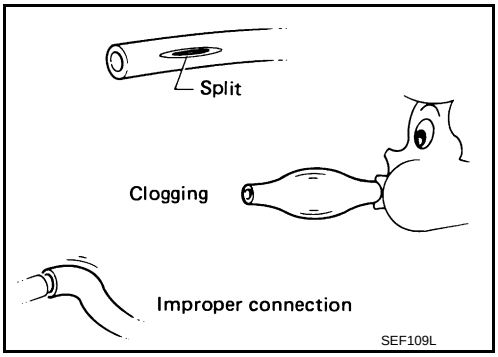
OK >> Repair or replace power valve actuator.
NG >> GO TO 4.

4. CHECK VACUUM HOSE

1. Stop engine.
2. Check hoses and tubes between intake manifold and power valve actuator for cracks, clogging, improper connection or disconnection. Refer to EC-788, "Vacuum Hose Drawing".

OK or NG

OK >> GO TO 5.
NG >> Repair hoses or tubes.



5. CHECK VACUUM TANK

Refer to EC-1334, "Component Inspection".

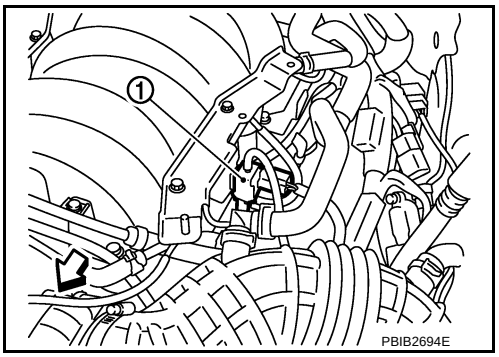
OK or NG

OK >> GO TO 6.

NG >> Replace vacuum tank.

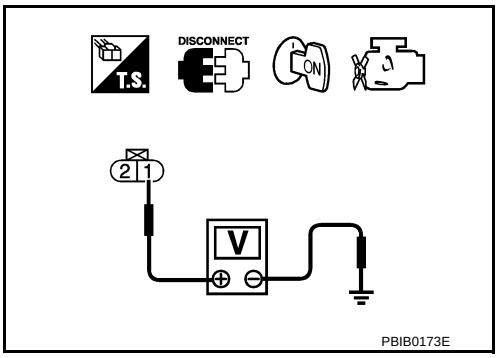
6. CHECK VIAS CONTROL SOLENOID VALVE POWER SUPPLY CIRCUIT

1. Turn ignition switch OFF.
2. Disconnect VIAS control solenoid valve (1) harness connector.
- ⇦: Vehicle front
3. Turn ignition switch ON.



4. Check voltage between VIAS control solenoid valve terminal 1 and ground with CONSULT-III or tester.

Voltage: Battery voltage



OK or NG

OK >> GO TO 8.
NG >> GO TO 7.

7. DETECT MALFUNCTIONING PART

Check the following.
- Harness connectors E12, F3
- Harness continuity between IPDM E/R and VIAS control solenoid valve

>> Repair open circuit or short to ground or short to power in harness or connectors.

8. CHECK VIAS CONTROL SOLENOID VALVE OUTPUT SIGNAL CIRCUIT FOR OPEN AND SHORT

1. Turn ignition switch OFF.
2. Disconnect ECM harness connector.
3. Check harness continuity between ECM terminal 29 and VIAS control solenoid valve terminal 2. Refer to Wiring Diagram.

Continuity should exist.

4. Also check harness for short to ground and short to power.

OK or NG

OK >> GO TO 9.
NG >> Repair open circuit or short to ground or short to power in harness or connectors.

9. CHECK VIAS CONTROL SOLENOID VALVE

Refer to EC-1334, "Component Inspection".

OK or NG

OK >> GO TO 10.
NG >> Replace VIAS control solenoid valve.

10. CHECK INTERMITTENT INCIDENT

Refer to EC-822, "Diagnosis Procedure".

>> **INSPECTION END**

Component Inspection

INFOID:0000000005354530

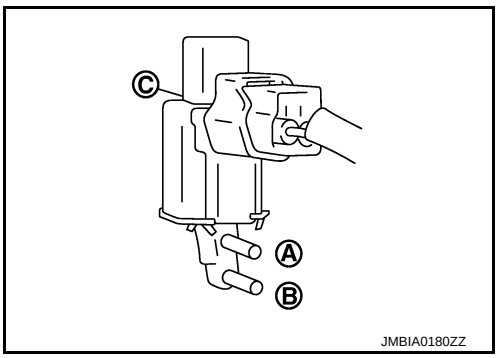
VIAS CONTROL SOLENOID VALVE

With CONSULT-III

1. Reconnect harness connectors disconnected.
2. Turn ignition switch ON.
3. Perform “VIAS S/V-1” in “ACTIVE TEST” mode.
4. Check air passage continuity and operation delay time under the following conditions.

Condition VIAS S/V-1	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
ON	Yes	No
OFF	No	Yes

Operation takes less than 1 second.

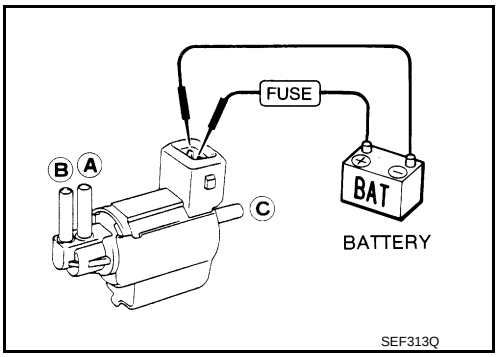


Without CONSULT-III

Check air passage continuity and operation delay time under the following conditions.

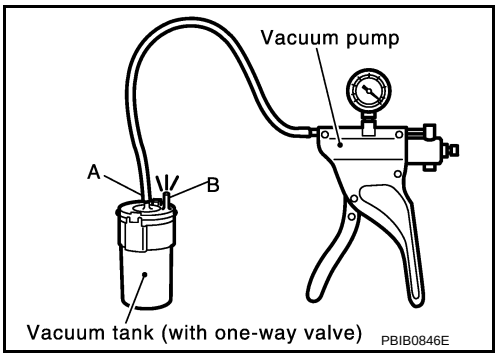
Condition	Air passage continuity between (A) and (B)	Air passage continuity between (A) and (C)
12V direct current supply between terminals 1 and 2	Yes	No
No supply	No	Yes

Operation takes less than 1 second.



VACUUM TANK

1. Disconnect vacuum hose connected to vacuum tank.
2. Connect a vacuum pump to the port A of vacuum tank.
3. Apply vacuum and make sure that vacuum exists at the port B.



Removal and Installation

INFOID:0000000005354531

VIAS CONTROL SOLENOID VALVE

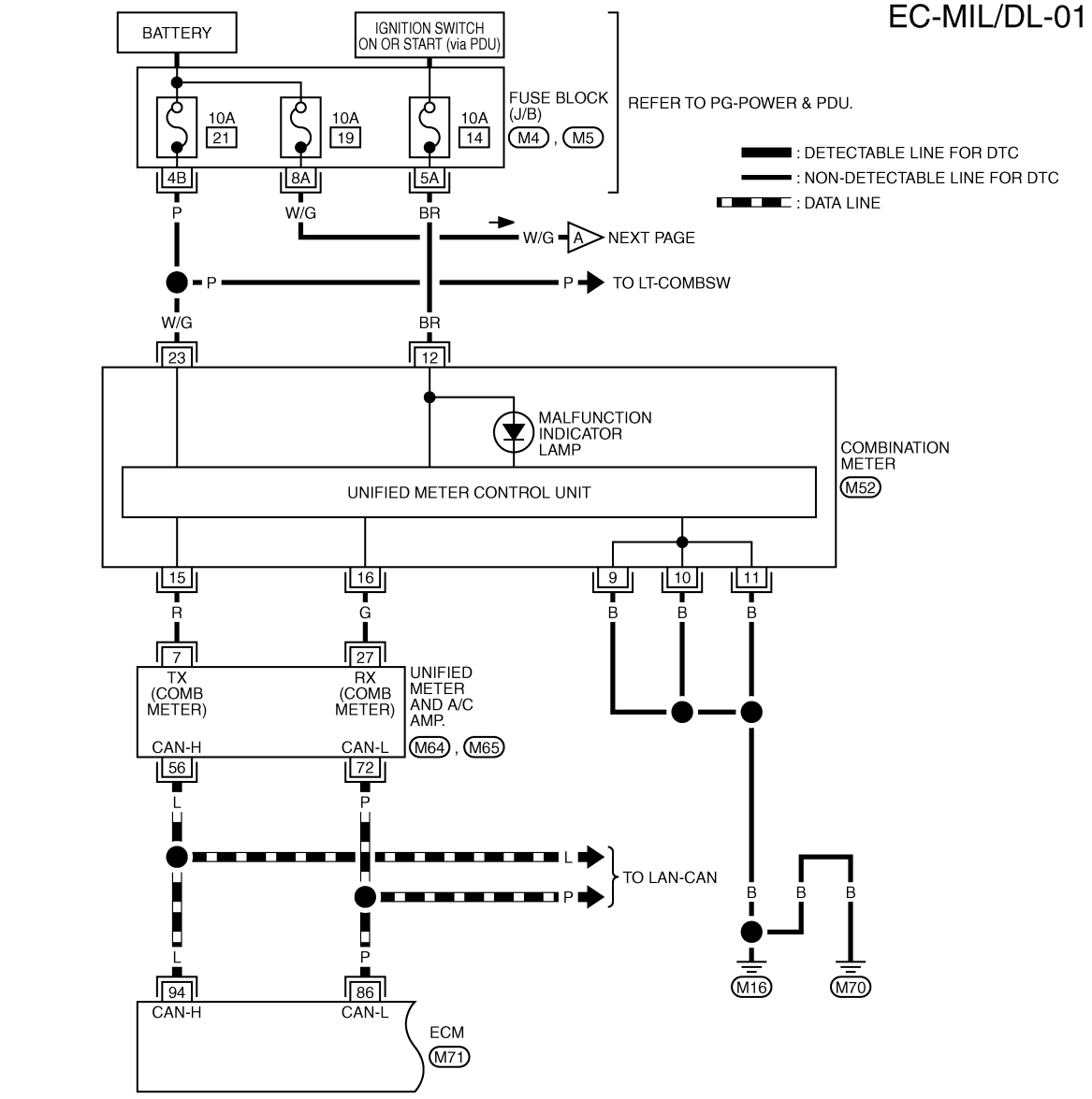
Refer to EM-174, "Component".

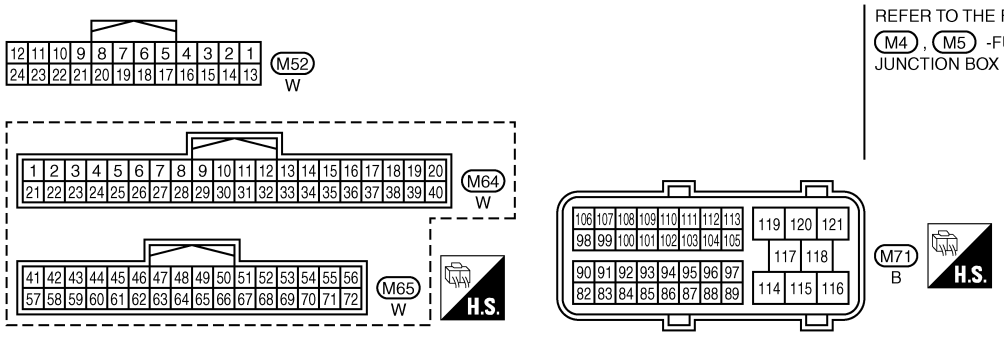
MIL AND DATA LINK CONNECTOR

Wiring Diagram

INFOID:0000000005354532

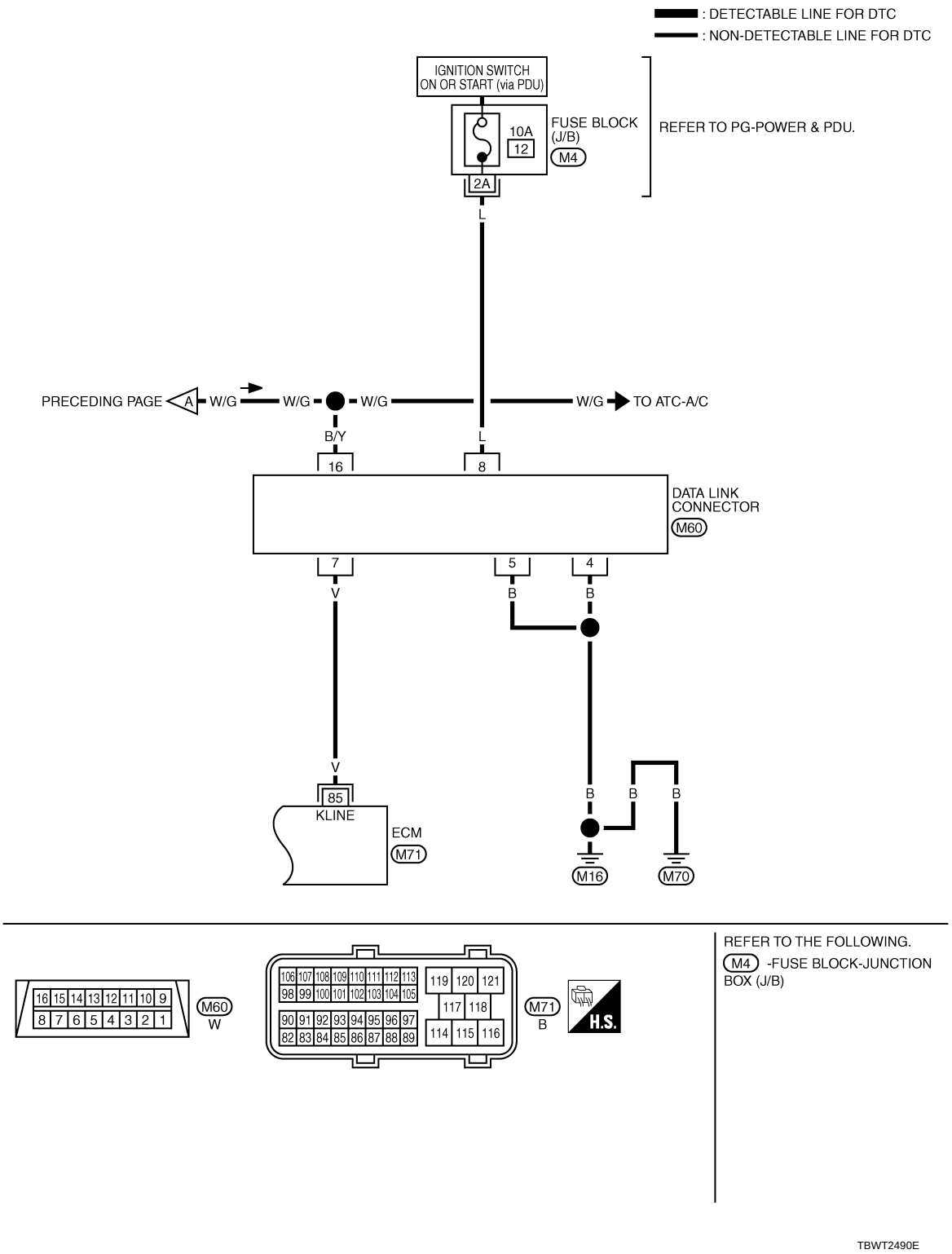
EC-MIL/DL-01





TBWT1508E

EC-MIL/DL-02


: DETECTABLE LINE FOR DTC
: NON-DETECTABLE LINE FOR DTC
IGNITION SWITCH ON OR START (via PDU)
FUSE BLOCK (J/B)
M4
10A
12
2A
REFER TO PG-POWER & PDU.
L
PRECEDING PAGE
A
W/G
W/G
W/G
W/G
TO ATC-A/C
B/Y
L
16
8
DATA LINK CONNECTOR
M60
7
5
4
V
B
B
V
85
KLINE
ECM
M71
B
B
B
M16
M70
16 15 14 13 12 11 10 9
8 7 6 5 4 3 2 1
M60
W
106 107 108 109 110 111 112 113
98 99 100 101 102 103 104 105
90 91 92 93 94 95 96 97
82 83 84 85 86 87 88 89
119 120 121
117 118
114 115 116
M71
B
H.S.
REFER TO THE FOLLOWING.
M4 -FUSE BLOCK-JUNCTION BOX (J/B)
TBWT2490E

SERVICE DATA AND SPECIFICATIONS (SDS)

Fuel Pressure

INFOID:0000000005354533

Fuel pressure at idling [kPa (kg/cm^2, psi)]	Approximately 350 (3.57, 51)

Idle Speed and Ignition Timing

INFOID:0000000005354534

Idle speed	No load* (in P or N position)	650 ± 50 rpm
Air conditioner: ON	In P or N position	650 rpm or more
Ignition timing	In P or N position	12 ± 5° BTDC

*: Under the following conditions:

- Air conditioner switch: OFF
- Electric load: OFF (Lights, heater fan & rear window defogger)
- Steering wheel: Kept in straight-ahead position

Calculated Load Value

INFOID:0000000005354535

Condition	Calculated load value [% (Using CONSULT-III or GST)]
At idle	14 - 33
At 2,500 rpm	12 - 25

Mass Air Flow Sensor

INFOID:0000000005354536

Supply voltage	Battery voltage (11 - 14 V)
Output voltage at idle	0.9 - 1.2 V*
Mass air flow (Using CONSULT-III or GST)	2.0 - 6.0 g·m/sec at idle* 7.0 - 20.0 g·m/sec at 2,500 rpm*

*: Engine is warmed up to normal operating temperature and running under no load.

Intake Air Temperature Sensor

INFOID:0000000005354537

Temperature [°C (°F)]	Resistance (kΩ)
25 (77)	1.800 - 2.200

Engine Coolant Temperature Sensor

INFOID:0000000005354538

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.1 - 2.9
50 (122)	0.68 - 1.00
90 (194)	0.236 - 0.260

Fuel Tank Temperature Sensor

INFOID:0000000005354539

Temperature [°C (°F)]	Resistance (kΩ)
20 (68)	2.3 - 2.7
50 (122)	0.79 - 0.90

Crankshaft Position Sensor (POS)

INFOID:0000000005354540

Refer to EC-1018, "Component Inspection".

Camshaft Position Sensor (PHASE)

INFOID:0000000005354541

Refer to EC-1024, "Component Inspection".

A/F Sensor 1 Heater

INFOID:0000000005354542

Resistance [at 25°C (77°F)]	2.3 - 4.3 Ω

Heated Oxygen Sensor 2 Heater

INFOID:0000000005354543

Resistance [at 25°C (77°F)]	5.0 - 7.0 Ω

Throttle Control Motor

INFOID:0000000005354544

Resistance [at 25°C (77°F)]	Approximately 1 - 15 Ω

Fuel Injector

INFOID:0000000005354545

Resistance [at 10 - 60°C (50 - 140°F)]	13.5 - 17.5 Ω

Fuel Pump

INFOID:0000000005354546

Resistance [at 25°C (77°F)]	0.2 - 5.0 Ω